Galileo Was Wrong
The Church Was Right

The Evidence from
Modern Science

Seventh edition

Volume 1

Chapters 1 to 6

Robert A. Sungenis, Ph.D.
and
Robert J. Bennett, Ph.D.

Special Appreciation

This volume is dedicated to:

Albert Einstein
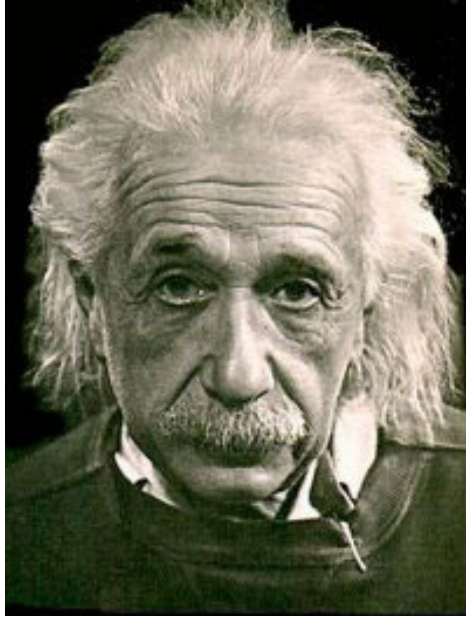
…who invented Special Relativity to counter
experiments revealing that the Earth was motionless
in space, which then led him to General Relativity
that forced him to accept a motionless Earth as a
viable and worthy cosmological system

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About the Authors

Robert A. Sungenis, Ph.D., is the founder of Catholic Apologetics International Publishing, Inc., a non-profit corporation. He holds advanced degrees in Theology and Religious Studies and was a physics major in college. His 700-page doctoral dissertation defended geocentric cosmology from scientific, theological and historical perspectives. He is the author of over twenty books on religion, politics, science and culture. He is also the managing partner of Stellar Motion Pictures, LLC in Los Angeles, which specializes in producing movies on science and religion. He is the executive producer of the recently released movie, *The Principle*. He has appeared on radio and television, including programs on CNN, the BBC and EWTN. He has authored all the chapters and appendices for *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science*, except for Chapter 10.
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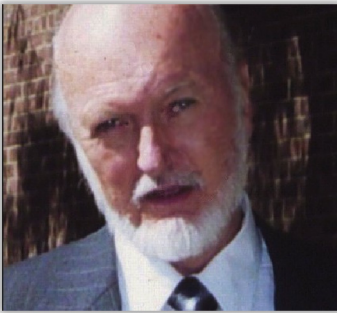
Robert J. Bennett, Ph.D., holds a doctorate in Physics from Stevens Institute of Technology with a thesis on General Relativity titled "Relativistic Rigid Body Motion." He served as a physics instructor at Manhattan College and Bergen Community College from 1967-1983, and is presently doing private tutoring in physics and mathematics. Dr. Bennett has written Chapter 10, a detailed, technical and mathematical explanation of the various arguments for Geocentrism. He has served as a consultant for the entire *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science* project.

Endorsements

A truly magnificent work. There exists no better exposition of the history and science of geocentrism. Very highly recommended and a must for all those interested in the issues surrounding geocentrism today. The animations of the CD are excellent. They illustrate the daily and yearly motions of the sun and planets about the earth, the seasons, retrograde motion, and parallax in a uniform way. The authors have done a very admirable job all around. At long last their book provides the solution to all the "dark" fudging and dead-ends in modern Big Bang cosmology – a solution that no one dared voice until an accumulation of evidence over the last two hundred years forced them to do so.

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Gerardus Bouw, Ph.D.
Astronomy, Case-Western University, Author of *Geocentricity*

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Drs. Sungenis and Bennett make a convincing case for the special and central position of the earth in the cosmos, both physically and spiritually. This is radically at odds from what everyone is taught from childhood; everyone "knows" the earth revolves around the sun. However, from time to time, like the little girl in Andersen's tale *The Emperor's New Clothes*, accepted "wisdom" is challenged; and what everyone "knows" to be true turns out to be merely a concocted fantasy. They make a powerful case that the "truths" of heliocentric and acentric cosmologies aiming to describe the "fabric" of space-time may in fact be constructed out of the same type of "cloth" as the outfit of the Emperor.

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Vincent J. Schmithorst, Ph.D., Physics

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This book shatters the mythology of the modern mind. Galileo and Einstein go the way of Zeus, as the truth ascends to reclaim man's destiny. It will change the world more dramatically than Copernicus, Galileo, Kepler, Newton and Einstein combined.

Gerald Benitz, M.A., Ph.D. Mathematics/Electrical Engineering

In their book, Robert Sungenis and Robert Bennett have provided an excellent synopsis of a field of science that most people today have probably not even heard about. It is not a regurgitation of some ancient, debunked theory. Neither is this a lightweight paperback, in the vein of so many publications by scientists who have lost the dividing line between science and science fiction. Rather, this book is a work of monumental proportion which ranks, in my opinion, on a par with the meticulous observations of the Danish astronomer, Tycho Brahe, and the tireless efforts of Walter van der Kamp who almost single-handedly raised

geocentrism from the ashes in the 1970s and 80s….This book is a scholarly piece of work that should thus be welcomed by any thinking person, and that provides ample food for thought on our place within God's universe."

Neville Thomas Jones, Ph.D. Physics, Imperial College, London

Now that the Enlightenment is over, it was inevitable that the system upon which it was based should come in for the powerful critique which Sungenis and Bennett provide. Not inevitable, however, was the brilliant way they provide it. Their book exposes the ideological underpinnings of the system that failed at the time of the Michelson-Morley experiments, got revived by Einstein, and is still causing mischief today.

E. Michael Jones, Ph.D. History, Temple Univ., Editor: *Culture Wars*

In their book, Sungenis and Bennett examine the 'anomalies' that arise from the Copernican model, anomalies that are swept under the rug by the same scientists who assume the earth is immobile in order to 'simplify' complex problems. A must read for those who can set aside prejudices and a priori assumptions. Human civilization is poised to undergo a colossal multi-faceted shift in perception, philosophy, science and metaphysics that is simply unprecedented in recorded history.

Joseph A. Strada, Ph.D., Aerospace Engineer, NRO

This book forcefully addresses the history, science, theological, philosophical, and worldview implications of our place in the universe. It is virtually a one-volume encyclopedia on geocentrism. After the science has been discussed and the history has been told, it is a powerful reminder of the worldview struggle that faces Christians today.

Russell T. Arndts, Ph.D., Chemistry, L.S.U.

Many works of art and science in the past have been claimed as "game-changers" or "paradigm shifts," only to be revealed later as only superficially different from the status-quo. This book may look like just another "new" and "improved" intellectual product, but it's the real thing.

Thaddeus J. Kozinski, Ph.D. Philosophy,
Wyoming Catholic College

It is with pleasure that I remand this volume into the hands of the reader, whether he or she is an atheistic scoffer, a Roman Catholic inquirer, a Protestant polemicist, an Evangelical skeptic, or is otherwise motivated to re-open an issue heretofore thought, wrongly, to have been settled nearly four centuries ago. This is all the more remarkable, insofar

as the present volume exposes the dark, seamy underside of modern science and its Janus-like propensity for speaking out of both sides of its mouth simultaneously.

Martin G. Selbrede, Vice President, The Chalcedon Foundation

This book takes a critical look at the thesis that the Earth is flying through space. Here you will find a thorough review of the scientific observations along with a review of the scientists themselves. You will have the evidence to make up your mind for yourself. Robert Sungenis and Robert Bennett have done a great service to science and to men of good will. Those who see the universe as the handiwork of God need no longer be subservient to fairy tales.

Anonymous, Ph.D. (name withheld by request)
Massachusetts Institute of Technology

This is an amazing work which opened my mind to many things in the field of astronomy and cosmology. I am grateful to Robert Sungenis and his co-author Robert Bennett for this lucid, philosophically powerful and meticulously documented work.

Caryl Johnston, M. Ed., M.L.S.
Jefferson Medical College, Author: *Consecrated Venom*

The very mention that the earth is motionless at the center of the universe, with the sun and universe revolving about it each day, as outlined and defended from physics and astronomy in this book, elicits a profound initial disbelieving shock. This is not a matter of belief but of evidence and of demanding study. Accumulated evidence justifies the rational claim of the text.

John Domen, MS, Physics, Massachusetts Institute of Technology

From Quasars to Gamma-Ray Bursts, from Parallax to Red Shifts, and from Michelson-Morley to Sagnac, Drs. Sungenis and Bennett's book meticulously applies the scientific mortar to the theological bricks of geocentrism, producing a compelling structure that brings Catholic teaching and modern science to a crossroads. If the Earth is really the center of the universe, then modern man must face his biggest fear – that there is a Creator who put it there, and man is subject to His rule and authority.

John Salza, Esquire, Author: *Masonry Unmasked*

Notice Concerning Terminology and Physics

This book is written for both layman and scientist. The main text of the book seeks to explain the scientific information in a simple and entertaining way. The footnotes contain the technical information and sources for the scientist and scholar. We employ the term "geocentrism" to represent the scientific position that the Earth is motionless in space at the center of the universe with neither diurnal rotation nor translational movement. We have adopted the term "heliocentrism" to represent the views of Copernicus, Galileo, Kepler, Newton, even though there are various differences among them, including the acentrism of Einstein. Others employ "geocentricity" or "geostatism" to represent the motionless Earth, and employ "geokineticism" or "antigeostatism" to represent a moving Earth. The term "geocentrism" will stand for any scientific theory that holds the Earth is the center of the universe and/or motionless in space. The term "heliocentrism" will stand for any scientific theory that holds that the Earth is not in the center, or that the sun is the center, or that there is no center of the universe, and that the Earth is in constant motion. In addition to the above, we have adopted the spelling "ether" rather than "aether," since most scientific texts have employed the former. We have adopted to capitalize titles such as Special Relativity, General Relativity, Quantum Mechanics, the Big Bang, String Theory, etc., in order to emphasize that a particular but controversial theory is being discussed. The word "Earth" has been consistently capitalized in distinction to "sun," "moon," "stars" or "universe" which have been left in the lower case. The cosmic microwave background radiation is abbreviated with the acronym "CMB." So as to limit the confusion often inherent in the words rotation and revolution, these volumes use word "rotation" to refer to the turning of an object upon its own axis, including the turn of the entire universe around the north-south axis of the Earth; whereas "revolution" refers to the angular movement of one object around another wherein both are separated by space, as in saying "Mercury revolves around the sun."

We make use of Newtonian, Machian, Lorentzian, Einsteinian, Quantum, LCDM (Big Bang) and other mathematical systems of physics but do not endorse any of them as having the correct physical representation of reality. We use these models to demonstrate that the geocentric universe can be substantiated by one or more of these models, but that none of them can provide the correct physical model of the universe. At times we will demonstrate how their limited view of reality has been used to obscure geocentric cosmology from the public, and at other times show how the logical conclusions of their own systems supports geocentric cosmology.

"All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."

Arthur Schopenhauer[1]

"Scientists...are used to dealing with doubt and uncertainty. All scientific knowledge is uncertain....Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers in the preceeding generation....Learn from science that you must doubt the experts...Science is the belief in the ignorance of experts."

Richard Feynman[2]

"Sometimes the first obligation of intelligent men is to restate the obvious."

George Orwell[3]

"Many people believe they are thinking when they are only rearranging their pre-existing prejudices."

Martin Selbrede[4]

"The Copernican revolution outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes."

Herbert Butterfield[5]

"The fool on the hill sees the sun going down and the eyes in his head see the world spinning round."

Lennon and McCartney[6]

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[1] Attributed, not verified.
[2] Richard, Feynman, *The Meaning of it All: Thoughts of a Citizen Scientist*, 1998, p. 26; Feynman, *The Pleasure of Finding Things Out*, 1999, p. 188; *ibid.*, p. 187.
[3] Attributed, not verified.
[4] Interview for the scientific documentary, *The Principle*, 2012.
[5] Owen Barfield, *Saving the Appearances: A Study in Idolatry*, 2nd edition, Wesleyan University Press, 1988, pp. 50-51.
[6] From the song, *The Fool on the Hill*, recorded 1967.

Introduction

This book, *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science*, will, at the least, be viewed as an unusual book by the world at large. In modern times, everyone is taught from early childhood through old age that the Earth rotates on its axis and revolves around the sun. It is considered a bedrock of truth so firmly established that only the insane or perhaps members of the Flat Earth Society, would doubt or question so sanctified a truth of modern man.
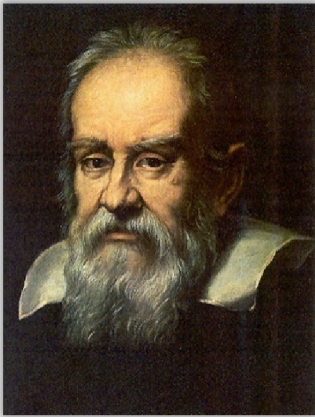
Unbeknownst to almost the entire human race, however, is the fact that no one in all of history has ever *proven* that the Earth moves in space. Despite his protestations to the contrary, the historical record reveals that **Galileo Galilei** had no proof for his controversial assertions. What he purported as proof in his day would be laughed out of science classrooms today. Galileo merely began a myth, a myth that eventually took on a life of its own and became the *status quo* of popular thinking.

Galileo Galilei
1564 – 1642

But this is not merely Galileo's burden. In fact, as we will see in Chapter 1, a year before he died Galileo renounced, quite dramatically, all his claims that the Earth went around the sun – a fact of history which has been kept well under wraps by the reigning powers of academia. The burden is now on modern science, since some three hundred years after Galileo, like him, it has also deprived us of proof that the Earth moves. As one honest scientist put it in a book endorsed by Einstein: "…nor has any physical experiment ever proved that the Earth actually is in motion."[7] Modern scientists freely admit that heliocentrism is merely the *preferred* model of cosmology, and the choice to believe it is made purely on philosophical grounds, not scientific ones. Although various scientists and historians have certainly made it *appear* as if many and varied proofs exist for heliocentrism, and thereby they have convinced a rather naïve public, in reality, modern

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[7] Lincoln Barnett, *The Universe and Dr. Einstein*, p. 73.

science is actually covering up the fact that it has no proof for its cherished view of cosmology.

As **Albert Einstein** himself once admitted, reliance on the doctrine of Copernicus is not nearly as strong as we were once led to believe:
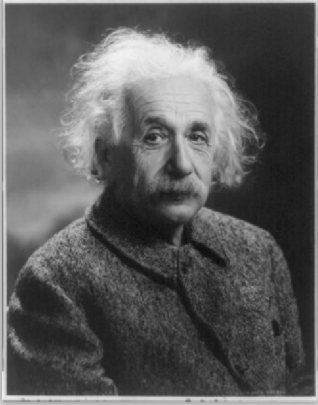
> Since the time of Copernicus we have known that the Earth rotates on its axis and moves around the sun. Even this simple idea, so clear to everyone, was not left untouched by the advance of science. But let us leave this question for the time being and accept Copernicus' point of view.[8]

Stephen Hawking, the next most famous physicist after Einstein, said something very similar:

> So which is real, the Ptolemaic or the Copernican system? Although it is not uncommon for people to say that Copernicus proved Ptolemy wrong, that is not true. As in the case of our normal view versus that of the goldfish, one can use either picture as a model of the universe, for our observations of the heavens can be explained by assuming either the earth or the sun to be at rest.[9]

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[8] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154-155. Thus, Einstein could say: "The four men who laid the foundation of physics on which I have been able to construct my theory are Galileo, Newton, Maxwell, and Lorentz" ("Einstein, too, is Puzzled; It's at Public Interest," *Chicago Tribune*, April 24, 1921, p. 6).

[9] *The Grand Design*, Stephen Hawking and Leonard Mlodinow, 2010, pp. 41-42. Hawking adds: "Despite its role in philosophical debates over the nature of our universe, the real advantage of the Copernican system is simply that the equations of motion are much simpler in the frame of reference in which the sun is at rest." Hawking is referring to Ptolemy's epicycles and equants. As we will see later, however, Ptolemy was seeking to account for the real motions of the planets as opposed to mere circular orbits. Copernicus desired to keep Aristotle's circular orbits but later was forced to add his own epicycles to account for the actual

Introduction

Modern science has, indeed, been very happy to follow Einstein's prescription to "accept Copernicus' point of view" even though it has been made very clear that "the advance of science" has revealed it is an unprovable assumption. As one of Einstein's staunch supporters and a much admired physicist in his own right, Sir Arthur Eddington, admitted about the question:

Which is right?....Or are both the victims of illusion?....No one knows which is right. No one will ever know, because we can never find out which, if either, is truly at rest in the aether….The bulge of the Earth's equator may be attributed indifferently to the Earth's rotation or to the outward pull of the centrifugal force introduced when the Earth is regarded as non-rotating.[10]
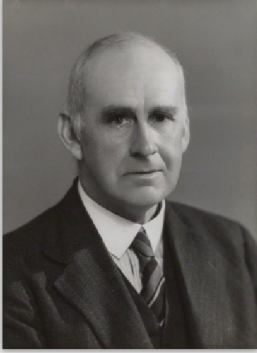
Arthur Eddington
1882-1944

A very famous experiment took place in 1887 to answer the above question – the Michelson-Morley experiment. The results were shocking to say the least. Based on the then current science, the experiment demonstrated the Earth wasn't moving through space. In a book endorsed by Einstein, theoretical physicist James Coleman admitted:

….The easiest explanation was that the earth was fixed in the ether and that everything else in the universe moved with respect to the earth and the ether….Such an idea was not considered seriously, since it would mean in effect that our earth occupied the omnipotent position in the universe, with all the other heavenly bodies paying homage by moving around it.[11]

Lincoln Barnett says much the same:

The Michelson-Morley experiment confronted scientists with an embarrassing alternative. On the one hand they could scrap the ether theory which had explained so many things about

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motion of the planets, and thus his system was not "much simpler" than Ptolemy's.

[10] *Space, Time and Gravitation*: *An Outline of the General Relativity Theory*, 1923, pp. 24, 41. Eddington adds: "Some would cut the knot by denying the aether altogether. We do not consider that desirable" (*ibid*., p. 39).

[11] James A. Coleman, *Relativity for the Layman*, p. 37. Of Coleman's book Einstein wrote: "Gives a really clear idea of relativity" (front cover 1954 edition).

electricity, magnetism, and light. Or if they insisted on retaining the ether they had to abandon the still more venerable Copernican theory that the earth is in motion. To many physicists it seemed almost easier to believe that the earth stood still than that waves – light waves, electromagnetic waves – could exist without a medium to sustain them. It was a serious dilemma and one that split scientific thought for a quarter century. Many new hypotheses were advanced and rejected. The experiment was tried again by Morley and by others, with the same conclusion; the apparent velocity of the earth through the ether was zero.[12]

After a quarter century of turmoil, a choice had to be made. Either mankind could retain its then present knowledge of physics but admit the Earth was motionless in space, or it could reinvent physics with all new concepts and formulas to keep the Earth moving. Needless to say, the latter option was chosen. The one to lead them in this new venture was Albert Einstein. In a word, Einstein was forced to turn science upside down in order to keep Copernicus enshrined in the hearts of men. In turn, Einstein's supporters have followed him and his theories with almost godlike devotion, developing what is, for lack of a better term, the 'cult of Einstein.' As his major biographer said it:

> A new man appears abruptly, the 'suddenly famous Doctor Einstein.' He carries the message of a new order in the universe. He is a new Moses come down from the mountain to bring the law and a new Joshua controlling the motion of heavenly bodies….The new man who appears at that time represents order and power. He becomes the θεῖος ἀνήρ, the divine man, of the twentieth century.[13]

The reality is quite different, however. The theory of Relativity, by its very nature, brings Copernican cosmology under great suspicion and ultimately forces it into becoming just one perspective among others. By design, these stark implications of Relativity theory have been

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[12] Lincoln Barnett, *The Universe and Dr. Einstein*, p. 44.
[13] Abraham Pais, *Subtle is the Lord*, 1982, 2005, p. 311. The phrase θεῖος ἀνήρ is the Greek for "divine man." As another physicist put it: "Too often students believe that Moses, or rather Newton or Einstein, came down from a physical Mt. Sinai with his laws engraved on tablets of stone" (Ronald Newburgh, "Inertial forces, absolute space, and Mach's principle: The genesis of relativity," *American Journal of Physics*, 75(5), May 2007, p. 427).

systematically ignored and the science community has decided to "leave this question for the time being" hoping that few people will be bold enough to follow the implications to their logical conclusion and ask, indeed, what right mankind has to "accept Copernicus' point of view." It is just a matter of time before books and articles like the one you are reading will begin to reveal this information to the public. Up until now almost all of it has been hidden from their eyes. Little is revealed at the university level, and virtually none of it has been divulged in the secondary curriculum, and we certainly haven't read it on the pages of *Time* or *USA Today*, except perhaps for the occasional ridiculing of "fundamentalists" and their offshoots for even broaching such subjects. There is a good reason why such reticence exists – there is simply too much at stake. The mere thought of having to tell the world that it might have to turn back the clock and admit that science took a wrong turn when it accepted the Copernican theory as a scientific fact is, as Einstein's biographer once put it, "unthinkable."[14]

We can sympathize with their plight. Think of the sheer embarrassment modern science would face if it were forced to apologize for 500 years of propagating one of the biggest blunders since the dawn of time. This is not the Middle Ages, a time in which mistakes can be excused due to primitive scientific tools and superstitious notions. This is the era of Newton, Maxwell, Faraday, Darwin, Einstein, Edison, Planck, Hubble, Hawking, and scores of other heroes of science. If Copernicus is wrong, how could modern science ever face the world again? How could it ever hold to the legacy left by these scientific giants if it were forced to admit it was wrong about one of its most sacrosanct and fundamental beliefs? Admitting such a possibility would put question marks around every discovery, every theory, every scientific career, and every university curriculum. The very foundations of modern life would crumble before their eyes. Not only would Earth literally become immobile, but it would figuratively come to a halt as well, for men would be required to revamp their whole view of the universe, and consider the most frightening reality of all – that a supreme Creator actually *did* put our tiny globe in the most prestigious place in the universe, since only fools would dare to conclude that Earth could occupy the center of the universe by chance. Most of all, science would be compelled to hand the reins of power and influence back to the Church and to Scripture, since it is from these sources alone that the teaching of a motionless Earth originated.

Although we can all agree that modern science certainly has more sophisticated instruments today that allows it to gather thousands of bits of

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[14] Ronald Clark, *Einstein: The Life and Times*, 1984, p. 110.

data about the universe, the problem is that scientists are at a loss how to interpret that information correctly and put it into a coherent and comprehensive understanding of the universe. Knowledge is plentiful, but wisdom is severely lacking. As one astronomer admitted: "Perhaps it is time for astronomers to pause and wonder whether they know too much and understand too little."[15] Hence, the first two volumes of *Galileo Was Wrong: The Church Was Right* will be devoted mainly to the scientific evidence concerning cosmology. Since modern science has made itself into such an imposing authority on the minds of men today, no study of this kind could possibly be adequate until the scientific assertions are thoroughly addressed and rebutted. We have compiled the most comprehensive scientific treatise on the issue ever offered to the public. The third volume will be devoted mainly to the scriptural, ecclesiastical and patristic evidence supporting the cosmology of geocentrism. We only ask that you, the reader, contemplate the issue with an open mind. All too often when controversial subjects of this nature arise, those who wish to protect the *status quo* are quick to demonize their opponents, choosing instead to associate them with such institutions as the "Flat earth society," or characterize them as geeks who don tinfoil hats and receive messages from outer space. Hopefully, you will not fall into that trap of bigotry and censorship. Rest assured, the authors of this book do not fill any of the above caricatures, but are dedicated solely to the cause of truth, both scientific and theological, and will seek to do their task in the face of any opposition.

The world today has lost sight of its purpose for existence. Corruption, apathy and decadence have penetrated almost every level of society. Consequently, the human soul desperately needs a refresher course on the meaning of life. Only a few have realized what a large part Copernicanism has played in the overall deterioration of society. The poet Johann von Goethe once wrote:

> But among all the discoveries and corrections probably none has resulted in a deeper influence on the human spirit than the doctrine of Copernicus…. Possibly mankind has never been demanded to do more, for considering all that went up in smoke as a result of realizing this change: a second Paradise, a world of innocence, poetry and piety: the witness of the senses, the conviction of a poetical and religious faith. No wonder his contemporaries did not wish to let all this go and offered every possible resistance to a doctrine which in its converts authorized

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[15] Herbert Friedman, *The Amazing Universe*, National Geographic, 1975, p. 180.

and demanded a freedom of view and greatness of thought so far unknown indeed not even dreamed of."[16]

Barring a conversion to geocentric cosmology, our modest goal is, whoever reads these volumes will not leave without realizing that what he has been taught about the Earth's annual journey around the sun is not so certain after all, and that similar to the rationale for deciding verdicts in a court of law, one should realize that there is enough evidence supporting geocentrism to cause a reasonable doubt in the minds of intelligent people. As even one of the leading science magazines recently stated: "When an author puts himself on the line by embracing an unfashionable idea, even though he is guaranteed to generate scorn or indifference, this should somehow be recognized" (*Discover*, December 2006).

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Robert Sungenis
December 2012

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[16] Zur Farbenlehre, Materialien zur Geschichte der Farbenlehre, Frankfurt am Main, 1991, Seite 666.

For it is He who gave me unerring knowledge
of what exists, to know the structure of the world
and the activity of the elements;
the beginning and end and middle of times,
the alternations of the solstices
and the changes of the seasons,
the cycles of the year
and the constellations of the stars…
I learned both what is secret and what is manifest,
for wisdom, the fashioner of all things, taught me.

Wisdom 7:17-19, 21

"I have come to believe that the motion of the Earth cannot be detected by any optical experiment."

Albert Einstein[17]

"…to the question whether or not the motion of the Earth in space can be made perceptible in terrestrial experiments. We have already remarked…that all attempts of this nature led to a negative result. Before the theory of relativity was put forward, it was difficult to become reconciled to this negative result."

Albert Einstein[18]

"Briefly, everything occurs as if the Earth were at rest…"

Henrick Lorentz[19]

"There was just one alternative; the earth's true velocity through space might happen to have been nil." Arthur Eddington[20]

"The failure of the many attempts to measure terrestrially any effects of the earth's motion…" Wolfgang Pauli[21]

"We do not have and cannot have any means of discovering whether or not we are carried along in a uniform motion of translation."

Henri Poincaré[22]

"A great deal of research has been carried out concerning the influence of the Earth's movement. The results were always negative."

Henri Poincaré[23]

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[17] Speech titled: "How I Created the Theory of Relativity," delivered at Kyoto University, Japan, Dec. 14, 1922, as cited in *Physics Today*, August, 1982.

[18] "Relativity – The Special and General Theory," cited in Stephen Hawking's, *A Stubbornly Persistent Illusion*, 2007, p. 169.

[19] Lorentz's 1886 paper, "On the Influence of the Earth's Motion of Luminiferous Phenomena," in A. Miller's *Albert Einstein's Special Theory of Relativity*, p. 20.

[20] Arthur Eddington, *The Nature of the Physical World*, 1929, pp. 11, 8.

[21] Wolfgang Pauli, *The Theory of Relativity*, 1958, p. 4.

[22] From Poincaré's lecture titled: "L'état actuel et l'avenir de la physique mathematique," St. Louis, Sept. 24, 1904, *Scientific Monthly*, April, 1956.

[23] From Poincaré's report *La science et l'hypothèse* ("Science and Hypothesis")1901, 1968, p. 182. L. Kostro's, *Einstein and the Ether*, 2000, p. 30.

"This conclusion directly contradicts the explanation…which presupposes that the Earth moves."

Albert Michelson[24]

"The data were almost unbelievable… There was only one other possible conclusion to draw — that the Earth was at rest."

Bernard Jaffe[25]

"…nor has any physical experiment ever proved that the Earth actually is in motion."

Lincoln Barnett[26]

"Thus, even now, three and a half centuries after Galileo…it is still remarkably difficult to say categorically whether the earth moves…"

Julian B. Barbour[27]

"…there must be no favored location in the universe, no center, no boundary; all must see the universe alike. And, in order to ensure this situation, the cosmologist postulates spatial isotropy and spatial homogeneity.…"

Edwin Hubble[28]

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[24] Albert A. Michelson, "The Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Vol. 22, August 1881, p. 125, said after his interferometer experiment did not detect the movement of ether against the Earth.

[25] Bernard Jaffe, *Michelson and the Speed of Light*, 1960, p. 76. Jaffe adds this conclusion to the above sentence: "This, of course, was preposterous."

[26] Lincoln Barnett, *The Universe and Dr. Einstein*, 2nd rev. edition, 1957, p. 73.

[27] Julian Barbour, *Absolute or Relative Motion*, Cambridge University Press, 1989, p. 226.

[28] Edwin Hubble, *The Observational Approach to Cosmology*, 1937, p. 63.

Chapter 1

The New Galileo & the Truth about Copernicanism

Galileo was wrong?! How could modern men from the twenty-first century dare to name a book with such a title? No doubt, almost every book written about cosmology in modern times begins with the premise that Copernicus' and Galileo's cosmology was correct and the Catholic Church that condemned them was very mistaken. Typical remarks in a book about Galileo begin with very stern and foreboding words. The reader is simply not permitted to entertain any other possibility as to the construction and movements of the cosmos. As one author put it: "Galileo…who produced *the irrefutable proofs of the Sun-centered system*…came into direct and disastrous conflict with the Church."[29] Another says: "Readers, who know quite well that the Earth goes around the sun…"[30] Yet another says:

> Who better than Galileo to propound the most stunning reversal in perception ever to have jarred intelligent thought: We are not the center of the universe. The immobility of our world is an illusion. We spin. We speed through space. We circle the Sun. We live on a wandering star.[31]

The reader, not knowing any differently, doesn't give the author's assertion a second thought for all his life he has been taught that the Earth revolves around the sun, and he has placed himself under the edict that this particular teaching of modern science is no more to be doubted than the fact that fish swim or that birds fly.

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[29] Ivan R. King, *The Unfolding Universe*, 1976, p. 132, emphasis added. Ivan King was professor of astronomy at the University of California, Berkeley.

[30] Giorgio de Santillana, Massachusetts Institute of Technology, *The Crime of Galileo*, 1962, editor's preface, pp. viii-ix. De Santillana's major thesis is stated very early in the book: "…the tragedy was the result of a plot of which the hierarchies themselves turned out to be the victims no less than Galileo – an intrigue engineered by a group of obscure and disparate characters in strange collusion who planted false documents in the file, who later misinformed the Pope and then presented to him a misleading account of the trial for decision" (p. xx). Suffice it to say, our book will show that it is Santillana who has been the victim of an intrigue engineered by a group of prominent and influential scientists in collusion, who made false conclusions from scientific experiments and then presented a misleading account to the public.

[31]Dava Sobel, *Galileo's Daughter*, 1999, p. 153.

As the typical author begins from the unquestioned premise that Galileo's sun-centered world has been indisputably proven, he will postulate various reasons why the Catholic Church did not accept this new and improved model of the universe. The suggestions are many and varied, ranging from "ecclesiastical bureaucracy," "deliberate chicanery," "religious fundamentalism," "corporate interests" to "unfair tactics,"[32] but there is little doubt that virtually all the biographers and historians will invariably dismiss the possibility that Galileo could have been wrong.

Galileo Galilei: 1564 – 1642

Galileo's Conversion to Geocentrism

Although it will certainly come as a shock to most people, one very important reason we argue against heliocentrism is that we are revealing the wishes of none other than Galileo himself.[33] Unbeknownst to almost every modern reader, and even most historians, is the fact that just one year prior to his death Galileo made it very clear to his former allies where he now stood on the subject of cosmology. On the 29th of March 1641,

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[32] These are some of the various reasons given for the Church's rejection of Galileo's theory in the opening pages of Giorgio Santillana's *The Crime of Galileo* (pp. ix, xv, xx), a very terse and satirically worded account of the Galileo affair which is highly critical of the Catholic Church's role and very favorable to Galileo.

[33] Galileo Galilei was also Latinized to Galileus Galileus, which was often the way Galileo signed his name, as for example in his exchange of letters with Kelper in 1597. He was also called Galileo Galilei Linceo.

Galileo responded to a letter that he received from his colleague Francesco Rinuccini, dated the 23rd of March 1641, containing discoveries made by the astronomer Giovanni Pieroni concerning the parallax motion of certain stars, from which both Rinuccini and Pieroni believed they had uncovered proof of the heliocentric system. Rinuccini writes to Galileo:

> Your Illustrious Excellency, Signor Giovanni Pieroni has written to me in recent months telling how he had clearly observed with an optical instrument the movement of a few minutes or seconds in the fixed stars, but with just that level of certainty that the human eye can attain in observing a degree. All this afforded me the greatest pleasure - witnessing such a conclusive argument for the validity of the Copernican system! However, I have felt no little confusion because of something I read a few days ago in a bookshop. I happened to look at a book that is just now on the verge of being published. According to the author, if it were true that the sun is the center of the universe, and that the Earth travels around it once every year, it would follow that we would never be able to see half of the whole sky by night, because the line passing through the center and the horizons of the Earth, touching the periphery of the great orb, is a cord of a piece of the arc of the circle of the starry heavens, the diameter of which passes through the center of the sun. And since I have always believed it to be true - not having personally witnessed it - that the first [star] of Libra rises at the same moment as the first [star] of Aries sets, my limited intelligence has been unable to arrive at a solution. I therefore implore you, in your very great kindness, to remove this doubt from my mind. I will be very greatly obliged to you. Reverently kissing your hand, etc. Francesco Rinuccini." [34]

Galileo, not being particularly moved by the assertions, writes this surprising response to Rinuccini:

> The falsity of the Copernican system should not in any way be called into question, above all, not by Catholics, since we have the unshakeable authority of the Sacred Scripture, interpreted by the most erudite theologians, whose consensus gives us certainty

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[34] *Le Opere Di Galileo Galilei*, Antonio Favaro, reprinted from the 1890-1909 edition by Firenze, G. Barbèra – Editore, 1968, vol. 18, p. 311, translated from the original Italian by Fr. Brian Harrison.

regarding the stability of the Earth, situated in the center, and the motion of the sun around the Earth. The conjectures employed by Copernicus and his followers in maintaining the contrary thesis are all sufficiently rebutted by that most solid argument deriving from the omnipotence of God. He is able to bring about in different ways, indeed, in an infinite number of ways, things that, according to our opinion and observation, appear to happen in one particular way. We should not seek to shorten the hand of God and boldly insist on something beyond the limits of our competence…. D'Arcetri, March 29, 1641. I am writing the enclosed letter to Rev. Fr. Fulgenzio, from whom I have heard no news lately. I entrust it to Your Excellency to kindly make sure he receives it."[35]

Search as one might, few today will find Galileo's retraction of Copernicanism cited in books or articles written on the subject of his life and work. Fewer still are those in public conversation about Galileo who have ever heard that he recanted his earlier view. The reason is, quite simply, that the letter has been obscured from the public's eye for the last four centuries. As Galileo historian Klaus Fischer has admitted: "The ruling historiographers of science cannot be freed from the reproach that they have read Galileo's writings too selectively."[36] Fortunately, Galileo's retraction managed to escape censorship and find its way among the rest of his letters in the twenty-volume compendium *Le Opere di Galileo Galilei* finally published in 1909 with a reprint in Florence in 1968. Centuries

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[35] *Ibid*, p. 316, translated from the original Italian by Fr. Brian Harrison. A note added by the editor states: "Bibl. Naz. Fir. Banco Rari, Armadio 9, Cartella 5, 33. – Orginale, di mano di Vincenzio Vivani." This means that the letter is stored in the rare archives of the National Library at Florence in the rare books department, in cabinet #9, folder #5, 33 and written in the original hand of Vincenzio Viviani, since Galileo was blind in both eyes in 1641. Viviani was Galileo's last pupil and first biographer. NB: Viviani had performed the first Foucault-type pendulum experiment in 1661. Galileo's letter to Rinuccini was translated into English by Fr. Brian Harrison upon request. Stillman Drake contains a similar translation in *Galileo At Work: His Scientific Biography*, 1978, p. 417.

[36] Klaus Fischer, *Galileo Galilei*, Munich, Germany, Beck, 1983, p. 114.

prior to its publication, there was a concerted effort by either Rinuccini or someone behind the scenes to cover up the fact that the letter was, indeed, written and sent by Galileo. We know this to be the case since a rather obvious attempt was made to erase Galileo's name as the signatory of the letter. The compiler of the original letter makes this startling notation: "The signature 'Galileo Galilei' has been very deliberately and repeatedly rubbed over, with the manifest intention of rendering it illegible."[37] Stillman Drake, one of the top Galileo historians, noticed the subterfuge:

> Among all Galileo's surviving letters, it is only this one on which his name at the end was scratched out heavily in ink. I presume that Rinuccini valued and preserved Galileo's letters no matter what they said, but did not want others to see this declaration by Galileo that the Copernican system was false, lest he be thought a hypocrite.[38]

Judging from the contents of his letter to Rinuccini, for quite some time it seems that Galileo had been contemplating the problems inherent in the Copernican system, as well as his desire to convert back to an Earth-centered cosmology. The wording in his letter is rather settled and direct as it does not reflect someone who is confused or equivocating. It holds the convictions of a man who has been swept off his feet by a more convincing position. Hence, far from being a hero of modern cosmology, shortly before his death Galileo had become its worst adversary – a fact of history that has been either quietly ignored or deliberately suppressed.

What has also been suppressed is the spiritual reason Galileo had a change of heart. In the new book *Galileo: Watcher of the Skies*, author David Wootton makes a substantial case that prior to 1639, three years before his death, Galileo was not a true Christian but merely a nominal Catholic who was a member of a secret society that actually rejected major Catholic doctrines. These doctrinal aberrations, coupled with his immoral life, strongly suggest that Galileo's quest to advance Copernicanism was motivated by a very strong anti-Church sentiment, as was the case with many other scientists in history. By 1641, it seems to be the case that Galileo's newfound faith led him to accept fully the Church's historic geocentric cosmology as a divine revelation.[39]

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[37] Original Italian: "La firma 'Galileo Galilei' è stata accuratissimamente coperta di freghi, con manifesta intenzione di renderla illeggibile" (*Le Opere Di Galileo Galilei*, vol. 18, p. 316, footnote #2). Translated by Fr. Brian Harrison.

[38] Stillman Drake, *Galileo At Work: His Scientific Biography*, 1978, p. 418.

[39] See Volume III, Chapter 16 for the details of Galileo's conversion. David Wootton, *Galieo: Watcher of the Skies*, New Haven, Yale Univ. Press, 2010.

Copernicanism's Procrustean Bed

Opposed to the repentant and converted Galileo, most of today's scientists impose on us a belief, according to Carl Sagan (d. 1996), that "we live on an insignificant planet of a humdrum star lost in a galaxy tucked away in some forgotten corner of a universe in which there are far more galaxies than people," and all of which popped into existence, by chance, "billions and billions" of years ago.[40]
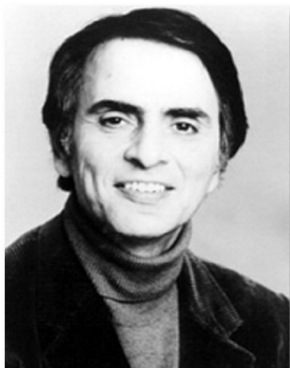
Carl Sagan
1934 – 1996

Stephen Gould
1941 – 2002

This glum picture of our place in the universe is, in the estimation of its most cherished icons, the springboard of all modern science. In the words of one of its leading figures, Stephen Jay Gould:

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[40] Carl Sagan, *Cosmos*, New York: Random House, 1980, p. 193. "The Cosmos is all that is or ever was or ever will be. Our feeblest contemplations of the Cosmos stir us — there is a tingling in the spine, a catch in the voice, a faint sensation of a distant memory, as if we were falling from a great height. We know we are approaching the greatest of mysteries" (*ibid*., p. 4). "The idea that God is an oversized white male with a flowing beard who sits in the sky and tallies the fall of every sparrow is ludicrous. But if by God one means the set of physical laws that govern the universe, then clearly there is such a God. This God is emotionally unsatisfying... it does not make much sense to pray to the law of gravity" ("Scientists & Their Gods," *U.S. News & World Report* Vol. 111 (1991); "Who is more humble? The scientist who looks at the universe with an open mind and accepts whatever it has to teach us, or somebody who says everything in this book must be considered the literal truth and never mind the fallibility of all the human beings involved?" Interview with Charlie Rose (1996).

"…the common component of all major scientific revolutions…revolutions that smash [the] pedestals…of our cosmic arrogance…[has been] the cosmological shift from a geocentric to a heliocentric universe, 'when [humanity] realized that our earth was not the center of the universe, but only a speck in a world-system of a magnitude hardly conceivable.'…. Revolutions are…consummated when people…grasp the meaning of this reconstruction for the demotion of human status in the cosmos.[41]

There is probably no statement better than Gould's that sums up the motivations, aspirations, and convictions of the modern scientific community. All of modern science, in one form or another, is based on the Copernican premise that the Earth revolves around the sun. To posit otherwise is, as one scientist put it, "a depressing thought."[42] In brief, heliocentrism has served as the quintessential catapult to release science from the so-called 'constraints of religion,' and it has never looked back. Gould continues the same theme in another book:

Galileo was not shown the instruments of torture in an abstract debate about lunar motion. He had threatened the Church's conventional argument for social and doctrinal stability: the static world order with planets circling about a central earth, priests subordinate to the Pope and serfs to their Lord. But the Church soon made its peace with Galileo's cosmology. They had no choice; the earth really does revolve around the sun.[43]

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[41] Stephen Jay Gould, *Dinosaur in a Haystack: Reflections in Natural History*, 1996, p. 325. The quotation is Gould's citation of Sigmund Freud, who adds: "Humanity has…had to endure…great outrages upon its naïve self-love." Gould is convinced that "we have truly discovered – as a fact of the external world, not a preference of our psyches – that the earth revolves around the sun…" (*ibid.*, p. 93). In other works, he is not so self-assured: "These are two things that we can't comprehend. And yet theory almost demands that we deal with it. It's probably because we're not thinking about them right. Infinity is a paradox within Cartesian space, right? When I was eight or nine I used to say, 'Well, there's a brick wall out there.' Well, what's beyond the brick wall? But that's Cartesian space, and even if space is curved you still can't help thinking what's beyond the curve, even if that's not the right way of thinking about it. Maybe all of that's just wrong! Maybe it's a universe of fractal expansions! I don't know what it is. Maybe there are ways in which this universe is structured we just can't think about" (Interview with John Horgan, cited in *The End of Science*, 1996, p. 125).
[42] Donald Goldsmith, *The Evolving Universe*, 1985, p. 140.
[43] Stephen J. Gould, *The Mismeasure of Man*, 1981, 1996, p. 54.

Of course, the other side of the story is, if Gould and his colleagues are wrong, then "the most important scientific revolution" of all time waits to be restored to its rightful place. Earth, as the center of the universe, motionless in space wherein all other celestial bodies revolve around it, would destroy, in one mortal blow, the theories of evolution, paleontology, cosmology, cosmogony, relativity, and many other modern disciplines, placing them all on the dust heap of history. If Earth is in the center of the universe, it means, with little argument from the science community, that Someone placed it there by design. Gould realized that fact better than anyone else. But with all due respect to Gould, it is not "arrogance" that leads one to see the Earth as the center of the universe. Rather, humility guides the human soul to recognize that there is Someone much higher than we Who has esteemed Earth so much that He put it in a most unique place in the universe to be the apple of His eye. Arrogance is on the side of those who would seek to remove that Someone from our immediate purview by throwing the Earth into the remote recesses of space. As Galileo historian Arthur Koestler concluded:

> The notion of limitlessness or infinity, which the Copernican system implied, was bound to devour the space reserved for God….This meant, among other things the end of intimacy between man and God. Homo sapiens had dwelt in a universe enveloped by divinity as by a womb; now he was being expelled from the womb. Hence Pascal's cry of horror.[44]

Not far behind Gould's sentiment is another science icon, Stephen Hawking:

> [We have moved] from the revolutionary claim of Nicolaus Copernicus that the Earth orbits the sun to the equally revolutionary proposal of Albert Einstein that space and time are curved and warped by mass and energy. It is a compelling story because both Copernicus and Einstein have brought about profound changes in what we see as our position in the order of

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[44] Arthur Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe*, 1959, 1979, p. 222. Koestler is referring to Blaise Pascal (d. 1662), a Catholic (Jansenist) philosopher who was unsure of God's existence and desperately tried to fill the void. He is noted as saying: "I am terrified by the emptiness of these infinite spaces" (*Pensées sur la religion*, 1669). Echoing similar sentiments, Edmund Burke stated in 1757: "Infinity has a tendency to fill the mind with that sort of delightful horror…" *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, pp. 129, 431.

things. Gone is our privileged place at the center of the universe, gone are eternity and certainty, and gone are absolute space and time.[45]

Stephen Hawking b. 1942

So not only does science wish to remove Earth from the center, the demotion also dictates that the things we have always held as reliable guideposts to our lives are suddenly torn away from us. An Earth set adrift will invariably make everything else relative and thus, as Hawking admits, will turn the notions of "certainty" and "absolutes" into mere figments of our imagination.

Curiously, Gould and Hawking don't seem bothered by such upheaval and unsettling of our world. In fact, they seem rather predisposed to it. They would have surely been opposed to Galileo's conversion (which Galileo based on his Catholic faith), and the reason, perhaps, has something to do with their self-attested atheism and their allegiance to rationalism and materialism. They know deep down in their souls that if they can keep the Earth in the outer recesses of space there is no longer clear evidence that the Someone exists, and they can live their lives happily ever after.

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[45] *On the Shoulders of Giants*, ed., Stephen Hawking, 2002, p. ix.
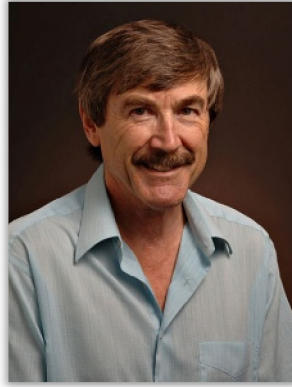
Paul C. W. Davies, b. 1946

Thus, the message of modern man, enshrined as it is in the gospel of Nicolaus Copernicus, has literally, and figuratively, turned the world upside down. Copernicanism is the foundation for modern man's independence from God, a connection that was recognized by the editor of the world's most prestigious scientific journal. When confronted in the late 1970s with the new model of cosmology invented by the well-known physicist George F. R. Ellis (a cosmology that proposed the Earth was in a central position in the universe), Paul C. W. Davies, the editor of *Nature*, was forced to reply: "His new theory seems quite consistent with our astronomical observations, even though it clashes with the thought that we are godless and making it on our own."[46]

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[46] P. C. W. Davies, "Cosmic Heresy?" *Nature*, 273:336, 1978. In the same article Davies admits: "…as we see only redshifts whichever direction we look in the sky, the only way in which this could be consistent with a gravitational explanation is if the Earth is situated at the center of an inhomogeneous Universe." Confirming Davies' agnosticism is a letter he wrote to me on August 9, 2004, stating: "I have long argued against the notion of any sort of God who resides within time, and who preceded the universe." Davies, however, is honest enough to admit he cannot lightly dismiss Ellis' science or mathematics that connect the Earth with the center of the universe. As for Ellis, although he realizes the geocentric evidence for the universe, he opts to describe it as a spherical dipole universe in which the Earth is the south pole position or "anticenter," while the point at which the Big Bang exploded is the north pole or "center." The diameter between the center and anticenter is the longest distance in the universe. The center contains a supermassive black hole from which light is so redshifted that it appears as 2.73 Kelvin temperature by the time it reaches earth. As such, his model merely takes the singularity from the past and puts it in the present. As he
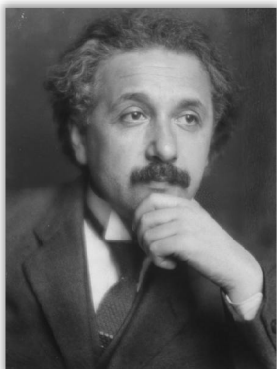
Albert Einstein, whose theory of Relativity sought to eliminate the possibility of having only one point in the cosmos serve as a center, knew instinctively, however, that the choice between a heliocentric or geocentric system was, from both a scientific and philosophical point of view, totally arbitrary. From the scientific viewpoint he enlightens us with these words:

The struggle, so violent in the early days of science, between the views of Ptolemy and Copernicus would then be quite meaningless. Either coordinate system could be used with equal justification. The two sentences: "the sun is at rest and the Earth moves," or "the sun moves and the Earth is at rest," would simply mean two different conventions concerning two different coordinate systems.[47]

Others have noted the same about Einstein's Relativity:

According to Einstein, the argument over whether the earth turns around or the heavens revolve around it, is seen to be no more than an argument over the choice of reference frames. There is no frame of reference from which an observer would not see the

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says in another paper: "In the FRW [Friedmann-Robertson-Walker] universes [*i.e.*, the Big Bang], the singularity is hidden away inaccessibly in the past; in these universes, it is sitting 'over there' (in a sense, surrounding the Universe), where it can influence, and be influenced by, the Universe continually…for this continuing interaction might be envisaged as the process which keeps the Universe in existence" ("Ellis, Maartens and Nel, "The Expansion of the Universe," *Monthly Notices of the Royal Astronomical Society*, 1978, p. 447). Ellis presented his radical view in a 1979 essay contest sponsored by the Gravity Research Foundation. Our point here, however, is not to condone Ellis' model of the universe, but only to show that even a hint of Earth's centrality prompts scientific philosophers such as Davies to recognize its divine implications.

[47] *The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, 1938, 1966, p. 212. In another sense, Relativity has no basis making such judgments, for as Einstein himself notes: "The theory of relativity states: 'The laws of nature are to be formulated free of any specific coordinates because a coordinate system does not conform to anything real'" (*Annalen der Physik* 69, 1922, 438, in *The Expanded Quotable Einstein*, p. 244).

effects of the flattening of the poles. Thus in frame number 1 (the earth turns round while the sky is at rest), the centrifugal force is a consequence of the earth's motion (uniform acceleration) relative to the heavens. This causes the flattening. In the latter frame, number 2 (the sky rotate and the earth stands still), the centrifugal force should be understood as being an effect of "the rotating heavens," which is generating a gravitational field that causes the flattening of the poles. The two explanations are equivalent as there is equivalence between inertial and gravitational mass.[48]

Consequently, Einstein concludes:

When two theories are available and both are compatible with the given arsenal of facts, then there are no other criteria to prefer one over the other except the intuition of the researcher. Therefore one can understand why intelligent scientists, cognizant both of theories and of facts, can still be passionate adherents of opposing theories.[49]

As it is with many scientists, Einstein had his biases that led him to choose which of the two relativistically equivalent systems he would endorse. Much of his bias came from his disdain for theology in general and the Catholic Church in particular. For Einstein, Galileo was

…a representative of rational thinking against the host of those who, relying on the ignorance of the people and the indolence of teachers in priest's and scholar's garb, maintain and defend their positions of authority" wherein Galileo had the will to "overcome the anthropocentric and mythical thinking of his contemporaries and lead them back to an objective and causal attitude toward the cosmos.[50]

Copernicus used a similar bias against Ptolemy when he decided to reintroduce the world to heliocentric cosmology. He knew by the sheer

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[48] "Einstein's Ether: D. Rotational Motion of the Earth," Galina Granek, Department of Philosophy, Haifa University, Mount Carmel, Haifa 31905, Israel, *Apeiron*, Vol. 8, No. 2, April 2001, p. 61.
[49] "Induction and Deduction in Physics," *Berliner Tageblatt*, December 25, 1919. Cited in *The Expanded Quotable Einstein*, p. 237.
[50] Albert Einstein's foreword in Stillman Drake's translation of Galileo's *Dialogue Concerning the Two Chief World Systems*, 2001, p. xxiii.

principle of relativity that there are at least two viable ways of looking at celestial movements. He states in his *De revolutionibus*:

> And why not admit that the appearance of daily revolution belongs to the heavens but the reality belongs to the Earth? And things are as when Aeneas said in Virgil: 'We sail out of the harbor, and the land and the cities move away.'[51]

But, at best, relativity will produce a draw between the heliocentrism and geocentrism. What was it, precisely, that led Copernicus and his followers to opt for one over the other? In light of this question, scientific historian Noel M. Swerdlow believes that

> …in his commentary on the *Commentariolus* that Copernicus probably discovered the Tychonic [geocentric] system at the same time as his own Copernican system. Why, Swerdlow wondered, did Copernicus choose his own system in preference to the Tychonic one, which avoids all the dynamical problems of terrestrial mobility, to say nothing of the theological problems? Swerdlow con-cluded…that Copernicus was strongly swayed by purely mechanical considerations to do with his acceptance of the theory that the planets are carried by material spheres. For in the Tychonic system Mars would have to pass at some points in its motion through the sphere of the sun, and Swerdlow believed that Copernicus must have found this an insuperable difficulty, therefore opting for the intellectually much more daring heliocentric system with a mobile earth.[52]

If true, the sheer irony is that by employing a later-to-be-discredited Aristotelian theory of planets orbiting the sun by being attached to rotating crystal spheres, Copernicus was led to deny the perfectly viable and less complicated geocentric model for the much riskier "terrestrial mobility" of heliocentrism. It was precisely for these kinds of haphazard developments

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[51] *On the Revolutions of the Heavenly Spheres*, Chapter 8, para. 4, trans. Charles Glenn Wallis, 1995, p. 17.

[52] Julian B. Barbour, *Absolute or Relative Motion*, p. 255-256. Although Barbour doesn't necessarily agree that Swerdlow's thesis about the spheres is what motivated Copernicus to reject the Tychonic model; and although Barbour agrees that Copernicus did, indeed, use Aristotle's crystalline spheres, he admits that "Copernicus seems to be on the point of advancing the Tychonic system as an explicit possibility…" but turns against it because of "Neoplatonic sympathies to see the center of the planetary system as an ideal location for the sun."

that critic Arthur Koestler titled his book, "The Sleepwalkers," since the record showed numerous examples that the history of science was comprised of one serendipitous thought process after another, whether good or bad.

Be that as it may, the geocentrists likewise appealed to relativity to answer the relativity of the Copernicans. As Barbour notes:

> It is another irony that the post-Copernican defenders of Aristotelian cosmology in the late sixteenth and early seventeenth centuries in fact pushed the principle of optical relativity to its extreme; for just as Copernicus invoked the principle of relativity to show that the earth could move, even if it seemed to be at rest, they argued that the same principle implied equally well that the earth could be at rest and the remainder of the universe in motion. They took refuge in the impartiality of relativity.[53]

Physicist Herbert Dingle, one of Einstein's most vehement critics, understood the implications very well. He writes:

> But velocity has no meaning apart from an accepted standard of rest, and the principle of relativity is the principle that there is no such standard fixed by nature but that you may adopt any standard you wish.[54]

We, of course, offer a return to an immobile Earth as the "accepted standard of rest," which, of course, will terminate any dependence on Relativity theory. Still, even though Relativity theory, if followed to its logical conclusion will not allow anyone to rest his case with Copernicus, most of the world will cling to it, either from sentiment or personal preference. Einstein knew this, too. From a more philosophical point of view he admits that we pick the universe with which we are most emotionally comfortable:

> Man tries to make for himself in the fashion that suits him best a simplified and intelligible picture of the world: he then tries to some extent to substitute this cosmos of his for the world of

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[53] Barbour, *Absolute or Relative Motion*, pp. 254-255.

[54] Herbert Dingle, *The Special Theory of Relativity*, 1961, p. vii. Dingle adds: "That makes 'length' of a body indefinite, and that means that all other physical measurements that are definitely related to length (*i.e.* all other physical measurements) must share that indefiniteness."

experience, and thus to overcome it. This is what the painter, the poet, the speculative philosopher, and the natural scientists do, each in his own fashion. Each makes this cosmos and its construction the pivot of his emotional life, in order to find in this way peace and security that he can not find within the all-too-narrow realm of swirling personal experience.[55]

Until these admissions were afforded to us, however, the dawn of Copernicanism faced mankind with a revolution in human thinking unsurpassed by any single event, save Noah's flood and the advent of Jesus Christ. As Alexander Koyré understood it:

The dissolution of the Cosmos…this seems to me to be the most profound revolution achieved or suffered by the human mind since the invention of the Cosmos by the Greeks. It is a revolution so profound and so far-reaching that mankind – with very few exceptions, of whom Pascal was one – for centuries did not grasp its bearing and its meaning; which, even now, is often misvalued and misunderstood. Therefore what the founders of modern science, among them Galileo, had to do, was not to criticize and to combat certain faulty theories, and to correct or to replace them by better ones. They had to do something quite different. They had to destroy one world and to replace it by another. They had to reshape the framework of our intellect itself, to restate and reform its concepts, to evolve a new approach to Being, a new concept of knowledge, a new concept of science – and even to replace a pretty natural approach, that of common sense, by another which is not natural at all.[56]

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[55] Said in honor of Planck's 60th birthday. *Albert Einstein, Creator and Rebel*, 1972, p. 222, Viking Press reprint.

[56] Alexandre Koyré, "Galileo and Plato," *Journal of the History of Ideas*, vol. 4, no. 4, Oct. 1943. Koyré adds elsewhere: "I need not insist on the overwhelming scientific and philosophical importance of Copernican astronomy, which, by removing the earth from the center of the world and placing it among the planets, undermined the very foundation of the traditional cosmic world-order…as we know, the immediate effect of the Copernican revolution was to spread skepticism and bewilderment….At the end we find nihilism and despair….The infinite Universe of the New Cosmology, infinite in Duration as well as in Extension, in which eternal matter in accordance with eternal and necessary laws moves endlessly and aimlessly in eternal space, inherited all the ontological attributes of Divinity. Yet only those – all the others the departed God took away with Him" (Alexandre Koyré, *From the Closed World to the Infinite Universe*, 1968, pp. 29, 43, 276).

Arthur Koestler says it this way:

> The new philosophy destroyed the mediaeval vision of an
> immutable social order in a walled-in universe together with its
> fixed hierarchy of moral values, and transformed the European
> landscape, society, culture, habits and general outlook as
> thoroughly as if a new species had arisen on this planet.[57]

James Burke adds:

> The work, published in 1543, was called *On the Revolution of
> the Celestial Spheres*. It stated that the center of the universe was
> a spot somewhere near the sun…The scheme met the
> requirements of philosophical and theological belief in circular
> motion. In every other respect, however, Copernicus struck at the
> heart of Aristotelian and Christian belief. He removed the Earth
> from the center of the universe and so from the focus of God's
> purpose. In the new scheme man was no longer the creature for
> whose use and elucidation the cosmos had been created. His
> system also placed the Earth in the heavens, and in doing so
> removed the barrier separating the incorruptible from the
> corruptible.[58]

Owen Barfield, in his penetrating book on human thought, suggests
that the Copernican revolution dwarfs any other:

> The real turning-point in the history of astronomy and of science
> in general was… when Copernicus…began to think, and others,
> like Kepler and Galileo, began to affirm that the heliocentric
> hypothesis not only saved the appearances, but was physically
> true. It was this, this novel idea that the Copernican (and
> therefore any other) hypothesis might not be a hypothesis at all
> but the ultimate truth, that was almost enough in itself to
> constitute the "scientific revolution," of which Professor
> Butterfield has written: "it outshines everything since the rise of
> Christianity and reduces the Renaissance and Reformation to the
> rank of mere episodes, mere internal displacements, within the
> system of medieval Christendom"….It was not simply a new
> theory of the nature of the celestial movements that was feared,

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[57] Arthur Koestler, *The Sleepwalkers*, p. 13.
[58] James Burke, *The Day the Universe Changed*, p. 135.

but a new theory of the nature of theory; namely, that, if a hypothesis saves all the appearances, it is identical with truth.[59]

Although Barfield does not give the citation, he is referring to the quote in Herbert Butterfield's book *The Origins of Modern Science: 1300-1800*.[60] Yet he left out the more significant of Butterfield's words:

Since it [the Copernican Revolution] changed the character of men's habitual mental operations even in the conduct of the non-material sciences, while transforming the whole diagram of the physical universe and the very texture of human life itself, it looms so large as the real origin both of the modern world and of the modern mentality, that our customary periodisation of European history has become an anachronism and an encumbrance.[61]

E. A. Burtt adds that after the Copernican revolution…

Man begins to appear for the first time in the history of thought as an irrelevant spectator and insignificant effect of the great mathematical system which is the substance of reality.[62]

Friedrich Engels, co-author with Karl Marx of the *Communist Manifesto*, reveals that the Copernican revolution was the beginning of modern man's humanistic religion, and for added flavor, he describes its advancement in Newtonian terms:

What Luther's burning of the papal Bull was in the religious field, in the field of natural science was the great work of Copernicus… from then on the development of science went forward in great strides, increasing, so to speak, proportionately to the square of the distance in time of its point of departure…[63]

Friedrich Engels
1820 – 1895

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[59] Owen Barfield, *Saving the Appearances: A Study in Idolatry*, 2nd ed., 1988, pp. 50-51.
[60] Herbert Butterfield, *The Origins of Modern Science: 1300-1800*, 1957, p. 7.
[61] *Ibid.*, pp. 7-8.
[62] E. A. Burtt, *The Metaphysical Foundations of Modern Science*, p. 90.

C. S. Lewis adds:

> "Go out on a starry night and walk alone for half an hour, resolutely assuming that the pre-Copernican astronomy is true. Look up at the sky with that assumption in your mind. The real difference between living in that universe and living in ours will then, I predict, begin to dawn on you."[64]
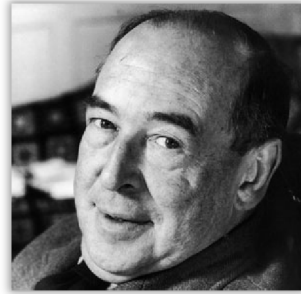
Clive Staples Lewis
1898 – 1963

The nihilist Friedrich Nietzsche, after seeing what the scientific revolution did to mankind, despondently concluded: "God is dead." What is even more significant is why Nietzsche proffered such sentiments. He writes:

> "Where has God gone?" he cried. "I shall tell you. We have killed him – you and I. We are his murderers. But how have we done this? How were we able to drink up the sea? Who gave us the sponge to wipe away the entire horizon? What did we do when we unchained the Earth from its sun? Whither is it moving now? Whither are we moving now? Away from all suns? Are we not perpetually falling? Backward, sideward, forward, in all directions? Is there any up or down left? Are we not straying as through an infinite nothing? Do we not feel the breath of empty space? Has it not become colder? Is it not more and more night coming on all the time? Must not lanterns be lit in the morning? Do we not hear anything yet of the noise

Friedrich Nietzsche
1844 – 1900

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[63] Nicholas Rescher, *Scientific Progress*, Oxford, United Kingdom, 1978, pp. 123-124. It is commonly admitted by historians that the Copernican Revolution spawned both the French and Bolshevik Revolutions. Marx said he was indebted to Copernicus.

[64] C. S. Lewis, *Studies in Medieval and Renaissance Literature*, 1966, p. 47.

of the gravediggers who are burying God? Do we not smell anything yet of God's decomposition? Gods, too, decompose. God is dead. God remains dead. And we have killed him. How shall we, murderers of all murderers, console ourselves?"[65]

The references to "What did we do when we unchained the Earth from its sun?" or "Is there any up or down left?" show that Nietzsche is speaking about none other than the Copernican revolution and the cataclysmic upheaval it ignited in the hearts of men. Many moderns have repeated Nietzsche's quote with the interpolation "God is dead…Our science has killed him," but few have noticed that the science to which Nietzsche was referring is Copernicanism and its offshoots, regardless of whether Nietzsche agreed or disagreed with heliocentric cosmology. The poet John Donne expressed a similar sentiment:

And new philosophy calls all in doubt
The element of fire is quite put out
The sun is lost, and th' Earth, and no man's wit
Can well direct him where to look for it.
And freely men confess that this world's spent,
When in the planets and the firmament
They seek so many new; they see that this
Is crumbled out again to his atomies
'Tis all in pieces, all coherence gone[66]

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[65] "The Gay Science" in Nietzsche's *Thus Spoke Zarathustra* (1885). The above quote is not chosen to suggest that Nietzsche had any sympathies or sentiments towards God or religion, but only that, in his inimitable way, he saw the obvious truth that, to whatever degree, Copernicanism separated man from God. Rest assured, many other quotes reveal Nietzsche's negative feelings about God and religion: "I cannot believe in a God who wants to be praised all the time." "After coming in contact with a religious man, I always feel that I must wash my hands." Nietzsche eventually contracted syphilis and committed suicide.

[66] John Donne (d. 1631). These lines extracted from a 238-line poem titled, *An Anatomy of the World* written in 1611, some say as an elegy for 15-year-old Elizabeth Drury whose death Donne saw as a symbol of the world's decay, while her heaven bound soul gave hope for regeneration. Others see included in it Donne's commentary on Galilean cosmology, since it came only a year after Galileo's *Sidereus Nuncius* published in 1610 (per Cohen, *Revolution in Science*, p. 498). Donne was born into Catholicism but joined the Anglican church in the 1590s, not caring much for the papacy. A poem written a year before, *Ignatius His*

The Ancient Origins of the
Heliocentric/Geocentric Debate

The heliocentric versus geocentric debate did not originate with Galileo, or even with Copernicus or Ptolemy. Long before Galileo met his match with the Catholic Church, the battle was between the sun-centered model of the Babylonians and the earth-centered model of the Hebrews described in Genesis.[67] The Babylonians were avid astronomers who believed that the sun god controlled the world, and naturally the sun occupied the center of the universe. They discovered the saros, which they used in predicting lunar eclipses. In fact, many centuries later the Greek astronomer Hipparchus published a star catalogue taken from the Babylonians but written as if it were made from his own observations.[68]

The next combatants were the Indian cosmologists versus the continuing Hebrew tradition, specifically from the book Joshua, although the Indians had both geocentrists and heliocentrists in their tradition.[69] By the time of the Greeks, cosmology was much more sophisticated as mathematics, philosophy, and experimentation were added to the debate.

Conclave, satirized the Jesuits. Ignatius of Loyola is ejected from hell and commanded to colonize the moon, a place in which he will not cause much harm.

[67] As Tycho Brahe said to Jewish astronomer David Gans: "Your sages were wrong to submit to the non-Jewish scholars. They assented to a lie for the truth lay with the Jewish sages" (André Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century: David Gans* (*1541-1613*) *and His Times*, translated from the French by David Maisel, 1986, p. 218).

[68] G. J. Toomer, "Ptolemy," *Dictionary of Scientific Biography*, 1975, p. 191.

[69] Some evidence of heliocentrism is found in the Vedic Sanskrits, the main text of Hinduism and most likely the oldest surviving religious texts. The word "Veda" means "knowledge" and/or "sacred book." Subhash Kak writes: "The theory that the sun was the 'lotus' [the central point] of the sky and that it kept the worlds together by its 'strings of wind' may have given rise to the heliocentric tradition in India." The *Shatapatha Brahmana* from the Upanishad era in the 9th century B.C., states: "The sun strings these worlds, [the earth, the planets, the atmosphere], to himself on a thread. This thread is the same as the wind" (8:7:3:10). (*Astronomy Across Cultures: The History of Non-Western Astronomy*, ed., Helaine Selin, 2000, p. 328). Kak also points out, however, that the earlier Indian astronomers adopted geocentrism: "The concepts of śīghrocca and mandocca cycles indicate that the motion of the planets was fundamentally around the sun, which, in turn, went around the earth….The śīghrocca maps the motion of the planet around the sun to the corresponding set of points around the earth. The sun, with its winds that holds the solar system together, goes around the earth" (*ibid*., p. 329). The model in which the planets revolve around the sun but the sun revolves around the Earth would be the same model propounded by Tycho Brahe.

The Basic Framework: Crystalline Spheres

No adequate understanding of cosmology is possible without first understanding the Greek concept of the crystalline spheres. It is the fundamental structure upon which all cosmology would either adhere or depart. As noted earlier, the very reason Copernicus rejected the simpler geocentric model (later to be demonstrated by Tycho Brahe) was that it required him to reject the Greek's concept of crystalline spheres, even though he had already rejected their geocentrism. Apparently, the spheres were very important to Copernicus. One reason is that spheres are essentially extended circles, and Copernicus believed, as a fundamental scientific fact, that all celestial motion had to occur by means of circles. As noted, he rejected Ptolemy's non-circular model based on that very premise.
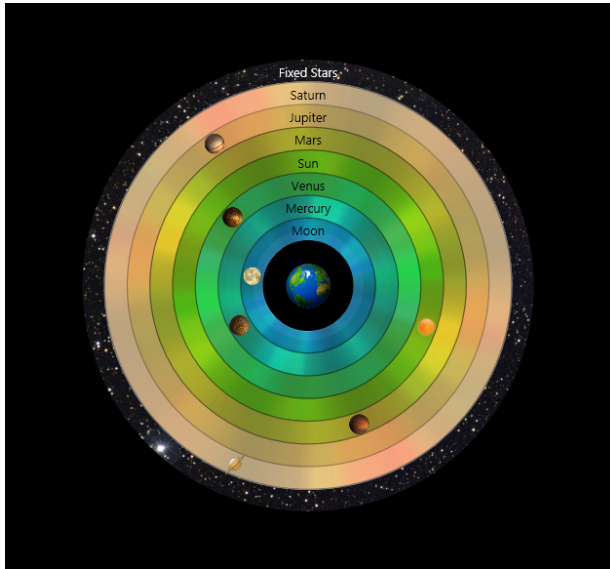
Aristotle's Crystalline Spheres[70]

The Greeks, especially after their model was refined by Aristotle, believed that the whole cosmos was structured upon dozens of transparent spheres. Each sphere had an inner and an outer wall. Attached to the inner wall were various celestial bodies. For example, Mars would be embedded into the wall of a sphere and the whole sphere rotated around the earth and

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[70] See CDROM for animation of Aristotle's Crystalline Spheres.

thus carried Mars with it, but since the sphere was transparent, it looked as though Mars was revolving around the earth by itself. These spheres were permitted to exist far away from the earth and rotate freely because they were composed of the fifth element, aether (the other four elements were: air, water, fire and earth), which was the lightest or most rarified element of the five.[71] Most important is the fact that any extensions in the planets' movement caused by epicyclic or eccentric variations were permitted in the space between the inner and outer wall of the sphere. Further, Aristotle believed that each sphere rotated around the earth because it was being pushed by one of the gods – who was the "unmoved mover." The medievals who later used an Aristotelian framework (but did so through Ptolemy's model) rejected the polytheistic cosmos and replaced it with only one Prime Mover who moved the outermost sphere which in turn moved the rest of the spheres.

Prior to Aristotle, the Greek school of astronomy was introduced by **Anaximander** (d. 546 BC) who believed that the Earth was like the central hub of a spoked wheel. The rim of the wheel rotated around the earth and carried the sun, moon and planets. The moon's rim was 19 times as big as the earth, while the sun's rim was 27 times as big. He believed that the sun and moon were composed of fire but that we saw them only through small openings, as if they were at the open end of a trumpet.[72] He did not believe the earth was spherical. It was a cylinder with a height three times its width and that we lived on the flat side at the top. The earth was suspended in space unsupported by anything and was in the exact center of the universe. He held that each star was carried by the rim of a wheel and that all of the thousands of rims coalesced into a giant spherical shell around the earth, although he held that the universe was originally a sphere.[73] His

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[71] There were seven basic spheres, one for each of the following: the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. More elaborate systems have the seven spheres incorporating secondary spheres. An eighth sphere outside Saturn was filled with all the stars and they were attached to that sphere. Some add a ninth sphere for the precession of the equinoxes; a tenth for their trepidation; and an eleventh for the variations in the obliquity of the ecliptic.

[72] Hippolytus says of Anaximander: "The heavenly bodies come into being as a circle of fire, separated off from the fire in the world and enclosed by air. There are certain tubular channels or breathing holes through which the heavenly bodies appear; hence eclipses occur when the breathing holes are blocked, and the moon appears sometimes waxing and sometimes waning according to whether the channels are blocked or open" (*Refutation of All Heresies*, I).

[73] Pseudo Plutarch writes: "Anaximander maintains that the eternally productive cycles of hot and cold separated off in the generation of this world and formed a spherical shell of fire surrounding the Earth and its atmosphere like the bark around a tree. When this sheath of fire finally tore up and divided into various

student, **Anaximenes** (d. 528 BC) followed him but with variations between the movement of the planets and the stars, the latter being attached to their crystal sphere but the former moving freely as if on air. **Parmenides** (d. 450 BC) added that the spheres around the Earth were evenly spaced. **Xenophanes** (d. 475 BC) said that the stars moved rectilinearly. **Empedocles** (d. 435 BC) believed the sphere of the stars was infinite. **Plato** (d. 347 BC) in his famous *Timaeus* continued the concept of spheres and specified that they were perfect shapes, but he proposed that the planets were spherical bodies set in rotating rings rather than the wheel rims of Anaximander. **Eudoxus** (d. 350 BC) has no extant works but we know his cosmology from Aristotle's *Metaphysics*.[74] He held that the sun, moon and planets moved within 27 spheres. With these additional spheres he was the first to attempt an explanation of the retrograde motion of the planets. He understood the revolution of the sun around the earth to be 365 days and 6 hours long, which is very close to our present understanding.

Callippus (d. 300 BC) added more spheres to Eudoxus' model, employing five spheres for the sun, moon, Mercury, Venus, and Mars, while giving four spheres for Jupiter and Saturn, making 33 total spheres. As was the case with his predecessors, each planet was attached to the sphere which carried it around the earth. **Aristotle** (d. 322 BC), using Eudoxus' model, created a more elaborate system of spheres. With earth in the center, the planets revolved around it by the interweaving motion of at least 47 but no more than 55 spheres. Distinguishing his from that of Eudoxus and Callippus, Aristotle had the spheres interconnected, but each sphere was moved by a separate "unmoved mover," which corresponded to one god for each sphere who moves it because he "loves" it.

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wheel-shaped stripes, the sun, moon and the stars were created from it" (*Stromateis* 2).

[74] "Eudoxus supposed that the motion of the sun or of the moon involves, in either case, three spheres, of which the first is the sphere of the fixed stars, and the second moves in the circle which runs along the middle of the zodiac, and the third in the circle which is inclined across the breadth of the zodiac; but the circle in which the moon moves is inclined at a greater angle than that in which the sun moves. And the motion of the planets involves, in each case, four spheres, and of these also the first and second are the same as the first two mentioned above (for the sphere of the fixed stars is that which moves all the other spheres, and that which is placed beneath this and has its movement in the circle which bisects the zodiac is common to all), but the poles of the third sphere of each planet are in the circle which bisects the zodiac, and the motion of the fourth sphere is in the circle which is inclined at an angle to the equator of the third sphere; and the poles of the third sphere are different for each of the other planets, but those of Venus and Mercury are the same" (Aristotle's *Metaphysics*, Ch. 8, Bk 12).

There were other developments to the geocentric school from Theaetus (d. 369 BC), Heraklides (d. 310 BC), Euclid (d. 265 BC), Hipparchus (d. 120 BC) and Apollonius (d. 190 BC). Of these, **Heraklides** made the earth rotate on its axis, but put it at the center of the world. Mercury and Venus were made to revolve around the sun in epicycles, but the sun and the remaning planets revolved around the earth.[75] In fact, because of his somewhat unique combination of the geocentric and heliocentric models, historian Giovanni Schiaparelli (d. 1910) believes that Heriklides is the precursor of both Copernicus' heliocentric model and Tycho Brahe's geocentric model.[76]

As time went on, **Apollonius** extended Heraklides' epicycles beyond Mercury and Venus and applied them to the outer planets, and had the earth rotating. **Hipparchus** also used a system of epicycles as well as eccentricities, which improved on Apollonius' model. As Barbour notes:

> Hipparchus's work is to be see as a most significant step forward in the Greek program of finding geometrokinetic explanations for why the observed motions of the sun, moon, and planets did not fit the divine paradigm of perfect uniform circular motion….the problems the astronomers faced were of quite a different kind and had very much to do with the specific eccentricities of the various planetary orbits.[77]

The Greek Heliocentrists

Pythagoras (d. 495 BC), famous for his geometry theorems, formed the Pythagorean school of heliocentrists, or what we might call semi-heliocentrists or anti-geocentrists, which included such names as: **Philolaus** (d. 385 BC) who put the earth in one of a number of spheres of the sun and planets circling a fiery mass. The central fire could not be seen because the populated portion of the earth was always facing away from it.

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[75] Heraklides' was used again by Martianus Capella in the 5th century AD; and again, with modifications, by Giovanni Riccioli in 1651 who included Mars in an orbit around the sun. The model of Tycho Brahe had all the planets revolving around the sun, while the sun revolved around a fixed earth. Riccioli had posited seventy-seven arguments against heliocentrism (See C. M. Graney at http://arxiv.org/abs/1011.3778).

[76] *I precursori di Copernico nell' Antichild*, as cited by W. Carl Rufus in *The Astronomical System of Copernicus*, 1923, p. 512, available from Maria Mitchell Observatory.

[77] Julian B. Barbour, *Absolute or Relative Motion, Vol. 1, The Discovery of Dynamics*, Cambridge University Press, 1989, pp. 118, 127.

The speed of revolution was dependent on their "harmonic" distances such that the nearer bodies to the fire traveled slower then the outer because of their "lower tone." For Philolaus, the sun was merely a spherical mirror that reflected the light and heat of the central fire. **Hiketas** (d. 450 BC) and **Ekphantus** (d. 450 BC) disfavored Philolaus' model and opted for a version in which the sun, moon and planets were fixed, while the earth rotated from west to east.[78] **Aristarchus** (d. 230 BC), who was from the same city, Samos, as Pythagorus, is usually credited with having the first full-blown heliocentric system. None of Aristarchus' writings are extant, but his cosmological model was described by his contemporary, Archimedes (who was himself a heliocentrist). He stated that Aristarchus' "hypotheses are that the fixed stars and the sun remain unmoved, that the earth revolves about the sun in the circumference of a circle, the sun lying in the middle of the orbit."[79] Based on his estimates, Aristarchus believed the sun had seven times the diameter of the earth and was hundred-folds more voluminous. Some believe this huge discrepancy in size led him to put the earth in orbit around the sun. Others hold that it was his claim to have finally detected a parallax of the sun by measuring it against the first and third quarter's of the moon's phases. A lack of parallax for the sun was apparently Aristotle's chief objection to heliocentrism. We know today, however, the same solar parallax can be shown from a geocentric system; and perhaps the reason Aristarchus' heliocentric model did not

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[78] See J. L. E. Dreyer, *A History of Astronomy from Thales to Kepler*, originally under the 1905 title: *History of Planetary Systems from Thales to Kepler*, Dublin, Ireland; Olaf Pederson, *A Survey of the Almagest*, Odense, Denmark, Odense University Press, 1974; Pierre Dunhem, *To Save the Phenomena: An Essay on the Idea of Physical Theory from Plato to Galileo*, Univ. of Chicago Press, 1969; W. Carl Rufus, "The Astronomical System of Copernicus," *Popular Astronomy*, 1923.

[79] The complete citation is as follows: "You King Gelon are aware the 'universe' is the name given by most astronomers to the sphere the center of which is the center of the Earth, while its radius is equal to the straight line between the center of the Sun and the center of the Earth. This is the common account as you have heard from astronomers. But Aristarchus has brought out a book consisting of certain hypotheses, wherein it appears, as a consequence of the assumptions made, that the universe is many times greater than the 'universe' just mentioned. His hypotheses are that the fixed stars and the Sun remain unmoved, that the Earth revolves about the Sun on the circumference of a circle, the Sun lying in the middle of the orbit, and that the sphere of fixed stars, situated about the same center as the Sun, is so great that the circle in which he supposes the Earth to revolve bears such a proportion to the distance of the fixed stars as the center of the sphere bears to its surface" *The Sand Reckoner* (Greek: Αρχιμήδης Ψαμμίτης, Archimedes Psammites) in *Arenarius*, 1, 4-7.

become popular was that his contemporaries knew such to be the case. Aristarchus also believed the stars were at huge distance from earth and that the earth rotated on its axis. Another heliocentrist was Seleucus (b. 190) who adopted Aristarchus' model.

The Geocentric Victory

Claudius Ptolemy
90 – 168 BC

We might say that the centuries long battle between the heliocentric and geocentric models was finally won by the geocentrists when Claudius Ptolemy, the Greek astronomer from Alexandria, Egypt, introduced his very refined model. His model was so successful that Islamic astronomers created various versions to help improve his accuracy. As Kak notes: "The geometrical structure of the universe conceived by Muslim astronomers of the early Islamic period (ca. 800-1050) is more or less that expounded in Ptolemy's *Almagest*, with the system of eight spheres being regarded essentially as mathematical models." [80]

Essentially, Ptolemy extended the use of epicycles begun by Heraklides and Apollonius.

Epicycle comes from the Greek *epi*, which means "added on," and *cycle*, which refers to a circle or something continuing in the same motion. In other words, Ptolemy added a smaller circle onto an already existing

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[80] "Kak also says: "Other significant Islamic modifications to Ptolemaic planetary models, devised to overcome the philosophical objections to the notion of an equant and the problem of the variation in lunar distance inherent in Ptolemy's lunar model, belong to the later period of Islamic astronomy. There were two main schools…in the thirteenth century (notably with al-Tūsī and his colleagues) and Damascus in the fourteenth (with Ibn al-Shāṭir), and the other developed in the late twelfth century (with al-Biṭrūjī) (*Astronomy Across Cultures: The History of Non-Western Astronomy*, ed., Helaine Selin, 2000, pp. 588-589). Consult the CDrom for animations of the models of al-Tūsī, Ibn al-Shāṭir, and al-Biṭrūjī. Prior to these developments were the heliocentric efforts of Āryabhata (476-550 A.D.) Kak adds: "It is not certain that Āryabhata was the originator of the rotation of the earth. It appears that the rotation of the earth is inherent in the notion that the sun never sets that we find in the *Aitareya Brāhmana* 2:7: "The sun never really sets or rises. In that they think of him 'He is setting,' having reached the end of the day, he inverts himself; thus he makes evening below, day above….He never sets, indeed, he never sets" (*ibid.*, p. 368).

larger circle. The larger circle was called a *deferent*; the smaller an *epicycle*. The reason Ptolemy did so was that the Greek's, mainly through the work of Hipparchus, had discovered that the planets and the sun did not move in perfect regularity. For example, the sun did not stay the same length of time in each of the four seasons. Spring was 94.5 days; summer 92.5 days; autumn 88.8 days; winter 90.8 days. This was due to the fact that the whole system was a bit off-center. In order to compensate for the resulting irregular movements, Ptolemy used the epicycle quite ingeniously.

But the epicycle was not what ultimately separated Ptolemy from his predecessors, since they had also used more primitive epicycles in one form or another. Ptolemy was distinguished because he broke with the tradition that the sun and planets had to revolve around the earth at uniform speed. Ptolemy made them move non-uniformly and thus he answered why the sun spent more time in one quadrant of its orbit than another.

Ptolemy's Epicycles

Direction of Deferent Orbit

Planet

Earth

Direction of Epicycle Orbit
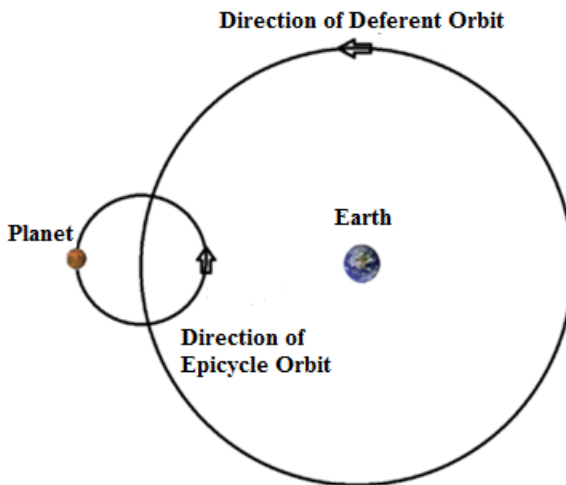
The device that allowed him to accomplish this victory was the **equant**, or what we might better describe as an "equalizer." In order to account for the off-centeredness of the orbits, Ptolemy created an imaginary point inside their orbits that was off-center. Barbour calls it "the crowning achievement of Hellenistic astronomy" but also an "*ad hoc* introduction made *in extermis* when all traditionally accepted means to reconcile the data had failed."[81] In brief, as Ptolemy moved the center of the orbit a little off-center, he created a point from which the planet would consequently move at a uniform speed from the equant's point of view, but move at a non-uniform speed from the center's point of view.
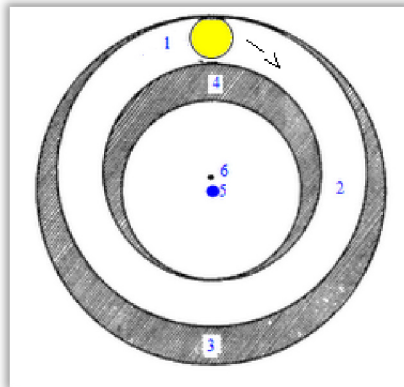
[82]

Perhaps the most remarkable thing about Ptolemy's equant is that it was essentially the basis upon which Kepler, over fourteen centuries later, would also solve the problem of irregular orbits, although he would do so

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[81] J. Barbour, *Absolute or Relative Motion*, pp. 163, 171, 208. Dennis Rawlins believes that Ptolemy commandeered the equant from his Greek predecessors, namely, Hipparchus, since it appears that Ptolemy took a lot of other material from them, especially the orbit of Mars. Although Rawlins has no hard evidence of the equant before Ptolemy, he retorts: "To suppose that no astronomer before Claudius Ptolemy's time came up with a theoretical model that could eliminate this glaringly monstrous inadequacy of the eccentric model is to imagine that the ancients were a lot less resourceful than is suggested by the elegant remnants we possess of third century BC mathematics (*e.g.*, Archimedes and Apollonios) 440 years before Ptolemy." Rawlins believes that Ptolemy was heavily influenced by his geocentric commitments. ("Ancient heliocentrists, Ptolemy, and the equant," Dennis Rawlins, Physics Dept., Loyola College, Baltimore, *American Journal of Physics* 55 (3), March, 1987, pp. 235-239).
[82] (1) the sun, moving clockwise around the Earth (5) inside a crystalline sphere (2) whose center is the equant (6), which is off-center from the complimentary space (3) but centered on complimentary space (4)

for the heliocentric system. By using elliptical orbits and foci and adjusting them as needed for each planet, Kepler could make them go faster in their orbits at the perihelion point (closet to the sun) as opposed to the aphelion (farthest from the sun). But Kepler's use of two foci in an ellipse was virtually the same as Ptolemy placing the equant and the Earth on opposite sides of the center. As Kepler could change the distance between the foci and the center to give greater eccentricity, Ptolemy could change the distance between the equant and the Earth to achieve whatever degree of non-uniform movement required. As a result, both Ptolemy's and Kepler's planets would sweep out the same area per unit time, but Ptolemy's discovery of this principle antedated Kepler by almost a millennium and a half.[83] The reason Kepler is so adulated is that he was the first one to apply it to the heliocentric system, whereas Ptolemy had used it exclusively for the geocentric.

All in all, the equant allowed Ptolemy's system to work very well. A problem came, however, when minor discrepancies in the positions and speeds of the planets (due to their own perturbations from their mutual gravitational attraction) became quite noticeable as they added themselves up over the centuries, thus throwing off the Julian calendar by weeks and even months. As we will see, it was this problem with the calendar that would eventually lead Copernicus to believe that Ptolemy's model had to be rejected rather than adjusted.

Ptolemy's Equant
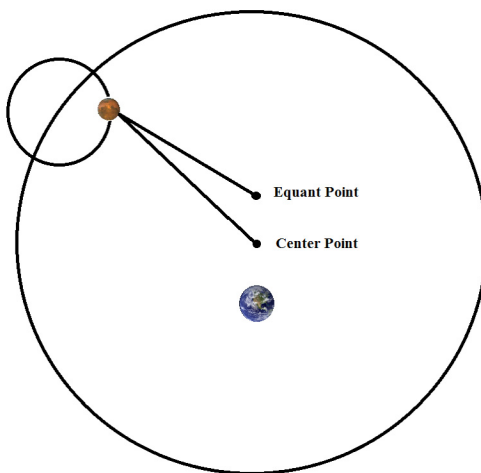
Equant Point

Center Point

Kepler's Ellipse as an Epicycle

━━ = Orbit   ▬▬ = Epicycle   ▬ ▬ = Deferent

The Deferent/Epicycle Covers Same Area in Same Time as the Ellipse
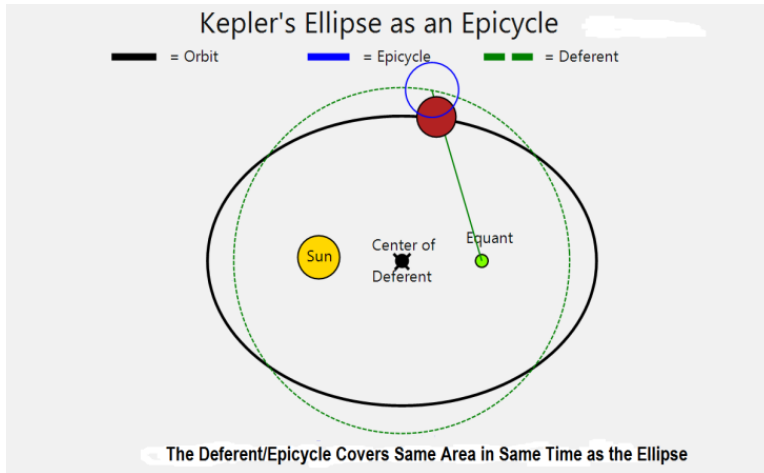
The other major problem for Ptolemy was that neither he nor his Greek predecessors knew the distances between the earth, the sun and the planets. Thus, among other difficulties, he didn't know how big to make Venus' deferent or even its epicycle, but he did decide to make it smaller than the deferent of the sun. Although this accounted for the position of Venus, it did not account for the phases of Venus. As Kitty Ferguson puts it:

> In Ptolemaic astronomy, Venus always lay between the Earth and the Sun. For that reason, if Venus sheds no light of its own but only shines with reflected sunlight, observers on Earth should never see the face of Venus anywhere near fully lit. In other words, it should never be equivalent to a full Moon.[84]

This was a discrepancy that eventually made Galileo believe he was on the right track in rejecting Ptolemy's system. Ferguson adds that the problem would have persisted "even if Venus' epicycle had been miscalculated and was actually on the other side of the Sun from the Earth….Finally, Galileo had found persuasive observational evidence that Ptolemaic astronomy was inferior to Copernican astronomy." But is this true? Was Ptolemy trapped by putting Venus inside the sun's orbit? Perhaps, but Ptolemy could have put the sun on an epicycle and put Venus on an epicycle around the sun but, of course, he, having no telescope with

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[84] Kitty Ferguson, *Measuring the Universe*, p. 92.

which to view Venus as Galileo did, had never seen its phases in order to know he even had a problem. As Barbour notes:

> The phases of the planets, visible through the telescope, especially in the case of Venus, provided strong confirmation of the distances that Copernicus had postulated and demonstrated beyond all doubt that Venus orbited the sun….Galileo was convinced that, in confirming Copernicus's prediction, these observations proved the earth's mobility.

Barbour makes us privy to a little known secret of Ptolemy's model:

> In fact, they were still compatible with what one might call the 'essential' Ptolemaic system….The Ptolemaic theory left six free parameters that had to be fixed by guesswork. No violence was done to the essentials of the Ptolemaic theory by fixing these in such a way that the deferents of Mercury and Venus were taken equal to the earth-sun distance and the deferents of the superior planets to their actual distances from the sun. This choice has the consequence that the geometrical arrangement of the Copernican system (when treated as here in the zero-eccentricity approximation) is *exactly* reproduced, the only difference being that in one system the earth is at rest, in the other the sun. This in fact is the system which Tycho Brahe proposed… As far as astronomical observations are concerned, the Tychonic system, which is a *special case* of the Ptolemaic one, is kinematically identical to Copernicus's except in its relation to the distant stars.[85]

In other words, the phases of Venus were no proof for the heliocentric system. The fact that Ptolemy did not know the distances between the heavenly bodies was compensated by the fact that his system incorporated six variables to account for such unknown quantities, thus making his model very pliable to what would actually be observed in the future. The simple fact is, Copernicus, influenced by many non-scientific factors,

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[85] Julian B. Barbour, *Absolute or Relative Motion*, *Vol. 1, The Discovery of Dynamics*, Cambridge University Press, 1989, pp. 224-225, italics his. Barbour's second volume, *Mach's Principle, General Relativity and Guage Theory*, was never formally published, although Dr. Barbour gave me a complete copy of his manuscript in preparation for his interview in the documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, CA.

simply chose not to make those adjustments and instead wanted to throw the baby out with the bath water, as it were.
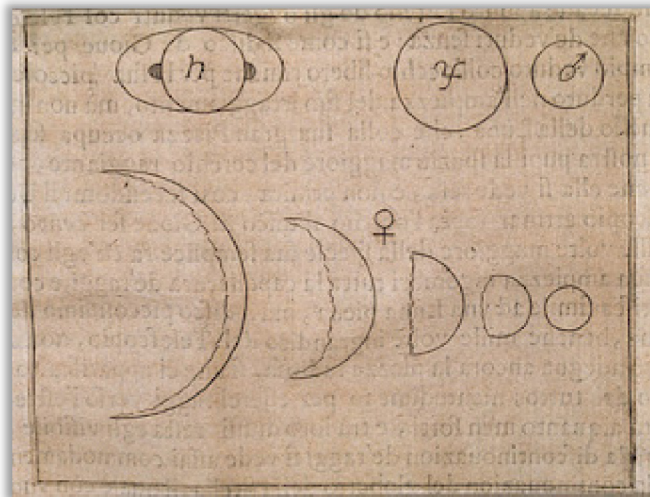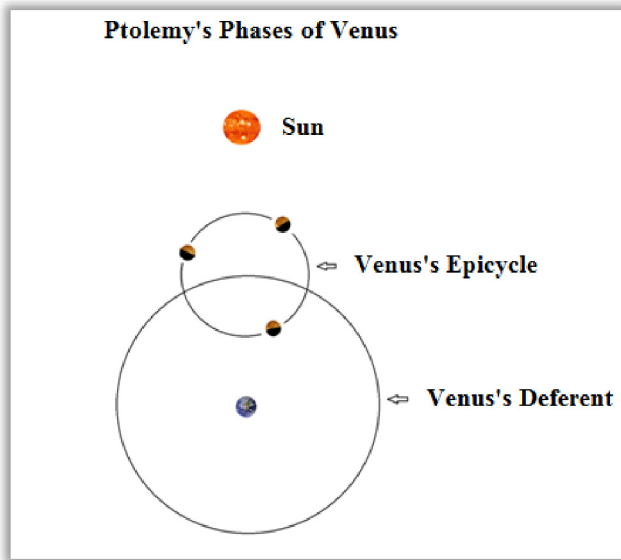
Galileo's original drawing of Venus and its phases

The Real Truth about the Copernican Solar System

Unbeknownst to almost all modern-day believers in the solar system of Nicholas Copernicus[86] is one stark but incontrovertible fact: the popular idea of the Earth revolving around the sun has never been proven. Despite all the pretentious claims purporting to have proof for heliocentrism (which are made on the basis of such phenomena as stellar parallax, stellar aberration, retrograde motion, the Foucault pendulum, the Coriolis effect, meteor showers, red shift, ring lasers, the equatorial bulge of the Earth and geosynchronous satellites: all of which, as we demonstrate in this volume, do not prove, in the least, the heliocentric system), honest scientists will candidly admit that heliocentrism is merely their *preferred* model of cosmology, but certainly not the proven one.

Nicholas Copernicus: 1473 – 1543

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[86] Nicolaus Copernicus is the Latinized version of the original Polish name Nicklaus Koppernigk. While the spelling of the first name varies between Nicklaus, Niklas, and Nicolaus, the last name has had more of a variety: Coppernic, Koppernieck, Koppernik, Koppernigk, Cupernick, and Kupernick. Copernicus signed his name in various ways as well: Copernic, Coppernig, Coppernik, Copphernic, but in later years mostly as Copernicus. He is also referred to as Nicklaus Koppernigk Warmiensis, since he was from the province of Warmia in Poland. Ironically, in the Frankonian local dialect of Poland, *koepperneksch* still means "a far-fetched, cockeyed proposition" (Koestler, *The Sleepwalkers*, p. 191).

Historically speaking, stellar parallax is particularly important to this debate, since a claim of finding the first parallax (and hence a false claim that heliocentrism was a proven fact), may have had something to do with the authorities under Pope Gregory XVI removing Copernicus and Galileo's works from the *Index of Forbidden Books* in 1835, although the pope gave no specific reason for the removal.[87] Even more intriguing is the fact that Gregory XVI, who was previously Cardinal Capellari when he served on the 1822 commission to give Canon Settele an imprimatur for his book on heliocentrism, appears to have been persuaded by a clever fabrication created by Frs. Antonio Grandi and Marizio Olivieri, the latter being the Commissary General of the Holy Office. In 1822 they posited that the only reason the Church declared the Copernican system formally heretical in 1616 and 1633 (at the trial of Galileo) was that it was a "defective" model because it did not contain elliptical orbits of the planets.[88] This was, indeed, a blatant fabrication since the ecclesiastical

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[87] As cited by astrophysicist and historian, Owen Gingerich, at St. Edmunds Public Lecture series, titled: "Empirical Proof and/or Persuasion," March 13, 2003, wherein he writes: "Hence, ironically, what persuaded the Catholic Church to take Copernicus' book off the Index was an ultimately false claim for the discovery of an annual stellar parallax. The new edition of the Index appearing in 1835 finally omitted *De Revolutionibus*, three years before a convincing stellar parallax observation was at last published." Gingerich cites his source for this information as Pierre-Noël Mayaud, S.J., *La Condamnation des Livres Coperniciens et sa Révocation: á la lumière de documents inédits des Congregation de l'Index et de l'Inquisition* (Rome: Editrice Pontificia Universita Gregoriana, 1997), no page number given. One of the contentions of our book *Galileo Was Wrong: The Church Was Right*, is that, not only was the 1835 rescission of Copernicus' and Galileo's works presumptuous in light of the false parallax claims, even after 1838 (when Bessel published the first authenticated parallax) the case for heliocentrism was not proven, since parallax can also be explained equally well from a geocentric model.

[88] As noted by Annibale Fantoli in *Galileo: For Copernicanism and for the Church*, p. 520, stating: "Father Grandi…working in agreement with Olivieri and basing himself on his argumentation, he had tried to realize the objective of saving the good name of the Holy See, substantially by emphasizing the fact that the Copernican system, by then recognized even by Catholic authors, had been purified from errors and inconsistencies which had made it unacceptable in its original form. This was equivalent to maintaining that the Church had not erred in 1616 by putting on the Index a work at that time so defective at the level of physics and that now the Church was legitimately authorized to approve it after its errors were corrected. And it was, as a matter of fact, this which 'was sugested' to poor Settele to make skillfully known in his work." Maurice Finocchiaro, in his recent book, *Retrying Galileo*, p. 251, gives more detail, as taken from Olivieri's November 1820 Summation, titled, "Ristretto di Ragione, e di Fatto," ¶30: "Along

records clearly show that Copernicanism was rejected purely because it made the earth move, not because it made the earth move incorrectly. What may have led to this fabrication was that, at this precise time in history, the Church was rather handicapped to discover the actual stipulations from the Galileo affair because all the records from the 1633 trial were in Napoleon's possession in France, since he had confiscated them while storming of the Vatican in 1809. He didn't return them until 1845, ten years after Galileo's name had been removed from the Index. The important details of these events will be covered thoroughly in volume 2 of this work.

Suffice it to say, a thorough study of the original Copernican system, the very system the pre-1641 Galileo brought to the Catholic Church and demanded she accept, reveals a model racked with so many problems one wonders how it ever saw the light of day. In 1514 Copernicus was asked by Pope Leo X to use his talents to help fix the calendar. The calendar had been causing slight but pestering problems for many centuries. The last revision was initiated by Julius Caesar, who employed his astronomers to create what we now know as the Julian calendar, a calibration that incorporated 365¼ days per year, a marked improvement from the previous 355 days per year.[89] As noted, even the Greek astronomer

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with modern astronomers, Settele does not teach that the sun is at the center of the world: for it is not the center of the fixed stars; it is not the center of heavy bodies, which fall toward the center of our world, namely of the earth; nor is it the center of the planetary system because it does not lie in the middle, or center, *but to one side at one of the foci of the elliptical orbits that all planets trace*. Still less does he teach that the sun is motionless; on the contrary, it has a rotational motion around itself and also a translational motion which it performs while carrying along the outfit of all its planets" (*ibid*., p. 205). But unfortunately, Finocchiaro perpetuates the same fabrication when he concludes: "That is, the Church had been right in condemning the latter from a scientific point of view, because Galileo had also upheld heliocentrism in its unsatisfactory Copernican form…" (*ibid*., p. 520). The Church condemned Copernicanism for one reason only: it made the earth move. For more information on this issue, see Volume 3, *Galileo Was Wrong: The Church Was Right*.

[89] In the pre-Christian era, there were two dating systems: (1) a dating system based on the dates of the reigning monarch. In this system, the foundation date is 753 B.C., which is the foundation date of Rome under the auspices of Romulus. The Romans titled this foundation date *ab urbe condita* (meaning: "from the foundation of the city"). Their year began on April 21st and they had 355 days in their calendar. This inaccurate calendar remained in force until the time of Julius Caesar, who in 46 B.C., under the tutelage of the Greek astronomer Sisogenes, increased the number of days in the year 46 B.C. to 445. Thereafter (45 BC and onward) there were 365¼ days in the year, and the year would begin on January

Eudoxus (d. 350 BC) knew that the year was 365 days and 6 hours long. But as good as Ptolemy's model was, it was not good at incorporating the perturbations of the planets caused by their mutual gravitational attraction (and neither has any other system).

One of the reasons Copernicus was invited by the pope was that he had published a precursor of his heliocentric theory between the years 1510-1514, titled **Commentariolus** ("Little Commentary") antedating his more famous work *De revolutionibus orbium coelestium*, which was released some thirty years later, in 1543, the year of Copernicus' death. It is in the *Commentariolus* that Copernicus makes his first claim that the Ptolemaic system is unsatisfactory, yet admits that it is "consistent with the data."[90] Among the more salient features of the treatise are Copernicus' three major premises: (1) "That the Earth is not the center of the universe, only of the moon's orbit and of terrestrial gravity"; (2) "That the apparent daily revolution of the firmament is due to the Earth's rotation on its own axis"; (3) "that the apparent annual motion of the sun is due to the fact that the Earth, like the other planets, revolves around the sun."

Copernicus' motivation for introducing his new system was that he was dissatisfied with Ptolemy's. As we noted earlier, however, whatever complexity and futility Copernicus saw in Ptolemy's model, he attributed this to Ptolemy's departure from the circle as the only possible movement for celestial bodies.

In **De revolutionibus orbium coelestium** he writes:

> We must however confess that these movements are circular or are composed of many circular movements, in that they maintain

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1st. (2) a dating system based on significant events. The commencement of the Olympic games in 776 B.C. is the foundation date. Every four years, the Greeks recorded the date of the Olympiads, abbreviated "OL." 1 A.D. would be the 754th year of the foundation of Rome, or the fourth year of the 194th Olympiad.

[90] *Commentariolus*, p. 57, as cited by Paul Feyerabend, *Against Method*, p. 71, n. 14. The full title is: *Nicolai Copernici de hypothesibus motuum coelestium a se constitutes commentariolus*. It had no name until given one by Tycho Brahe (Repcheck, *Copernicus' Secret*, p. 185). Its exact date is uncertain, but evidence points to 1510-1514, predating *De revolutionibus orbium coelestium* by at least three decades. Koestler remarks on its effect: "…the first pebble had fallen into the pond and gradually, in the course of the following years, the ripples spread by rumour and hearsay in the Republic of Letters. This led to the paradoxical result that Canon Koppernigk enjoyed a certain fame, or notoriety, among scholars for some thirty years without publishing anything in print, without teaching at a university or recruiting disciples. It is a unique case in the history of science. The Copernican system spread by evaporation or osmosis, as it were" (*Sleepwalkers*, p. 149).

these irregularities [of motion] in accordance with a constant law and with fixed periodic returns; and that could not take place, if they were not circular. For it is only the circle which can bring back what is past and over with…"[91]

The Commentarilous: 1510 ~ 1513

So enamored was Copernicus with the circle that he retained Aristotle's crystalline spheres as the perfect mold for the circle. As scientific historian from Harvard, I. Bernard Cohen, reveals:

In both *De revolutionibus* and the *Commentariolus* Copernicus attacks the Ptolemaic astronomy not because in it the sun moves rather than the earth, but because Ptolemy has not strictly adhered to the precept that all celestial motions must be explained only by uniform circular motions or combinations of such circular motions. Ptolemy had recognized that an accurate representation of planetary motion necessitated the abandoning of uniform circular motion, and he boldly introduced what was

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[91] *On the Revolution of the Heavenly Spheres*, trans., Wallis, p. 12.

later called an "equant," from which nonuniform motion along an arc would appear uniform. From the point of view of accuracy, this was a great step forward, indeed, the best representation of planetary motion before Kepler. But Copernicus considered the use of an equant to be a violation of fundamental principles and devoted his original astronomical research to devising a system of sun, planets, moon, and stars in which the planets and the moon glide with uniform motion along a circle or with some combination of such motions.[92]

De revolutionibus orbium coelestium: **1543**

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[92] I. Bernard Cohen, *Revolution in Science*, 1985, 1994, p. 112. He adds: "Copernicus mentioned with approval in both the *Commentariolus* and *De revolutionibus* the ancient doctrine of Callippus and Eudoxus, in which combinations of circular motions (or rotations of spheres) had been used to account for the phenomena" (*ibid*). Aristotle has "a body that moves in a circle has neither heaviness nor lightness for it cannot change its distance from the center" (*De Coelo*, 269b34f).

In light of this singular motivation, it appears that the legacy of the Copernican revolution is based on a fallacious premise – that circles are somehow superior to ovals. Cohen adds:

> He then turned to ancient authors in order to find out whether in any of their writings they might have proposed alternative doctrines to Ptolemy's. During this study, he said, he encountered the ideas of the Pythagoreans concerning the motion of the earth. It was only then, assured by a tradition of antiquity, that in humanist fashion he began to consider the astronomical consequences of the earth's orbit, since he knew that "others before me had been given the same liberty" ("quia sciebam aliis ante me hanc concessam libertatem").[93]

 Copernicus seems to have tried to take the best from each school of Greek cosmology. While he borrowed a moving Earth from Pythagoras, he commandeered the crystalline spheres of Aristotle who believed that the Earth was motionless in the center. Contrary to popular opinion, Copernicus' solar system was not one of free floating planets pushed by natural forces around the sun, but the same Greek idea of crystal spheres, within which the planets were hung, that rotated around a center point. As Cohen puts it, "the only thing Copernicus did was transform the old Greek idea of earth-centered spheres into new sun-centered spheres." This can be seen in the original drawings made by Copernicus. Noel Swerdlow points out that in his manuscript drawing Copernicus has "seven numbered captions and eight circles, so that it would appear that the captions do refer to the seven spaces between the circles," which correspond to "the spheres themselves, each being of a certain thickness…and everywhere contiguous to the sphere above and below it."[94] Hence Cohen remarks that Copernicus' title, *De Revolutionibus Orbium Coelestium* ("On the Revolution of the Celestial Spheres") has the operative word "Spheres" for the very reason that he intended on keeping the Greek spheres in his cosmology. Later drawings of Copernicus' system tend to hide this fact, since the captions for the circles are put outside the circles' boundary.[95]

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[93] *Ibid.*, p. 488.
[94] Noel Swerdlow, "Pseudodoxica Copernicana: or, enquiries into very many received tenents and commonly presumed truths, mostly concerning spheres," *Archives Internationales d'Histoire des Sciences* 26:108-158, 1976, as cited in Cohen's *Revolution in Science*, p. 110. The diagram of Copernicus' original system is now housed in the Jagiellonian Library, Cracow, Poland.
[95] *E.g.*, *Encyclopedia of Astronomy*, 2004, uses outside captions but claims it is a "Diagram of the heliocentric universe from…*De revolutionibus* of 1543" (p. 103).

Planets inside the circles, published 1543

Apparently, Copernicus understood his model as only an improvement on Ptolemy rather than a revolution in thinking. As Cohen notes, the "order and mode of presentation closely follow the plan of Ptolemy's *Almagest*."[96]

In that sense we might say that Copernicus' model had more of a psychological and philosophical influence than it had in improving the knowledge of the heavenly orbs. Still, in his "improvements," Barbour opines that Copernicus "comes under suspicion of plagiarism. In *De revolutionibus* his method of eliminating the equant is identical to Gutb al-Dīn's, while the Tūsī couple is used both in his theory of precession and in his model of Mercury's motion…his lunar theory is essentially that of Ibn al-shātir."[97] Barbour adds that the only thing that may save him from the charge is that independent discoveries are "commonplace in science."

In any case, since the *Commentariolus* allowed Copernicus to enjoy a certain distinction among various astronomers and intellectuals, he seemed a likely candidate to offer some help in fixing the calendar. Copernicus informed the pope, however, that a further improvement could not be made until the motions of the sun and moon were more precisely

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[96] *Revolution in Science*, pp. 109-110.
[97] *Absolute or Relative Motion*, p. 231.
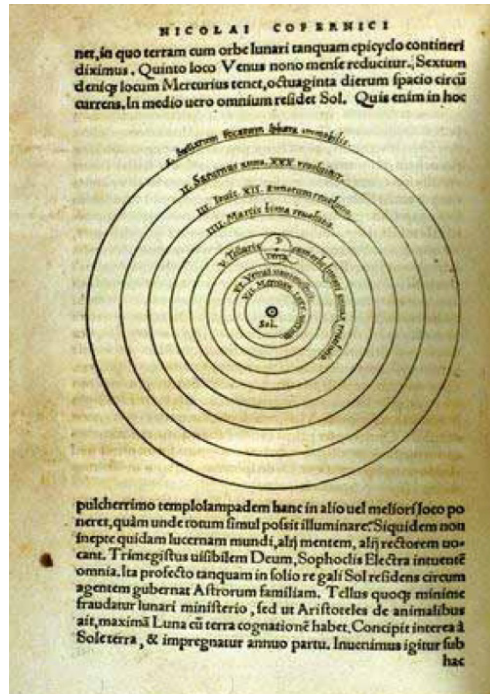
Planets outside the circles, post-1543

coordinated, and thus he declined the pope's invitation.[98] Still, various Vatican officials continued to make overtures toward Copernicus. For example, in 1533, the personal secretary of Pope Clement VII, Johann Albrecht of Widmanstadt, gave a lecture on the heliocentric system to a

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[98] Copernicus was correct about the difficulty, but such precision is not needed to coordinate a calendar. Still, the moon's motions remain one of the most complicated of all celestial bodies. As Kuhn notes: "The moon travels around the ecliptic faster and less steadily than the sun. On the average it completes one journey through the zodiac in 27⅓ days, but the time required for any single journey may differ from the average by as much as 7 hours….Successive new moons may be separated by intervals of either 29 or 30 days, and only a complex mathematical theory, demanding generations of systematic observation and study, can determine the length of a specified future month. Other difficulties derive from the incommensurable lengths of the average lunar and solar cycles" (*The Copernican Revolution*, pp. 46-47). It is also known that the moon drifts tangentially from its orbit about 4cm/year. Hoyle adds: "The two most striking bodies in the sky, the Sun and Moon, cause difficulties at the outset, even before we come to the planets" (*Nicolaus Copernicus*, p. 53).

chosen audience in the Vatican gardens.[99] Then, under Paul III in 1535, Cardinal Nikolaus von Schöenberg became interested in Copernicus and requested Theodoric of Radzyn to copy all of Copernicus' writings and have them sent to Rome. He then encouraged Copernicus in a private letter of 1536: "In it you maintain that the earth moves; that the sun occupies the lowest, and thus the central, place in the universe…. I entreat you, most learned sir, unless I inconvenience you, to communicate this discovery of yours to scholars."[100]

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[99] Fantoli adds that Albrecht "had probably received his information on the Copernican theory from Theodoric of Radzyn, who at that time represented at Rome the chapter of Warmia, to which Copernicus as canon also belonged." Rewarded with an ancient codex, Albrecht wrote these words on it: "The Supreme Pontiff Clement VII gave me this codex in Rome in the year 1533 after which I had explained to him the opinion of Copernicus on the motion of the Earth in the Vatican gardens in the presence of Cardinals Francesco Orsini and Giuseppe Salviati, of Giovanni Pietro, vescovo di Viterbo, and of the doctor, Matteo Curzio" (*For Copernicanism and for the Church*, p. 41). Pope Clement VII was the nephew of Lorenzo Medici, who ruled as the Grand Duchy of Tuscany from 1449-1492. The Grand Duchy of Tuscany was the head of about a half-dozen smaller Duchies in northern Italy (Duchy of Urbino to the west, Duchy of Modena to the north, etc.). Florence was in Tuscany, while Rome was part of the papal states directly to the south of Tuscany. Below the papal states was the kingdom of Naples and Sicily governed by Spain. Galileo would often seek refuge in Florence away from the pope in Rome, but he was often called back to Rome on such occasions.

[100] The complete letter states: "Some years ago word reached me concerning your proficiency, of which everybody constantly spoke. At that time I began to have a very high regard for you, and also to congratulate our contemporaries among whom you enjoyed such great prestige. For I had learned that you had not merely mastered the discoveries of the ancient astronomers uncommonly well but had also formulated a new cosmology. In it you maintain that the earth moves; that the sun occupies the lowest, and thus the central, place in the universe; that the eighth heaven remain perpetually motionless and fixed; and that, together with the elements included in its sphere, the moon, situated between the heavens of Mars and Venus, revolves around the sun in the period of a year. I have also learned that you have written an exposition of this whole system of astronomy, and have computed the planetary motions and set them down in tables, to the greatest admiration of all. Therefore with the utmost earnestness I entreat you, most learned sir, unless I inconvenience you, to communicate this discovery of yours to scholars, and at the earliest possible moment to send me your writings on the sphere of the universe together with the tables and whatever else you have that is relevant to this subject. Moreover, I have instructed Theodoric of Reden to have everything copied in your quarters at my expense and dispatched to me. If you gratify my desire in this matter, you will see that you are dealing with a man who

That **Cardinal Schöenberg** was going against all previous Catholic tradition in his praise of Copernicus' system was certainly out of the ordinary. Schöenberg was a progressive cleric who believed the Church needed to be reformed. Beyond that, however, the question lingers as to why such interest was showered on Copernicus' book, since the detailed math and geometry was somewhat beyond his expertise to judge, not to mention the fact that he was well aware of the geocentric tradition of the Catholic Church stemming from the consensus of the Church Fathers and medievals. Something else was influencing Schöenberg and his immediate superior, Clement VII, for both to look favorably upon Copernicus. Part of the interest may have been generated by the persuasive lectures by Albrecht of Widmanstadt concerning Copernicus' *Commentariolus*. But due to the severity with which Paul III (1548), Paul V (1616) and Urban VIII (1633) would eventually condemn heliocentrism, Schöenberg was treading on uncharted territory. Whatever the real impetus for his interest, Schöenberg died the year after he wrote his 1536 letter to Copernicus, and Clement VII died the year after Albrecht's lectures. Paul III became pope in 1534 and a much more ominous cloud came over the horizon.

In 1541, Copernicus summoned the courage to present his work to Paul III, at least under the pretext that his work was merely a "hypothetical" model and that he had no intentions of promoting it as the actual system.[101] Copernicus records this sequence of events in the Introduction to *De revolutionibus*:

is zealous for your reputation and eager to do justice to so fine a talent. Farewell. Rome, 1 November 1536."

[101] Protestant reformer, Andreas Osiander, who wrote the Introduction to *De revolutionibus* (although he did so anonymously so as to leave room for the inference that Copernicus himself wrote it) and George Rheticus, Copernicus' Protestant confidant who vigorously sought for the publication of the book against his master's reticence, had different plans, however. Osiander's April 20, 1541 letter to Rheticus reveals the ploy: "The Aristotelians and theologians will easily be placated if they are told that several hypotheses can be used to explain the same apparent motions…and eventually they will go over to the opinion of the author" (quoted in Johannes Kepler's *Apologia Tychonis contra Ursum*, and published in the same's *Opera Omnia*, ed. Frisch, I, pp. 236-276, cited in Koestler's, *The Sleepwalkers*, p. 171). Based on a June 1542 letter from T. Forsther to J. Schrad,

For not many years ago under Leo X when the Lateran Council was considering the question of reforming the Ecclesiastical Calendar, no decision was reached, for the sole reason that the magnitude of the year and the months and the movements of the sun and moon had not yet been measured with sufficient accuracy. From that time on I gave attention to making more exact observations of these things and was encouraged to do so by that most distinguished man, Paul, Bishop of Fossombrone, who had been present at those deliberations. But what have I accomplished in this matter I leave to the judgment of Your Holiness in particular and to that of all other learned mathematicians.[102]

Despite all the introductory fanfare, *De revolutionibus* was certainly not a smash hit in the annals of book publishing. The first run was a thousand copies, which never sold out. There were only four reprints in the next four hundred years. Compared to other books on astronomy being sold at that time, including Ptolemy's *Almagest*, whose reprints were in the hundreds, *De revolutionibus* had one reprint prior to 1700.[103] One reason

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Koestler reasons that Copernicus knew of Osiander's Introduction but allowed it to be attributed to himself, and thus it became "the greatest scandal in the history of science" (*ibid.*, p. 169). Koestler concludes: "There is a strangely consistent parallel between Copernicus' character, and the humble, devious manner in which the Copernican revolution entered through the back door of history, preceded by the apologetic remark: 'Please don't take seriously – it is all meant in fun, for mathematicians only, and highly improbable indeed'" (*ibid.*, p. 175).

[102] *On the Revolutions of Heavenly Spheres*, trans. Charles G. Wallis, 1995, p. 7.

[103] These included Jesuit Christopher Clavius' book *Treatise on the Sphere*, reprinted nineteen times; Philip Melanchthon's *Doctrine of Physics*, reprinted seventeen times, which refuted Copernicus' book. Claudius Ptolemaeus' book was originally titled μαθηματικὴ σύταξις (*Mathematike Syntaxis*) in AD 142 but was renamed by Arab astronomers *Almagest*, which means "the greatest." As Toomer notes: "It was dominant to an extent and for a length of time which is unsurpassed by any scientific work except Euclid's *Elements*….In the late eighth and ninth centuries, with the growth of interest in Greek science in the Islamic world, the *Almagest* was translated, first into Syriac, then, several times, into Arabic. In the middle of the twelfth century no less than five such versions were still available….Two of these translations are still extant, those of al-Hajjāj and Ishāq-Thābit. In them we find the title of Ptolemy's treatise given as 'al-mjsty'. This is undoubtedly derived…from a Greek form μεγίστη (?sc. σύνταξις), meaning 'greatest [treatise]', but it is only later that it was incorrectly vocalized as al-majastī, whence are derived the mediaeval Latin 'almagesti,' 'almagestum,' the

for its unpopularity was its unreadability. It was choppy, obtuse, and pedantic. The thrust of the theory fills fewer than twenty pages at the beginning of the book, roughly five percent of the whole treatise. More than half the book is filled with useless charts that prove nothing for Copernicus' case. When the book reaches its end, there is little left of the original teaching, and thus Copernicus can offer no concluding statement, even though it was promised many times in the text. Truth be told, the main reason for its unpopularity was that it offered no real improvement over Ptolemy's system. In the *Introduction*, Copernicus claims to have rid cosmology of Ptolemy's somewhat cumbersome epicyclical system, which had been in use for over a thousand years. To Paul III he writes:

> For some make use of homocentric circles only, others of eccentric circles and epicycles, by means of which however they do not fully attain what they seek. For although those who have put their trust in homocentric circles have shown that various different movement can be composed of such circles, nevertheless they have not been able to establish anything for certain that would fully correspond to the phenomena. But even if those who have thought up eccentric circles seem to have been able for the most part to compute the apparent movements numerically by those means, they have in the meanwhile admitted a great deal which seems to contradict the first principles of regularity of movement.[104]

Theologically speaking, Paul III wasn't bothered by this assertion, since it appeared that Copernicus exhibited no insistence on making the heliocentric model more than an intriguing hypothesis. Unbeknownst to the pope, however, Copernicus' solar system was in many instances more complicated than Ptolemy's. What Copernicus claimed as simplicity is one thing; what his work shows is quite another. Even a cursory reading of *De revolutionibus* reveals that the model he proposed was complicated and uncertain.[105] As one author observes:

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ancestors of the modern title 'Almagest'" (G. J. Toomer, *Ptolemy's Almagest*, London, Duckworth, 1984, pp. 1-2).

[104] *On the Revolutions of Heavenly Spheres*, p. 5.

[105] Some of the things with which Copernicus had to contend are: the obliquity of the ecliptic; the intersection of the equator, ecliptic and meridian; declinations and ascensions of stars; angles of the ecliptic with the horizon; precessions of solstices and equinoxes; irregularities of the equinoctial precession; the magnitude and difference of the solar year; the irregularity of the sun's movement; the changes of the apsides; regular and apparent movement; the moon's very complicated and

What we call the Copernican revolution was not made by Canon Koppernigk. His book was not intended to cause a revolution. He knew that much of it was unsound, contrary to evidence, and its basic assumption unprovable.[106] ….As a result of all this, Canon Koppernigk's lifework seemed to be, for all useful purposes, wasted. From the seafarers' and stargazers' point of view, the Copernican planetary tables were only a slight improvement on the earlier Alphonsine tables, and were soon abandoned. And insofar as the theory of the universe is concerned, the Copernican system, bristling with inconsistencies, anomalies, and arbitrary constructions, was equally unsatisfactory, most of all to himself. In the lucid intervals between the long periods of torpor, the dying Canon must have been painfully aware that he had failed.[107]

Copernicus: More Epicycles than Ptolemy

One of the more obvious faults of *De revolutionibus* was that for all its complaints against epicycles, in the end Copernicus actually produced more epicycles than Ptolemy. Ptolemy's system has forty epicycles, whereas Copernicus ends up with forty-eight. Yet in the earlier work, the *Commentariolus*, Copernicus stated that his heliocentric system needed **only thirty-four epicycles**, and even this numeration was off by four.[108]

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irregular movement; the unequal apparent diameter of the moon and its parallaxes; the mean oppositions and conjunctions of the sun and moon; ecliptic conjunctions; the irregular movements of the other planets; the latitudes of the planets; the planets' angles of obliquation; and many other issues.

[106] *The Sleepwalkers*, p. 151. So reticent was Copernicus to publish his work for fear of ridicule that Rheticus, wishing to obscure the true author, published a summary of the contents and attributed the work to "the learned Dr. Nicolas of Torun," the town Copernicus was born.

[107] Arthur Koestler, *The Sleepwalkers*, p. 126.

[108] Copernicus writes in the *Commentariolus*: "Then Mercury runs on seven circles in all; Venus on five; the earth on three, and round it the moon on four; finally Mars, Jupiter, and Saturn on five each. Altogether, therefore thirty-four circles suffice to explain the entire structure of the universe and the entire ballet of the planets," translated by E. Rosen in *Three Copernican Treatises*, 1971, cited in Barbour's *Absolute or Relative Motion*, p. 255. But Koestler remarks: "Incidentally, as Zinner has pointed out, even the famous count at the end of the *Commentariolus* is wrong as Copernicus forgot to account for the precession, the motions of the aphelia and the lunar nodes. Taking these into account, the *Commentariolus* uses thirty-eight not thirty-four circles," adding that Copernicus makes no mention of the total number of epicycles in *De revolutionibus*: "Apart

What happened, of course, was that since the *Commentariolus* was merely a preliminary thesis, Copernicus soon discovered that when the time came to work out the finer details of his system a couple of decades later, he was forced to add fourteen more epicycles just to make his version of celestial mechanics come close to the accuracy of Ptolemy's.[109] Books IV and V are

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from the erroneous reference to 34 epicycles, I have nowhere seen a count made of the number of circles in *De revolutionibus*" (*The Sleepwalkers*, p. 580), perhaps hiding the fact from his reader that it contained more epicycles than the *Commentariolus*. Gingerich adds: "Copernicus must have realized that with his small epicyclets he actually had more circles than the Ptolemaic computational scheme used in the Alfonsine Tables or for the Stoeffler ephemerides" (op. cit., p. 58). Regarding the discrepancies among the orbits of Mars, Jupiter and Saturn in 1504, Gingerich writes: "…the evidence is firm that he had observed the cosmic dance at this time [1504] and was fully aware of the discrepancies in the tables. But what is most astonishing is that Copernicus never mentioned his observation, and his own tables made no improvement in tracking these conjunctions" (*ibid.*, p. 59).

[109] *The Sleepwalkers*, pp. 194-195. One reason Copernicus had so many epicycles is, rather than placing the sun in the center of the universe, he placed the Earth's entire orbit in the center (although, according to Gingerich: "this was an unresolved mystery in the book, for Copernicus hedged on the issue," *The Book that Nobody Read*, p. 163). Koestler says discrepancies on the number of epicycles is because most historians have not read Copernicus' book but depended on other biographers. Koestler's notes show that he did a painstaking analysis of *De revolutionibus* that allows him to conclude Copernicus used forty-eight epicycles (pp. 579-580). Gingerich accounts for these extra epicycles as follows: "While he [Copernicus] had eliminated all of Ptolemy's major epicycles, merging them all into the Earth's orbit, he then introduced a series of little epicyclets to replace the equant, one per planet" (*The Book that Nobody Read*, pp. 54-55). For mistaken scholarly accounts that settled on Copernicus having only 34 epicycles, Koestler cites the *Chamber's Encyclopedia* as stating the Copernican system reduced the epicycles "from eighty to thirty-four," as is the case with Herbert Dingle's address to the *Royal Astronomical Society* in 1943. I found the same discrepancies. Ivars Peterson writes: "Copernicus needed more circles in his sun-centered model than Ptolemy did in his Earth-centered scheme [a] total of 34 circles for all the planets and the moon" (*Newton's Clock*, p. 54). Some add more epicycles: "To account for the apparent alterations in speed and movement of the planets, Copernicus was obliged to use as many as ninety Ptolemaic epicycles" (James Burke, *The Day the Universe Changed*, p. 134); "[Ptolemy] ultimately required 80 circles and nested epicycles" (*Introduction to Modern Astronomy* I, Peter A. Becker, George Mason Univ., lecture 4). Outlandish estimates include: "Although Copernicus introduced…about 40 epicycles to account for observations, he considered this a great improvement since the Ptolemaic theory contained more than 240 such epicycles" (Lloyd Motz and Anneta Duveen,

filled with pages of epicycle after epicycle. Here is just one sample of many:

Page from Copernicus' *De revolutionibus* showing his epicycles

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Essentials of Astronomy, Wadsworth Publishing, CA, 1966, p. 135). Motz was an astronomer with a Ph.D. in physics from Columbia Univ.

As one source describes Copernicus' use of epicycles:

> His actual reason for this was because planetary observations indicated that even when the slowing down and speeding up of the observed planets due to retrograde motion was precisely accounted for, the planets still nevertheless did not seem to travel at uniform speed about the sun. Rather, the observations clearly demonstrated that they appeared to travel faster through space when closer to the sun and slower when further away from it. Indeed, this noted fact that the planets did not maintain a constant distance from the sun at all times in their orbits led Copernicus to offset his major orbital circles so that they were not precisely centered on the sun. Thus, in holding fast to his circles, and through his conviction that the speed of the planets was uniform, he was forced to retain small planetary epicyclical orbits as a subtle way to account for the continued presence of their apparent non-uniform motion about the sun....If one were to plot the actual path of one full orbit about the sun, the planet would be found to trace out an elongated circular path as opposed to an exact circle. Such is the result of combining two uniform circular orbits in the proscribed manner.[110]

Contrast Between Copernicus' 1510 *Commentariolus*
and the 1543 *De Revolutionibus* Regarding the Number of Epicycles

Object	Motion Problem	*De Revolutionibus*	*Commentariolus*
Earth	Diurnal rotation	1	1
	Motions in longitude	3	1
	Conic motion of Earth's axis for its fixed direction	1	1
	Two rectilineal oscillations for precession and obliquity	4	3
Moon	Motions in longitude	3	3
	Motion in latitude	1	1
Three Outer Planets	Motions in longitude 3 × 3	9	9
	Oscillations in latitude 3 × 2	6	6
Venus	Motions in longitude	3	3
	3 oscillatory motions in latitude to 6 circular	6	2
Mercury	Motions in longitude	5	5
	Motions in latitude	6	2
Total		48	*34

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[110]http://www.ancient-world-mysteries.com/ancient-astro nomy.html.

Hence, Cohen remarks:

> …the claim for a great simplicity of the Copernican system, as opposed to a great complexity of the Ptolemaic system, must therefore – insofar as the number of circles is concerned – be taken *cum grano salis*, in fact, with the whole saltcellar…it takes only the most cursory leafing through the pages of *De revolutionibus*…to be struck by Copernicus' use of epicycles page after page. Even a neophyte will recognize in the diagrams of *De revolutionibus* and the *Almagest* a kinship of geometrical methods and constructions that belies any simple claim that Copernicus's book is in any obvious sense a more modern or a simpler work than Ptolemy's."[111]

> Copernicus is reported by Rheticus to have said to him that if his planetary theory agreed with the observed positions of the planets (that is, to within ten minutes of arc), he would be as well pleased with himself as Pythagoras had been when he discovered the famous theorem associated with his name. In fact, however, Copernicus never attained this accuracy. To see how large or small this value is, it may be pointed out that the average naked-eye observer can just distinguish as two a pair of near-by stars four minutes of arc apart. According to Neugebauer, ten minutes was considered adequate agreement of observation….Before long, ten minutes of arc was considered to be so far off the mark that a difference of approximately this magnitude between a theory and the observed positions of Mars determined by Tycho Brahe could decide that a theory was worthless and should be cast aside. For Kepler it was unthinkable that there could be an error of even eight minutes of arc in Tycho's planetary observations. The positions Tycho assigned to certain fundamental stars were generally less than one minute of arc from the true positions."[112]

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[111] I. Bernard Cohen, *Revolution in Science*, pp. 111, 119-120. Cohen adds: "But of course Copernicus was fully aware that no set of simple circular motions could give an accurate representation of the heavenly world….Anyone conversant with astronomy would be aware that the diagram in book I of *De revolutionibus* was at best schematic, a greatly oversimplified model of the system" (p. 111). J. L. E. Dreyer says Copernicus' system had "a serious defect" (*History of the Planetary Systems from Thales to Kepler*, 1909, p. 342).
[112] *Revolution in Science*, p. 117.

More disturbing is the fact that, to make Ptolemy's model appear worse than it really was, Copernicus exaggerated the number of epicycles employed by his ancient rival. Although Ptolemy used only forty epicycles, Copernicus asserted that he had eighty.[113] This gives us a strong hint that perhaps Copernicus was not in this game merely to give the world a better model of cosmology; rather, he thought of it as an historic competition that allowed him to inflate his opponent's errors. As Barbour notes: "In fact, there are far fewer circles in the Ptolemaic scheme presented in the *Almagest* than many accounts would lead one to believe; Ptolemy was remarkably economic in his use of circular motions."[114] But most astronomers perpetuate an illusion about Copernicus. Cohen remarks again:

> A biography of Copernicus, subtitled "The Founder of Modern Astronomy," would have us believe that "by making the Earth rotate on an axis and revolve in an orbit, Copernicus reduced by more than half the number of circular motions which Ptolemy had found it necessary to postulate."[115]

As it stands, Ptolemy's equant made his model much more economical. Copernicus had to add a **second circular epicycle** (or epicyclet) to do what Ptolemy's equant had accomplished; and Copernicus was compelled to do so because he believed Ptolemy, by introducing the equant, had departed from strictly circular motion. As noted earlier, Ptolemy's equant was so versatile that it would rival Kepler's ellipse, for it allowed the planets to sweep out the same area per unit time of revolution

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[113] Cohen remarks on Robert Palter's coining of the "80-34 syndrome" of those who desired to place Copernicus above Ptolemy. Owen Gingerich adds that the myth of having to put up with Ptolemaic epicycles perpetuated itself like an out-of-control gossip chain. He writes: "The legend reached its apotheosis when the 1969 *Encyclopedia Britannica* announced that, by the time of King Alfonso, *each planet* required 40 to 60 epicycles! The article concluded, 'After surviving more than a millennium, the Ptolemaic system failed; its geometrical clockwork had become unbelievably cumbersome and without satisfactory improvements in its effectiveness.' When I challenged them, the *Britannica* editors replied lamely that the author of the article was no longer living, and they hadn't the faintest idea if or where any evidence for the epicycles on epicycles could be found" (*The Book that Nobody Read*, pp. 56-57). Elsewhere Gingerich adds: "the Copernican system is slightly more complicated than the original Ptolemaic system" ("Crisis versus aesthetic in the Copernican revolution," *Vistas in Astonomy*, 17, p. 87, 1975.
[114] Julian Barbour, *Absolute or Relative Motion*, p. 184.
[115] I. Bernard Cohen, *Revolution in Science*, p. 119.

that Kepler's famous Second law of motion (the "equal area law") would eventually accomplish a millennia and a half later.

Copernicus' Double Epicycle Creates Non-Uniform Motion

—— = Orbit   —— = Epicycles   ▬ ▬ = Deferent   ● = Planet

☐ Animation

Sun

Planet speeds up when near the Sun   [116]
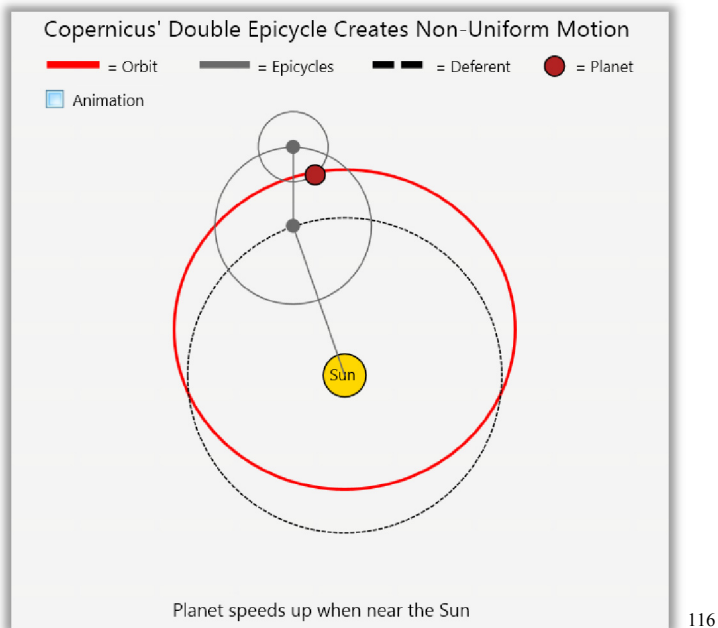
The complexity of Copernicus' heliocentric system stems in part from the fact that most of the charts and figures in *De revolutionibus* were not original. Copernicus merely borrowed them from the Greeks and then reworked the figures to fit his heliocentric model:

> Canon Koppernigk was not particularly fond of star-gazing. He preferred to rely on the observations of Chaldeans, Greeks, and Arabs – a preference that led to some embarrassing results. *The Book of the Revolutions* contains, altogether, only twenty-seven observations made by the Canon himself; and these were spread over thirty-two years!…Even in the position he assumed for his basic star, the Spica, which he used as a landmark, was erroneous by about forty minutes' arc, more than the width of the moon.[117]

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[116] See CDROM for animation of Copernicus' epicycles.
[117] Koestler, *The Sleepwalkers*, p. 125.

Chapter 1: The New Galileo and the Truth about Copernicanism

The great scholar on early astronomy, Otto Neugebauer, writes:

> The popular belief that Copernicus' heliocentric system constitutes a significant simplification of the Ptolemaic system is obviously wrong. The choice of the reference system has no effect on the structure of the model, and the Copernican models themselves require about twice as many circles as the Ptolemaic models and are far less elegant and adaptable.[118]

> Modern historians, making ample use of the advantage of hindsight, stress the revolutionary significance of the heliocentric system and the simplification it had introduced. In fact, the actual computation of planetary positions follows exactly the ancient patterns and the results are the same. The Copernican solar theory is definitely a step in the wrong direction for the actual computation as well as for the underlying kinematic concepts.[119]

Koestler adds:

> Alexandrian astronomers can hardly be accused of ignorance. They had more precise instruments for observing the universe than Copernicus had; Copernicus himself hardly bothered with star-gazing; he relied on the observations of Hipparchus and Ptolemy. He knew no more about the actual motions of the stars than they did. Hipparchus' Catalogue of the fixed stars and Ptolemy's Tables for calculating planetary motions were so reliable and precise that they served, with insignificant corrections, as navigational aids to Columbus and Vasco da Gama. Eratosthenes, another Alexandrian, computed the diameter of the Earth as 7,850 miles with an error of only ½ per cent. Hipparchus calculated the distance of the moon as 30¼ Earth diameters – with an error of only 0.3 per cent. Thus, insofar as factual knowledge is concerned, Copernicus was no better off, and in some respects worse off, than the Greek astronomers of Alexandria who lived at the time of Jesus Christ.[120]

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[118] Otto Neugebauer, *The Exact Sciences in Antiquity*, 1957, p. 204.
[119] Otto Neugebauer, "On the Planetary Theory of Copernicus," *Vistas in Astronomy* 10, p. 103, 1968.
[120] Arthur Koestler, *The Sleepwalkers*, p. 73. NB: Before the invention of the telescope, an accurate measurement of the distance between the sun and the Earth

Along these lines, Thomas Kuhn reveals the modern misconception of Copernicus:

> But this apparent economy of the Copernican system, though it is a propaganda victory that the proponents of the new astronomy rarely failed to emphasize, is largely an illusion….The seven-circle system presented in the First Book of the *De revolutionibus*, and in many modern elementary accounts of the Copernican system, is a wonderfully economical system, but it does not work. It will not predict the position of planets with an accuracy comparable to that supplied by Ptolemy's system.[121]

To drive home the point, Kuhn adds:

> …this brief sketch of the complex system of …Copernicus…indicates the third great incongruity of the *De revolutionibus* and the immense irony of Copernicus' lifework. The preface to the *De revolutionibus* opens with a forceful indictment of Ptolemaic astronomy for its inaccuracy, complexity, and inconsistency, yet before Copernicus' text closes, it has convicted itself of exactly the same shortcomings. Copernicus' system is neither simpler nor more accurate than Ptolemy's. And the methods that Copernicus employed in constructing it seem just as little likely as the methods of Ptolemy to produce a single consistent solution of the problem of the planets. The *De revolutionibus* itself is not consistent with the single surviving early version of the system, described by Copernicus in the early manuscript *Commentariolus*. Even Copernicus could not derive from his hypothesis a single and unique combination of interlocking circles, and his successors did not do so….Judged on purely practical grounds, Copernicus'

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was not possible. Ptolemy had estimated the distance to be 610 Earth diameters, while Copernicus estimated it to be 571 Earth diameters. The actual distance is 11,500 Earth diameters.

[121] Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, 1957, 1959, p. 169. N. R. Hanson adds: "…in no ordinary sense of 'simplicity' is the Copernican theory simpler than the Ptolemaic" (*Constellations and Conjectures*, Dordrecht, D. Reidel, 1973. Cited in Imre Lakatos' *The Methodology of Scientific Research Programmes*, p. 175).

new planetary system was a failure; it was neither more accurate nor significantly simpler than its Ptolemaic predecessors.[122]

Having heard of his fame, a fellow heliocentrist, Georg Joachim Rheticus,[123] visited with Copernicus in 1539. After befriending Copernicus and reading his works, Rheticus worked very hard in convincing him to publish his *De revolutionibus*. Prior to Copernicus' decision, Rheticus wrote a summary version of Copernicus' work titled *Narratio prima* in 1540.[124] It was Rheticus' purpose to do all that he could to disseminate the heliocentric universe. With the help of the Protestant publisher Johannes Petreius,[125] Rheticus acquired the services of Lutheran Andreas Osiander to write a preface for *De revolutionibus*. After years of labor, Rheticus was finally nearing success, but he did not get to see the final draft of *De revolutionibus* before it was published. In the meantime, Copernicus had suffered a stroke in December 1542, but his book was finally published in March 1543 by Petreius, and Copernicus had died shortly thereafter.

In regard to his heliocentric theory, Copernicus consistently appealed to the "harmony" of his system, but it was a harmony ennobled by a sun that he personified, and, some say, deified. Copernicus writes:

In the middle of all sits Sun enthroned. In this most beautiful temple could we place this luminary in any better position from which he can illuminate the whole at once? He is rightly called

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[122] Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, p. 171. Herbert Butterfield adds: "[Copernicus] was puzzled by the variations he had observed in the brightness of the planet Mars…Copernicus' own system was so far from answering to the phenomena in the case of Mars that Galileo in his main work on this subject praises him for clinging to his new theory though it contradicted observation…." (*The Origins of Modern Science: 1300-1800*, p. 37).

[123] Rheticus' original name was Georg Joachim Iserin. His father, Georg Iserin, had been convicted of various crimes (either sorcery or theft, or both) and was executed. Families of the executed were required to change their last name. He chose "Rheticus" from the region of Rhaetia from where his mother originated.

[124] Rheticus writes in the *Narratio*: "…each of the planets, by its position and order and every inequality of its motion, bears witness that the earth moves and that we who dwell upon the globe of the earth, instead of accepting its changes of position, believe that the planets wander in all sorts of motions of their own" (translated by Edward Rosen, in *Three Copernican Treatises*, 1971, p. 165).

[125] Petreius published works on Luther, Erasmus, Melanchthon, Henry VIII, Regiomontanus and Gasser. Although he also published a few works by Augustine, Calvin and Luther had commandeered some of Augustine's works on predestination for the cause of Protestantism.

the Lamp, the Mind, the Ruler of the Universe: Hermes Trismegistus names him the Visible God, Sophocles' Electra calls him the All-seeing. So the Sun sits as upon a royal throne ruling his children the planets which circle round him. The Earth has the Moon at her service. As Aristotle says, in his *On Animals*, the Moon has the closest relationship with the Earth. Meanwhile the Earth conceives by the Sun, and becomes pregnant with an annual rebirth.[126]

Karl Popper shows the origin of these cultic ideas:

Copernicus studied in Bologna under the Platonist Novara; and Copernicus' idea of placing the sun rather than the Earth in the center of the universe was not the result of new observations but of a *new interpretation* of old and well-known facts in the light of semi-religious Platonic and Neo-Platonic ideas. The crucial idea can be traced back to the sixth book of Plato's *Republic*, where we can read that the sun plays the same role in the realm of visible things as does the idea of the good in the realm of ideas. Now the idea of the good is the highest in the hierarchy of Platonic ideas. Accordingly the sun, which endows visible things with their visibility, vitality, growth and progress, is the highest in the hierarchy of the visible things in nature.…Now if the sun was to be given pride of place, if the sun merited a divine status…then it was hardly possible for it to revolve about the Earth. The only fitting place for so exalted a star was the center of the universe. So the Earth was bound to revolve about the sun. This Platonic idea, then, forms the historical background of the

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[126] *De revolutionibus*, "10. Of the Order of the Heavenly Bodies," as cited in *The Copernican Revolution*, pp. 179-180 (Kuhn's translation from the Latin). Charles Glenn Wallis' translation (or his editor's), although similar, seems desirous to lessen Copernicus' deification of the sun by using slightly different wording and lower case letters: "In the center of all rests the sun. For who would place this lamp of a very beautiful temple in another or better place than this wherefrom it can illuminate everything at the same time? As a matter of fact, not unhappily do some call it the lantern; others, the mind, the pilot of the world. Trismegistus calls it a 'visible god'; Sophocles' Electra, 'that which gazes upon all things.' And so the sun, as if resting on a kingly throne, governs the family of stars which wheel around. Moreover, the Earth is by no means cheated of the services of the moon; but as Aristotle says in the *De Animalibus*, the Earth has the closest kinship with the moon. The Earth moreover is fertilized by the sun and conceives offspring every year" (*On the Revolutions of Heavenly Spheres*, 1995, pp. 24-26).

Copernican revolution. It does not start with observations, but with a religious or mythological idea.[127]

Popper, being a supporter of the heliocentric revolution, couches his critique of Copernicus in rather polite terms, but essentially he is saying that Copernicus' brainchild had all the earmarks of originating from pagan sun-worship. As Wolfgang Smith notes:

…in the Renaissance movement championed by Marsiglio Ficino, the doctrine came alive again, but in a somewhat altered form; one might say that what Ficino instituted was indeed a religion, a kind of neo-paganism. Copernicus himself was profoundly influenced by this movement, as can be clearly seen from numerous passages in the *De revolutionibus*.[128]

Upon reading *De revolutionibus*, one is struck by the preponderance of philosophical and humanistic arguments Copernicus brings to his aid. As J. D. Bernal notes: "[Copernicus'] reasons for his revolutionary change were essentially philosophic and aesthetic," and in a later edition he is more convinced that the "reasons were mystical rather than scientific."[129] Overall, Copernicus presents about five-dozen arguments, at least half of which are solely philosophical in nature. Although the other half of his argumentation depends more on mechanics, these also have philosophical appendages to them. Very few of his arguments are based on his own personal observations, since, as we noted earlier, Copernicus merely reworked the observations of his Greek predecessors. In fact, Copernicus concludes that, because the Greeks did not detail their cosmological

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[127] *Conjectures and Refutations: The Growth of Scientific Knowledge*, p. 187. Popper is referring to Dominicus Maria da Novara, a mathematician and astronomer in Italy. Indulging in a bit of anachronistic evaluation, Popper goes on to defend him, suggesting that even though Copernicus' idea came before the observation, he was nevertheless correct and "not a crank." More of Popper's *a-posteriori* thinking appears later in the book: "The Copernican system, for example, was inspired by a Neo-Platonic worship of the light of the Sun who had to occupy the 'centre' because of his nobility. This indicates how myths may develop testable components. They may, in the course of discussion, become fruitful and important for science" (*ibid.*, p. 257).

[128] Wolfgang Smith, *The Wisdom of Ancient Cosmology*, p. 174. Copernicus was also influenced heavily by the liberal humanist, Codrus, who was known for denying various Church doctrines.

[129] J. D. Bernal, *Science in History*, 1st edition, London, Watts, 1954; 2nd edition, 1965. Cited in Lakatos, *Methodology of Scientific Research Programmes*, p. 129.

models more thoroughly, history (and God) have called upon him to provide the long-awaited documentation of true cosmology.[130]

But if one were to read *De revolutionibus* to discover a geometric sun that corresponded to Copernicus deified sun, he would be at a loss. For all Copernicus' talk about the sun, it rarely appears in the diagrams of his book. It is replaced by "C" to designate the center. He said the sun was *near* the center, but he really didn't know where to put it. Copernicus was mainly interested in moving the earth, but not necessarily moving it precisely around the sun. The Copernican Revolution, in essence, was a revolution to get the earth moving. The details of how to achieve that goal were certainly not accomplished with Copernicus or Galileo.

The Real Truth about Kepler's Solar System

After Copernicus there were, of course, refinements, such as Johannes Kepler's elliptical orbits of the planets, which seemed to make things run a bit more smoothly for the heliocentric system. Kepler illustrated these ideas in his famous work **Astronomia Nova** in 1609. It was right around this time that Galileo began to profess publicly his belief in heliocentrism, although he failed to attribute much of anything to Kepler.

Kepler, although a Lutheran, was influenced by the occult, as was his mother, Katherina Kepler, and the latter's endeavor may have led to her trial as a witch.[131] Following his philosophy, Kepler's main motivation for

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[130] Thomas Heath sheds more light on this connection: "Copernicus himself admitted that the [heliocentric] theory was attributed to Aristarchus, though this does not seem to be generally known….But it is a curious fact that Copernicus did mention the theory of Aristarchus in a passage which he afterwards suppressed: 'Credibile est hisce similibusque causis Philolaum mobilitatem terrae sensisse, quod etiam nonnulli Aristarchum Samium ferunt in eadem fuisse sentential.'" Heath also shows by quotes from Plutarch and Archemides that Aristarchus was the originator of the heliocentric view (Thomas Heath, *Aristarchus of Samos: The Ancient Copernicus*, 1913, p. 301ff). J. L. E. Dreyer provides a more readable translation of Archimedes' words: "You know that according to most astronomers the world (κόσμος) is the sphere, of which the center is the center of the earth, and whose radius is a line from the center of the earth to the center of the sun. But Aristarchus of Samos has published in outline certain hypotheses, from which it follows that the world is many times larger than that. For he supposes (ὑποτιθέται) that the fixed stars and the sun are immovable, but that the earth is carried round the sun in a circle which is in the middle of the course…" (J. L. E. Dreyer, *History of the Planetary Systems from Thales to Kepler*, 1906, p. 136).
[131] *Kepler's Witch*, James A. Connor, 2004, pp. 275-307. *The Sleepwalkers*, pp. 389-393. The woman relative who raised Katherina was executed for practicing witchcraft (John Lear, *Kepler's Dream*, 1965, p. 31).

bringing the sun into the center of the planetary system, as had Copernicus before him, was that he considered it worthy of symbolic deification.

Johannes Kepler: 1571 – 1630

In one passage he describes the sun as: "Who alone appears, by virtue of his dignity and power, suited…and worthy to become the home of God himself, not to say the first mover."[132]

Similar to Copernicus, Kepler was also influenced by Greek thought, and in particular the Pythagorean concept of the harmony of the spheres. Using the idea of harmonic ratios, Kepler developed his third law of motion wherein the cube of a planet's orbital period is proportional to the square of its distance from the sun. Kepler believed that even God was subject to these "harmonic" laws and had no other choice than to make the solar system by them. At one point Kepler attributes divinity to geometry, stating: "Geometry, coeternal with the divine mind before the origin of things, God himself (for what is there in God that is not God himself) has supplied God with the examples for the creation of the world."[133]

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[132] *On the Motion of Mars*, Prague, 1609, Chapter 4, as cited in Thomas S. Kuhn, *The Copernican Revolution*, 1959, p. 214. Kuhn notes: "This symbolic identification of the sun and God is found repeatedly in Renaissance literature and art" (*ibid*., p. 130). Later adding: "This conviction [of Kepler's], together with certain intrinsic incongruities discussed above, was his reason for rejecting the Tychonic system" (*ibid*., p. 214). Kepler's reference to the "first mover" encapsulates his concept that as the sun rotated on its axis, its rays would act like a brush to move the planets.

[133] Johannes Kepler, *De Harmonice Mundi*, 1619.
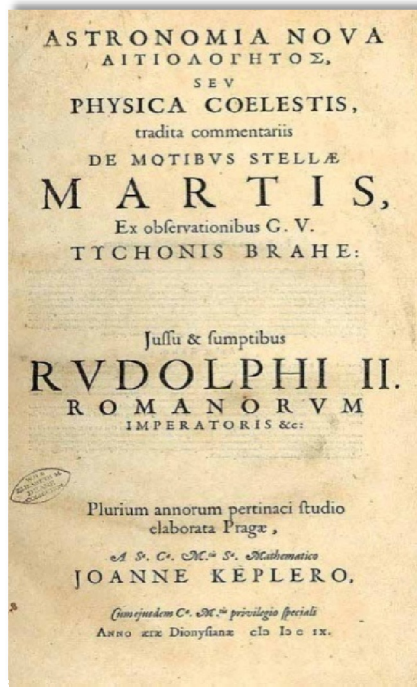
Astronomia Nova, 1609

Kepler versus Tycho

Ironic as it may seem, astronomers realize that "the Keplerian system contradicts Copernicus on almost every fundamental principle….he jettisoned all but the two most general Copernican axioms: that the sun stands still and that the earth rotates and revolves."[134] Whereas Copernicus had no specific value or place for the sun, Kepler's distinction among all his predecessors was that he attributed a significant role to the sun in the motion of the planets. Aristotle believed that the planets were attached to spheres that were pushed by the gods. Copernicus, with the other medievals, believed that the Christian God moved only the outer sphere, which then moved the inner spheres holding the planets. The spheres had enough room between their inner and outer walls to accommodate the epicycles of either Ptolemy or Copernicus.

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[134] Cohen, *Revolution in Science*, pp. 125-126.

Kepler's "Harmonic Laws" of the Planets

As noted earlier, in the course of his work Copernicus stumbled upon a geocentric system that did not use Ptolemaic epicycles, but he rejected that system because it did not incorporate the crystal spheres of the Greeks. But Copernicus' trash became Tycho Brahe's treasure.

Brahe, through his discovery in 1577 of a comet, proved there were no crystal spheres in outer space, since a comet circling the sun would have crashed into the spheres. There was no more excuse to reject the geocentric alternative. Copernicus' objection had now been answered and Tycho returned to the immobile earth with a revolving sun. Geometrically, all was sound. Everything that Copernicus' system could do, Brahe's could do, except the sun and the earth were switched.

Tycho Brahe: 1546 – 1601
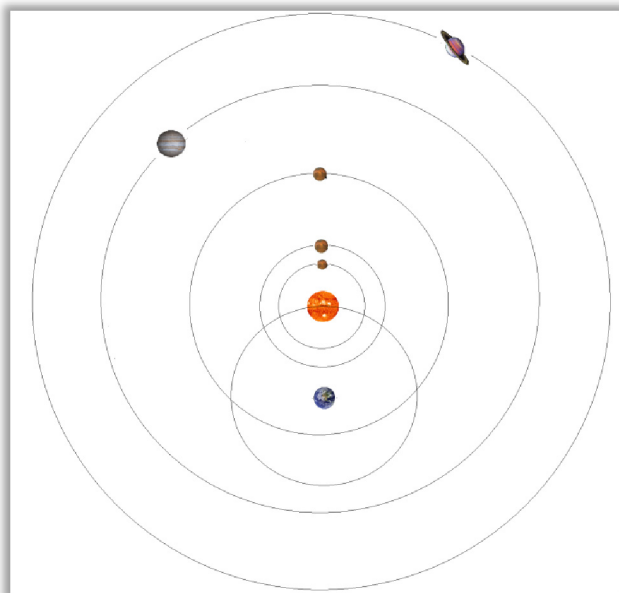
Tycho's Immobile Earth and Revolving Sun

One thing missing from Brahe's model, however, was the power grid. What was making the sun revolve around the earth, and the planets around the sun? How, in fact, could the larger sun revolve around the smaller earth (which was one of the issues that bent Copernicus toward a sun-centered model)?[135] The Greeks believed the power came from their gods; the Christians believed it was God of the Bible, but no one had supplied a natural reason for the celestial movements (even if the natural cause was created by God). Brahe didn't offer any solutions. He was merely a planet-charter who was devoted to the biblical geocentric system but didn't know quite how to use his forty-years worth of figures to prove his case. Of course, although Kepler offered a solution (the magnetic pull of the sun) it

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[135] The objection raised by Hartman and Nissim against Brahe's system is worded in a similar vein: "Brahe's system violates conservation of momentum in that the solar system does not orbit around its center of mass and Mach gives no inkling on how to deal with the nonconservation of momentum in Brahe's system" ("On Mach's critique of Newton and Copernicus," *American Journal of Physics* 71 (11) November 2003, p. 1167). We will thoroughly address this objection in Chapter 2. Suffice it to say for now that the "center of mass" in the geocentric system is no longer defined on a local, solar system, basis but on the basis of the whole universe in rotation around a fixed Earth at the universe's center of mass.

would later be discredited.[136] To this day, no one has found the power grid. Two centuries later, Newton would merely refine Kepler's area law and show how gravity, not magnetism, was involved with the orbits of the planets, but he couldn't explain the mechanism that produced gravity. He merely developed an equation to show its effects.

Meanwhile, Kepler wrote his first book on astronomy in 1596 titled *Mysterium Cosmographicum*, which defended the Copernican system by asserting that the planets' orbits were tied into the ratios of the Platonic solids. He found that each of the five Platonic solids could be encased in a sphere and thus produce six circular layers corresponding to the six orbits of the known planets: Mercury, Venus, Earth, Mars, Jupiter, and Saturn. By a precise ordering of the solids: octahedron, icosahedron, dodecahedron, tetrahedron, and cube, Kepler showed that the spheres could be made to correspond to the orbits of the planets.

Kepler sent his book to Brahe. Brahe was impressed and wrote a letter to Kepler's professor with due praise, but added that he believed Kepler's ingenuity would be better served by applying his mathematics to the geocentric system. Tycho also revealed his possession of planetary charts that would be useful for an intellect like Kepler's. After a while, Tycho hired Kepler as an assistant and put him to work crunching astronomical numbers, but he did not give Kepler his planetary charts, probably because he didn't know whether he could trust the young apprentice. Kepler worked for Brahe off and on for about a year, but he soon became restless. He desperately needed Brahe's forty-years planet-charting to bring his *Mysterium Cosmographicum* theory to fruition. As Kepler describes it:

> For among the most powerful causes of visiting Tycho was this also, that I might learn the truer proportions of the deviations [of the planets] from him, by which I might examine both my *Cosmic Mystery* and *The Harmony of the World*. For these *a priori* speculations ought not to impinge on clear experience: but with it be reconciled.[137]

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[136] After reading William Gilbert's 1600 book *De Magnete* on magnetism, Kepler believed that each planet contained a magnet, and the sun contained a huge magnet. Depending on how the magnets were positioned, the result would either pull or push the planet around the sun. The farther the planet was from the sun, the weaker the magnetic field, and thus the slower the planet would move around the sun. The precise orientation of the polarities of the sun and the planets would then determine the ellipticity of the latter's orbits.

[137] *Heavenly Intrigue*, p. 154. The Gilders' add: "Kepler had not forgotten Brahe's advice; he understood that, without the empirical backing only Brahe's

Without these charts, Kepler would have been just another seventeenth-century astronomer struggling to make a living by reading astrological horoscopes, for he would have had little evidence upon which to base his theory regarding the motions of the planets. Modern telescopic observation reveals that, without ever using a telescope, Brahe's star charts were consistently accurate to within 1 minute of arc or better. His observations of planetary positions were reliable to within 4 minutes of arc, which was more than twice the accuracy produced by the best observers of antiquity. In fact, it was Tycho's express desire to use his precise measurements to uncover the errors in Copernicus' solar system. This data was absolutely priceless, and Kepler, who revered Tycho and called him *The Phoenix of Astronomy*, would eventually pay, the evidence shows, the ultimate price to obtain them. Tycho knew of Kepler's desire to possess the charts but Tycho did not want to see them pressed into service for Copernicus since he was the staunchest anti-Copernican of his day. Tycho's very first letter to Kepler outlined his express desire that his forty-years of painstaking work be used to promote the geocentric system. In his book published in 1588, *De mundi aetherei recentioribus phaenomenis*, he stated his devotion to Scripture and to geocentrism:

> What need is there, without any justification, to imagine the earth, a dark dense and inert mass, to be a heavenly body undergoing even more numerous revolutions than the others, that is to say, subject to triple motion, in violation not only of all physical truth but also of the authority of Holy Scripture, which ought to be paramount.[138]

Tycho had more than a suspicion that Kepler saw things very differently. As the story develops, Kepler is now suspected of murdering Brahe in order to obtain the planetary charts.[139] In the words of one author:

> Kepler knew that in Tycho's possession were the raw observations that he, as "architect," longed to assemble into a coherent picture of planetary motion. And Tycho knew that the gifted Kepler had the mathematical wherewithal to prove the validity of the Tychonic [geocentric] system of the heavens. But Kepler was a confirmed Copernican; Tycho's model had no

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incomparable observations could provide, his idea of universal structure and harmony would never amount to anything but an elegant theory" (*ibid.*).

[138] Brahe's work is cited in Repcheck's *Copernicus's Secret*, p. 187.

[139] See Volume 3, *Galileo Was Wrong: The Church Was Right*, Chapter 11.

appeal to him, and he had no intention of polishing this flawed edifice to the great man's ego.[140]

All in all, Kepler's geometrical modification didn't prove Copernicus' sun-centered system was right. It merely revealed Kepler's preferences, since he knew that, if the same elliptical modifications were given to the reigning geocentric model of Tycho Brahe, they would have shown heliocentrism to be merely an alternative system, not a superior one. As one physics course put it: "However, one could also construct a 'Tychonean' model with elliptical orbits."[141]

Be that as it may, some historians hold that although Kepler claimed the discovery of elliptical orbits was supported by independent computations of planetary positions, in actuality, he employed the elliptical theory in order to derive his "observations."[142]

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[140] Alan W. Hirshfeld, *Parallax: The Race to Measure the Universe*, 2001, pp. 92-93. Brahe was the principal author but perhaps not the only one who discovered what we now know as the Tychonic system. Helisaeus Roeslin worked on a similar system, but his work was never published. Nicholas Reimers Bär (also known as Ursus), published a Tychonic system with a rotating Earth in the *Fundaments of Astronomy* [actual title: *Nicolai Raimari Ursi Dithmarsi Fundamentum astronomicum*, Strasburg, 1588] but was known to have stolen it from Brahe, whereupon Brahe sought litigation against him, but Ursus died before the trial [see *Heavenly Intrigue*, pp. 120-185].

[141] University of Illinois, Physics 319, Spring 2004, Lecture 03, p. 11.

[142] Knowing this fact, historian Owen Gingerich says that Kepler's ploy "may simply have been a legitimate flourish meant to persuade recalcitrant colleagues of the correctness of his insight" (As cited in the *Bulletin of the Tychonian Society*, No. 53, 1990, p. 32). Gingerich also suggests that elliptical orbits may not have been the brainchild of Kepler, but of Jerome Schreiber. He writes: "On folio 143 [of Kepler's copy of *De revolutionibus*] there appears the single Greek word ελλειψις – that is, ellipse – together with the same sort of emphasis marks that Schreiber used to highlight the passage on folio 96. When I first saw that book in Leipzig, I assumed that it was Kepler who had written ελλειψσις in the margin, and I hadn't made a color slide of it. Later, when I had discovered more information about the double layer of annotations and the evidence that it was likely Schreiber's handiwork, I had to worry about which one wrote it….Eventually I obtained excellent transparencies, which left no doubt that it was indeed Schreiber's ink in the book Kepler had inherited" (*The Book that Nobody Read*, p. 165).

Eccentricity: The Shape of a Planet's Orbit

Circle: Eccentricity = 0

Ellipse: Eccentricity = 0.4

Ellipse: Eccentricity = 0.8

Parabola: Eccentricity = 1.0

Others are more endearing to Kepler and state that…

> after trying 70 different combinations of circles and epicycles, he finally devised a combination for Mars that would predict its position – when compared to Tycho's observations – to within 0.13° …however, the error of 0.13° still exceeded the likely error in Tycho's measurements. Kepler knew enough about Tycho's methods to know that an error of 0.13° in the data was too much….Finally, Kepler decided to abandon the idea of circular orbits…He tried various ovals….After 9 years of work, he found a shape that fit satisfactorily with the observed path of Mars.[143]

Whatever the true state of affairs, in the end the discovery of ellipses helped both the heliocentric and geocentric models to conclude that planetary orbits were not perfect circles (although some are very close to perfect circles).[144] In fact, when Kepler discovered the elliptical orbit of

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[143] Theo Koupelis, *In Quest of the Universe*, 6th edition, Jones & Bartlett Publishers, 2010, p. 57.

[144] Not only may Schreiber have pre-dated Kepler in regards to inventing elliptical orbits, it seems that neither Schreiber nor Kepler were the first to introduce the phenomenon. That honor apparently belongs to the Greeks. As Koestler notes:

Mars, he found that its deviation from a circle was only one part in 450 (the same deviation Ptolemy found for Mars and which was demonstrated by his equant).[145] Kepler could see this deviation because, unlike Copernicus, he had the sun pushing the planets in their orbits by a magnetic sweeping motion and thereby he sought to make the sun the actual center of the solar system to replace Copernicus' 'mean sun' – the common point of intersection for all the orbits of the planets. Once the sun is placed in the center, it is just a matter of measuring how the planet advances toward and recedes from the sun.

One historical note of interest is that on his deathbed Brahe asked Kepler to use his forty-years of planet-charting to support the geocentric system. Kepler fulfilled Brahe's wishes but did so in his usual style – showing the three systems side-by-side (the Ptolemaic, Tychonic and Copernican). As Barbour notes: "Kepler immediately takes the opportunity to point out that, viewed in purely geometrical terms, the three forms are completely equivalent," but Kepler believes he has "physical and dynamical" evidence of "the severe difficulties that the two rivals to Copernicus face."[146] As noted earlier, the only differences are that Kepler, for his model only, employs precise elliptical orbits (and, in particular, he halves Tycho's eccentricity of the sun-earth circumference); and uses the "area law" so that the consequent improvements of planetary motion and speed favor him alone. If Kepler had done the same to Tycho's or even a modified Ptolemaic model, the equivalence would not only be "geometric" but also "physical and dynamical." Unfortunately, Barbour never mentions

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"There exist some fragmentary remains, dating from the first century AD, of a small-sized Greek planetarium – a mechanical model designed to reproduce the motions of sun, moon, and perhaps also of the planets. But its wheels, or at least some of them, are not circular – they are egg-shaped [footnote: Ernst Zinner, Entstehung und Ausbreitung der Copernicanischen Lehre (Erlangen, 1943), p. 48]. Gingerich adds: "The equant got Ptolemy into a lot of trouble as far as many of his successors were concerned. It wasn't that his model didn't predict the angular positions satisfactorily. Rather, the equant forced the epicycle to move nonuniformly around the deferent circle, and that was somehow seen as a deviation from the pure principle of uniform circular motion. Ptolemy himself was apologetic about it, but he used it because it generated the motion that was observed in the heavens. Altogether his system was admirably simple considering the apparent complexity and variety of the retrograde loops" (*The Book that Nobody Read*, p. 53).

[145] Compare this to the bulge of the earth's equator, which is one part in 231.

[146] Julian B. Barbour, *Absolute or Relative Motion*, pp. 273, 291. Kepler's "area law" holds that as a planet travels in its elliptical orbit around the sun, it will cover the same area in the same time due to the fact that it speeds up when it is closer to the sun and slows down when it is farther away.

this fact in his review. Instead, he quotes Kepler as saying: "Thus, the house that we erected on the basis of the Tychonic observations we have now demolished with other observations of the same man." In actuality, Kepler didn't demolish anything except his chance to be honest with the application of the scientific data.

That Kepler was biased toward the Copernican universe is noted in his statement about the great advantages of having a moving earth:

> For it was not fitting that man, who was going to be the dweller in this world and its contemplator, should reside in one place of it as in a closed cubicle: in that way he would never have arrived at the measurement and contemplation of the so distant stars, unless he had been furnished with more than human gifts…it was his office to move around in this very spacious edifice by means of the transportation of the earth his home and to get to know the different stations, according as they are measurers, *i.e.*, to take a promenade so that he could all the more correctly view and measure the single parts of his house.[147]

Hence Kepler is driven to Copernicanism because he believes it is better for the Earth to take part in an adventurous excursion through the universe rather than being in a unique and immovable position from which to observe the universe, thus proving once again that modern cosmology is influenced by a significant percentage of philosophical bias. In actuality, a moving earth would not allow man to "more correctly view and measure the single parts of his house," simply because without an immovable foundation on which to set his measuring stick, there is no accurate way to know the distances, positions, or motions of the house. It is the very reason that Barbour titled his book "*Absolute or Relative Motion?*" for he, like Kepler, cannot tell what is moving and what is not.

Of course, like Copernicus who had to form a crib for his moving Earth by placing it inside a fixed wall of stars in order for the latter to serve as his absolute frame of reference, Kepler did the same. He writes:

> The region of the fixed stars supplies the movables with a place and a base upon which the moveables are, as it were, supported;

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[147] In Kepler's *Epitome Astronomiae Copernicanae*, 1618, 1620, as cited by Barbour, *op. cit.*, p. 298. Barbour adds that Kepler's bias toward Copernicanism is quite different "from the modern viewpoint according to which the main effect of the Copernican revolution was to demote man from the central position in the universe."

and movement is understood as taking place relative to its absolute immobility.[148]

In saying this, however, Kepler knew, as did Copernicus before him citing Virgil,[149] that assuming the star field is fixed rather than rotating around the earth is completely arbitrary. The only thing Kepler knew for certain is that both the star field and the Earth couldn't be rotating simultaneously. He had to choose one or the other, and his philosophy led him to a fixed star field. Part of that philosophy was evident in Kepler's deification of the sun, the same philosophy that helped push Copernicus over the edge into heliocentrism when he stumbled upon a Tychonic style geocentric model. Kepler writes: "The Sun represents, symbolizes, and perhaps even embodies God the Father; the stellar vault, the Son; and the space in between, the Holy Ghost."[150]

Regardless of Kepler's motivations, Tycho Brahe's system is its mirror image. Whatever improvements Kepler gave to his system were automatically true for Brahe's, even if Kepler failed to apply them. In Brahe's, the sun is in orbit around the Earth, while all the planets orbit the sun. In this way, all the distances, geometry and velocities of the heliocentric system are identical with the geocentric. Ptolemy's deferent of Venus is now outside the sun, and thus all of Venus' phases can be seen from Earth.

Before we leave Tycho, we need to see one important discrepancy in his system that would eventually show that even his model was not adequate. Although it is true that if elliptical orbits are applied to Tycho's planets his model would be just as accurate as Kepler's, Tycho had always asserted that one of the main scientific reasons he had rejected heliocentrism was that it necessitated the existence of stellar parallax. That is, as the Earth revolves around the sun, at six month intervals it is on opposite sides of its orbit and thus we should be able to see closer stars shift in position when compared to stars that are more distant. Since no stellar parallax had ever been found, Tycho used this lacuna as proof of the geocentric system. But eventually the lack thereof could not serve as proof, especially since stellar parallax was confirmed about 250 years later

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[148] In Kepler's *De Stella Nova in Pede Serpentarii*, 1606, as cited in Barbour, *op. cit.*, p. 336.

[149] "And why not admit that the appearance of daily revolution belongs to the heavens but the reality belongs to the Earth? And things are as when Aeneas said in Virgil: 'We sail out of the harbor, and the land and the cities move away," as stated in *De Revolutionibus*, Ch. 8, para. 4.

[150] In *De Stella Nova in Pede Serpentarii*, 1601, cited in Closed World to Infinite Universe, p. 58, fn. 2.

by Bessel in 1838. So, if the geocentric system is true, it cannot be based on Tycho's original model, unless, of course, it is modified to account for stellar parallax. We will cover this issue in Chapter 2. Suffice it to say for now, each of the foregoing systems had inherent flaws. Even today we do not have a perfect system to know the precise movements of the heavenly bodies. The only question we can address at this point is which model at least begins with the correct status for the Earth. Does the Earth move or is it fixed in space? As we move on, Chapter 2 will show that modern science has no proof for a moving Earth. Chapter 3 will show evidence that the Earth is in the center of the universe, while Chapter 4 will show evidence that the Earth does not move, either by rotation or revolution.

Ptolemy, Copernicus and Kepler in Perspective

Sir Fred Hoyle, one of the better-known celestial mechanics of our generation, gives an insight into the relationship of the various models:

> …the geocentric theory of Ptolemy had proved more successful than the heliocentric of Aristarchus. Until Copernicus, experience was just the other way around. Indeed, Copernicus had to struggle long and hard over many years before he equaled Ptolemy, and in the end the Copernican theory did not greatly surpass that of Ptolemy.[151]

Accordingly, no less a scientific luminary than Stephen Hawking admits the same:

> We now have a tendency to dismiss as primitive the earlier world picture of Aristotle and Ptolemy in which the Earth was at the center and the sun went around it. However we should not be too scornful of their model, which was anything but simple-minded. It incorporated Aristotle's deduction that the Earth is a round ball rather than a flat plate and it was reasonably accurate in its main function, that of predicting the apparent positions of the heavenly bodies in the sky for astrological purposes. In fact, it was about as accurate as the heretical suggestion put forward in 1543 by Copernicus that the Earth and the planets moved in circular orbits around the sun.

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[151] Fred Hoyle, *Nicolaus Copernicus: An Essay on his Life and Work*, 1973, p. 5.

Galileo found Copernicus' proposal convincing not because it better fit the observations of planetary positions but because of its simplicity and elegance, in contrast to the complicated epicycles of the Ptolemaic model. In *Dialogues Concerning Two Sciences*, Galileo's characters, Salviati and Sagredo, put forward persuasive arguments in support of Copernicus. Yet, it was still possible for his third character, Simplicio, to defend Aristotle and Ptolemy and to maintain that in reality the Earth was at rest and the sun went round the Earth.[152]

Even though Hawking betrays the fact that he hasn't thoroughly studied Copernicus' *De revolutionibus* and is thus under the false impression that only Ptolemy, not Copernicus, had "complicated epicycles," still, he reveals the distinct advantage a twentieth-century astronomer possesses over his sixteenth-century counterpart, that is, in the science of kinematics it is possible to make any point in space the center, and subsequently coordinate all of the other bodies around it. As Hoyle notes again:

Let it be understood at the outset that it makes no difference, from the point of view of describing planetary motion, whether we take the Earth or the Sun as the center of the solar system. Since the issue is one of relative motion only, there are infinitely many exactly equivalent descriptions referred to different centers – in principle any point will do, the Moon, Jupiter….So the passions loosed on the world by the publication of Copernicus' book, *De revolutionibus orbium caelestium libri VI*, were logically irrelevant…[153]

In other words, mathematically and relatively speaking, we can make any planet, or even the moon, the center of the solar system, and the geometric proportions will turn out precisely the same as having the sun at the center.

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[152] *On the Shoulders of Giants*, ed., Stephen Hawking, 2002, pp. ix-x.

[153] Fred Hoyle, *Nicolaus Copernicus: An Essay on his Life and Work*, p. 1. Two years later he wrote: "We know that the difference between a heliocentric theory and a geocentric theory is one of relative motion only, and that such a difference has no physical significance. But such an understanding had to await Einstein's theory of gravitation in order to be fully clarified" (*Astronomy and Cosmology*, 1975, p. 416).

Sir Fred Hoyle: 1915 – 2001

He further adds:

> …we can take either the Earth or the Sun, or any other point for that matter, as the center of the solar system. This is certainly so for the purely kinematical problem of describing the planetary motions. It is also possible to take any point as the center even in dynamics, although recognition of this freedom of choice had to await the present century.[154]

Other notables recognize the same principle. Physicist Max Born states:

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[154] Fred Hoyle, *Nicolaus Copernicus: An Essay on his Life and Work*, p. 82. Also from the same book: "Today we cannot say that the Copernican theory is "right" and the Ptolemaic theory is "wrong" in any meaningful sense. The two theories are…physically equivalent to one another" (*ibid*, p. 88). Physicist J. L. McCauley who reviewed Hoyle's book stated it was "The only brief account, using understandable modern terminology, of what Ptolemy and Copernicus really did. Epicycles are just data analysis (Fourier series), they don't imply any underlying theory of mechanics. Copernicus did not prove that the Earth moves, he made the equivalent of a coordinate transformation and showed that an Earth-centered system and a sun-centered system describe the data with about the same number of epicycles. For the reader who wants to understand the history of ideas of motion, this is the only book aside from Barbour's far more exhaustive treatment" (Letters on File, 10-1-04).

Max Born: 1882 – 1970

...Thus we may return to Ptolemy's point of view of a 'motionless Earth.' This would mean that we use a system of reference rigidly fixed to the Earth in which all stars are performing a rotational motion with the same angular velocity around the Earth's axis…one has to show that the transformed metric can be regarded as produced according to Einstein's field equations, by distant rotating masses. This has been done by Thirring. He calculated a field due to a rotating, hollow, thick-walled sphere and proved that inside the cavity it behaved as though there were centrifugal and other inertial forces usually attributed to absolute space. Thus from Einstein's point of view, Ptolemy and Copernicus are equally right. What point of view is chosen is a matter of expediency.[155]

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[155] Max Born, *Einstein's Theory of Relativity*, 1962, 1965, pp. 344-345. In Volume 2, Chapter 9 will address this aspect of physics in more detail. Suffice it to say for now, Thirring's model has been duplicated by Barbour & Bertotti (*Il Nuovo Cimento B*, 38:1, 1977) and Joseph Rosen ("Extended Mach's Principle," *American Journal of Physics*, Vol 49, No. 3, March 1981) using Hamiltonians; and by William G. V. Rosser (*An Introduction to the Theory of Relativity*, 1964) who expanded on Thirring's paper and and noted that the universe's rotation can exceed *c* by many magnitudes; Christian Møller (*The Theory of Relativity*, 1952) who also extended Thirring's paper using a ring universe rather than a shell; G. Burniston Brown ("A Theory of Action at a Distance," *Proceedings of the Physical Society*, 1955) who discovered geocentrism based on Newtonian physics; Parry Moon and Domina Spencer ("Mach's Principle," *Philosophy of Science*,

Martin Gardner, who authored one of the most popular and well-written books on Einstein's theory of Relativity, states quite candidly:

> The ancient argument over whether the Earth rotates or the heavens revolve around it (as Aristotle taught) is seen to be no more than an argument over the simplest choice of a frame of reference. Obviously, the most convenient choice is the universe…. Nothing except inconvenience prevents us from choosing the Earth as a fixed frame of reference…If we choose to make the Earth our fixed frame of reference, we do not even do violence to everyday speech. We say that the sun rises in the morning, sets in the evening; the Big Dipper revolves around the North Star. Which point of view is "correct"? Do the heavens revolve or does the Earth rotate. The question is meaningless.[156]

In the late 1800s, author and scientist J. L. E. Dryer adds that the Earth-centered system developed in 1583 by Tycho Brahe "…is in reality absolutely identical with the system of Copernicus and all computation of the places of the planets are the same for the two systems."[157] Physicist Hans Reichenbach, contemporary of and firm supporter of Einstein, admits:

> …it is very important to acknowledge that the Copernican theory offers a very exact calculation of the apparent movements of the planets…even though it must be conceded that, from the modern standpoint practically identical results could be obtained by means of a somewhat revised Ptolemaic system….It makes no sense, accordingly, to speak of a difference in truth between Copernicus and Ptolemy: both conceptions are equally

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1959) who arrive at geocentrism using Mach's principle; J. David Nightingale ("Specific physical consequences of Mach's principle," 1976) who transposed the Einstein equation of Mach's principle into Newtonian physics for a geocentric universe; and several others do the same.

[156] *The Relativity Explosion*, 1976, pp. 86-87. The previous edition was published in 1962 under the title: *Relativity for the Million*.

[157] J. L. E. Dreyer, *A History of Astronomy from Thales to Kepler*, New York, Dover Publications reprint, 1953, p. 363. See also his 1890 work *Tycho Brahe*, (New York, Dover Publications reprint, 1963). Modern astronomy admits that the Tychonean planetary model is observationally indistinguishable from the Copernican model, yet in that model the Earth remains absolutely fixed while the universe revolves around the sun, and the sun, in turn, revolves around Earth. For a simulation, please employ the enclosed CDROM.

permissible descriptions. What has been considered as the greatest discovery of occidental wisdom, as opposed to that of antiquity, is questioned as to its truth value.[158]

Lincoln Barnett, another Einstein disciple, is quite honest about science's inability to prove Copernicanism and disprove geocentrism. He writes: "We can't feel our motion through space; nor has any experiment ever proved that the Earth actually is in motion."[159] Henri Poincaré admits: "A great deal of research has been carried out concerning the influence of the Earth's movement. The results were always negative."[160] Carl E. Wulfman adds: "…I tell my classes that had Galileo confronted the Church in Einstein's day, he would have lost the argument for better reasons. You may use my name if you wish."[161] Philosopher and scientist Bertrand Russell reveals:

> Whether the Earth rotates once a day from west to east, as Copernicus taught, or the heavens revolve once a day from east to west, as his predecessors believed, the observable phenomena will be exactly the same. This shows a defect in Newtonian dynamics, since an empirical science ought not to contain a metaphysical assumption, which can never be proved or disproved by observation.[162]

> Before Copernicus, people thought that the Earth stood still and that the heavens revolved about it once a day. Copernicus taught that 'really' the Earth revolves once a day, and the daily rotation

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[158] *From Copernicus to Einstein*, 1970, pp, 18, 82.

[159] Lincoln Barnett, *The Universe and Dr. Einstein*, 1957, p. 73. Albert Einstein wrote the Foreword to Barnett's book, yet while Barnett says in his book that there is no proof to Copernicanism, in Einstein's famous 1905 paper it is stated: "…the same dynamic and optical laws are valid, as this for first-order magnitudes already has been proven," showing that Einstein based Relativity on his belief that Copernicanism was, indeed, a "proven" fact ("Zur Elektrodynamik bewegter Korper," *Annalen der Physik*, Vol. 17, 1905, pp. 891-892). In addition, Barnett's book contains Einstein's following endorsement: "Lincoln Barnett's book represents a valuable contribution to popular scientific writing. The main ideas of the theory of relativity are extremely well presented: Princeton, New Jersey, September 10, 1948."

[160] Stated in 1901 in *La science et l'hypothèse*, Paris, Flammarion, 1968, p. 182.

[161] Letter from Carl E. Wufman (University of the Pacific) to Mr. Roush, Nov. 2, 1975, cited in "Galileo to Darwin," P. Wilders, *Christian Order*, Apr.1993, p. 225.

[162] Quoted from Dennis W. Sciama's, *The Unity of the Universe*, 1961, pp. 102-103.

of sun and stars is only 'apparent.' Galileo and Newton endorsed this view, and many things were thought to prove it – for example, the flattening of the Earth at the poles, and the fact that bodies are heavier there than at the equator. But in the modern theory the question between Copernicus and his predecessors is merely one of convenience; all motion is relative, and there is no difference between the two statements: 'the earth rotates once a day' and 'the heavens revolve about the Earth once a day.' The two mean exactly the same thing, just as it means the same thing if I say that a certain length is six feet or two yards. Astronomy is easier if we take the sun as fixed than if we take the Earth, just as accounts are easier in decimal coinage. But to say more for Copernicus is to assume absolute motion, which is a fiction. All motion is relative, and it is a mere convention to take one body as at rest. All such conventions are equally legitimate, though not all are equally convenient.[163]

Philosopher of science I. Bernard Cohen wrote in 1960:

There is no planetary observation by which we on Earth can prove that the Earth is moving in an orbit around the sun. Thus all Galileo's discoveries with the telescope can be accommodated to the system invented by Tycho Brahe just before Galileo began his observations of the heavens. In this Tychonic system, the planets…move in orbits around the sun, while the sun moves in an orbit around the Earth in a year. Furthermore, the daily rotation of the heavens is communicated to the sun and planets, so that the Earth itself neither rotates nor revolves in an orbit.[164]

In the 1930s, physicist Arthur Lynch saw the same truth:

Descartes is, however, doubly interesting to us in the discussion of Relativity, for at one time when the Inquisition was becoming uneasy about his scientific researches, he gave them a reply that satisfied them, or perhaps he merely gained time, which was long, while they were trying to understand its meaning. He declared that the sun went around the Earth, and that when he

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[163] Bertrand Russell, *The ABC of Relativity*, London, revised edition, editor Felix Pirani, 1958, pp. 13-14.
[164] I. Bernard Cohen, *Birth of a New Physics*, revised and updated, 1985, p. 78.

said that the Earth revolved round the sun that was merely another manner of expressing the same occurrence. I met with this saying first from Henri Poincaré, and I thought then that it was a witty, epigrammatic way of compelling thought to the question; but on reflection I saw that it was a statement of actual fact. The movements of the two bodies are relative one to the other, and it is a matter of choice as to which we take as our place of observation.[165]

And once again from the celebrated astronomer, Fred Hoyle:

Tycho Brahe proposed a dualistic scheme, with the Sun going around the Earth but with all other planets going around the Sun, and in making this proposal he thought he was offering something radically different from Copernicus. And in rejecting Tycho's scheme, Kepler obviously thought so too. Yet in principle there is no difference.[166]

We know now that the difference between a heliocentric and a geocentric theory is one of motions only, and that such a difference has no physical significance," [the Ptolemaic and Copernican views], "when improved by adding terms involving the square and higher powers of the eccentricities of the planetary orbits, are physically equivalent to one another."[167]

Even college physics textbooks make it known to their students that geocentrism has not been dethroned. The authors of these texts know the relevance of the question, since virtually every physics book published in

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[165] Arthur Lynch, *The Case Against Einstein*, p. 22.

[166] Fred Hoyle, *Nicolaus Copernicus: An Essay on His Life and Work*, p. 3. Hoyle continues: "So what was the issue? The issue was to obtain even *one* substantially correct empirical description of the planetary motions. The issue was to find out *how* the planets moved….With knowledgeable hindsight, the situation may not seem unduly complicated, but looked at without foreknowledge the problem of *how* is anything but simple" (emphasis his). In the same book, Hoyle adds a time-lapsed photograph of the motions of the planets as seen from Earth. The photo shows looping motions, zig-zagging motions, abrupt reversal motions, in short, a dizzying array of complexity.

[167] The first quote taken from Fred Hoyle's *Astronomy and Cosmology*, 1975, p. 416; the second, from Hoyle's *Nicolaus Copernicus: An Essay on His Life and Work*, p. 88.

the last two centuries begins its lessons by making reference to the debate between the Ptolemaic and Copernican systems. One text puts it this way:

> Does the Earth really go around the Sun? Or is it also valid to say that the Sun goes around the Earth? Discuss in view of the first principle of relativity (that there is no best reference frame).[168]

Obviously, in light of the principle of Relativity to which the student was introduced earlier, the above questions are merely rhetorical. The textbook is actually preparing the student for the fact that modern science will no longer allow anyone to lay claim to the Copernican principle, and the text further implies that it has no way of determining which model is correct, the heliocentric or the geocentric. The author, Douglas C. Giancoli, attempts to reinforce the relativity principle with a discussion of the famous 1887 Michelson-Morley experiment, which, he states: "…was intended to measure the motion of the Earth relative to an absolute reference frame. Its failure to do so implies the absence of any such preferred frame."[169] Of course, the alternative he fails to offer his reader, in line with his rhetorical question above ("Or is it also valid to say that the Sun goes around the Earth?"), is that a perfectly valid "implication" of the Michelson-Morley experiment is that *no* "motion of the Earth" exists and, consequently, the Earth itself is the "preferred frame."

Interestingly enough, in the first and second editions of the same physics textbook, Giancoli freely admitted the geocentric "implications" of the Michelson-Morley experiment:

> But this implies the earth is somehow a preferred object; only with respect to the earth would the speed of light be *c* as predicted by Maxwell's equations. This is tantamount to assuming that the earth is the central body of the universe, an ancient idea that had been rejected centuries earlier.[170]

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[168] *Physics: Principles with Applications*, 4th ed., Douglas Giancoli, 1995, p. 767.
[169] *Physics: Principles with Applications*, 5th ed., Douglas Giancoli, 1998, p. 800.
[170] Douglas C. Giancoli, *Physics: Principles with Applications*, 1985, pp. 613-614 and 1980, p. 625. From pages 610-614 (1985 edition) and 621-625 (1980 edition), the text reads: "However, it appeared that Maxwell's equations did not satisfy the relativity principle. They were not the same in all inertial frames. They were simplest in the frame where $c = 3.00 \times 10^8$ m/s; that is, in a reference frame at rest in the ether. In any other reference frame, extra terms would have to be added to take into account the relative velocity. Thus, although most of the laws of physics obeyed the relativity principle, the laws of electricity and magnetism apparently

did not. <u>Instead, they seemed to single out one reference frame that was better than any other – a reference frame that could be considered absolutely at rest.</u> Scientists soon set out to determine the speed of the Earth relative to this absolute frame, whatever it might be. A number of clever experiments were designed. The most direct were performed by A. A. Michelson and E. W. Morley in the 1880s….[p. 613] …Michelson and Morley should have noted a movement in the interference pattern of $(7.0 \times 10^{-16}\text{s})/(1.8 \times 10^{-15}\text{s}) = 0.4$ fringe. They could have easily detected this, since their apparatus was capable of observing a fringe shift as small as 0.01 fringe. But they found no significant fringe shift whatever! They set their apparatus at various orientations. They made observations day and night, so that they would be at various orientations with respect to the sun. They tried at different seasons of the year (the Earth at different locations due to its orbit around the Sun). Never did they observe a significant fringe shift. This "null" result was one of the great puzzles of physics at the end of the nineteenth century. One possibility was that...v would be zero and no fringe shift would be expected. But this implies that the earth is somehow a preferred object; only with respect to the earth would the speed of light be c as predicted by Maxwell's equations. <u>This is tantamount to assuming that the earth is the central body of the universe</u>." The fourth and fifth editions read as follows: "However, it appeared that Maxwell's equations did not satisfy the relativity principle. They were not the same in all inertial frames. They were simplest in the frame where $c = 3.00 \times 10^8$ m/s; that is, in a reference frame at rest in the ether. In any other reference frame, extra terms would have to be added to take into account the relative velocity. Thus, although most of the laws of physics obeyed the relativity principle, the laws of electricity and magnetism apparently did not. Instead, they seemed to single out one reference frame that was better than any other – a reference frame that could be considered absolutely at rest. Scientists soon set out to determine the speed of the Earth relative to this absolute frame, whatever it might be. A number of clever experiments were designed. The most direct were performed by A. A. Michelson and E. W. Morley in the 1880s…Michelson and Morley should have noted a movement in the interference pattern of $(7.0 \times 10^{-16}\text{s})/(1.8 \times 10^{-15}\text{s}) = 0.4$ fringe. They could have easily detected this, since their apparatus was capable of observing a fringe shift as small as 0.01 fringe. But they found no significant fringe shift whatever! They set their apparatus at various orientations. They made observations day and night, so that they would be at various orientations with respect to the sun. They tried at different seasons of the year (the Earth at different locations due to its orbit around the Sun). Never did they observe a significant fringe shift. This "null" result was one of the great puzzles of physics at the end of the nineteenth century. To explain it was a difficult challenge. <u>One possibility to explain the null result was to apply an idea put forth independently by G. F. Fitzgerald and H. A. Lorentz</u> (in the 1890s) in which they proposed that any length (including the arm of an interferometer) contracts by a factor of $\sqrt{1-v^2/c^2}$ in the direction of motion through the ether" (Douglas C. Giancoli, *Physics: Principles with Applications*, fourth edition, pp. 746, 749, and fifth edition, pp. 796, 799).

Unfortunately, we don't see these admissions in later editions of the same book. Perhaps in later editions the publisher was reticent to advertise the geocentric alternative to the Michelson-Morley experiment and thus felt the need to excise it from future editions; or worse, in order to obscure the true state of affairs regarding the once sacrosanct world of Copernicus, they made a deliberate decision to conceal their previous analysis from the public.

We see the biases of current scientific investigation against geocentrism and toward the "Copernican Principle" in almost every hall of modern academia. For example, popular today are "The Great Courses" produced by *The Teaching Company*. In one episode taught by Professor Richard Wolfson of Middlebury College, the Michelson-Morley experiment is being discussed. He states:

> What happened when the experiment was done in 1887? There was never, never, in any orientation at any time of year, any shift in the interference pattern; none; no shift; no fringe shift; nothing. What's the implication? Here was an experiment that was done to measure the speed of the earth's motion through the ether. This was an experiment that was ten times more sensitive than it needed to be. It could have detected speeds as low as two miles a second instead of the known 20mps that the earth as in its orbital motion around the sun. It didn't detect it. What's the conclusion from the Michelson-Morley experiment? The implication is that the earth is not moving relative to the ether; no shift; null results."

When we hear words from noted scientists such as, "There was never, never, in any orientation at any time of year, any shift in the interference pattern; none; no shift; no fringe shift; nothing," it seems convincing to the average layman. As a scientist, however, Wolfson should know better. The same is true of more famous scientists, such as **Stephen Hawking**. He writes in his most current book:

> …in 1887 Michelson and Edward Morley carried out a very sensitive experiment designed to measure the speed at which the earth travels through the ether…If the speed of light were a fixed number relative to the ether, the measurements should have

revealed light speeds that differed depending on the direction of the beam. But Michelson and Morley observed no such difference.[171]

Suffice it to say, like every other modern scientist who bases his interpretation of the Michelson-Morley experiment on his cosmological presuppositions, Hawking believes they "observed no such difference" because he presumes the Earth is moving. Fortunately, other scientists are more precise in telling what actually occurred. For example, John D. Norton who teaches philosophy and science at the University of Pittsburgh, puts it this way:

> Michelson and Morley found shifts in the interference fringes, but they were very much smaller than the size of the effect expected from the known orbital motion of the Earth.[172]

As Norton states, the experiment did not result in "no fringe shifts" but fringe shifts "much smaller than the size" of those equal to an Earth revolving around the sun. As we will see later, the "shifts in the interference fringes" were commensurate with a 1,054 miles per hour speed in a 24-hour rotation (of either the Earth rotating within a fixed universe or a rotating universe around a fixed Earth) but were nothing near what was required of an Earth revolving around the sun at 66,000 miles per hour. As **Martin Selbrede** notes:

> Certainly, we expect to see that rotation, because if space is rotating diurnally every 24 hours around the Earth, then that so-called scouring effect, the drag, is going to be very real and we are going to measure it. But we are not going to see that motion around the sun. Consequently, the experimental data actually conforms to the geocentric model.[173]

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[171] *The Grand Design*, p. 95.
[172] "The Origins of Special Relativity," www.pitt.edu/~jdnorton/teaching/HPS_0410/chapters/origins/index.html, p. 14.
[173] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2013.

Wolfson attempts to dissuade his audience from any non-Copernican interpretation of Michelson-Morley by little more than a philosophical presupposition:

> If [earth] it isn't moving relative to the ether, then earth alone among the cosmos is at rest relative to the ether. Now that may be an absurd possibility but maybe it's true. I think you can see that this is not going to be very philosophically satisfying, and it isn't satisfying physically either, but it violates the Copernican Principle that the earth isn't special. It is particularly absurd in light of what we know from modern cosmology namely that there are places in the universe, distant galaxies in particular, that are moving away from us at speeds very close to the speed of light. It's absurd to imagine that everything in the universe is pinned to earth when there are such a wide range of speeds relative to earth throughout the universe, but it suffices to rule it out on this philosophical ground.[174]

As Giancoli did, Wolfson admits that a perfectly viable solution to the Michelson-Morley experiment is that the Earth is motionless, but he immediately dissuades his audience from that option by appealing to the "Copernican Principle that the earth isn't special," adding that "it suffices to rule it out on this philosophical ground." This clearly shows that the Copernican Principle from which modern science creates its interpretations of the cosmological data is not scientific but philosophical. In other words, even if the empirical evidence shows Earth is not moving, the ever-present Copernican Principle requires that every piece of scientific data must be interpreted by assuming the earth *is* moving and thus cannot hold a special place in either the physical or the intellectual world of mankind.

In his book, *Simply Einstein*, Wolfson presents the same kind of "philosophical" argument, almost as if he wants to make the reader feel guilty for even thinking about a non-Copernican universe:

> Consider first the possibility that Earth isn't moving relative to the ether. I can think of two ways for this to be the case. First, the ether might be a fixed substance that extends throughout the Universe. Then Earth alone among all the cosmos would be at rest relative to the ether. I say "alone" because all other celestial objects—the Moon, Mars, Venus, the other planets, the Sun,

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[174] "Einstein's Relativity and the Quantum Revolution," Richard Wolfson, The Teaching Company, 2000, Lecture 5: "Speed c Relative to What?"

other stars in our galaxy, and the other galaxies in the Universe—all are moving relative to Earth. So if Earth is at rest relative to the ether, then is alone is at rest. That makes us pretty special….Do you really want to return to parochial, pre-Copernican ideas? Do you really think you and your planet are so special that, in all the rich vastness of the Universe, you alone can claim to be "at rest."[175]

Additionally, Wolfson's claim that his conclusion is supported by the proposition that "galaxies…are moving away from us at speeds very close to the speed of light" is, as we will see in later chapters, a classic case of *petitio principii*, since it is an interpretation of red shift data that must first assume the Copernican Principle is true in order to conclude that the galaxies are receding at light speed. In actuality, it is an unproven hypothesis of modern cosmology which, in actuality, admits it is missing 96% of the matter and energy it needs to allow the galaxies to expand in accordance with Big Bang theory predictions. As Martin Selbrede notes:

Those who hold to the Copernican Principle believe there is no center, or every place is a center, but if there is a single center it is any place but here, and they propose this as a scientific position. But where is the science behind that? It's not. It's a metaphysical commitment. It's not science anymore. So it's not the geocentrist that is being unscientific here, it is the other side that being unscientific, because their commitment precedes the science. At least our position follows the science. They are trying to derive the science by a metaphysical commitment.[176]

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[175] Richard Wolfson, *Simply Einstein: Relativity Demystified*, New York, W. W. Norton Co. 2003, pp. 63-64.

[176] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2013. Selbrede continues: "We've actually proposed taking a Raleigh interferometer onto the space shuttle….Three geocentric scientists proposed this and published it in one of the journals….A Raleigh interferometer…sends light through both a vacuum and a water tube and combines the light together and this allows us to maximize the effect of a Michelson-Morley style experiment….The reason that these experiments are not done is the assumption that we already know the result….This is perhaps, again, a matter of being fearful of the result…They don't want to do it. They assert, 'Well, a ring laser does the same thing.' No it doesn't. It's a completely different measurement entirely…Of course, Einstein dies on the vine the second that you get a non-zero result…and all of physics collapses with the experiment."

The majority of today's Protestant conservatives who advocate an *ex nihilo* six-day creation but are reluctant to entertain the possibility of a geocentric universe, admit, nevertheless, that the whole matter is one of perspective, such that heliocentrism is merely a preferred model, but certainly not the proven one. Popular author Jonathan Sarfati writes:

> Both sides should have realized that all movement must be described in relation to something else – a reference frame – and from a descriptive point of view, all reference frames are equally valid…Using the sun (or center of mass of the solar system) is the most convenient for discussing planetary motions.[177]

This very question had troubled the Greeks and Romans over two thousand years ago. Seneca, for example, writes a description very similar to what Born, Hoyle, or Hawking write today, only back then he didn't have anyone to provide him a scientific answer:

> It will be proper to discuss this, in order that we may know whether the universe revolves and the Earth stands still, or the universe stands still and the Earth rotates. For there have been those who asserted that…risings and settings do not occur by virtue of the motion of the heaven, but that we ourselves rise and set. The subject is worthy of consideration…whether the abode allotted to us is the most slowly or the most quickly moving, whether God moves everything around us or ourselves instead.[178]

Almost two thousand years later, however, modern science hasn't provided Seneca with a good answer. From Born, Hoyle, and Hawking we see that the only response science can give to Seneca is that science doesn't know the answer. In fact, as we will see in this intriguing saga, science has come full circle. It wasn't until the dawn of Relativity (which, as we will see later, was the very physics invented in hopes of saving mankind from having to revert back to geocentrism), that science realized it could never prove heliocentrism, and thus, in every experiment devised since then to show otherwise, science became like Sisyphus pushing the rock up the mountain hoping to reach the summit, only to find that the weight of the evidence could not be overcome, and thus it would be forced to watch the heliocentric rock roll down time after time.

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[177] Jonathan Safarti, "The Sun: Our Special Star," subtitle: "Sunspots, Galileo and Heliocentrism," *Answers in Genesis*, Vol. 22, Issue 1, p. 5.
[178] Seneca, *Nat. Quaest*. vii. 2, 3. Cited in *Aristarchus of Samos: The Ancient Copernicus*, Sir Thomas Heath, 1913, p. 308.

Although many more scientists could be cited, the above quotes give a sufficient across-the-board sampling of the consensus. The irony about the above citations is that they all come from the pens of those who have been classed as heliocentrists. Obviously, then, we can conclude that each scientist will, if he is honest, admit that his advocacy for heliocentrism is merely a preference, and more often a bias, but certainly not the proven system.

Why No System is Completely Accurate

Even after Kepler's modifications, anomalies regarding the motions of the heavenly bodies remained, and stubbornly so. Although geometrically speaking the orbits are not perfect circles, they are not perfect ellipses either, but precess at different rates and contain various eccentricities. Quoting Hoyle again:

> The planetary orbits are not strictly ellipses, as we have so far taken them to be, because one planet disturbs the order of another through the gravitational force that it exerts….In all cases the orbits are nearly circles….It is curious that although the actual orbits do not differ in shape much from circles the errors of a circular model can nevertheless be quite large. Indeed, errors as large as this were quite unacceptable to Greek astronomers of the stature of Hipparchus and Ptolemy. It was this, rather than prejudice, which caused them to reject the simple heliocentric theory of Aristarchus….The Hipparchus theory grapples with the facts whereas the circular picture of Aristarchus fails to do so….The theory of Ptolemy, a few minor imperfections apart, worked correctly to the first order in explaining the planetary eccentricities. Copernicus with his heliocentric theory had to do at least as well as this, which meant that he had to produce something much better than the simple heliocentric picture of Aristarchus…. Kepler achieved improvements, but not complete success, and always at the expense of increasing complexity. Kepler and his successors might well have gone on in this style for generations without arriving at a satisfactory final solution, for a reason we now understand clearly. There is no simple mathematical expression for the way in which the direction of a planet – its heliocentric longitude – changes with time. Even today we must express the longitude as an infinite series of terms when we use time as the free variable. What Ptolemy, Copernicus, and Kepler, in his early long calculations, were

trying to do was to discover by trial and error the terms of this series. Since the terms become more complicated as one goes to higher orders in the eccentricity, the task became successively harder and harder…[179]

Professor of celestial mechanics at Columbia University, Charles Lane Poor, says much the same:

From the time of Newton, it has been known that Kepler's laws are mere approximations, computer's fictions, handy mathematical devices for finding the approximate place of a planet in the heavens. They apply with greater accuracy to some planets than to others. Jupiter and Saturn show the greatest deviations from strictly elliptical motion. The latter body is often nearly a degree away from the place it would have been had its motion about the sun been strictly in accord with Kepler's laws. This is such a large discrepancy that it can be detected by the unaided eye. The moon is approximately half a degree in diameter, so that the discrepancy in the motion of Saturn is about twice the apparent diameter of the moon. In a single year, during the course of one revolution about the sun, the Earth may depart from the theoretical ellipse by an amount sufficient to appreciably change the apparent place of the sun in the heavens.[180]

Expanding on Hoyle and Poor's argument, it is clear from the historical record that heliocentric cosmology has been built upon the myth of "simplicity," or what is often referred to in science disciplines as

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[179] Fred Hoyle, *Nicolaus Copernicus: An Essay on his Life and Work*, pp. 73, 8, 9, 53, 11-12, 13-14, in the order of ellipses.

[180] Charles Lane Poor, *Gravitation versus Relativity*, p. 129. Owen Gingerich adds: "Naturally astronomy textbooks don't show it this way, because they can't make the point about ellipses unless they enormously exaggerate the eccentricity of the ellipse. So for centuries, beginning with Kepler himself, a false impression has been created about the elliptical shape of planetary orbits. The eccentricity of planetary orbits (that is, their off-centeredness) is quite noticeable – even Ptolemy had to cope with that – but the ellipticity (the degree the figure bows in at the sides) is very subtle indeed. Observations of Mars must be accurate to a few minutes of arc for this tiny ellipticity to reveal itself" (*The Book that Nobody Read*, p. 166).

"Occam's razor," that is, 'the simplest solution is the best solution.'[181] It was the same logic employed in Galileo's time to promote the heliocentric system, with such clichés as: "*natura simplicitatem amat*" (nature loves simplicity); "*natura semper quod potest per faciliora, non agit per ambages difficiles*" (nature always decides to go through the easy path; it does not seek difficult paths). In 1674, the famous scientist Robert Hooke (contemporary of Newton), in his book *An Attempt to Prove the Motion of the Earth from Observation*, admitted he could not show the Earth was moving in space. He gave two rationalizations for his failure. In the first he claimed it was more or less a psychological problem:

> Whether the Earth move or stand still hath been a Problem, that since Copernicus revived it, hath much exercised the Wits of our best modern Astronomers and Philosophers, amongst which notwithstanding there hath not been any one who hath found out a certain manifestation either of the one or the other Doctrine… [Some] have been instructed in the Ptolemaik or Tichonick System, and by the Authority of their Tutors, over-awed into a belief, if not a veneration thereof: Whence for the most part such persons will not indure to hear Arguments against it, and if they do, 'tis only to find Answers to confute them. [182]

In the second he tries to settle the issue by an appeal to Occam's razor, but in the end, Hooke himself sees the fallacy of such an approach:

> On the other side, some out of a contradicting nature to their Tutors; others, by as great a prejudice of institution; and some few others upon better reasoned grounds, from the proportion and harmony of the World, cannot but embrace the Copernican Arguments.
>
> [But] what way of demonstration have we that the frame and constitution of the World is so harmonious according to our notion of its harmony, as we suppose? Is there not a possibility that things may be otherwise? Nay, is there not something of a probability? May not the Sun move as Ticho supposes, and that the Planets make their Revolutions about it whilst the Earth

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[181] From the writings of William of Occam (1300-1349) who stated: "Essentia non sunt multiplicanda praeter necessitatem."

[182] Robert Hooke, *An Attempt to Prove the Motion of the Earth from Observations*, 1674, pp. 1, 3, as cited in Owen Gingerich's St. Edmunds lecture, "Empirical Proof and/or Persuasion," March 13, 2003. Also in Hirshfeld's, *Parallax*, p. 144.

stands still, and by its magnetism attracts the Sun and so keeps him moving about it?[183]

The pretentious appeal to Occam has never subsided. When, because of his presupposition toward Relativity, physicist and mathematician Henri Poincaré was faced with the question of whether the Earth rotated within fixed stars or the stars rotated around a fixed Earth, his only recourse was to assert that the former should be accepted because it enables us to devise a simpler mathematical theory of astronomy.[184] But the reality is, not only is the dependence on simplicity an unproven assumption, the heliocentric system is not any simpler than the geocentric system. As Imre Lakatos admits:

> The superior simplicity of the Copernican theory was just as much of a myth as its superior accuracy. The myth of superior simplicity was dispelled by the careful and professional work of modern historians. They reminded us that while Copernican theory solves certain problems in a simpler way than does the Ptolemaic one, the price of the simplification is unexpected complications in the solution of other problems. The Copernican system is certainly simpler since it dispenses with equants and some eccentrics; but each equant and eccentric removed has to be replaced by new epicycles and epicyclets…he also has to put the center of the universe not at the Sun, as he originally intended, but at an empty point fairly near to it….I think it is fair to say that the 'simplicity balance' between Ptolemy's and Copernicus' system is roughly even.[185]

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[183] Robert Hooke, *An Attempt to Prove the Motion of the Earth from Observations*, pp. 1, 3, as cited in Gingerich.

[184] As summarized by Morris Kline in *Mathematics: The Loss of Certainty*, 1982, p. 344. Kline himself goes on to argue: "And in fact simplicity of the mathematical theory was the only argument Copernicus and Kepler could advance in favor of their heliocentric theory as opposed to the older Ptolemaic theory."

[185] Imre Lakatos, *The Methodology of Scientific Research Programmes: Philosophical Papers*, edited by J. Worrall and G. Currie, Vol. 1, 1978, 1999, pp. 173-174. He adds: "Koestler correctly points out that only Galileo created the myth that the Copernican theory was simple [*The Sleepwalkers*, p. 476]; in fact, [quoting J. L. E. Dreyer, 1906, chapter xiii] 'the motion of the Earth had not done much to simplify the old theories, for though the objectionable equants had disappeared, the system was still bristling with auxiliary circles'" (*ibid.*, p. 33); "The Copernican revolution was generally taken to be the paradigm of *conventionalist historiography*, and it is still so regarded in many quarters. For instance Polanyi tells us that Copernicus's 'simpler picture' had 'striking beauty'

In fact, considering how mathematically complex the motions of the celestial bodies really are (*e.g.*, the complex motions of the sun and moon cited earlier; Newton's "three-body" problem and the "perturbations" of the planets, all requiring the use of complex differential and integral calculus to chart their motions), no cosmological system should base its appeal on the simplicity of its system, for in the case of celestial motion, modern science has actually found that if the solution is too simple it is probably wrong, for it means that it isn't taking everything into account.[186]

Even more revealing is the fact that, as modern science prides itself on having dispensed with Ptolemy's epicycles, conceptually speaking they are still very much in use, although they are labeled with different names in order to conceal their identity. Charles Lane Poor revealed this secret back in the 1920s:

> The deviations from the "ideal" in the elements of a planet's orbit are called "perturbations" or "variations" …. In calculating the perturbations, the mathematician is forced to adopt the old device of Hipparchus, the discredited and discarded epicycle. It is true that the name, epicycle, is no longer used, and that one may hunt in vain through astronomical text-books for the slightest hint of the present day use of this device, which in the popular mind is connected with absurd and fantastic theories. The physicist and the mathematician now speak of harmonic motion, of Fourier's series, of the development of a function into a series of sines and cosines. The name has been changed, but the essentials of the device remain. And the essential, the

and 'justly carried great powers of conviction' [M. Polanyi, *The Logic of Liberty*, 1951, p. 70]. But modern study of primary sources, particularly by Kuhn [*The Copernican Revolution*, 1957], has dispelled this myth and presented a clear-cut historiographical refutation of the conventionalist account. It is now agreed that the Copernican system was 'at least as complex as the Ptolemaic' [I. Bernard Cohen, *The Birth of a New Physics*, p. 61]. But if this is so, then, if the acceptance of Copernican theory was rational, it was not for its superlative objective simplicity" (Lakatos, *Methodology*, p. 129).

[186] Philosopher of science Mario Bunge has shown how presumptuous and naïve it is to assume that the scientifically correct solution always turns out to be the least complex (*The Myth of Simplicity*, 1963). Regarding the three-body problem, Lagrange offered a partial solution by assuming one of the three bodies had negligible mass. If a small mass is placed at a *Lagrangian Point*, it will remain stationary in the rotating system. In 1912, K. F. Sundman attempted a solution based on a converging infinite series, but it converges much too slowly to be of any practical use. As it stands, no method has been developed to solve the equations of motion for a system with four or more bodies.

fundamental point of the device, under whatever name it may be concealed, is the representation of an irregular motion as the combination of a number of simple, uniform circular motions.[187]

In essence, Poor tells us that the introduction of the Fourier series, invented by Jean Baptiste Joseph Fourier (d. 1830),[188] takes the veil off the Copernican system and re-establishes geocentrism to its rightful place. The Fourier series plainly shows that any cosmological system can be demonstrated within reasonable accuracy simply by introducing the proper number of cyclical modulations (or "circular arguments," if you will, including, as we will see, the "curved space" of General Relativity). In other words, one can create any mathematical system and then "curve-fit" any deviations or discrepancies back into the system. In the end, Fourier inadvertently exposed the shaky foundations of modern cosmology by showing that there is simply no possibility of being certain about the coordinates of any rotating system, since the math and geometry can be manipulated to fit the observations. In fact, based on Fourier analysis one could design a universe that is constructed from the foundation of a flat Earth (as we see in a two-dimensional map) and make it mathematically indistinguishable from one based on a spherical Earth. Math works wonders, but it doesn't provide us with the knowledge of how the actual physical system works. As Poor notes:

> No more did Hipparchus believe that the bodies of the solar system were actually attached to the radial arms of his epicycles; his was a mere mathematical, or graphical device for representing irregular, complicated motions. While the graphical, or mechanical method is limited to a few terms, the trigonometrical, or analytical method is unlimited. It is possible to pile epicycle upon epicycle, the number being limited only by the patience of the mathematician and computer. The

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[187] Charles Lane Poor, *Gravitation versus Relativity*, p. 132. See also Robert W. Brehme, "A New Look at the Ptolemaic System," *American Journal of Physics*, 44:506-514, 1976. Brehme examines in detail the Ptolemaic system of planetary motions in order to demonstrate its direct kinematical connection with a heliocentric system. Ptolemy's planetary parameters are shown to be in good agreement, upon transformation, with modern values. See also Bina Chatterjee, "Geometrical Interpretation of the Motion of the Sun, Moon and the Five Planets as Found in the Mathematical Syntaxis of Ptolemy and in the Hindu Astronomical Works," *Journal of the Royal Asiatic Society of Bengal*, 15:41-88, 1947.
[188] Joseph B. J. Fourier, *Théorie analytique de la chaleur* [The Analytic Theory of Heat], 1822.

expressions for the disturbing action of one planet upon another, due to the attraction of gravitation, involve an unlimited number of such terms; or, as the mathematician puts it, the series is infinite.[189]

Koestler adds:

> The Copernican system is not a discovery…but a last attempt to patch up an out-dated machinery by reversing the arrangement of its wheels. As a modern historian put it, the fact that the Earth moves is "almost an incidental matter in the system of Copernicus which, viewed geometrically, is just the old Ptolemaic pattern of the skies, with one or two wheels interchanged and one or two of them taken out."[190]

What Was the Attraction to Copernicanism?

All this evidence provokes the question as to how the Copernican system gained such popularity. How is it that a treatise riddled with geometrical and mathematical presumptions, in addition to being one of the less-popular and least-studied books of its day, became the world's most sacrosanct "fact" of existence? Koestler offers at least one plausible answer, one very similar to that with which we opened this chapter:

> The answer is that the details did not matter, and that it was not necessary to read the book to grasp its essence. Ideas which have the power to alter the habits of human thought do not act on the conscious mind alone; they seep through to those deeper strata

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[189] Charles Lane Poor, *Gravitation versus Relativity*, p. 139. In practical terms, Fourier analysis, or harmonic motion, allows one to use as many circles of motion as needed in order to create the path that coincides most accurately with the actual path of the planet. Astronomer George Abell adds another insight: "Quite likely, however, the spheres of Eudoxus and Callippus were intended as a mere mathematical representation of the motions of the planets. It was a scheme that 'saved the phenomena' better than ones before it, and in this respect it was successful. The epicycles of Ptolemy, developed later, may similarly be regarded as mathematical representations not intended to describe reality. Modern science does no more. The laws of nature 'discovered' by science are merely mathematical or mechanical models that describe how nature behaves, not why, nor what nature 'actually' is" (*Exploration of the Universe*, 1969, p. 16).
[190] *The Sleepwalkers*, pp. 214-215.

which are indifferent to logical contradictions. They influence not some specific concept, but the total outlook of the mind. The heliocentric idea of the universe, crystallized into a system by Copernicus, and restated in modern form by Kepler, altered the climate of thought not by what it expressly stated, but by what it implied…"[191]

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[191] *The Sleepwalkers*, p. 218. Kepler was the first astronomer to publicly endorse Copernicus. Koestler adds: "The Mysterium…the first chapter, which is an enthusiastic and lucid profession of faith in Copernicus. It was the first unequivocal, public commitment by a professional astronomer which appeared in print fifty years after Canon Koppernigk's death….Galileo…and astronomers like Maestlin, were still either silent on Copernicus, or agreed with him only in cautious privacy" (*ibid.*, p. 255). Yet he found out quickly the muddle of Copernicus' figures. Kepler writes: "How human Copernicus himself was in adopting figures which within certain limits accorded with his wishes and served his purpose….He selects observations from Ptolemy, Walter, and others with a view to making his computations easier, and he does not scruple to neglect or to alter occasional hours in observed time and quarter degrees of angle" (*Mysterium Cosmographicum*, Gesammelte Werke, vol. I, note 8). Owen Gingerich takes a different view, claiming that *De revolutionibus* was more popular than Koestler admits. Having found a marked copy of the technical parts of Copernicus' book among the effects of Erasmus Reinhold, Gingerich was prompted to do a worldwide search for evidence of who, precisely, possessed an original edition of *De revolutionibus*, leading him to conclude: "I found copies owned by saints, heretics, and scalawags, by musicians, movie stars, medicine men, and bibliomaniacs. But most interesting are the exemplars once owned and annotated by astronomers." Gingerich's findings amount to "six hundred printed copies of Copernicus' magnum opus," which coincides with the fact that the first edition was only a thousand copies (*The Book Nobody Read: Chasing the Revolutions of Nicolaus Copernicus*, Owen Gingerich, pp. ix-x). Gingerich adds: "Clearly, when Arthur Koestler wrote that *De revolutionibus* was 'the book that nobody read' and 'an all time worst seller,' he couldn't have been more mistaken. He was wrong. Dead wrong" (*ibid.*, p. 255). Gingerich, however, has the tendency throughout his book to insulate Copernicus and his work from negative criticism. Moreover, Koestler's thesis is not based on the number of people who possessed copies of Copernicus' book, but on the number who actually read it completely and did a thorough study of its contents. In that sense, Gingerich does not prove his point against Koestler. For the record, Reinhold's publications on astronomy include a 1553 commentary on Georg Purbach's *Theoricae novae planetarum*. He was aware of Copernicus' heliocentric system prior to the 1543 appearance of *De revolutionibis* and cited him in his commentary. But Reinhold rejected heliocentrism on physical and theological grounds. Hanne Andersen, *et al.*, *The Cognitive Structure of Scientific Revolutions*, New York, Cambridge University Press, 2006, pp. 138-148.

Feyerabend is even more candid:

> It is clear that allegiance to the new ideas will have to be brought
> about by means other than arguments. It will have to be brought
> about by *irrational means* such as propaganda, emotion, *ad hoc*,
> hypotheses, and appeal to prejudices of all kinds. We need these
> 'irrational means' in order to uphold what is nothing but a blind
> faith until we have found the auxiliary sciences, the facts, the
> arguments that turn the faith into sound 'knowledge.' It is in this
> context that the rise of a new secular class with a new outlook
> and considerable contempt for the science of the schools, its
> methods, its results, even for its language, becomes so important.
> The barbaric Latin spoken by the scholars, the intellectual
> squalor of academic science, its other-worldliness which is soon
> interpreted as uselessness, its connection with the Church – all
> these elements are now lumped together with the Aristotelian
> cosmology and the contempt one feels for them is transferred to
> every single Aristotelian argument. This guilt-by-association
> does not make the arguments less *rational*, or less conclusive,
> *but it reduces their influence* on the minds of those who are
> willing to follow Copernicus. For Copernicus now stands for
> progress in other areas as well, he is a symbol for the ideals of a
> new class that looks back to the classical times of Plato and
> Cicero and forward to a free and pluralistic society. The
> association of astronomical ideas and historical and class
> tendencies does not produce new arguments either. But it
> engenders a firm commitment to the heliocentric view – and this
> is all that is needed at this stage, as we have seen. We have also
> seen how masterfully Galileo exploits the situation and how he
> amplifies it by tricks, jokes and *non-sequiturs* of his own.[192]

Of course, we would be remiss if we did not add the fact that
Copernicus, as the old saying goes, came at the right time in the right
place. As Carl Rufus puts it:

> Not only was Copernicus well prepared for his work, but the
> time was opportune. Revolutionary changes were in vogue.
> Gutenberg's invention had provided movable type and printing
> presses were busily engaged spreading new ideas. Columbus
> discovered a new world and the ships of Magellan

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[192] Paul Feyerabend, *Against Method*, pp. 114-115.

circumnavigated the globe. Savonarola preached his prophetic warnings and Martin Luther nailed his theses to the Wittenberg cathedral door. Aristotle's authority in science was beginning to be questioned. The old everywhere was being challenged and the new was being tried.[193]

As we opened this chapter with Gould's bold proclamation that modern science has founded itself upon a non-centered, infinite universe, so the same rationale had been employed in previous eras. As Solomon said, "There is nothing new under the sun" – a statement which we can now take both literally and figuratively. The theological, philosophical, social, and intellectual fabric of history has been divided right down the middle by those who have taken one side or the other in the on-going debate as to what revolves around what; a debate that stretches as far back as written records take us.

In the second millennium, the drama played itself out much faster since the invention of the printing press made it possible to publish one's views far and wide. Moreover, the arguments on either side became more technical and refined. On this stage the next combatants were the Scholastic astronomers who brought their intellectual muscle against Nicolaus of Cusa and Nicolaus Copernicus. Then, of course, there was Johannes Kepler versus Tycho Brahe, and then Galileo Galilei versus Robert Cardinal Bellarmine, and Isaac Newton versus the Jesuits and Dominicans,[194] and James Bradley versus George Airy's "failure." After

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[193] W. Carl Rufus, "The Astronomical System of Copernicus," *Popular Astronomy*, 1923, p. 516.

[194] Dorothy Stimson lists the advocates and dissidents of the Copernican theory as catalogued by Giovani Riccioli, SJ, who held that there were "40 new arguments in behalf of Copernicus and 77 against him." The list is as follows: Those advocating heliocentrism were: Copernicus, Rheticus, Mæstlin, Kepler, Rothman, Galileo, Gilbert, Foscarini, Didacus Stunica, Ismael Bullialdus, Jacob Lansberg, Peter Herigonus, Gassendi ("but submits his intellect captive to the Church decrees"), Descartes ("inclines to this belief"), A. L. Politianus, Bruno. Those disavowing heliocentrism were: Aristotle, Ptolemy, Theon the Alexandrine, Regiomontanus, Alfraganus, Macrobius, Cleomedes, Petrus Aliacensis, George Buchanan, Maurolycus, Clavius, Barocius, Michael Neander, Telesius, Martinengus, Justus-Lipsius, Scheiner, Tycho, Tasso, Scipio Claramontius, Michael Incofer, Fromundus, Jacob Ascarisius, Julius Cæsar La Galla, Tanner, Bartholomæus Amicus, Antonio Rocce, Marinus Mersennius, Polacco, Kircher, Spinella, Pineda, Lorinis, Mastrius, Bellutris, Poncius, Delphinus, Elephantutius (*The Gradual Acceptance of the Copernican Theory of the Universe*, p. 81-82). Jean Buridan (1300-58) had once entertained the possibility of a heliocentric system based on its reciprocity with the geocentric, but opted to reject it in favor

this, geocentrism had a new challenger, the Relativity of Albert Einstein, which, faced with experiments by Albert Michelson and Edward Morley that demonstrated the distinct possibility of a motionless Earth, sought to win the battle of the cosmos by decentralizing the whole universe, since the very idea of having to return to geocentrism was "unthinkable."[195]

As we saw earlier, Einstein himself concluded: "The struggle, so violent in the early days of science, between the views of Ptolemy and Copernicus would then be quite meaningless. Either…could be used with equal justification."[196] A fair question to ask in light of Einstein's remarkable admission of the viability of geocentric cosmology is: how many people have been enlightened to this knowledge? The answer is: hardly anyone. They have been duly shrouded from the implications of Relativity theory by a campaign engineered like no other in history. The evidence, as we have seen, is just dripping from the textbooks, but very few have been forthright enough to advertise it.

Willem de Sitter: 1872 – 1934   **Ernst Mach: 1838 – 1916**
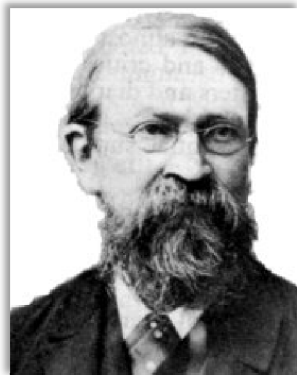
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of Aristotle. Others not on Riccioli's list who advocated geocentrism are: Francis Bacon, Thomas Feyens, Libert Froidmont, Gerogius Agricola, Johann Henrich Voight, André Tacquet, S.J., Giovanni Cassini.

[195] "Unthinkable" is the word employed by Einstein's biographer Ronald W. Clark to describe Einstein's reaction to the famous 1887 Michelson-Morley experiment, which, to the consternation of its scientists, offered as one solution to its puzzling results that the Earth was not moving in space (*Einstein: The Life and Times*, p. 110). As W. G. V. Rosser put it, "…this would give the earth an omnipotent position in the universe which people had been loathe to accept since the time of Copernicus" (*An Introduction to the Theory of Relativity*, p. 58).

[196] *The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, 1938, 1966, p. 212.

Einstein's contemporary and a world-renowned physicist in his own right, Willem de Sitter, admitted much the same: "The difference between the system of Ptolemy and that of Copernicus is a purely formal one, a difference of interpretation only."[197] Ernst Mach, who more or less was the pioneer in taking Newtonian relativity to its logical conclusion, stated it quite plainly:

> Obviously it matters little if we think of the Earth as turning about on its axis, or if we view it at rest while the fixed stars revolve around it. Geometrically these are exactly the same case of a relative rotation of the Earth and the fixed stars with respect to one another.[198]

> All masses, all velocities, thus all forces are relative. There is no basis for us to decide between relative and absolute motion....If there are still modern authors who, through the Newtonian water bucket arguments, allow themselves to be misled into differentiating between relative and absolute motion, they fail to take into account that the world system has been given to us only once, but the Ptolemaic and Copernican views are only our interpretations, but both equally true.[199]

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[197] Willem de Sitter, *Kosmos*, 1932, p. 17.

[198] Ernst Mach, *Die Mechanik in Ihrer Entwicklung Historich-Kritisch Dargestellt*, Liepzig: Brokhaus, 1883. English title: *The Science of Mechanics: A Critical and Historical Account of its Development*, translated by T. J. Macormack, La Salle, Open Court Publishing, 1960, 6th edition, p. 201. The seventh edition of Mach's book was published in 1912. Although in this treatise Mach does not himself adopt geocentrism, he repeatedly challenges modern science with the fact that geocentrism is not only a viable alternative, but that it substantially answers the famous 1887 Michelson-Morley experiment.

[199] Ernst Mach, *Die Mechanik in Ihrer Entwicklung Historich-Kritisch Dargestellt*, Liepzig: Brokhaus, 1883, p. 222. The original German reads: "Alle Massen, alle Geschwindigkeiten, demnach alle Kräfte sind relativ. Es gibt keine Entscheidung über Relatives und Absolutes, welche wir treffen könnten, zu welcher wir gedrängt wären....Wenn noch immer moderne Autoren durch die Newtonschen, vom Wassergefäß hergenommenen Argumente sich verleiten lassen, zwischen relativer und absoluter Bewegung zu unterscheiden, so bedenken sie nicht, daß das Weltsystem uns nur einmal gegeben, die ptolemäische oder kopernikanische Auffassung aber unsere Interpretationen, aber beide gleich wirklich sind" (Translated by Mario Derksen). NB: Although Mach forbids Copernican science from making any distinctions, he cannot forbid the same to geocentric science, for it is upon divine revelation that the distinction is made, that is, the Earth is motionless and is our absolute rest frame.

Gerald Holton and Stephen Brush, two well-known physicists, agree with the consensus:

> To us it is clear, although it did not enter the argument then, that the scientific content of both theories [Ptolemy's and Copernicus'], the power of prediction of planetary motion, was about the same at that time….In our modern terminology we would say…that the rival systems differed mainly in the choice of the coordinate system used to describe the observed movements.[200]

Holton admitted the same in another book with two other physicists, showing how practical a geocentric system really is:

> Copernicus and those who followed him felt that the heliocentric system was right in some absolute sense – that the sun was really fixed in space….But the modern attitude is that the choice of a frame of reference depends mainly on which frame will allow the simplest discussion of the problem being studied. We should not speak of a reference system being right or wrong, but rather as being convenient or inconvenient. (To this day, navigators use a geocentric model for their calculations.)[201]

In addition to contemplating the numerous quotes we have cited from qualified scientists who have concluded that there is no superiority of the heliocentric system over the geocentric system, the layman can afford himself the opportunity to come to the same conclusion by means of a simple mechanical device. If the opportunity affords itself, make a visit to the nearest planetarium. Inside, one will find what astronomers know as an orrery. An orrery, named after the fourth Earl of Orrery, Charles Boyle (d. 1731), is a moving mechanical model of the sun and planets. Since almost all orreries are heliocentric models, the sun will be placed in the center and all the planets will be revolving around the sun in their proportionate sizes and speeds. Holding the sun stationary in hand, one can watch all the other planets revolve around it. But with a repositioning of one's hand, the same orrery will demonstrate the geocentric system. Instead of holding the sun, hold the Earth. One will now see the sun and the planets revolve around

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[200] Gerald Holton and Stephen G. Brush, *Introduction to Concepts and Theories in Physical Science*, 1973, p. 28.

[201] James F. Rutherford, Gerald Holton and Fletcher G. Watson, *The Project Physics Course*, 1970, Unit, p. 40. Apollonius was the first to show that eccentricity and epicycles could be manipulated to show exactly the same motion.

the Earth, *and they will do so in precisely the same relation to one another as when the sun was held in the center*. If one cannot locate an orrery, simply draw a heliocentric model of the sun and planets on a piece of paper and place the point of the pencil in the middle of the sun and then rotate the paper. This will simulate the planets revolving around the sun (as we imagine them in their own paces). But now, put the pencil in the middle of the Earth and rotate the paper. One will discover that the only difference between the two models is that the sun will assume the orbit the Earth had.[202] As one astronomer remarked: "The equivalence of these two pictures was already known to Apollonius, who lived in the third century, B.C., long before Ptolemy (ca. A.D. 150)."[203] Or, as Thomas Kuhn has noted about the above demonstration:

> Now imagine that…the whole mechanism is picked up…and put down again with the sun fixed at the central position formerly held by the Earth….All of the geometric spatial relations of the Earth, sun and Mars…are preserved…and since only the fixed point of the mechanism has been changed, all the relative motions must be identical…the Tychonic system is transformed to the Copernican system simply by holding the sun fixed instead of the Earth. The relative motion of the planets are the same in both systems, and the harmonies are therefore preserved.[204]

Ironically, the very theory that was invented to escape geocentrism, Relativity, is now the one that gives it *carte blanche* privileges. Honest scientists admit these facts. Once again, Fred Hoyle, one of the more outspoken and candid astronomers of the twentieth century, is unafraid to cross the scientific picket line and admit the errors and shortcomings of his own field of endeavor. He writes:

> We might hope therefore that the Einstein theory, which is well suited to such problems, would throw more light on the matter. But instead of adding further support to the heliocentric picture of the planetary motions, the Einstein theory goes in the opposite direction, giving increased respectability to the geocentric picture. The relation of the two pictures is reduced to a mere coordinate transformation, and it is the main tenet of the Einstein

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[202] One can also consult Henry C. King's *Geared to the Stars: The Evolution of Planetariums, Orreries and Astronomical Clocks*, 1978, pp. 442. King shows both geocentric and heliocentric orreries in use beginning from 1650.
[203] Fred Hoyle, *Nicolaus Copernicus*, 1973, p. 63.
[204] Thomas S. Kuhn, *The Copernican Revolution*, 1959, pp. 204-205.

theory that any two ways of looking at the world which are related to each other by a coordinate transformation are entirely equivalent from a physical point of view.[205]

Science writer Kitty Ferguson goes one step farther:

Fred Hoyle has argued that a subtler understanding of Einstein's theories reveals they may actually slightly favor an Earth-centered model. Had Galileo had Hoyle at his elbow, he might have produced the book that would have pleased the pope and not have been tried for heresy!"[206]

Being completely honest with her reader, she adds:

Why, then, does Ptolemy come off so badly in this contest? Paradoxically, the enormous success of Ptolemaic astronomy is not an argument in its favor. It can account for all apparent movement in the heavens. It could also account for a great deal that never happens. It allows for too much. Copernican astronomy, as it has evolved, allows for far less. It's easier to think of something that Copernican theory could not explain. The more scientific way of putting this is that Copernican theory is more easily "falsifiable" than Ptolemy's, easier to disprove. Falsifiability is considered a strength…if new discoveries don't undermine it but fall neatly into place….

There is another criterion by which theories are judged, and, for better or worse, it shows that modern scientists do have a certain kinship with those recalcitrant seventeenth-century scholars they so disdain. When new theories and the implications of new discoveries disagree with the way a scientist personally feels the universe ought to run, he or she is reluctant to accept them.[207]

Is There a Copernican Conspiracy?

As there are many honest scientists and biblical exegetes who might reveal these facts to the public, there are just as many uneducated ones who are oblivious to them, or knowledgeable but dishonest ones who hide

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[205] Fred Hoyle, *Nicolaus Copernicus: An Essay on His Life and Work*, p. 87.
[206] Kitty Ferguson, *Measuring the Universe*, 1999, p. 106.
[207] *Ibid*., p. 107.

them. Still others are afraid to reveal them and hope that few people will seek to become educated and make provocative inquires, for then the proverbial cat will be out of the bag. Alexander von Humboldt, the founder of modern geography and of whom Charles Darwin said that he was "the greatest scientific traveler who ever lived," and, of whom, after his death, Geoffrey Martin said "no individual scholar could hope any longer to master the world's knowledge about the Earth,"[208] acknowledged geocentrism's viability but also fear of revealing it:

> I have known, too, for a long time, that we have no arguments for the Copernican system, but I shall never dare to be the first to attack it. Don't rush into the wasp's nest. You will but bring upon yourself the scorn of the thoughtless multitude. If once a famous astronomer arises against the present conception, I will communicate, too, my observations; but to come forth as the first against opinions which the world has become fond of – I don't feel the courage.[209]

Alexander von Humboldt 1769 – 1859

Not only can it be demonstrated mechanically, mathematically and scientifically that the sun and stars can revolve around the Earth, but using already-performed scientific experiments it can also be demonstrated that the Earth is in the center of the universe and motionless in space. In fact, the evidence is so plain that, in order to hide this information from the public, there is, as you will see before your eyes, a drama of cover-up and obfuscation that perhaps not even Hollywood could have dreamt up.

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[208] Geoffrey J. Martin and Preston E. James, *All Possible Worlds: A History of Geographical Ideas*, p. 131. If there was anyone who knew his trade, it was Humboldt. In addition to the thirty volumes he wrote about his geographical field studies, in 1845, at the age of 76, he wrote the book *Kosmos*, which is said to contain everything he knew about the Earth. The first volume, a general overview of the universe, sold out in two months and was promptly translated into many languages. Humboldt died in 1859 and the fifth and final volume was published in 1862, based on his notes for the work.

[209] Quoted in F. K. Schultze's synopsis and translation of F. E. Pacshe's *Christliche Weltanschauung* (cited in *De Labore Solis*, p. 133). Also cited in C. Schoepffer's *The Earth Stands Fast*, C. H. Ludwig, 1900, p. 59.

Beneath it all is an intellectual war occurring between two opposing scientific philosophies that have been waging their respective campaigns for well nigh 500 years since its revival by Copernicus. Yet so successful have the heliocentrists been in their propaganda machine that the average person is completely unaware there still might be a controversy. The main reason for the ignorance is that anyone who dares to question the *status quo* of current cosmology has been successfully ridiculed and silenced, many being threatened with the fate like that of Ignaz Semmelweiss.[210] As in any high-stakes game, there will be lying, cheating, theft, murder, twisting of evidence, political intrigue, religious skirmishes, opposing philosophies, and fortunes and fame, which are all involved in the ongoing war between the sun-centered and Earth-centered systems. The stakes are indeed high; in fact, as we shall see, they are about as high as any stakes that history has to offer.

Various battles between the heliocentrists and the geocentrists continued many years after the Catholic Church's confrontation with Galileo. As noted earlier, Tycho Brahe and Johannes Kepler sparked another skirmish, and this one, so say current historians, ended in the murder of Brahe at the hands of Kepler.[211] As we touched upon earlier, the next climactic point came when the interferometer was invented – a device that could measure minute differences in the speed of light. It was called an "interferometer" because it measured the interference of two or more light waves. The prevailing thought was: if the Earth is moving around the sun at 30 km/sec, this should have some effect on the speed of light discharged in the direction of that motion. A whole host of experimenters in the 1800s (*e.g.*, Arago, Airy, Hoek, Fizeau, Fresnel, Michelson, Morley, Roentgen, Lodge, Rayleigh, Brace, et al.) confirmed to their satisfaction that the Earth was having no effect on the speed of light. In fact, it can be safely said that no experiment has ever been performed with such agonizing persistence and meticulous precision, and in every conceivable

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[210] Dr. Ignaz Semmelweiss (d. 1865) suggested to his medical colleagues that women were dying after they gave birth because the doctors who delivered their babies were carrying germs from the cadavers they had been dissecting previously. Semmelweiss suggested that these medical students wash their hands before attempting to assist in childbirth. Prior to Semmelweiss's solution, one woman in six died during childbirth. Unfortunately, Semmelweiss was ridiculed so severely by his medical colleagues that he suffered a mental breakdown and was committed to an insane asylum.

[211] Joshua Gilder and Anne-Lee Gilder, *Heavenly Intrigue: Johannes Kepler, Tycho Brahe, and the Murder Behind One of History's Greatest Scientific Discoveries*, 2004.

way, as that of determining whether the Earth is indeed moving through space. The haunting fact is: all of them have failed to detect any motion.

Hendrick Lorentz: 1853 – 1928

By the time of physicist Henrick Lorentz in the early 1890s, it was obvious to many what the experimental results were saying. In Lorentz's own words: "Briefly, everything occurs as if the Earth were at rest…"[212]

Lorentz knew the profound implications of his statement. He was very familiar with the dizzying world created by Einstein's Relativity, which was desperately commandeered to answer the failure of the interferometers to detect any motion of the Earth. In a personal letter he wrote to Einstein in 1915, it is apparent that he was feeling the effects of the drift into which Einstein forced the human race. In a moment of seeming desperation Lorentz wishes for a divine being that could hold it all together and make it work. He writes to Einstein:

> A "world spirit," who would permeate the whole system under consideration without being tied to a particular place or "in whom" the system would consist, and for whom it would be possible to "feel" all events directly would obviously immediately single out one of the frames of reference over all others.[213]

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[212] Lorentz's 1886 paper, "On the Influence of the Earth's Motion on Luminiferous Phenomena," quoted in Miller's *Albert Einstein's Special Theory of Relativity*, p. 20.

[213] Henrick Lorentz to Albert Einstein, January 1915, Robert Schulmann, A. J. Kox, Michael Janssen and József Illy, editors, *The Collected Papers of Albert Einstein, Correspondence 1914-1918*, 1998, Document 43.

This is an amazing admission from Lorentz. Despite popular opinion, he was the impetus for Relativity, since it was his "transformation" equation that was the brains behind Einstein's Special Relativity. In any case, it is obvious from the above quote that Lorentz could not live in the universe he created for himself. Consequently, he searched for a ubiquitous entity that could not only sense and coordinate all events instantaneously, but one that could also provide him with an absolute frame of reference. Why? Because Lorentz knew deep within his soul that it can work no other way. Things are an absolute mess without an absolute frame of reference from which everything else can be set and measured. As Einstein himself said:

> It has, of course, been known since the days of the ancient Greeks that in order to describe the movement of a body, a second body is needed to which the movement of the first is referred."[214]

But alas, once the Copernican system came into vogue, no longer was there a comforting reference point. Consequently, Isaac Newton soon discovered that: "It may well be that there is no body really at rest to which the places and motions of others may be referred."[215] Even with his alternative concept of "absolute space," Newton found no solace:

> It is indeed a matter of great difficulty to discover and effectually to distinguish the true motions of particular bodies from the apparent, because the parts of that immovable space in which these motions are performed do by no means come under the observations of our senses.[216]

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[214] Article written by Einstein at the request of the *London Times*, November 28, 1919, as cited in Einstein's *Ideas and Opinions*, Wings Books, Crown Publishers, 1954, p. 229.

[215] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689); translated by Andrew Motte (1729), revised by Florian Cajori, 1934, Definition VII, p. 8. Newton continues in Definition VIII with: "And therefore as it is possible, that in the remote regions of the fixed stars, or perhaps far beyond them, there may be some body absolutely at rest; but impossible to know from the position of bodies to one another in our regions, whether any of these do keep the same position to that remote body; it follows that absolute rest cannot be determined from the position of bodies in our regions" All of Newton's hand-wringing is superfluous if the Earth is fixed in space.

[216] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689), Definition XIV, p. 12.

Likewise, Arthur Eddington laments:

> …for there is nothing to guide him as to the planet to be selected for the standard of rest.…There is no answer, and so far as we can see no possibility of an answer…. Our common knowledge of where things are is not a miraculous revelation of unquestionable authority…. Location is not something supernaturally revealed to the mind…. It would explain for instance, why all the forces of Nature seem to have entered into a conspiracy to prevent our discovering the definite location of any object… naturally they cannot reveal it, if it does not exist….Nature has been too subtle…she has not left anything to betray the frame which she used…. Our predecessors were wise in referring all distances to a single frame of space…[217]

Indeed, through all the twists and turns of differeing cosmological theories, especially those of the relativistic variety that claim no absolutes, when the noise and clatter of claims and disclaims are over, all systems show a dependence on some type of absolute. Note the following:

System	Absolute
Ptolemy	Earth
Copernicus	Fixed Stars
Galileo	Fixed Stars
Brahe	Earth
Kepler	Fixed Stars
Newton	Space and Time
Lorentz	Ether
Einstein	Speed of Light
Ellis	CMB Radiation
Modern Science	Copernican Principle
Big Bang	Universal Expansion
Steady State	Infinity
Scripture/Church	Earth

So which one is correct? Fortunately, there is "a guide as to the planet to be selected as the standard or rest"; that Nature has not "betrayed" or formed a "conspiracy" against us; rather her knowledge comes from a

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[217] Arthur Eddington, *The Nature of the Physical World*, 1929, pp. 15, 17, 18, 27, 25, in order of ellipses.

"miraculous revelation of unquestionable authority" – God through Holy Writ. Pope Pius X once wrote:

Pope Pius X: 1835 – 1914

Human science gains greatly from revelation, for the latter opens out new horizons and makes known sooner other truths of the natural order, and because it opens the true road to investigation and keeps it safe from errors of application and of method. Thus does the lighthouse show many things they otherwise would not see, while it points out the rocks on which the vessel would suffer shipwreck.[218]

As even Andreas Osiander admitted in the Foreword he wrote for the book that started it all, Copernicus' *De revolutionibus*:

"But since for one and the same movement varying hypotheses are proposed from time to time…the astronomer much prefers to take the one which is easiest to grasp. Maybe the philosopher demands probability instead; but neither of them will grasp anything certain or hand it on, *unless it has been divinely revealed to him*…. And as far as hypotheses go, let no one expect anything in the way of certainty from astronomy, since astronomy can offer us nothing certain, lest, if anyone take as

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[218] Pope Pius X, encyclical of March 12, 1904, *Iucunda Sane*, 35.

true that which has been constructed for another use, he go away from this discipline a bigger fool than when he came to it."[219]

Andreas Osiander: 1498 – 1552

If science chooses to conspire against the revelation, life will, indeed, seem like a "conspiracy" against him, for he will be forever mired in the haunted house of moving targets and elusive shadows. Without a standard of rest, simply put, man will never find rest. As George Berkeley once registered against Newton as he recognized the full implications of the Copernican theory, if we start off with relative observations but end up with an absolute reference frame (Newton's "absolute space"), then somewhere along the way we must have been duly influenced by philosophical preferences. Accordingly he observes:

> If every place is relative, then every motion is relative, and as motion cannot be understood without a determination of its direction which in its turn cannot be understood except in relation to our or some other body.

> Up, down, right, left, all directions and places are based on some relation and it is necessary to suppose another body distant from the moving one.[220]

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[219] *On the Revolution of the Heavenly Spheres*, trans. by Charles Glenn Wallis, 1995, p. 4.

[220] *De Motu* ("On Motion"), Section 58, 1721, discussing Newton's two-globe thought experiment. Cited in William G. V. Rosser's *The Theory of General Relativity*, pp. 453-454, citing Sciama's *The Unity of the Universe*, 1959, p. 97.

George Berkeley: 1685 – 1753

Following the Greek Heraclides, Berkeley was one of the first moderns to hold that it would be possible to construct a system in which the universe rotates around a fixed Earth, and one that will produce the same mechanical effects when the Earth rotates in a fixed universe:

> The let us suppose that the sky of the fixed stars is created; suddenly from the conception of the approach of the globes to different parts of that sky the motion will be conceived.[221]

Close to two hundred years later, Ernst Mach put the idea and its mathematics on paper. But without a sure footing as to which system was actually correct, Mach's observation led inevitably to the theory of Relativity. Alas, late 19th century man came ever so close to discovering, scientifically, the correct system, but faced with such an unexpected and overwhelming truth, he, as the common saying goes, blinked first, and things have never been the same since. Einstein was well aware of the anti-Copernican implications of the interferometer experiments. In the words of one of his biographers:

> The problem which now faced science was considerable. For there seemed to be only three alternatives. The first was that the Earth was standing still, which meant scuttling the whole Copernican theory and was unthinkable.[222]

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[221] *De Motu*, Section 59, as translated by Andre K. T. Assis in *Relational Mechanics*, 1999, p. 104. As Mach's precursor, Berkeley held that gravity was the only real force and that inertia was Newton's invention. Whereas Newton held to $F = ma$ and inertial forces as fictitious, Berkeley opened the way for viewing inertial forces as real forces, caused by the universe's collective gravity.
[222] *Einstein: The Life and Times*, 1984, pp. 109-110.

Everyone in the physics establishment saw the same implications, and they were beside themselves with consternation. As several authors describe it:

> The data [of the interferometers] were almost unbelievable…. There was only one other possible conclusion to draw – that the Earth was at rest. This, of course, was preposterous.[223]

> Always the speed of light was precisely the same….Thus, failure [of Michelson-Morley] to observe different speeds of light at different times of the year suggested that the Earth must be 'at rest'…It was therefore the 'preferred' frame for measuring absolute motion in space. Yet we have known since Galileo that the Earth is not the center of the universe. Why should it be at rest in space?[224]

> In the effort to explain the Michelson-Morley experiment…the thought was advanced that the Earth might be stationary….Such an idea was not considered seriously, since it would mean in effect that our Earth occupied the omnipotent position in the universe, with all the other heavenly bodies paying homage by revolving around it.[225]

Even Michelson couldn't avoid the implications of his experiment:

> This conclusion directly contradicts the explanation of the phenomenon of aberration which has been hitherto generally accepted, and which presupposes that the Earth moves.[226]

But….

> As Einstein wrestled with the cosmological implications of the General Theory, the first of these alternatives, the Earth-centered universe of the Middle Ages, was effectively ruled out…[227]

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[223] Bernard Jaffe, *Michelson and the Speed of Light*, p. 76.

[224] Adolf Baker, *Modern Physics & Antiphysics*, pp. 53-54.

[225] Arthur S. Otis, *Light Velocity and Relativity*, p. 58.

[226] Albert A. Michelson, "The Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Vol. 22, August 1881, p. 125.

[227] *Einstein: The Life and Times*, p. 267.

Indeed it was "ruled out," yet not by any scientific proof but only because, after having five hundred years of Copernicanism drummed into one's head from childhood, it was "unthinkable" to believe that mankind got it wrong and that the Earth was actually motionless in space. But there was a price to pay for this presumption. Rejecting what was "unthinkable" created what was unmanageable. Since, on the one hand, an Earth-centered cosmos was "ruled out," but, on the other hand, Einstein was forced to answer both the results of the interferometer experiments and Maxwell's electromagnetic equations, his only "alternative" was to invent a whole new physics; in fact, it was necessary to adopt a whole new way of looking at the world. If the Earth wouldn't budge, then science had to budge. Consequently, Relativity theory advanced principles and postulates that heretofore would have been considered completely absurd by previous scientists, things such as matter shrinking, clocks slowing down, and mass growing larger; that two people could age at different rates, that space was curved, that light travels at the same speed for all observers (even observers moving at the speed of light); that time and space are one entity, and many other strange and bizarre concepts, all in an effort to answer the numerous experiments that showed the Earth was motionless in space. In that day *The Times* of London called Einstein's Relativity "an affront to common sense."[228] Indeed it was, and still is.

In the face of Relativity's fantastic postulates and the utter upheaval it caused in science and culture, one would expect that the burden of proof would be completely on Einstein and his fellow Relativists to show that his theory was the only viable explanation of reality, not merely an *ad hoc* alternative that was created under the pressure of unexplainable experiments. But the historical record shows that this was never done. By 1920, Relativity was accepted with impunity,[229] for up to that time, and still today, it is the only way to escape the "unthinkable" alternative – a motionless Earth in the center of the universe. But what the public at large is kept from knowing is that, if Relativity fails, there is no other answer for modern man. Men will be forced to accept an Earth-centered cosmos, for that is what all the interferometer experiments dictate. As even his biographer suggests, we will discover that Einstein's Relativity was invented for the express purpose of freeing the world from having to adopt

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[228] *Einstein: The Life and Times*, p. 101. In 1920, physicist Oliver Lodge said that Relativity was "repugnant to common sense" and of Relativists he said "however much we may admire their skill and ability, I ask whether they ought not to be regarded as Bolsheviks and pulled up" ("Popularity Relativity and the Velocity of Light," *Nature*, vol. CVI, November 4, 1920, p. 326).
[229] See Volume II, "Einstein: Everything is Relative," "Do the 1919 Eclipse Photographs Prove General Relativity?"

the "unthinkable" immobile Earth – the very one Tycho Brahe had bequeathed to Kepler and which the latter refused to accept for his own devious purposes. In fact, Einstein would be called "a new Copernicus."[230]

As this book progresses, because there is such an intimate link between the heliocentric/geocentric battle and the cosmology of Albert Einstein, much of the time will be spent unraveling and critiquing the theories of Relativity. We will seek to break down the façade upon which Relativity is built. Although Relativity proponents will claim that, since Einstein's mathematics can be made to work, even then, the question that haunts Relativity is whether Einstein's math is merely a case of saying that 3 + 1 = 4 when in reality the correct equation is 2 + 2 = 4. In other words, does Einstein's math represent what is occurring in physical reality, or does the math merely save the appearances?

Karp Popper puts this phenomenon in proper perspective:

> Properly understood, a mathematical hypothesis does not claim that anything exists in nature which corresponds to it….It erects, as it were, a fictitious mathematical world behind that of appearance, but without the claim that this world exists. [It is] to be regarded only as a mathematical hypothesis, and not as anything really existing in nature.[231]

Certainly, if the Earth is fixed, then space and time are fixed, and consequently Einstein's model is fallacious, even though the math can be made to look as if it is correct. As physicist Herbert Dingle pointed out about mathematics:

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[230] *Einstein: The Life and Times*, p. 192.

[231] Karl Popper, *Conjectures and Refutations*, p. 169, commenting on the concepts of George Berkeley, *Siris*, 1744, p. 234, and *De Motu*, pp. 18, 39. Popper adds: "But it can easily be misinterpreted as claiming more, as claiming to describe a real world behind the world of appearance. But no such world *could* be described; for the description would necessarily be meaningless" (*ibid.*). From a similar yet slightly different perspective, Ernst Gehrcke wrote in 1913: "The theory of relativity is nothing but a completely novel interpretation of the theory of electrodynamics and optics of bodies in motion, which Lorentz had already developed. The theory of relativity is *not* distinguished by the creation of substantially new equations, but by a substantially new *interpretation* of the known transformation equations of Lorentz. The arguments made against this *interpretation* condemn it, not the equations themselves, which, as was stated, are not Einstein's, but rather Lorentz's equations, and still stand intact today" ("Die gegen die Relativitätstheorie erhobenen Einwände," *Die Naturwissenschaften*, Vol. 1, No. 3, Jan. 17, 1913, pp. 62-66, reprinted in *Kritik der Relativitätstheorie*, Hermann Meusser, Berlin, 1924, p. 20, emphasis in original).

…in the language of mathematics we can tell lies as well as truths, and within the scope of mathematics itself there is no possible way of telling one from the other. We can distinguish them only by experience or by reasoning outside the mathematics, applied to the possible relation between the mathematical solution and its supposed physical correlate.[232]

As we will see in the following pages, however, although mathematics is touted as the handmaiden of modern Copernican cosmology, in reality it has become its worst enemy. In every case, the mathematics reveals insurmountable flaws in whatever cosmological model is being proposed. Whether it's the Big Bang theory, the Steady State theory, the closed universe, the open universe, the Friedman-Robertson-Walker model or the dozens of other possibilities available from plugging in different numbers to Einstein's field equations, the math always reveals incongruities. None of them can claim supremacy. As Omer noted in 1948:

E. Hubble has shown that the observational data which he has obtained do not agree satisfactorily with the homogeneous relativistic cosmological models [Big Bang models]…the homogeneous models give an unrealistic picture of the physical universe. Perhaps this should not be too surprising, since Tolman [*Proceedings of the National Academy of Sciences*, 20, 169, 1934] has shown that, subject to certain simplifying conditions, a homogeneous model is unstable under perturbations in density. Any local tendency to expand would be emphasized by further expansion. Likewise, any local tendency to contract would be followed by further contraction. Thus if a homogeneous model is disturbed, it becomes nonhomogeneous.[233]

The connection between modern man's quest to deny the Earth a central place in the cosmos and the search for life on other planets was stated no better than in a recent article by *National Geographic*:

It's hard to overstate the excitement scientists feel at the prospect of seeing that faint blue dot. If it told of a watery, temperate

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[232] *Science at the Crossroads*, p. 33.
[233] Guy C. Omer, Jr., "A Nonhomogeneous Cosmological Model," *Journal of the American Astronomical Society*, vol. 109, 1949, pp. 165-166. See also W. B. Bonnor, "The Instability of the Einstein Universe."

place, humanity would face a 21st century version of Copernicus's realization nearly 500 years ago that the Earth is not the center of the solar system. The discovery would show "that we're not in a special place, that we might be part of a continuum of life in the cosmos, and that life might be very common," says Michael Meyer, an astronomer at the University of Arizona.[234]

Indeed, it is the quest of today's scientists to silence all challengers to modern cosmology. For them, the Earth must remain in the remote recesses of space so that mankind need not be troubled by the possibility that Someone is behind it all and a Someone to whom they must hold themselves accountable. This is, indeed, a high-stakes game.

Fortunately, there are some voices in the wilderness of academia that have seen and announced the implications of the evidence. Catholic scientist, author and M.I.T. professor Wolfgang Smith writes:

> If there has been little debate in recent times on the subject of geocentrism, the reason is clear: almost everyone takes it for granted that the geocentrist claim is a dead issue, on a par, let us say, with the flat-Earth hypothesis. To be sure, the ancient doctrine has yet a few devoted advocates in Europe and America, whose arguments are neither trivial nor uninformed; the problem is that hardly anyone else seems to care, hardly anyone is listening. Even the biblically oriented creation-science movement, which of late has gained a certain prestige and influence, has for the most part disavowed geocentrism. The fact remains, however, that geocentrist cosmology constitutes not only an ancient, but indeed a traditional doctrine; should we not presume that as such it enshrines a perennial truth? To maintain, moreover, that this truth has nothing to say on a cosmographic plane – that the doctrine, in other words, is "merely symbolic or allegorical" – to think thus is to join the tribe of theologians who are ever willing to "demythologize" at the latest behest of the scientific establishment. It will not be without interest, therefore, to investigate whether the geocentrist claim – yes, understood cosmographically! – had indeed been ruled out of court. I shall urge that it has not. As regards the Galileo controversy, I propose to show that Galilean heliocentrism has proved to be

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[234] Cited in "The History and the Pseudo-History of Science," by Gene Callahan, January 25, 2005.

scientifically untenable, and that in fact the palm of victory belongs to the wise saintly Cardinal Bellarmine.[235]

Perhaps there may be a few who will see the truth, but, the world's scientists, by and large, are the last on our list of concerns. We do not expect those whose careers, salaries, and Nobel Prizes depend upon supporting Copernicanism, Evolution, and Relativity to their dying breath, will ever consider that the Earth is motionless and in the center of the universe. As noted earlier, an immobile Earth in the center of the universe would destroy all three legs of *Scientism's* stool in one fell swoop. Sadly, rather than prompting such men to lift their eyes in awe, the information gathered herein may only serve to harden their hearts even more, and thus serve as a testimony against them when they meet their Maker. As such, our book is geared to the next generation of scientists and theologians who are tired of the cosmological shell game that has been going on for the last several centuries.

In closing this chapter, let us say that, in spite of the harsh criticisms we levy against modern scientists, we are not disparaging their intellects. The halls of science house some of the most intelligent men this world has ever known. One glance at their mathematical equations and we know we are not dealing with ordinary human beings. Most of these men are geniuses. But the sad fact is, it doesn't matter how smart you are, how many books you've written, what chairs of science or mathematics you hold, how many Nobel prizes you've won, or how popular you are. The difficult but undeniable truth is: if you start out with the wrong premise, you are going to end up with the wrong conclusion. With the wrong answers, as the saying goes, 'you may be able to fool some of the people some of the time, but you cannot fool all the people all of the time.' The advantage this work has is that it starts with the right premise, for it obtained that premise from divine revelation and was not afraid to accept it at face value, and now all that is left is to work backwards, as it were, and verify the premise by using the very tools with which modern man prides himself: science, math, and logic. As Scripture assures us: "But thou hast arranged all things by measure and number and weight."[236]

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[235] *The Wisdom of Ancient Cosmology*, p. 149.
[236] Wisdom 11:20 [Douay-Rheims: 11:21].

"Although it is not uncommon for people to say that Copernicus proved Ptolemy wrong, that is not true….one can use either picture as a model of the universe, for our observations of the heavens can be explained by assuming either the earth or the sun to be at rest."

Stephen Hawking[237]

"…the most recent scientific findings vindicate the Church of 1633." Fr. Walter Brandmüller[238]

"I have two things to say that might surprise you: first, geocentrism is a valid frame of reference, and second, heliocentrism is not any more or less correct." Phil Plait[239]

"To entertain the notion that we may, in fact, have a special location in the universe is, for many, unthinkable. Nevertheless, that is exactly what some small groups of physicists around the world have recently been considering."

Timothy Clifton and Pedro Ferreira[240]

"Perhaps it is time for astronomers to pause and wonder whether they know too much and understand too little."

Herbert Friedman[241]

"We are unreconstructed geocentrists hiding behind a Copernican veneer." Carl Sagan[242]

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[237] *The Grand Design*, Stephen Hawking and Leonard Mlodinow, NY, Bantam, 2010, p. 41.

[238] "Light and Shadows: Defending Church History Amid Faith, Facts and Legends" (2009), p. 134. Fr. Brandmüller is the President of the Pontifical Committee for Historical Science and the Vatican's chief historian.

[239] *The Bad Astronomer* website: http://blogs.discovermagazine.com/ badastronomy/2010/09/14/geocentrism-seriously

[240] "Does Dark Energy Really Exist?" *Scientific American*, April 2009, p. 48.

[241] *The Amazing Universe*, National Geographic Society, 1975, p. 180.

[242] Carl Sagan, *A Universe Not Made For Us*, p. 39

Chapter 2

Answering Common Objections about Geocentrism

In this chapter we will address some of the more common and popular objections that are raised against geocentrism, as well as demonstrate that the purported proofs of heliocentrism are invalid. We address these objections at this early stage of the book so that the reader can have an open mind when reading the rest of the book, as well as resolve any latent prejudices he may have formed in his mind from a lifelong advocacy to the heliocentric model. In answering these issues, however, we will do so only in a preliminary manner in this present chapter. The remaining details will be addressed more comprehensively in later chapters.

Objection #1: Doesn't the Smaller Body Always Revolve Around the Larger Body?

One of the more common objections to geocentrism is the claim that Isaac Newton's laws of motion prove that the Earth, because it is smaller, must revolve around the sun, which is larger. In reality, Newton neither said nor proved any such thing. A close examination of his laws reveals that he merely stated, of two or more bodies in a rotating system, all bodies will revolve around the center of mass (also known as the center of gravity). As Newton himself put it: "That the center of the system of the world is immovable: this is acknowledged by all, although some contend that the Earth, others that the sun, is fixed in that center."[243]

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[243] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Book 3: *The System of the World*, Proposition X, Hypothesis I. The Latin original is: Centrum systematis mundane quiescere. Hoc ab omnibus consessum est, dum aliqui terram, alii solem in centro systematis quiescere contendant. Videamus quid inde sequatur." In Proposition XI, Theorema XI, Newton adds: "That the common center of gravity of the Earth, the sun, and all the planets, is immovable. For that center either is at rest or moves uniformly forwards in a right line; but if that center moved, the center of the world would move also, against the Hypothesis." Original Latin is: Commune centrum gravitates terræ, solis & planetarum omnium quiescere. Nam centrum illud (per legum corol. iv) vel quiescent vel progredietur uniformiter in directum. Sed centro illo semper progrediente centrum mundi quoque movebitur contra hypothesin.

Isaac Newton: 1642 – 1727

In a closed system where the only two bodies present are a massive sun and a small Earth, the center of mass will be much closer to the sun than the Earth, and thus, *in that system* the Earth would, indeed, revolve around the sun. But this is precisely the problem with the appeal to Newtonian mechanics: the appeal invariably limits the system to two bodies, the sun and the Earth, while it ignores the rest of the universe. When the rest of the universe is incorporated, we now have a center of mass that is dependent on far more than the local bodies and their forces we experience in our tiny solar system. On that basis, as we shall see, even Newton could not object to the Earth being the center of mass for the universe. The grand summation of his three laws of motion (namely, in a closed system the acceleration of the center of mass equals zero), will allow an immobile Earth to be the center if the universe is included in Newton's equations. As the eminent cosmologist Fred Hoyle admitted concerning past attempts to use Newton to support heliocentrism:

> Although in the nineteenth century this argument was believed to be a satisfactory justification of the heliocentric theory, one found causes for disquiet if one looked into it a little more carefully. When we seek to improve on the accuracy of calculation by including mutual gravitational interactions between planets, we find – again in order to calculate correctly – that the center of the solar system must be placed at an abstract point known as the "center of mass," which is displaced quite appreciably from the center of the Sun. And if we imagine a star to pass moderately close to the solar system, in order to calculate the perturbing effect correctly, again using the inverse-square

rule, it could be essential to use a "center of mass" which included the star. The "center" in this case would lie even farther away from the center of the Sun. It appears, then, that the "center" to be used for any set of bodies depends on the way in which the local system is considered to be isolated from the universe as a whole. If a new body is added to the set from outside, or if a body is taken away, the "center" changes.[244]

Sir Fred Hoyle: 1915 – 2001

As we can see from Hoyle's account, even if there is only one star to take into account, its mass and gravitational force must be added into the formula for determining the center of mass (or barycenter). Although there are many local centers of mass contained in the universe, this does not impinge on the center of mass for the universe itself. In other words, while each galaxy has its own center of mass; while our sun and its planets have a center of mass near the sun; and while the moons of the planets have a center of mass near their respective planet, these are only local centers of mass. When we consider all the mass of the universe, there is only one place where the universe's center of mass exists. If the universe rotates, Newton's laws require that it rotate around its singular center of mass, and the Earth can certainly occupy that solitary position. As Hoyle states it, the equivalence between of the two systems was recognized not only in the geometry, but also in the gravitational and inertial dynamics:

> …we can take either the Earth or the Sun, or any other point for that matter, as the center of the solar system. This is certainly so

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[244] Fred Hoyle, *Nicolaus Copernicus*, 1973, p. 85.

for the purely kinematical problem of describing the planetary motions. It is also possible to take any point as the center even in dynamics, although recognition of this freedom of choice had to await the present century.[245]

In short, although our solar system has its own local center of mass, in the larger picture, it cannot be considered an isolated system. Advocates of heliocentrism can mount no opposition to this logic since they already believe our solar system is revolving around the Milky Way, which, of course, it cannot do unless it is experiencing a strong gravitational attraction from the center of the Milky Way. Using that same principle, when we add to our galaxy the billions of other galaxies present in the universe,[246] we can certainly understand that they will have a substantial effect on determining the universe's barycenter.

As stated very simply by some of the most respected modern physicists (even if they don't prefer the geocentric model): "Mass there governs inertia here."[247] Although Newton failed to take into account the gravitational or inertial forces laden in the rest of the universe when he composed his laws of motion and preferred instead to add them in by hand, modern scientists have voiced one chorus in agreeing that Newton's blindness to the "mass there" is the primary inadequacy of his theory. Although Newton never admitted it, the missing parts of his theory directly affect the choice one makes for either Copernicus or Ptolemy. As the Brazilian physicist, Andre Assis, puts it:

> As we have seen, Leibniz and Mach emphasized that the Ptolemaic geocentric system and the Copernican heliocentric system are equally valid and correct…the Copernican world view, which is usually seen as being proved to be true by Galileo and Newton…the gravitational attraction between the sun and the planets, the earth and other planets do not fall into the sun because they have an acceleration relative to the fixed stars. The

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[245] Fred Hoyle, *Nicolaus Copernicus: An Essay on his Life and Work*, p. 82. Also from the same book: "Today we cannot say that the Copernican theory is "right" and the Ptolemaic theory is "wrong" in any meaningful sense. The two theories are…physically equivalent to one another" (*ibid*, p. 88).

[246] The universe is estimated to contain five sextillion stars, or 5×10^{22} stars.

[247] Misner, Charles W., Kip S. Thorne and John A. Wheeler, *Gravitation*, 1973, pp. 543, 546-47, 549. See Kip Thorne in a 2004 flash video speaking of Mach's Principle in relation to Gravity Probe-B and its detection of the dragging of space with respect to the Earth at http://einstein.stanford.edu/Media/Thorne-GPB_ Significance-Flash.html

distant matter in the universe exerts a force, $-m_g\vec{a}_{mf}$, on accelerated planets, keeping them in their annual orbits.

In the Ptolemaic system, the earth is considered to be at rest and without rotation in the center of the universe, while the sun, other planets and fixed stars rotate around the earth. In relational mechanics this rotation of distant matter yields the force (8.17)[248] such that the equation of motion takes the form of equation (8.47).[249] Now the gravitational attraction of the sun is balanced by a real gravitational centrifugal force due to the annual rotation of distant masses around the earth (with a component having a period of one year). In this way the earth can remain at rest and at an essentially constant distance from the sun. The diurnal rotation of distant masses around the earth (with a period of one day) yields a real gravitational centrifugal force flattening the earth at the poles. Foucault's pendulum is explained by a real Coriolis force acting on moving masses over the earth's surface in the form $-2m_g\vec{u}_{me} \times \omega_{Ue}$ where $\vec{u}_{me}$ is the velocity of the test body relative to the earth and $\vec{\omega}_{Ue}$ is the angular rotation of the distant masses around the earth. The effect of this force will be to keep the plane of oscillation of the pendulum rotating together with the fixed stars.[250]

A simpler way of viewing this is to take the "Absolute Space" in Newton's $F = ma$ and replace it with Absolute Matter, namely, the stars and their collective gravity. Whereas in Newton's Absolute Space the centrifugal (C_f), Coriolis (C_o) and Euler (E) forces are "fictitious" or secondary, the model for Absolute Matter they are real and written $F = ma + C_f + C_o + E$, the latter three caused by the gravity of the stars (G_s), so that we can write $F = ma + G_s$ or $F - ma = G_s$. In essence, the gravity of the stars acts precisely like the rigid Absolute Space that Newton wanted but could not find the cause. Any object [m] in sudden movement [a] against the spatial rigidness caused by stellar gravity [G_s or F] will result in equal and opposite inertial forces, which is why T. E. Phipps once said: "When the subway jerks, it's the fixed stars that throw you down."

A paper published in January 2013 in the *European Journal of Physics*, shows by mathematical analysis how the Newtonian and Machian

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[248] $\vec{F}_{lm} = -\Phi m_g [\vec{a}_{mS} + \vec{\omega}_{US} \times (\vec{\omega}_{US} \times \vec{r}_{mS}) + 2\vec{u}_{mS} \times \vec{\omega}_{US} + \vec{r}_{US} \times \frac{d\vec{\omega}_{US}}{dt}$, p. 176.

[249] $\sum_{j=1}^{N} \vec{F}_{jm} - \Phi m_g [\vec{a}_{mS} + \vec{\omega}_{US} \times (\vec{\omega}_{US} \times \vec{r}_{mS}) + 2\vec{u}_{mS} \times \vec{\omega}_{US} + \vec{r}_{US} \times \frac{d\vec{\omega}_{US}}{dt} = 0$, p. 185.

[250] André Koch Torres Assis, *Relational Mechanics*, pp. 190-191.

systems combined support the Earth-centered universe with the sun revolving around the Earth. He writes in the Conclusion to his paper:

> The analysis of planetary motions has been performed in the Newtonian framework with the assumption of Mach's principle. The kinematical equivalence of the Copernican (heliocentric) and the Neo-tychonian (geocentric) systems is shown to be a consequence of the presence of pseudo-potential (23) in the geocentric system, which, according to Mach, must be regarded as the real potential originating from the fact of the simultaneous acceleration of the Universe. This analysis can be done on any other celestial body observed from the Earth. Since Sun and Mars are chosen arbitrarily, and there is nothing special about Mars, one can expect to come up with the same general conclusion. There is another interesting remark that follows from this analysis. If one could put the whole Universe in accelerated motion around the Earth, the pseudo-potential corresponding to pseudo-force (21) will immediately be generated. That same pseudo-potential causes the Universe to stay in that very state of motion, without any need of exterior forces acting on it.[251]

As it stands, modern science can mount no objection to geocentrism due to the duality of its own force laws. Mach's Principle and Einstein's use of it[252] allows the Earth to be at rest in the center of the universe and

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[251] Luka Popov, "Newtonian–Machian analysis of the neo-Tychonian model of planetary motions," *European Journal of Physics*, 34, 383-391 (2013). Also available at arXiv:1301.6045 [physics.class-ph]. Dr. Popov is employed by the Dept. of Physics, University of Zagreb, Bujenička cesta 32, Zagreb, Croatia.

[252] "Mach's Principle" was the term coined by Albert Einstein in 1918. As Barbour notes: "In his first published reference to the principle he attributed to Mach, Einstein (1912, p. 39) formulated it as 'the entire inertia of a point mass is the effect of the presence of all other masse, deriving from a kind of interaction with the latter.' A footnote appended to this sentence announced its origin: 'This is exactly the point of view which E. Mach urged in his acute investigations on the subject. (E. Mach, *The Development of the Principle of Dynamics*. Second Chapter. Newton's Views of Time, Space and Motion.) The attribution is deliberate and unequivocal" (J. Barbour and H. Pfister, *Mach's Principle: From Newton's Bucket to Quantum Gravity*, p. 11). For our purposes, Mach's Principle of reciprocity holds that forces such as inertia, centrifugal, the Coriolis and Euler, are created by distant masses when the Earth is taken at rest. Some descriptions of Mach's Principle in this light are the following: Dennis Sciama: Inertial frames are those which are unaccelerated relative to the 'fixed stars,' that is, relative to a suitably defined mean of all the matter in the universe"; G. B. Brown: "Inertia is

have the sun revolving around it. The distant matter (*e.g.*, galaxies) that rotates around the Earth creates a centrifugal force, which acts like but counteracts the force of gravity, keeping the sun a certain distance from the motionless Earth, namely, 93 million miles.[253] As Einstein notes:

> We need not necessarily trace the existence of these centrifugal forces back to an absolute movement of K' [Earth]; we can instead just as well trace them back to the rotational movement of the distant ponderable masses [stars] in relation to K' whereby we treat K' as 'at rest.'…On the other hand, the following important argument speaks for the relativistic perspective. The centrifugal force that works on a body under given conditions is determined by precisely the same natural constants as the action of a gravitational field on the same body (*i.e.*, its mass), in such a way that we have no means to differentiate a 'centrifugal field' from a gravitational field….This quite substantiates the view that we may regard the rotating system K' as at rest and the

not due to movement with respect to 'absolute space,' but due to surrounding matter"; F. A. Kaemppfer: "By 'Mach's Program' is meant the intention to understand all inertial effects as being caused by gravitational interaction"; P. Moon and D. Spencer: "Inertia is not an inherent property of matter but is the result of forces caused by the distant galaxies"; Schiff: "The inertial properties of matter on the local scene derive in some way from the existence of the distant masses of the universe and their distribution in space"; Mario Bunge: "The motion and consequently the mass of every single body is determined (caused, produced) by the remaining bodies in the universe"; Jammer: "The inertia of any body is determined by the masses of the universe and their distribution"; M. Reinhardt: "The inertial mass of a body is caused by its interaction with the other bodies in the universe"; T. E. Phipps: "When the subway jerks, it's the fixed stars that throw you down"; Raine: "Inertial forces should be generated entirely by the motion of a body relative to the bulk of matter in the universe"; J. Barbour: "Mach suggested that inertial motion here on the earth and in the solar system is causally determined in accordance with some quite definite but as yet unknown law by the totality of the matter in the universe." All cited by Assis, p. 121.

[253] The mass of the sun and the amount of energy it produces also play a part in the reason it is 93 million miles from Earth. If the sun were placed too close or too far from the Earth then biological life would not be sustainable. The annual distance from the sun to the Earth is between 91 million and 94 million miles. This is due to both the elliptical orbit of the sun and the precession of the universe. All these factors (*i.e.*, mass, energy, distance) result in a 24-hour diurnal revolution of the sun around the Earth, as opposed to a 23 hour, 56 minute and 4 second diurnal revolution of the universe. This difference results in the sun lagging behind the universe by about 1° per day, which we see as it travels annually counter-clockwise through the twelve constellations of the Zodiac.

centrifugal field as a gravitational field….The kinematic equivalence of two coordinate systems, namely, is not restricted to the case in which the two systems, K [the universe] and K′ [the Earth] are in uniform relative translational motion. The equivalence exists just as well from the kinematic standpoint when for example the two systems rotate relative to one another.[254]

The principle of equivalence was not limited to Einstein's early use of Mach's mechanics, but also much later. In a 1950 paper the same principle appears, only K and K′ are now A and I:

Let A be a system uniformly accelerated with respect to an "inertial system." Material points, not accelerated with respect to I, are accelerated with respect to A, the acceleration of all the points being equal in magnitude and direction. They behave as if a gravitational field exists with respect to A, for it is a characteristic property of the gravitational field that the acceleration is independent of the particular nature of the body. There is no reason to exclude the possibility of interpreting this behavior as the effect of a "true" gravitational field (principle of equivalence).[255]

This also means, of course, that not only the sun but the planets and every other moving object in our system are controlled by the galaxies. As such, it takes the mystery out of inertia and why the planets travel in precise orbits. As Barbour notes:

Kepler's standpoint is particularly interesting, since he was deeply impressed by Tycho Brahe's 'demolition' of the crystal spheres. Kepler posed the problem of astronomy in the famous words: "From henceforth the planets follow their paths through the ether like the birds in the air. We must therefore philosophize about these things differently." His response to the problem was very 'Machian'…. The planets could not possibly follow such precise orbits by a mere inspection of empty space – they must be both guided and driven in their motion by the real masses in

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[254] Einstein's October 1914 paper titled: "Die formale Grundlage der allgemeinen Relativitätstheorie," trans. by Carl Hoefer, in *Mach's Principle: From Newton's Bucket to Quantum Gravity*, eds. Julian Barbour and Herbert Pfister, pp. 69, 71.
[255] Albert Einstein, "On the Generalized Theory of Gravitation," *Scientific American*, Vol. 182, No. 4, April 1950, p. 14.

the universe, namely, the sun and the sphere of the fixed stars. This deeply held conviction was a decisive factor in Kepler's discovery of the laws of planetary motion – truly, a pre–Machian triumph of Mach's Principle."[256]

In this perspective, the total mass of the universe is an integral factor in determining both the inertial and gravitational forces that affect us, as well as the forces that create the barycenter of the universe. Certainly no one can object, then, if the Creator decided long ago to put the Earth in the barycenter, while obeying all the laws that we have discovered today.

In the geocentric system we will be working with in this volume, the star field and the sun work in tandem. The star field is aligned with the sun and is weighted in one of its hemispheres, which will cause a slight precession and nutation as the universe rotates around the Earth. The mass of the universe is in perfect balance with the gravity of the sun. As Assis notes: "…the gravitational attraction of the sun is balanced by a real gravitational centrifugal force due to the annual rotation of distant masses around the earth….In this way the earth can remain at rest and at an essentially constant distance from the sun."
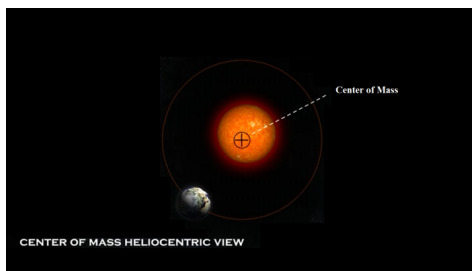
Heliocentric system eliminates the stars for the solar system's center of mass
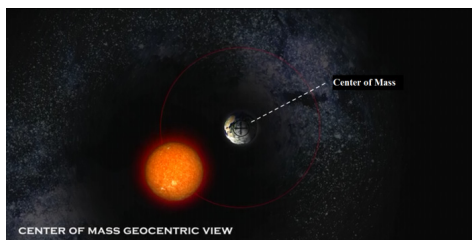
Geocentric system includes the stars for the solar system's center of mass[257]

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[256] *Mach's Principle: From Newton's Bucket to Quantum Gravity*, p. 9.
[257] See CDROM for animation of the Center of Mass.

Newtonian-Machian Mathematical Analysis of Neo-tychonian Model of Planetary Motions[258]

The calculation of the trajectories in the Sun-Earth-Mars system will be performed in two different models, both in the framework of Newtonian mechanics. First model is the well-known Copernican system, which assumes the Sun is at rest and all the planets orbit around it. Second one is less known model developed by Tycho Brahe (1546-1601), according to which the Earth stands still, the Sun orbits around the Earth, and other planets orbit around the Sun. The term "Neo-tychonian system" refers to the assumption that orbits of distant masses around the Earth are synchronized with the Sun's orbit. It is the aim of this paper to show the kinematical and dynamical equivalence of these systems, under the assumption of Mach's principle.

The discussion of motion of celestial bodies is one of the most interesting episodes in the history of science. There are two diametrically opposite schools of thought: one that assumes that the Sun stands still, and Earth and other planets orbit around it; and another that assumes that the Earth stands still, and Sun and other planets in some manner orbit around the Earth. The first school of thought comes from Aristarchus (310-230 BC) and is generally addressed as heliocentrism, another from Ptolemy (90-168 BC) and is generally known as geocentrism. Since Aristotle, the ultimate authority in science for more than two millennia, accepted the geocentric assumption, it became dominant viewpoint among scientists of the time. The turnover came with Copernicus (so-called "Copernican revolution") who in his work *De Revolutionibus* proposed a hypothesis that the Sun stands in the middle of the known Universe, and that Earth orbits around it, together with other planets. Copernicus' system was merely better than Ptolemy's, because Copernicus assumed the trajectories of the planets are perfect circles, and required the same number of epicycles (sometimes even more) as Ptolemy's model. The accuracy of Ptolemy's model is still a subject of vivid debates among historicna of science. [2]

The next episode in this controversy is Kepler's system with elliptical orbits of planets around the Sun. That system did not require epicycles, it was precise and elegant. It is therefore general view that Kepler's work finally settled the question whether it is the Sun or the Earth that moves.

But what is less known is that Tycho Brahe, Kepler's tutor, developed a geostatic system that was just as accurate and elegant as Kepler's: the Sun orbits around the Earth, and all the other planets orbit around the Sun. The trajectories are ellipses, and all the Kepler's laws are satisfied. In that moment of history, the Kepler's and Brahe's models were completely equivalent and equally elegant, since neither of them could explain the mechanism and reason why the orbits are the way they are. It had to wait for Newton.

Sir Isaac Newton, as it is generally considered, gave ultimate explanation of planetary motions that was in accord with Kepler's model, and excluded Brahe's one. The laws of motions and the inverse square law of gravity could reproduce all the observed data only with the assumption that the Sun (*i.e.* the center of mass of the system, which can be very well approximated by the center of the Sun) stands still, and all planets move around it. According to Newton's laws, it is impossible for the small Earth to keep the big Sun in its orbit: the gravitational pull is just too weak. This argument is very strong, and it seems to settle the question for good.

But in the end of 19th century, the famous physicist and philosopher Ernst Mach (1839-1916) came with the principle which states the equivalence of non-inertial frames. Using the famous "Newton's bucket" argument, Mach argues that all so-called pseudo-forces (forces which results from accelerated motion of the reference frame) are in fact real forces originating from the accelerated motion of distant masses in the Universe, as observed by the observer in the non-inertial frame. According to Mach's principle, the Earth could be considered as the "pivot point" of the Universe: the fact that the Universe is orbiting around the Earth will create the exact same forces that we usually ascribe to the motion of the Earth.

Mach's principle played a major role in the development of Einstein's general theory of relativity [4], as well as other developments in gravitational theory, and has inspired some interesting experiments [5]. This principle still serves as a guide for some physicists who attempt to reformulate ('Machianize') Newtonian dynamics [6, 7], or try to construct new theories of mechanics [8]. Some arguments against and critiques of Mach's principle have also been raised [9]. Since the time of its original appearance [10–12], Mach's principle has been reformulated in a number of different ways [13, 14]. For the purpose of this paper, we will focus on only one of the consequences of Mach's principle: that the inertial forces can be seen as resulting from real interactions with distant matter in the Universe, as was for example shown by Zylbersztajn [15].

The only question that remains is: *are these forces by themselves enough to explain all translational motions that we observe from Earth,*

and can they reproduce the Tycho Brahe's model? The discussion in this paper will show that the answer to this question is positive. In order to demonstrate it, we will consider the Sun-Earth-Mars system.

The paper is organized as follows. In section 2 an overview of two-body problem in the central potential and Kepler's problem is given. In section 3 the calculations of Earth's and Mars' trajectories are performed in the heliocentric system, both analytically (by applying the results from previous section) and numerically. In section 4 the calculations of Sun's and Mars' trajectories are performed in geocentric system, due to the presence of pseudo-potential originating from the fact of accelerated motion of the Universe. Finally, the conclusion of the analysis is given.

2. TWO-BODY PROBLEM IN THE CENTRAL POTENTIAL

2.1 General overview

We start with the overview of two body problem in Newtonian mechanics (for details see *e.g.* [3] or [4]). The Lagrangian of the system reads:

$$L = \tfrac{1}{2}m_1\dot{\mathbf{r}}_1^2 + \tfrac{1}{2}m_2\dot{\mathbf{r}}_2^2 - U(|\mathbf{r}_1 - \mathbf{r}_2|), \tag{2.1}$$

where U is potential energy that depends only on the magnitude of the difference of radii vectors (so-called central potential). We can easily rewrite this equation in terms of relative position vector $\mathbf{r} \equiv \mathbf{r}_1 - \mathbf{r}_2$, and let the origin be at the center of mass, *i.e.*, $m_1\mathbf{r}_1 + m_2\mathbf{r}_2 \equiv 0$. Solution of these equations are:

$$\mathbf{r}_1 = \frac{m_2}{m_1 + m_2}\,\mathbf{r}, \qquad \mathbf{r}_2 = -\frac{m_2}{m_1 + m_2}\,\mathbf{r}\,. \tag{2.2}$$

The Lagrangian (2.1) so becomes

$$L = \tfrac{1}{2}\mu\dot{\mathbf{r}}^2 - U(r), \tag{2.3}$$

where $\mathbf{r} \equiv |\mathbf{r}|$ and μ is the reduced mass,

$$\frac{1}{\mu} = \frac{1}{m_1} + \frac{1}{m_2} \tag{2.4}$$

In that manner, the two-body problem is reduced to one body problem of particle with coordinate $\mathbf{r}$ and mass μ in the potential $U(r)$.

Using polar coordinates, the Lagrangian (3) can be written as:

$$L = \tfrac{1}{2}\mu(\dot{r}^2 + r^2\dot{\phi}^2) - U(r) \tag{2.5}$$

One can immediately notice that variable ϕ is cyclic (it does not appear in the Lagrangian explicitly). Consequence of that fact is momentum conservation law, since $(\partial/\partial t)(\partial L/\partial \dot{\phi}) = \partial L/\partial \phi = 0$. Therefore,

$$\ell \equiv \frac{\partial L}{\partial \dot{\phi}} = \mu r^2 \dot{\phi} = \text{const.} \tag{2.6}$$

is the integral of motion.

In order to find a solution for the trajectory of a particle, it is not necessary to explicitly write down the Euler-Lagrange equations. Instead, one can use the energy conservation law,

$$E = \tfrac{1}{2}\mu(\dot{r}^2 + r^2\dot{\phi}^2) + U(r) = \tfrac{1}{2}\mu\dot{r}^2 + \frac{\ell^2}{2\mu r^2} + U(r) \tag{2.7}$$

Straightforward integration of (2.7) gives the equation for the trajectory,

$$\phi(r) = \int \frac{\ell \, dr/r^2}{\sqrt{2m[E - U(r) - \ell^2/r^2}} \tag{2.8}$$

2.2 Kepler's problem

Let us now consider the particle in the potential

$$U(r) = -\frac{k}{r} \tag{2.9}$$

generally known as *Kepler's problem*. Since our primary interest is in the planetary motions under the influence of gravity, we will take $k > 0$. Solution of eq. (8) for that potential is [2]:

$$\frac{p}{r} = 1 + e \cos\phi, \tag{2.10}$$

where $2p$ is called the *lactus rectum* of the orbit, and e is the eccentricity. These quantities are given by

$$p = \frac{2\ell^2}{\mu k}, \qquad e = \sqrt{1 + \frac{2E\ell^2}{\mu k^2}} \tag{2.11}$$

Expression (2.10) is the equation of a conic section with one focus in the origin. For $E < 0$ and $e < 1$ the orbit is an ellipse.

One can also determine minimal and maximal distances from the source of the potential, called perihelion and aphelion, respectively:

$$r_{min} = \frac{p}{1+e}, \qquad r_{max} = \frac{p}{1-e} \tag{2.12}$$

These parameters can be directly observed, and often are used to test a model or a theory regarding planetary motions.

3. EARTH AND MARS IN HELIOCENTRIC PERSPECTIVE

According to Newton's law of gravity, the force between two massive objects reads:

$$\mathbf{F} = \frac{Gm_1m_2}{|\mathbf{r_1}-\mathbf{r_2}|^3}(\mathbf{r}_1 - \mathbf{r}_2) \tag{3.1}$$

Which leads to a potential ($\mathbf{F} = -\nabla U$)

$$U(|\mathbf{r}_1 - \mathbf{r}_2|) = -\frac{Gm_1m_2}{|\mathbf{r_1}-\mathbf{r_2}|} \tag{3.2}$$

This is obviously Kepler's potential (2.9) with $k = Gm_1m_2$, where G is Newton's gravitational constant.

Since the Sun is more than 5 orders of magnitude more massive than Earth and Mars, we will in all future analysis use the approximation

$$\mu \approx m_i \tag{3.3}$$

where m_i is mass of the observed planet. For the same reason, gravitational interaction between Earth and Mars can be neglected, since it is negligible compared with the interaction between Mars and the Sun. Using these assumptions, we can write down corresponding Lagrangians,

$$L_{ES} = \tfrac{1}{2}m_E\dot{\mathbf{r}}_{ES}^2 + \frac{Gm_EM_S}{\mathbf{r}_{ES}},$$

$$L_{MS} = \tfrac{1}{2}m_M\dot{\mathbf{r}}_{MS}^2 + \frac{Gm_MM_S}{\mathbf{r}_{MS}} \tag{3.4}$$

where m_E and m_M are masses of Earth and Mars, respectively. Subscripts *ES* (*MS*) correspond to the motion of Earth (Mars) with respect to the Sun. These trajectories can be calculated using the exact solution (2.10) with

appropriate strength constants k and initial conditions which determine E and ℓ. Another way is to solve the Euler-Lagrange equations numerically, using astronomical parameters [20] (*e.g.*, aphelion and perihelion of Earth/Mars) to choose the initial conditions that fit the observed data. The former has been done using *Wolfram Mathematica* package. The result is shown on Fig. 1.
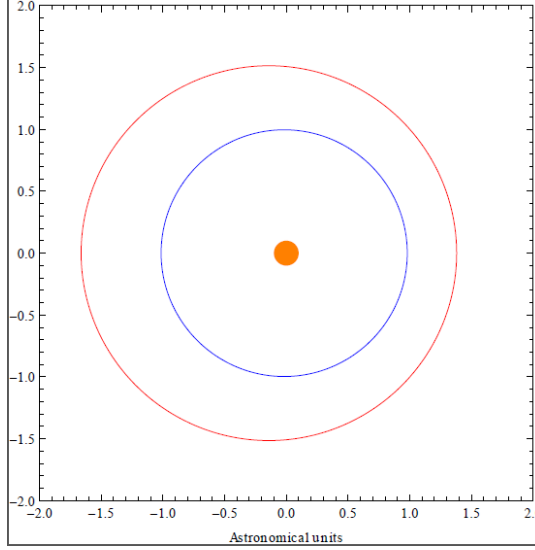
FIG. 1: Trajectories of Earth and Mars in heliocentric system over the period of 2 years. Blue and red lines represent Earth's and Mars' orbits, respectively.

For the later comparison, one could write out the expressions for the e and p parameters for the Earth. Putting the expressions for energy (2.7) and momentum (2.6) into eqs. (2.11) it is straightforward to obtain

$$p = \frac{\dot{\phi}^2 r^4}{GM_S}$$

$$e = \sqrt{1 - \frac{2GM_S\dot{\phi}^2 r^3 - \dot{r}^2\dot{\phi}^2 r^4 - \dot{\phi}^4 r^6}{G^2 M_S^2}} \tag{3.5}$$

where ϕ, $\dot{r}$ and r are angular velocity, radial velocity and distance respectively, taken in the same moment of time (*e.g.* in $t = 0$).

Fig. 2 displays motion of the Mars as viewed from the Earth, gained by trivial coordinate transformation

$$\mathbf{r}_{EM}(t) = -\mathbf{r}_{ES}(t) + \mathbf{r}_{MS}(t), \tag{3.6}$$

where $\mathbf{r}_{ES}(t)$ and $\mathbf{r}_{MS}(t)$ are solutions of Euler-Lagrange equations for the Lagrangians (3.4). Equation (3.6) is just the mathematical expression of the Tycho Brahe's claim. The retrograde motion of Mars can be useful in the attempt to understand and determine orbital parameters, as was shown qualitatively and quantitatively by Thompson [21].

The acceleration that Earth experiences due to the gravitational force of the Sun is usually referred as centripetal acceleration and is given by

$$\mathbf{a}_{cp} = \frac{\mathbf{F}_{cp}}{m_E} = \frac{GM_S}{r_{ES}^2} \, \hat{\mathbf{r}}_{ES} \qquad (3.7)$$

where $\hat{\mathbf{r}}$ is the unit vector in the direction of vector $\mathbf{r}$, $\mathbf{r}_{ES}(t)$ is radius vector describing motion of Earth around the Sun, and F_{cp} is centripetal force, *i.e.* the force that causes the motion.
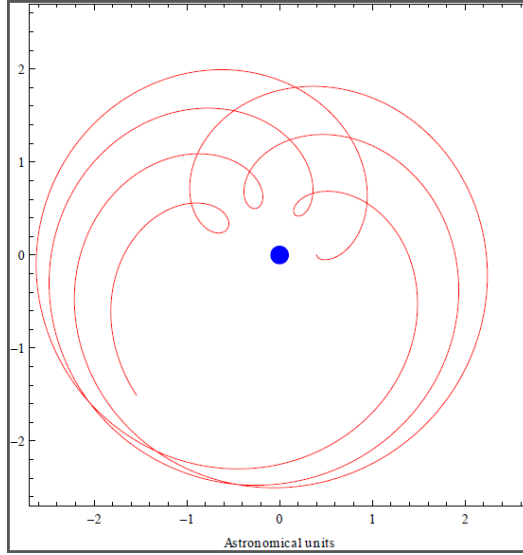
FIG. 2: Trajectory of the Mars as seen from the Earth over the period of 7 years. Calculation of this trajectory is done numerically in the heliocentric system.

4. SUN AND MARS IN GEOCENTRIC PERSPECTIVE

4.1 The pseudo-potential

From the heliocentric perspective, the fact that the Earth moves around the Sun results with centrifugal pseudo-force, observed only by the observer on the Earth. But if we apply Mach's principle to the geocentric

viewpoint, one is obliged to speak about the real forces resulting from the fact that the Universe as a whole moves around the observer on the stationary Earth. Although these forces will further be considered as the real forces, we well keep the usual terminology and call them pseudo-forces, for the sake of convenience. Our focus here will be on the annual orbits, not on diurnal rotation which requires some additional physical assumptions [8] [22] that are beyond the scope of this paper.

The Universe is regarded as an $(N + 1)$–particle system (N celestial bodies plus planet Earth). From the point of a stationary Earth, one can write down the Lagrangian that describes the motions of celestial bodies:

$$L = \tfrac{1}{2}\sum_{i=1}^{N} m_i \, \dot{r}_i^2 - \tfrac{1}{2}\sum_{i=1}^{N} \frac{Gm_im_j}{r_{ij}} - \sum_{i=1}^{N} \frac{Gm_Em_i}{r_i} - U_{ps}, \qquad (4.1)$$

where $r_{ij} \equiv |\mathbf{r}_i - \mathbf{r}_j|$, U_{ps} stands for pseudo-potential, satisfying $\mathbf{F}_{ps} = -\nabla U_{ps}$. $\mathbf{F}_{ps}$ is the pseudo-force given by

$$\mathbf{F}_{ps} = -m\sum_{i=1}^{N} \mathbf{a}_{cp,i} , \qquad (4.2)$$

where $\mathbf{a}_{cp,i}$ is centripetal acceleration for given celestial body (with respect to the Earth) and m is a mass of the object that is subjected to this force. It's easy to notice that the dominant contribution in these sums comes from the Sun. The close objects (planets, moons, etc.) are much less massive than the Sun, and massive objects are much farther distant. The same approximation is implicitly used in section 3.

In the Machian picture, the centripetal acceleration is a mere relative quantity, describing the rate of change of relative velocity. Therefore, centripetal acceleration of the Sun with respect to Earth is given by Equation 3.7, with $\mathbf{r}_{ES} = -\mathbf{r}_{SE}$. All that considered, Equation 4.2 becomes

$$\mathbf{F}_{ps} = \frac{GmM_S}{r_{SE}^2} \, \hat{\mathbf{r}}_{SE} \qquad (4.3)$$

where $\mathbf{r}_{SE}(t)$ describes the motion of the Sun around the Earth.

We can now finally write down the pseudo-potential which influences every body observed by still observer on Earth:

$$U_{ps}(\mathbf{r}) = \frac{Gm \, M_S}{r_{SE}^2} \, \hat{\mathbf{r}}_{SE} \cdot \mathbf{r} \qquad (4.4)$$

where $\mathbf{r}(t)$ describes motion of particle of mass m with respect to the Earth. Notice that this is not a central potential.

4.2 Sun in Earth's pseudo-potential

In order to determine Sun's orbit in Earth's pseudo-potential, one needs to take the dominant contributions of the Lagrangian (4.1), as was explained earlier. Taking into account the expression for pseudo-potential given in Equation 4.4, one ends up with

$$L_{SE} = \frac{1}{2}M_S\dot{r}_{SE}^2 - \frac{GM_S^2}{r_{SE}} \tag{4.5}$$

This Lagrangian has the exact same form as the reduced Lagrangian (2.3). That means that we can immediately determine the orbit by means of Equation (2.11) by substituting $\mu = M_S$ and $k = GM_S^2$. This leads to the following result (subscript *SE* will be omitted):

$$p = \frac{\dot{\phi}^2 r^4}{GM_S}$$

$$e = \sqrt{1 - \frac{2GM_S\dot{\phi}^2 r^3 - \dot{r}^2\dot{\phi}^2 r^4 - \dot{\phi}^4 r^6}{G^2 M_S^2}} \tag{4.6}$$

which is the exact equivalent of the previous result given in Equations (3.5), since $\dot{\phi}$, $\dot{r}$ and r are relative quantities, by definition equivalent in both models. We can therefore conclude that the Sun's orbit in the Earth's pseudo-potential is equivalent as one observed from the Earth in the heliocentric system. It remains to show the same thing for Mars' orbit.

4.3 Mars in Earth's pseudo-potential

In the similar way as before, we take dominant contributions of Lagrangian (4.1) together with Equation (4.4) and form the following Lagrangian:

$$L_{ME} = \frac{1}{2}m_M\dot{r}_{ME}^2 + \frac{Gm_M M_S}{|r_{ME} - r_{SE}|} - \frac{Gm_M M_S}{r_{SE}^2}\,\hat{r}_{SE} \cdot r_{ME} \tag{4.7}$$

where subscript *ME* refers to the motion of Mars with respect to Earth, and $r_{SE}(t)$ is solution of the Euler-Lagrange equations for the Lagrangian (4.5).

The Euler-Lagrange equations for $r_{ME}(t)$ Lagrangian (4.7) are too complicated to be solved analytically, but can easily be solved numerically. The numerical solutions for equations of motion for both the Sun and Mars are displayed in Fig. 3. The equivalence of trajectories gained in two different ways is obvious, justifying the model proposed by Tycho Brahe.
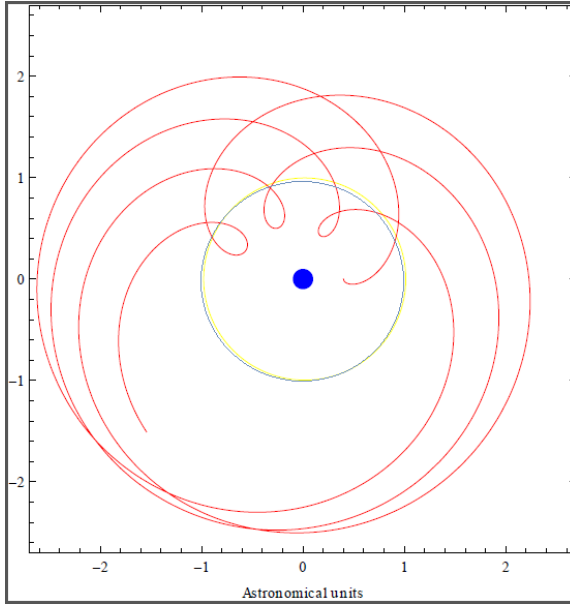
FIG. 3: Trajectories of the Sun (dark, blue) and the Mars (light, red) moving in Earth's pseudo-potential over the period of 7 years. Calculation of this trajectory is performed numerically in the geocentric system.

5. CONCLUSION

The analysis of planetary motions has been performed in the Newtonian framework with the assumption of Mach's principle. The kinematical equivalence of the Copernican (heliocentric) and the Neo-tychonian (geocentric) systems is shown to be a consequence of the presence of pseudo-potential (4.4) in the geocentric system, which, according to Mach, must be regarded as the real potential originating from the fact of the simultaneous acceleration of the Universe. This analysis can be done on any other celestial body observed from the Earth. Since Sun and Mars are chosen arbitrarily, and there is nothing special about Mars, one can expect to come up with the same general conclusion. There is another interesting remark that follows from this analysis. If one could put the whole Universe in accelerated motion around the Earth, the pseudo-potential corresponding to pseudo-force (4.2) will immediately be generated. That same pseudo-potential then causes the Universe to stay in

that very state of motion, without any need of exterior forces acting on it.[259]

What about the Milky Way?

Some might object that in calculating gravitational attraction, the stars are too far away to have any effect on our solar system. For the sake of argument, let's assume that most of the stars in the universe do not affect

[259] [1] Koestler A 1959 *The Sleepwalkers: A History of Man's Changing Vision of the Universe* (London: Hutchinson) pp 194–5; [2] Rawlins D 1987 "Ancient heliocentrists, Ptolemy, and the equant" *Am. J. Phys.* 55 235–9; [3] Rosen J 1981 "Extended Mach principle" Am. J. Phys. 49 258–64; [4] Newburgh R 2007 "Inertial forces, absolute space, and Mach's principle: the genesis of relativity" *Am. J. Phys.* 75 427–30; [5] Lichtenegger H and Mashhoon B 2004 "Mach's principle" arXiv:physics/0407078 [physics.hist-ph]; [6] Hood C G 1970 "A reformulation of Newtonian dynamics" *Am. J. Phys.* 38 438–42; [7] Barbour J 1974 "Relative-distance Machian theories" *Nature* 249 328; [8] Assis A K T 1999 *Relational Mechanics* (Montreal: Aperion); [9] Hartman H I and Nissim-Sabat C 2003 "On Mach's critique of Newton and Copernicus" *Am. J. Phys.* 71 1163–8; [10] Mach E 1872 *Die Geschichte und die Wurzel des Satzes von der Erhaltung der Arbeit* (Prague: Calve); [11] Mach E 1883 *Die Mechanik in ihrer Entwickelung Historisch–Kritisch Dargestellt* (Leipzig: Brockhaus); [12] Mach E 1911 *History and Root of the Principle of the Conservation of Energy* (Chicago, IL: Open Court); [13] Rovelli C 2004 *Quantum Gravity* (Cambridge: Cambridge University Press) p 75; [14] Barbour J 2010 "The definition of Mach's principle" arXiv:1007.3368 [gr-qc]; [15] Zylbersztajn A 1994 "Newton's absolute space, Mach's principle and the possible reality of fictitious forces" Eur. J. Phys. 15 1–8; [16] Hauser W 1985 "On planetary motion" *Am. J. Phys.* 53 905–7; [17] Gauthier N 1986 "Planetary orbits" *Am. J. Phys.* 54 203; [18] Landau L D and Lifshiz E M 1976 *Mechanics* 3rd edn (Oxford: Butterworth-Heinemann) pp 25–40; [19] Goldstein H 1980 *Classical Mechanics* 2nd edn (Reading, MA: Addison-Wesley) pp 70–102; [20] Weast R C (ed) 1968 *Handbook of Chemistry and Physics* 49th edn (Cleveland, OH: Chemical Rubber Company) pp F145–6; [21] Thompson B G 2005 "Using retrograde motion to understand and determine orbital parameters" *Am. J. Phys.* 73 1023–9; [22] Vetö B 2011 "Gravitomagnetic field of the universe and Coriolis force on the rotating Earth" *Eur. J. Phys.* 32 1323–9.

our solar system. But let's also say, (a) in accord with the heliocentric theory that the Milky Way's gravity affects the sun and requires the sun to revolve around the Milky Way, and (b) that we consider only the stars in the Milky Way as having any negligible effect on our sun/earth system. In that case, the geocentric system is still viable in one of two ways. As such, the rotation of the Milky Way around a fixed Earth would be situated in such a way that it counterbalances the gravity of the sun so that the Earth will remain the center of mass for the whole system. The Milky Way would be revolving with the rest of the universe around the Earth and thus there would be no issue about the forces involved. The universe of galaxies will have the effect on the Milky Way such that it will be situated within the universe of galaxies so that the center of mass for the whole system is the Earth which sits on one of the arms of the Milky Way. In turn, since the Milky Way and the sun are revolving around the Earth, the Milky Way will create a constant gravitational pull on the sun and keep it at the appropriate distance away from the Earth.
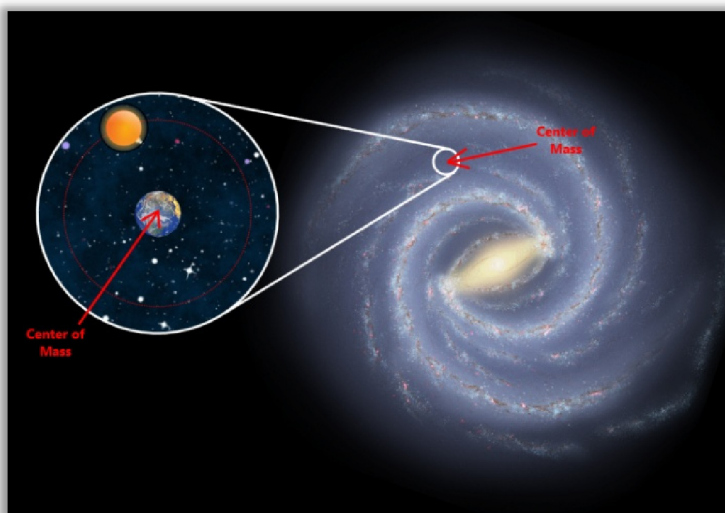
However, the Milky Way, and the rest of the stars in the universe, revolve a little faster around the Earth than the sun does. The sun lags behind by about four minutes per day. Hence, the gravitational force between the Milky Way and the sun will change from day to day since different stars will be pulling on the sun. This change would affect the Earth being the center of mass except for the fact that a change in the distance between the sun and the Earth will serve to compensate for the change of distance between the sun and various stars of the Milky Way.

Thus the sun will be 91 million miles from Earth at the perihelion and 94 million miles at the aphelion. Some might object that the center of mass for the Milky Way is at or near the center of the Milky Way. This presents no problem to geocentrism since it can operate with more than one center of mass, that is, with local centers of mass and one universal center of mass. Some might object that, although it may be true that the Earth can serve as a barycenter, we do not see any cases in the rest of the cosmos of a larger object revolving around a smaller object. But this is precisely what we would expect in a geocentric universe. The reason we do not see any such phenomena is that there is only one special place where the larger will revolve around the smaller – at the barycenter of the universe.

Finally, being a spiral galaxy, the Milky Way has a corotation circle between the disc and the spiral pattern. It just so happens that the Earth is very near the corotation circle.[260] This means the Earth is nestled within a spiral arm and that the spiral arm will not move against it.

Lagrangian Points

In conjunction with the preceeding, the Lagrange points of the heliocentric and geocentric systems will be proportionately the same.
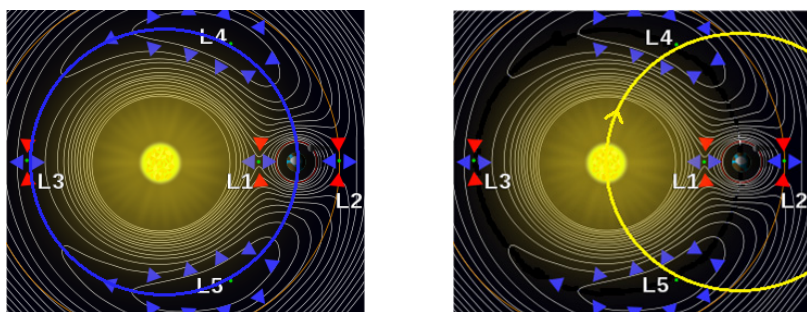
Figure 1: For the Earth revolving around the sun (the thick circle going through Lagrange points L3, L4 and L5), there are five major Lagrange points.

Figure 2: For the sun revolving around the Earth (represented by the thick circle going through Lagrange points L4 and L5), and second point, which we will call L6, would be on the right side of the diagram and an equal length from Earth as L3 is from Earth.

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[260] Mishurov, Yu. N., I. A. Zenina, "Yes, the Sun is Located Near the Coronation Circle," *Astronomy and Astrophysics*, 341:81, 1999, p. 85.

Objection #2: Doesn't Stellar Parallax Prove the Earth is Moving?

Historically speaking, if we could point to one cosmological phenomenon that has been consistently advocated as the vindicator of heliocentrism, it is stellar parallax. Science books by the hundreds have declared that Friedrich Bessel finally discovered heliocentrism's long-awaited proof when in 1838 he observed a slight shift in the position of a nearby star (Cygnus) against the background of a more distant star.

Copernican astronomers continue to praise Bessel, but invariably they do so without either the slightest indication that parallax does not prove heliocentrism, or any admission that there is a perfectly good alternative which allows one to interpret parallax from a geocentric perspective.

To understand how parallax is formed, place a finger from your right hand at arms length and align it with a finger from your left hand at half an arm's length, both in front or your face. Observe your fingers first with your right eye open, and then with your left eye open. As you switch from one eye to the other, the nearer finger will appear to shift to the right.

In the heliocentric system, parallax is said to occur when, on one side of the Earth's orbit, say January 1, two stars are viewed at the same time in a telescope, one star near us and the other star far away (at least by conventional means to measure star distances). Let's say that the two stars we view on January 1 are aligned vertically in the same plane, that is, one star is at a higher position in our telescope lens than the other but both are on the same vertical line. Six months pass and we look at the same two stars on July 1. If parallax is demonstrated, we will see that the stars are not in a vertical alignment any longer. Assuming the Earth has orbited in a counterclockwise direction, the nearer star appears to have shifted to the right. This is due to the fact that, in the interval of six months, one has looked at the two stars from two separate locations that are 186 million miles apart (the diameter of the Earth's orbit). Since stellar parallax can now be detected among a select few stars, most astronomers predisposed to accepting the Copernican worldview interpret the phenomenon as proof for the Earth's movement around the sun.

What most people don't know (and what most scientists keep from them) is that in the geocentric system the same optical phenomenon can be demonstrated. In the geocentric system, the stars are centered on the sun, (which is also true in the heliocentric system). The only difference, of course, is that in the geocentric system the Earth is fixed in space while *both* the sun and stars revolve around the Earth. Once again, on January 1, the two stars from our above example are in vertical alignment. When we

look at these same two stars again on July 1, the nearer star will appear to have shifted to the right of the farther star, and it will do so at the same precise angle as in the heliocentric model.

Friedrich Wilhelm Bessel: 1784 – 1846

The equivalence of geocentric parallax and heliocentric parallax is nothing out of the ordinary. Based on geometrical reciprocity, the two systems must be equal on all counts. The only difference is that in the heliocentric model the Earth is moving and the stars are fixed, while in the geocentric model the Earth is fixed and the stars are moving. Everything else is exactly the same. What *is* out of the ordinary, however, is that the natural equivalence between the two systems has been systematically suppressed out of virtually every science book written since the days of Newton, yet it is as simple and natural as the symmetry between one's right hand and left hand. Simply put, parallax does not prove heliocentrism. Rather, history shows that the phenomenon of parallax only proves there has been a rush to judgment in favor of heliocentrism that was based on nothing more than preference, not scientific fact.

One stumbling block toward understanding the equivalence between the heliocentric and geocentric concepts of parallax is that the original model of geocentrism advocated by Tycho Brahe did not have the stars centered on the sun; they were centered on the Earth. That being the case, no parallax would be forthcoming, at least based on the above mechanics and geometric proportions. That is, the stars would be in the same vertical alignment when one looked at them six months apart. Perhaps no one in

Bessel's day (circa 1838) realized that the only thing required to bring the geocentric model into conformity with the results of heliocentric model was to shift the center of the stars from the Earth to the sun. Consequently, the geocentric model that had the stars centered on the sun never gained its rightful place in the halls of astronomy. Tycho Brahe had not presented such a model because in his day (1546-1601) no one had yet discovered a stellar parallax (laying aside the claims of Giovanni Pieroni cited earlier), and, in fact, this lacuna in the astronomical evidence was one of the arguments Tycho used to discredit heliocentrism. As it stands now, however, unless some astronomical proof is forthcoming that demonstrates that the stars are not centered on the sun (which is virtually impossible to do based on observation), then geocentrism has the same mechanical answer to the phenomenon of parallax as the heliocentric model. All that is needed is a slight modification to the original Tychonic model, which most geocentrists know as the modified Tychonic or neo-Tychonic model.

    The neo-Tychonic model has been known to astronomy for some time and is still mentioned in some circles. At the department of physics at the University of Illinois, one class lecture states:

> It is often said that Tycho's model implies the absence of parallax, and that Copernicus' requires parallax. However, it would not be a major conceptual change to have the stars orbit the sun (like the planets) for Tycho, which would give the same yearly shifts in their apparent positions as parallax gives. Thus if parallax were observed, a flexible Tychonean could adjust the theory to account for it, without undue complexity. What if parallax were not observed? For Copernicus, one only requires that the stars be far enough away for the parallax to be unmeasurable. Therefore the presence or absence of parallax doesn't force the choice of one type of model over the other. If different stars were to show different amounts of parallax, that would rule out the possibility of them all being on one sphere, but still not really decide between Tycho and Copernicus.[261]

> In fact, if we don't worry about the distant stars, these two models describe identical relative motions of all the objects in the solar system. So the role of observation is not as direct as you might have guessed. There is no bare observation that can

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[261] University of Illinois, Physics 319, Spring 2004, Lecture 03, p. 8.

distinguish whether Tycho (taken broadly) or Copernicus (taken broadly) is right.[262]

Snapshots of animations compare heliocentric and geocentric parallaxes.
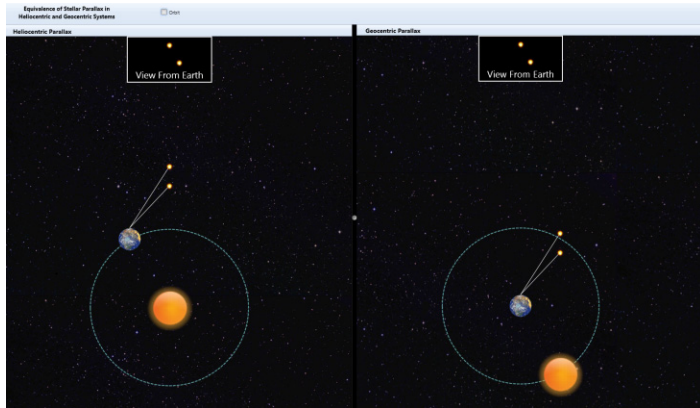
Figure 1: The heliocentric parallax is on the left, the geocentric on the right. In the heliocentric model, the Earth is at the 11:00 o'clock position and is moving counterclockwise. In the geocentric model, the sun is at the 5:00 o'clock position and moving counterclockwise with the stars. The white lines converge at Earth and form the parallax angle. Notice that in both models the parallax angle is the same. At the top of the box is the "View from Earth." Each box has the same view, showing the equivalence of the heliocentric and geocentric models.[263]
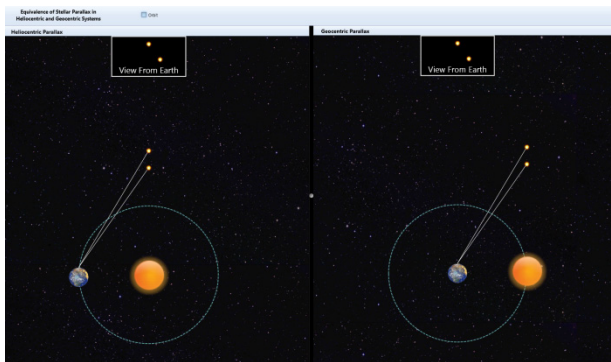
Figure 2: Heliocentric model has Earth at the 9:00 o'clock position while the geocentric model has the sun at 3:00 o'clock. The parallax angle is the same in both models.

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[262] University of Illinois, Physics 319, *ibid*.
[263] See CDROM for animations of the geocentric and heliocentric versions of stellar parallax.
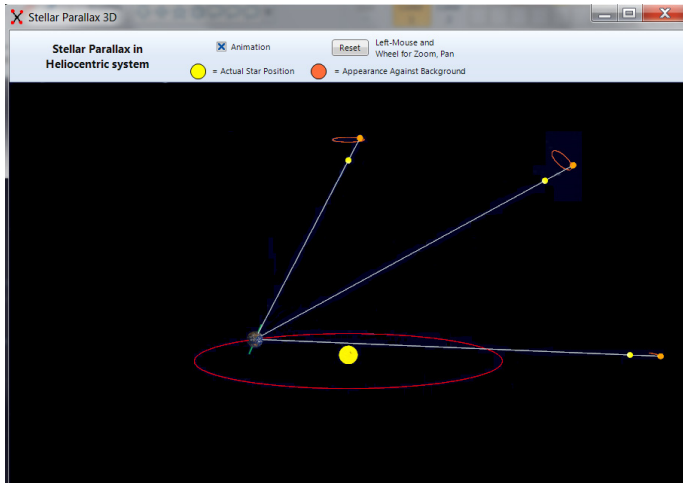
Figure 3: Three-dimensional perspective of heliocentric stellar parallax. Earth is revolving around the sun and viewing three different stars at three different latitudes. (See CDrom for the animation).
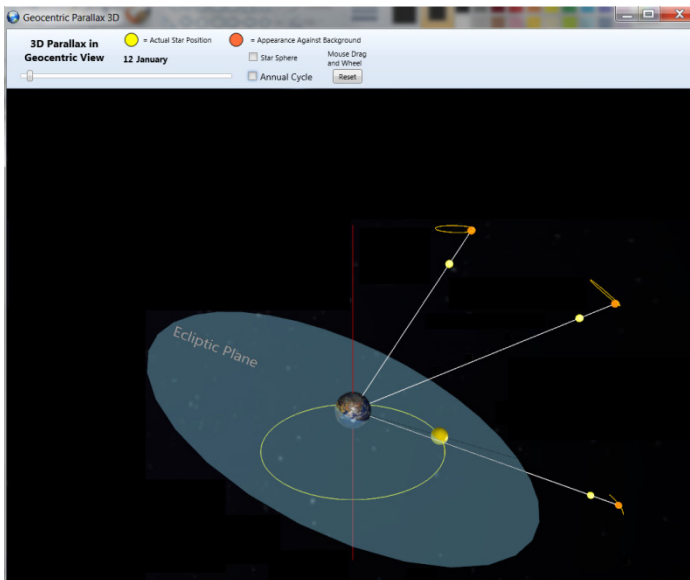
Figure 4: Three-dimensional perspective of geocentric parallax. Sun and star field are revolving around Earth where three different stars are viewed from three different latitudes. (See CDrom for the animation).

Stellar parallax in the Neo-Tychonian planetary system[264]

The recent paper published in European Journal of Physics [1] aimed to demonstrate the kinematical and dynamical equivalence of heliocentric and geocentric systems. The work is performed in the Neo-Tychonian system, with key assumption that orbits of distant masses around the Earth are synchronized with the Sun's orbit. Motion of Sun and Mars have been analyzed, and the conclusion was reached that the very fact of the accelerated motion of the Universe as a whole produces the so-called "pseudo-potential" that not only explains the origin of the pseudo-forces, but also the very motion of the celestial bodies as seen from the static Earth. After the paper was published, the question was raised if that same potential can explain the motion of the distant stars that are not affected by the Sun's gravity (unlike Mars), and if it can be used to reproduce the observation of the stellar parallax. The answer is found to be positive.
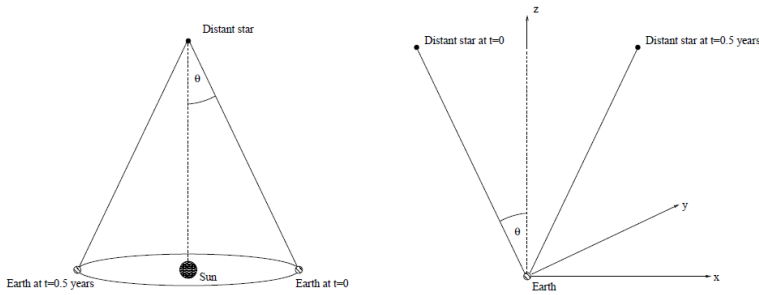
Figure 1. Illustrations of the stellar parallax in the heliocentric (left pannel) versus geocentric (right pannel) frames of reference.

1. **Introduction**

The well-known effect of stellar parallax can be explained in two ways. The first and most common one is in the heliocentric system, in which the Sun and the observed stars are approximately considered to be at rest. While the Earth moves around the Sun, its position relative to the stars changes, which results with the effect of motion of the near stars [2]. The parallax is observed using the more distant stars in the background.

The second way to explain stellar parallax is by saying that the apparent movement of the stars is in fact the real motion in the pseudo-

potential that is, according to Mach's principle [3], generated by the very fact of the simultaneous accelerated motion of all the bodies in the Universe, including the distant stars.

The comparison between two approaches is given in the Figure 1, with the appropriate choice of coordinate axes that will be used in the calculation which follows.

2. **Motion of Proxima Centauri in the Earth's pseudo-potential**

Now in order to demonstrate how one can arrive to the correct prediction of the stellar parallax in the Neo-Tychonian system, we will calculate the trajectory of the star Proxima Centauri in the pseudo-potential given by Eq (4.4) in [1, 4],

$$U_{ps}(\mathbf{r}) = \frac{G m M_S}{r_{SE}^2} \hat{\mathbf{r}}_{SE} \cdot \mathbf{r} \tag{2.1}$$

Here G stands for Newton's constant, MS stands for the mass of the Sun and $\mathbf{r}_{SE}(t)$ describes the motion of the Sun in the Earth's pseudo-potential and was calculated in [1].

The Lagrangian that describes the motion of the Proxima Centauri in the Earth's pseudo-potential is therefore given by (gravitational interaction between the star and the Sun is, of course, neglected):

$$L = \tfrac{1}{2} m \dot{\mathbf{r}}^2 - \frac{G m M_S}{r_{SE}^2} \hat{\mathbf{r}}_{SE} \cdot \mathbf{r} \tag{2.2}$$
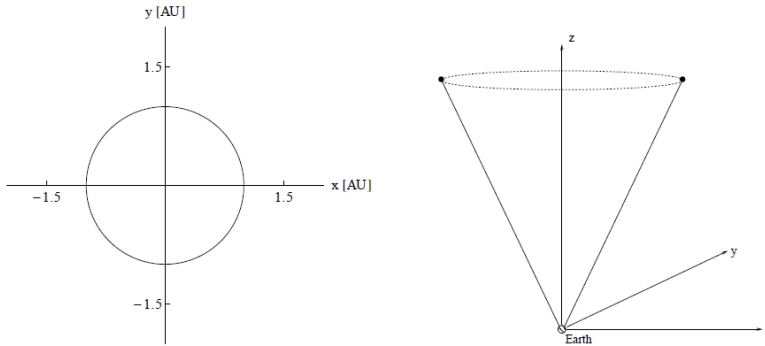
Figure 2. Left pannel displays the result of the numerical solutions for equations of motion derived from the Lagrangian (2.2) over the period of 1 year. It represents the trajectory of the star in the x-y plane, as seen from the Earth. Right pannel illustrates the stellar parallax effect, in consistence with the numerical results.

where m is the mass of the star, and $\mathbf{r}(t)$ describes its motion. The equations of motions are mass-independent, as expected.

The Euler-Lagrange equations for this Lagrangian are solved numerically in the Cartesian coordinate system, using *Wolfram Mathematica* package. The numerical solutions over the period of 1 year are presented in the Fig 2.

Stellar parallax can now be geometrically calculated:

$$\arctan \theta = \frac{r_x\,(t=0.5y)}{D} \tag{2.3}$$

where $D = 4.24$ light years is the well-known distance of Proxima Centauri from the Earth [5]. Using the numerical results obtained above, one can evaluate the expression (2.3). The result is

$$\theta = 3.705 \times 10^{-6}\ \mathrm{rad} = 0.76'' , \tag{2.4}$$

which is perfectly consistent with the astronomical data [6].

3. **Conclusion**

We have analyzed the motion of the star Proxima Centauri in the Earth's pseudo-potential previously derived from Mach's principle [1]. The obtained results are in accord with the observed data. The kinematical and dynamical equivalence of Neo-Tychonian and Copernican systems has once again been demonstrated.[265]

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[265] References: [1] Popov L 2013 Newtonian-Machian analysis of Neo-tychonian model of planetary motions Eur. J. Phys. 34 383 (Preprint arXiv:1301.6045v2); [2] Ostlie D A and Carrol B W 2007 An Introduction to Modern Stellar Astrophysics 2nd ed (San Francisco: Addison Wesley) pp 57–59; [3] Barbour J 2010 The definition of Mach's principle arXiv:1007.3368 [gr-qc]; [4] Popov L 2013 Corrigendum to "Newtonian-Machian analysis of Neo-tychonian model of planetary motions" (in press); [5] Wikipedia 28 Feb 2013 Proxima Centauri http://en.wikipedia.org/wiki/Proxima_Centauri; [6] Benedict G F et al 1999 Astron. J. 118 1086.

But Isn't There a Daily Parallax in the Geocentric System?

We can see from the previous illustrations that on an annual basis the heliocentric and geocentric systems would produce the same stellar parallax. But let's say someone raises the objection that in the heliocentric system parallax is caused by a semi-annual, 186 million mile difference in the Earth's position in its revolution around the sun, but in the geocentric system the 186 million mile difference occurs every day since the sun and stars revolve around the Earth on a daily basis. Since such is the case, should not the geocentric system show the same stellar parallax every day that it also shows in six months? The answer is no. Both systems will show the same annual and daily parallax. Moreover, the daily motions of both the geocentric and heliocentric systems will not be measurable parallax. We can arrive at this answer by further investigating the previous animations of annual parallax.

First, the annual parallax animation of the geocentric system does not show the daily revolution of the stars around the sun. Rather, the animation shows only a "snapshot" of the position of the sun and stars at a certain hour and minute each day. If we add up these daily snapshots for six months, it will be the same as that which we display in the annual parallax animation. In actuality, the sun is not really needed in the animation, since it serves only as the reference point around which the stars are centered. We remind ourselves here that stellar parallax is caused by the stars being centered on a point in space that is 1 AU distance from the Earth. The sun just happens to occupy that 1 AU point.

Second, the annual parallax animation does not show the movement of the sun against the stars for both the heliocentric or geocentric systems. The reason is that this particular movement is insignificant enough that it can be ignored for purposes of illustrating annual parallax. In reality, in the geocentric system the stars complete their daily revolution around the sun in 23 hours, 56 minutes and 4 seconds (23:56:04), while the sun completes its daily revolution around the fixed Earth in exactly 24 hours. Likewise, in the heliocentric system, the Earth rotates daily with respect to a fixed star in the same 23:56:04 time.[266] So in both systems there is a difference

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[266] A sidereal day is the time required for one complete rotation of the star field around a fixed Earth (or, in the heliocentric system, one complete rotation of the Earth with respect to a fixed star), which equals 23 hours, 56 minutes, 4.09 seconds of solar time. A sidereal year is the time required for one complete revolution of the sun through the star field (or, in the heliocentric system, one complete revolution of the Earth around the Sun with respect to a fixed star), which is 365 days, 6 hours, 9 minutes, 9.54 seconds of solar time. A sidereal

between the sidereal (star) time and the solar (sun) time by 3 minutes and 56 seconds. Thus, the sun lags behind the stars by about four minutes per day, and we observe this difference as we see the sun go through the twelve constellations of the Zodiac each year. If we were to make the annual parallax animation completely accurate, it would show the sun lagging behind by almost a degree per day. But this would make no difference in the parallax we see, since parallax is determined by the angular positions of two stars, that is, one star closer to us and one farther away being observed from different angles.

We will use a different perspective when we are discussing daily movement as opposed to annual movement. As noted above, in the daily movement of the geocentric system, the stars revolve around the sun every 23:56:04, and the sun revolves around the Earth every 24:00:00. Because of this slight difference, the viewing angle of the stars that we have on Earth does, indeed, change every day, but it is so very, very slight that we simply cannot notice any change when we view two stars on any two successive nights. Even the most powerful telescopes set at the farthest reaches of the Earth would not be able to detect any parallax on a daily basis. Essentially, the parallax from one day to the next is only $1/182.5^{th}$ of the parallax we will see over a six month period (since there are 182.5 days in six months). Parallaxes over six months are difficult enough to see, much less those which are $1/182.5^{th}$ of a six-month size. We know daily parallax exists only in theory.

The heliocentric system has the same small amount of parallax on a daily basis. By the time the Earth rotates in one day and a second night sky appears, the Earth has moved $1/182.5^{th}$ of its semi-annual annual orbit, and thus the viewing angle for two stars (one star closer to Earth and the other farther away) has changed and will cause a very slight parallax – the same parallax that appears in the geocentric system. But since the parallax is so small, we have no instruments that can detect it. Again, we know it only in theory.

Below are two geocentric and two heliocentric snapshots of the daily movement of the sun and stars with respect to the Earth. The angle of viewing the stars from Earth does not change appreciably during the time period from 6:00 pm to 11:00 pm to cause any measurable parallax.[267]

See next page

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month is the average period of revolution of the Moon around the Earth with respect to a fixed star, equal to 27 days, 7 hours, 43 minutes of solar time.
[267] See the CDROM for the animation of daily parallax.

Geocentric Daily Parallax
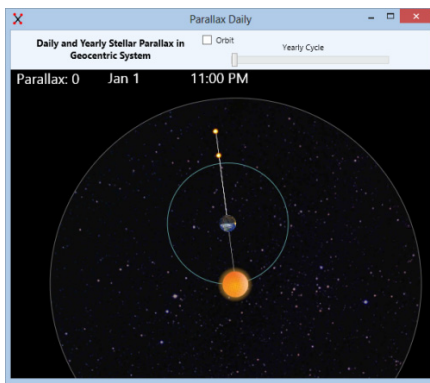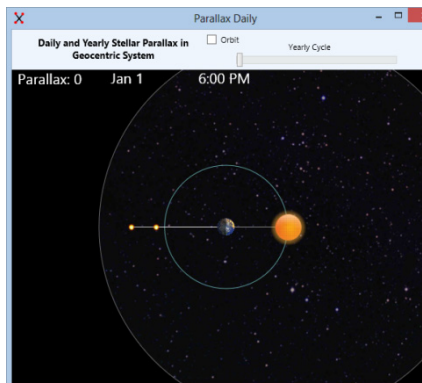
Heliocentric Daily Parallax
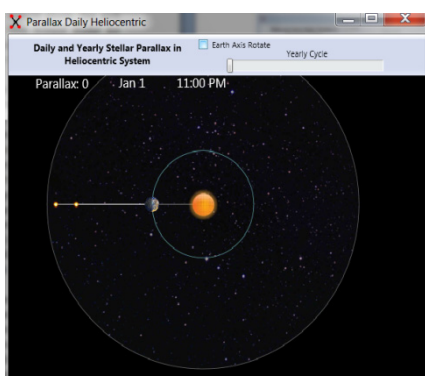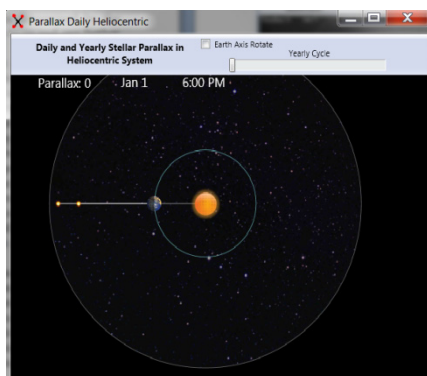
Objection #3: Doesn't Stellar Aberration Prove the Earth is Revolving Around the Sun?

Stellar aberration has long been held as a proof for heliocentrism. The proof is even implied in the name given to the phenomenon, since it purports to be an "aberration" of star light due to the assumed motion of the Earth around the sun. It was first discovered by James Bradley in 1725 when he was actually looking for stellar parallax. The main question that needs to be answered is: is stellar aberration due to the Earth moving, the star moving, or something between them moving?

The Heliocentric Explanation

In stellar aberration we observe the stars moving very slightly around their general location over the course of a year. The precise path of the movement will depend on where the star is in relation to the latitude from which they are observed on Earth. For example, if one looks along the north celestial pole (*i.e.*, the extension of the North Pole into outer space)
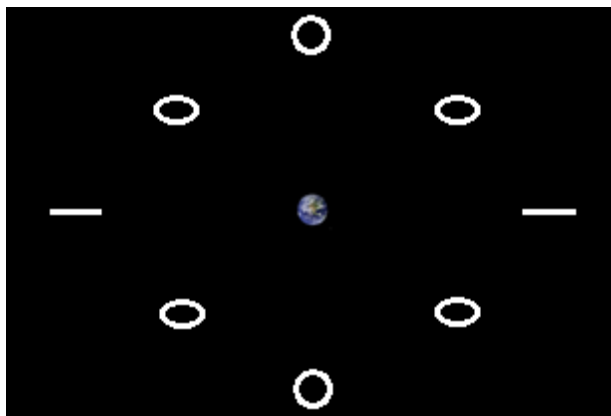
**Movements of stars over the course
of a year as viewed from Earth**

and plots the position of the stars in that vicinity over a year's time, he will see the stars revolve in a circle. In 1725, James Bradley observed the movements of a number of stars, but particularly Gamma Draconis, which is very close to the North Star, Polaris. The chart at right shows the "constant of aberration" from Bradley's many observations of various stars. In this particular chart, Gamma Draconis shows an aberration of

20.1825 arc seconds.[268] If one observes the stars at a 45° celestial latitude, he will see each of the stars form ellipses over a year's period. The eccentricity of the ellipse will increase the greater one's distance from the North Pole. If one observes from the equatorial plane, one will see the stars form an acute hyperbola or even a horizontal line.

James Bradley's chart showing stellar aberrations

This phenomenon occurs for each star in the sky, without exception. It does not matter how far or how close the star is from Earth. Moreover, it will occur in both the northern hemisphere and the southern hemisphere,

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[268] Taken from *Reduction of the Observations Made by Bradley at Kew and Wansted to Determine the Quantities of Aberration and Nutation*, Dr. Busch, Assistant Astronomer at the Royal Observatory of Königsberg, Oxford University Press, 1838.

and in the same shapes and proportions. Additionally, the sun and the planets will show the same aberration, approximately 20.5 arc seconds. The only body exempt is the Earth's moon. So the natural question is: what is causing the light of these celestial bodies to create these shapes and why is the moon exempt?

Normally, light is aberrated by the medium through which it travels, just as a pencil placed in a glass of water appears crooked due to the fact that the light waves are bent by the water. Hence, the first question regarding aberration is whether a medium in space is bending the star light. Heliocentrists have argued that there is no medium in space (*i.e.*, space is a vacuum) and thus the star light cannot be aberrated by a medium. At this stage in the discussion, we will accept this stipulation for the sake of argument.

If space is a vacuum, the cause for the aberration must then be from either: (a) the source, (b) the receiver or (c) the light itself. Of the three, modern heliocentrism believes that the star is fixed and the Earth is moving, thus it discounts any arguments claiming that the source (*i.e.*, the star) causes the aberration. This leaves either (b) the receiver (Earth) or (c) the light itself as the cause. Of the two possibilities, modern heliocentrism argues that the receiver, depending on its speed, determines when and how the star light is observed. That is, the faster the receiver is moving, the more the star light will be aberrated.

This particular explanation works in tandem with the speed of light. Light travels at 186,000 mps, but in the heliocentric system the earth is moving at 19 mps around the sun, hence the star light will be aberrated in proportion to the ratio of the speed of light and the speed of Earth. This is solved by taking the arc tangent of 19/186,000, which is 0.0057 degrees. Hence the light will be aberrated over the course of a year by 0.0057 degrees or about 20.5 seconds of arc. A second of arc is 1/1,296,000 of a section of sky. In other words, the circle, ellipse or horizontal line caused by stellar aberration will be about 20.5 arc seconds wide or cover a 20.5/1,296,000 patch of the 360° night sky.[269] That is indeed very small but the effect is quite noticeable with the right equipment.

A common analogy employed to describe the effect is walking in the rain carrying a stove pipe. If one desires to have as many rain drops as possible go through without hitting the inside walls of the stove pipe, one will need to tilt the stove pipe forward at bit.

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[269] There are 360 degrees in a circle, but 60 minutes for every degree, and 60 seconds for every minute, thus equaling 1,296,000 seconds in 360 degrees.
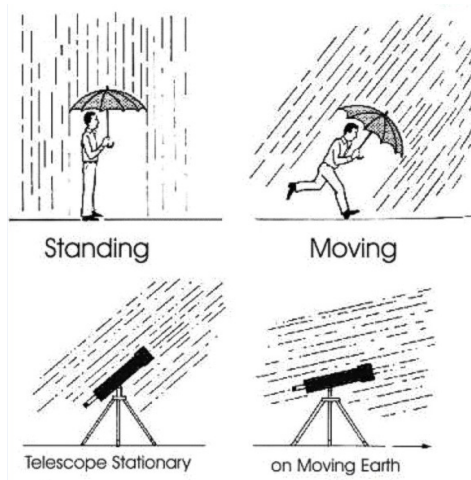
The same principle is said to apply to viewing a star. Since the Earth is moving at 19 mps and is either advancing toward, receding from, or moving laterally in relation to the star, the telescope must be tilted to catch the star's light so that the light does not hit the wall of the telescope. The star light is always coming to Earth at the same angle, but since the Earth is moving against the star light, the telescope must be slightly tilted to compensate for the Earth's movement.
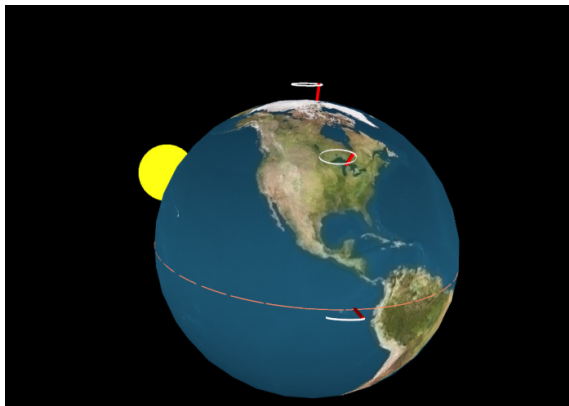
Figure 1: In the above image, the Earth, moving counterclockwise, has passed in front of the sun. The three positions of aberration: the circle at the North Pole; the ellipse at 45º latitude, and the horizontal line at the equator are represented in white. The rods represent how the star's position is viewed from Earth.

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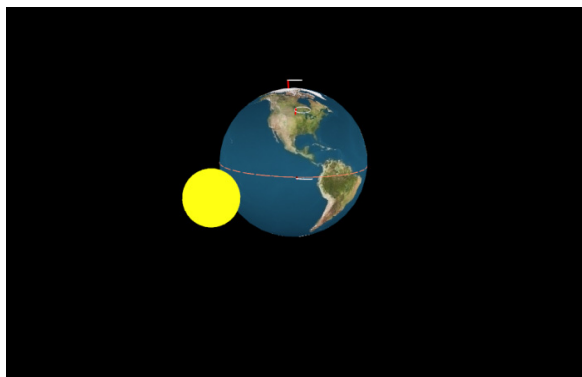
Figure 2: The Earth has now revolved in a third of its annual orbit. The red lines representing how the star is viewed from Earth are now on the far left side of the circle, the ellipse and the horizontal line.
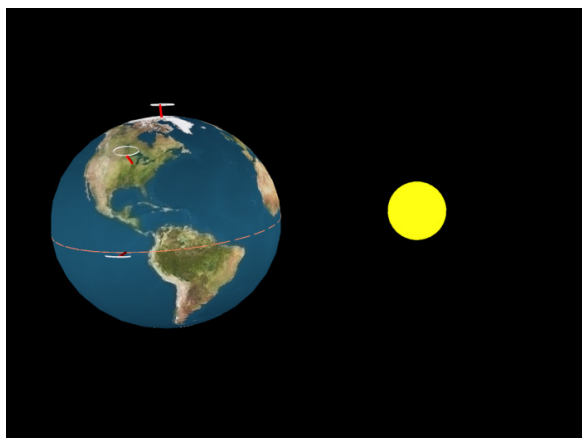
Figure 3: The Earth is now two-thirds through its annual orbit. Notice at 45º the red line is at the bottom half of the ellipse and is moving left to right.[270]

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[270] See CDROM for animations of the geocentric and heliocentric versions of stellar aberration.

Aberration of the Sun

Modern heliocentrism has a different explanation for why the sun shows aberration, however. The following is from Wikipedia:

> A special case of annual aberration is the nearly constant deflection of the Sun from its true position by κ towards the west (as viewed from Earth), opposite to the apparent motion of the Sun along the ecliptic (which is from west to east, as seen from Earth). The deflection thus makes the Sun appear to be behind (or retarded) from its actual position on the ecliptic by a position or angle κ [20.49552"]. This constant deflection is often explained as due to the motion of the Earth during the 8.3 minutes that it takes light to travel from the Sun to Earth. This is a valid explanation provided it is given in the Earth's reference frame (where it becomes purely a light-time correction for the position of the eastward-moving Sun as seen from a stationary Earth), whereas in the Sun's reference frame the same phenomenon must be described as aberration of light when seen by the westward-moving Earth, which involves having Earth's telescopes pointed "forward" (westward, in a direction toward the Earth's motion relative to the Sun) by a slight amount. Since this is the same physical phenomenon, simply described from two different reference frames, it is not a coincidence that the angle of annual aberration of the Sun is equal to the path swept by the Sun along the ecliptic, in the time it takes for light to travel from it to the Earth (8.316746 minutes divided by one sidereal year (365.25636 days) is 20.49265", very nearly κ [20.49552]). Similarly, one could explain the Sun's apparent motion over the background of fixed stars as a (very large) parallax effect.[271]

Although the wording is somewhat obtuse, the author's statement that 8.3 minutes is to be divided by 365.25 days means that during the time it takes light from the sun to travel to the Earth (8.3 minutes), the Earth has moved ahead in its orbit by 20.49265 arc seconds, but he also agrees that the frame of reference can be reversed to say that the sun moved by 20.49265" along the ecliptic while the Earth remained fixed. In either case, however, the author fails to note that the result is only a coincidence and not an explanation of aberration. As such he has two different explanations

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[271] Explanation posted as of Dec. 2011.

for the 20.5" difference in the sun's position. The first is formulated from the "Earth's frame of reference" and is not understood as an aberration but only a "light-time correlation." The second is formulated from the "sun's frame of reference…when seen by the westward moving Earth" and is said to be an actual aberration.

Whatever the true state of affairs for the heliocentric side, the dual explanation from different "frames of reference" will lend itself to establishing the geocentric explanation, which will offer a more cogent reason why the sun takes part in annual aberration. Moreover, the heliocentric argument will show itself not to have an explanation for why the planets show aberration and why the moon does not.

The Geocentric Explanation

The geocentric explanation for stellar aberration is very simple, and the simplicity speaks for itself. In reality, there is no aberration of star light. Rather, what appears as aberrated star light on Earth is caused by a movement of the whole star field around a fixed Earth. Essentially, the cause for stellar aberration is the same as stellar parallax – the stars are aligned with the sun and thus revolve with the sun around the Earth each year.
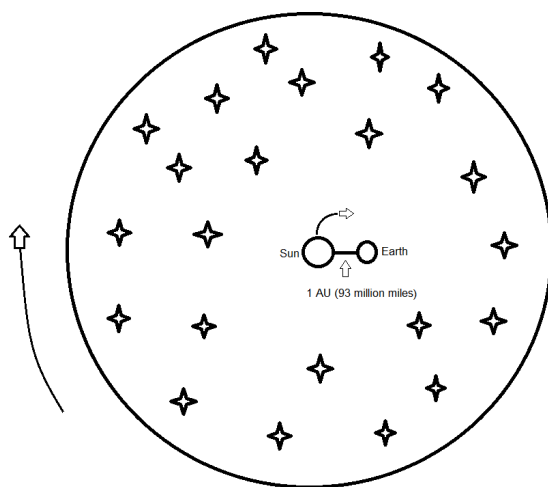
Figure 1: The sun and stars revolve around the Earth on a 1AU (astronomical unit) pivot. The only separation of the sun from the stars is that the sun lags behind by 3 minutes and 4 seconds.

Consequently, stellar aberration is not caused by a bending of the star's light, but by the revolution of all the stars around the Earth, which, depending on the latitude of the star with respect to the Earth's equator, makes the starlight appear as a circular or elliptical annual motion on Earth. The star field rotates around the Earth on the north/south celestial pole, but the pole itself revolves with a 20.5 arc second radius. As viewed from Earth, the motion of the stars on or near the celestial pole will form a circle in the north, an ellipse at 45° latitude and a hyperbola at the equator.
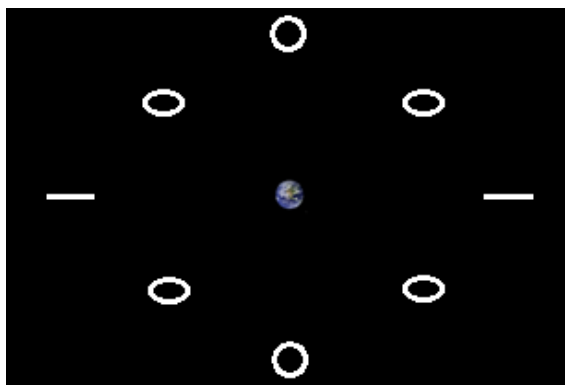
Figure 2: As seen from Earth, each star in the sky makes an annual movement.

It is noteworthy that James Bradley, as noted by Godfray, "when discussing his observations after the discovery of aberration, found that the changes of declination of the stars could not all be accounted for by precession and aberration alone...found an intimate connection between these oscillations of the earth's axis, to which he gave the name of Nutation."[272] Precession and nutation are caused by either an outside torque, the influence of gravity and/or an imbalance in mass distribution. In the geocentric system, as the universe rotates 365 times a year around the Earth, it will precess and nutate by 0.112 arc seconds per day, which will cause all the stars to move over the course of the year. Observe the following slides:

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[272] Hugh Godfray, *A Treatise on Astronomy*, Cambridge, MacMillan, 1866, p. 219.
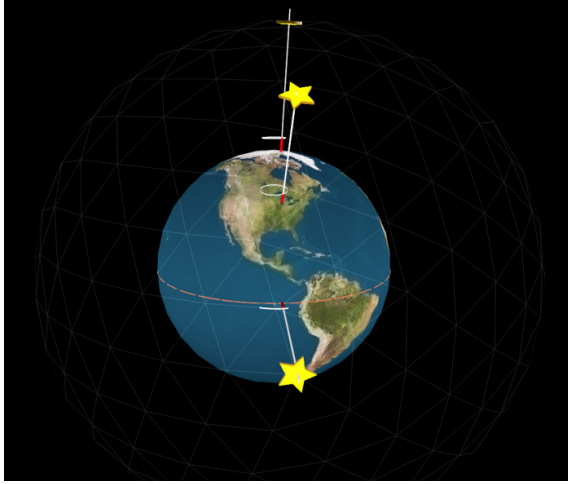
Figure 1: In the above image, the star field (represented by the spherical grid and the three stars) is precessing/nutating around the Earth, left to right. The three positions of aberration: the circle at the North Pole; the ellipse at 45º latitude; and the horizontal line at the equator, are represented in white. The red rods represent how the star light is viewed from Earth. Notice at 45º the red line is at the top half of the ellipse and is moving right to left.
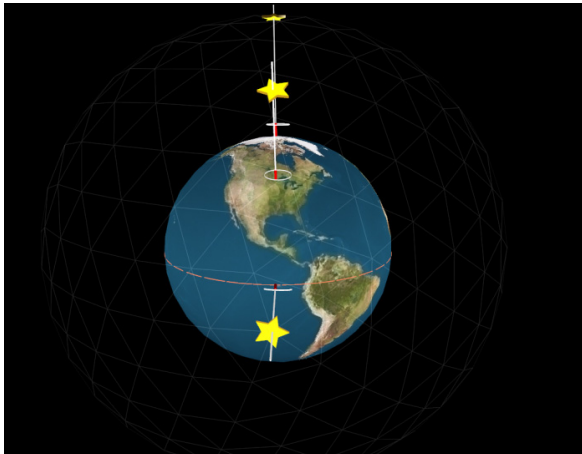
Figure 2: The stars have now precessed/nutated one–third of their motion. The red lines representing the star light are now on the top side of the circle, the ellipse and the horizontal line, and moving right to left.
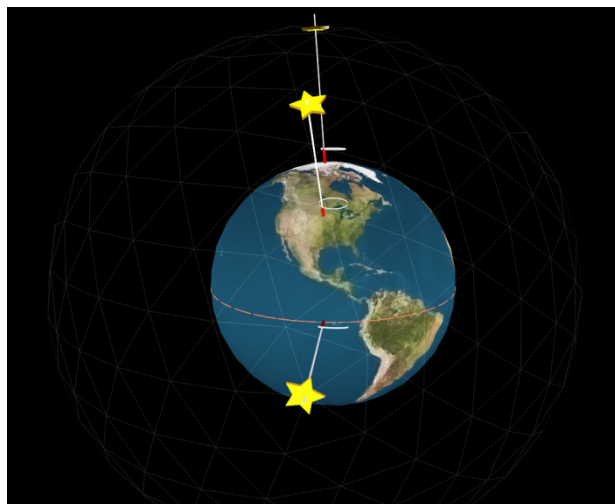
Figure 3: The stars have now precessed/nutated two-thirds of their motion. The red lines representing the star light are now on the bottom side of the circle, the ellipse and the horizontal line, and are moving left to right.

The Speed of Light

There is one other factor to consider – the speed of light and the difference between the source and the receiver of the star light. Modern heliocentrism believes: (a) star light is independent from the star once it is emitted from the star, and (b) the emitted star light is not independent of the motion of the receiver. The geocentric explanation has incorporated both of these heliocentric parameters. In doing so, it has shown that whereas the heliocentric explanation requires the phenomenon to be an actual aberration of light, the geocentric explanation holds that it is caused by a vector radiation of light from the star that is not aberrated but travels in a linear direction to the viewer on Earth. In later chapters we will see how this result agrees in principle with the results of the experiments performed in 1871 by George Biddell Airy.

Finally, in the geocentric model, the sun and planet's 20.5" movement is caused by their annual traveling with the rest of the star field and thus they will react in the same manner as the stars. The moon, however, does not show a 20.5" movement since it is locked in place by the gravity of the fixed Earth. The heliocentric model has no explanation for these phenomena.

Objection #4: Doesn't the Foucault Pendulum
Prove the Earth is Rotating?

Jean Foucault
1819 – 1868

The Foucault pendulum is another in a long line of purported proofs for the Copernican system. All over the world museums and universities house a working replica of Foucault's pendulum, modeled after the original device that was invented by the French physicist, Jean Foucault in 1851. As one engineer noted:

"They are centerpieces in some of the most influential places in the world. And they are built like altars, marble railings, floor stars and all. It shows how much the geocentricity-heliocentricity controversy means to those in power and just how important it is to them to prove that the Bible is wrong. The longest one is I think in the cathedral in Leningrad which the communists put up when they took over the Church….The U.N. building has one, too. There they are, mesmerizing millions…"[273]

Like any pendulum, such as those in the typical grandfather clock, the main action is the back-and-forth motion of a bob that hangs from a wire or rope of some proportionate length. But, unlike a grandfather clock that anchors the pendulum in one plane, the Foucault pendulum allows the anchor to rotate. That being the case, the plane of the pendulum will rotate over a given period of time. For example, if the pendulum begins its swing back-and-forth between the 12 o'clock and 6 o'clock position of the platform, within an hour or so, the pendulum will have moved to swinging between the 1 o'clock and the 7 o'clock position. Within an extended length of time (12 hours and 24 hours or longer), the pendulum will once again be swinging between the 12 o'clock and 6 o'clock position.

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[273] Richard G. Elmendorf, private letter of April 15, 1992, cited in Paula Haigh's paper, *Galileo's Heresy*, p. 13. The pendulum in Leningrad (now St. Petersburg) to which Elmendorf refers was housed at St. Isaac's Cathedral, which the communists had converted from Orthodox worship to an "anti-Christian" museum. The pendulum was put in place on April 12, 1931 for the inauguration of the museum. I personally visited the cathedral to verify this information. The pendulum is no longer there but a plaque commemorating it remains.

At different latitudes, however, there are different effects on the pendulum. At the North Pole the plane of the pendulum will rotate a full 360 degrees each 24-hours, or about 15 degrees per hour. As one moves farther from the North Pole in a southerly direction, the pendulum will slow down its rotation. In Washington DC, for example, instead of rotating 15 degrees in one hour, it moves about 9 degrees. At the equator there is no rotation of the pendulum. As one source describes it from the heliocentric or rotating Earth perspective:

> At either the North Pole or South Pole, the plane of oscillation of a pendulum remains pointing in the same direction while the Earth rotates underneath it, taking one sidereal day to complete a rotation. When a Foucault pendulum is suspended somewhere on the equator, then the plane of oscillation of the Foucault pendulum is at all times co-rotating with the rotation of the Earth. What happens at other latitudes is a combination of these two effects. At the equator the equilibrium position of the pendulum is in a direction that is perpendicular to the Earth's axis of rotation. Because of that, the plane of oscillation is co-rotating with the Earth. Away from the equator the co-rotating with the Earth is diminished. Between the poles and the equator the plane of oscillation is rotating both with respect to the stars and with respect to the Earth. The direction of the plane of oscillation of a pendulum with respect to the Earth rotates with an angular speed proportional to the sine of its latitude; thus one at 45° rotates once every 1.4 days and one at 30° every 2 days.[274]

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[274] http://www.geophysik.uni-muenchen.de/outreach/ foucault-pendulum

Below the equator the rotation begins again, but in the opposite direction than the northern hemisphere (which is similar to the fact that weather systems rotate counterclockwise in the northern hemisphere and clockwise in the southern hemisphere, at least most of the time).

From the above description, one can imagine why many who were looking for proof of a rotating Earth would appeal to the Foucault pendulum. It seems logical to posit that the reason the plane of the pendulum appears to be moving in a circle is that the Earth beneath it is rotating. In other words, the heliocentrist insists that the pendulum's circular motion is an illusion. The pendulum is actually moving back-and-forth in the *same plane* and the Earth is turning beneath it. Since the Earth is too big for us to sense its rotation, we instead observe the plane of the pendulum rotate. All one need do to prove the Earth is rotating, he insists, is to reverse the roles, that is, imagine the plane of the pendulum is stationary and the Earth beneath it is moving. As Assis notes, it was Foucault himself who had made the original claim that the oscillating pendulum proved the Earth rotated:

> It is curious to note Foucault's description of his experiment. Sometimes he speaks of the rotation of the earth relative to space and other times relative to the fixed stars (heavenly sphere). He does not distinguish these two rotations or these two concepts….For instance, he begins by stating that his experiment showing the rotation of the plane of oscillation "gives a sensible proof of the diurnal motion of the terrestrial globe." To justify this interpretation of the experimental result he imagines a pendulum placed exactly at the North pole oscillating to and fro in a fixed plane, while the earth rotates below the pendulum. He then says: "Thus a movement of oscillation is excited in an arc of a circle whose plane is clearly determined, to which the inertia of the mass gives <u>an invariable position in space</u>. If then these oscillations continue for a certain time, the motion of the earth, which does not cease turning from west to east, will become sensible by contrast with the immobility of the plane of oscillation, whose trace upon the ground will appear to have a motion conformable to the <u>apparent motion of the heavenly spheres</u>…[275]

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[275] L. Foucault, "Physical demonstration of the rotation of the earth by means of the pendulum," *Journal of the Franklin Institute*, 21:350-353, 1851, as cited in *Relational Mechanics* by Andre K.T. Assis, 1999, p. 78-79.

This particular logic, however, doesn't prove the Earth is rotating. One can begin the critique by asking this simple question: if the pendulum is constantly swinging in the same plane (while the Earth is rotating beneath it), what force is holding the pendulum in that stationary position? In other words, if the plane of the pendulum is stationary, with respect to what is it stationary? This is understood as an "unresolved" force in physics. The only possible answer is: it is stationary with respect to the rest of the universe, since it is certainly not stationary with respect to the Earth. With a little insight one can see that this brings us back to the problem that Einstein and the rest of modern physics faced with the advent of Relativity theory: is it the Earth that is rotating under fixed stars, or is it the stars revolving around a fixed Earth? As Einstein said: "The two sentences: 'the sun is at rest and the Earth moves,' or 'the sun moves and the Earth is at rest,' would simply mean two different conventions concerning two different coordinate systems."[276] As such, it would be just as logical and scientifically consistent to posit that the combined forces of the universe which rotate around the Earth are causing the plane of the pendulum to rotate around an immobile Earth. In other words, in the geocentric model the movement of the pendulum is not an illusion – it really rotates. Modern physics has no argument against this reasoning since according to Einstein, there is no difference between the two models. Ernst Mach, from whom Einstein developed many of his insights, stated much the same. Critiquing Newton's "absolute space" as the pivot upon which the Foucault pendulum would turn, Mach writes:

> If the earth is affected with an absolute rotation about its axis, centrifugal forces are set up in the earth: it assumes an oblate form, the acceleration of gravity is diminished at the equator, the plane of Foucault's pendulum rotates, and so on. [In Newton's view] all these phenomena disappear if the earth is at rest and the other heavenly bodies are affected with absolute motion round it, such that the same relative rotation is produced. But if we take our stand on the basis of facts, we shall find we have knowledge only of relative spaces and motions. Relatively, not considering the unknown and neglected medium of space, the motions of the universe are the same whether we adopt the Ptolemaic or the Copernican mode of view.[277]

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[276] *The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, 1938, 1966, p. 212.

[277] Dr. Ernst Mach, *The Science of Mechanics*, 4th edition, Merchant Books, pp. 231-232. In the same vein, Assis notes that Foucault is equivocal about the precise pivot point for his pendulum, noting: "To justify this interpretation of the

Hence, the Foucault pendulum offers no proof for heliocentrism; rather, it only proves how presumptuous modern science has been for the last few hundred years. The same goes for the appeal to the oblateness of the Earth as proofs of the Earth's rotation. The only fact these particular phenomena prove is that there is a force causing the effect, not that a rotation of the Earth is causing the force.
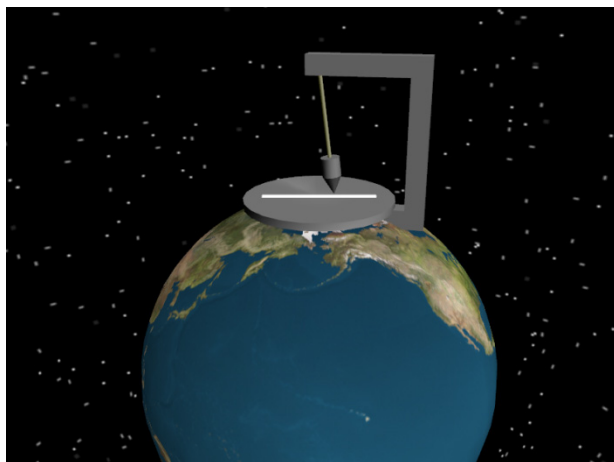
**The Foucault Pendulum:
turning Earth or turning space?**[278]

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experimental result he imagines a pendulum placed exactly at the North pole oscillating to and fro in a fixed plane, while the earth rotates below the pendulum. He then says: 'Thus a movement of oscillation is excited in an arc of a circle whose plane is clearly determined, to which the inertia of the mass gives <u>an invariable position in space</u>. If then these oscillations continue for a certain time, the motion of the earth, which does not cease turning from west to east, will become sensible by contrast with the immobility of the plane of oscillation, whose trace upon the ground will appear to have a motion conformable to the <u>apparent motion of the heavenly spheres</u>' (L. Foucault, "Physical demonstration of the rotation of the earth by means of the pendulum," *Journal of the Franklin Institute*, 21:350-353, 1851, as cited in Assis' *Relational Mechanics* 1999, pp. 78-79). Assis shows the fallacy in Foucault's thinking: "Experimentally it is found that this ω_d [angular rotation of the earth] has the same value (in direction and order of magnitude) as the kinematical rotation of the earth relative to the fixed stars….But there is no explanation of this fact in Newtonian mechanics" (*op. cit.,* p. 79).
[278] See CDROM for animation of the heliocentric and geocentric movements of the Foucault Pendulum.

The force that is moving the pendulum to change the plane of its swing is the Coriolis force. As we noted in the discussion of Newton's laws, Coriolis force is created not only by a rotating Earth in a fixed universe, but also by a rotating universe around a fixed Earth. As Assis notes, the rotating galaxies also create a Coriolis force that turns the Foucault Pendulum on a fixed Earth.

> …diurnal rotation of distant masses around the earth (with a period of one day) yields a real gravitational centrifugal force flattening the earth at the poles. Foucault's pendulum is explained by a real Coriolis force acting on moving masses over the earth's surface in the form $-2m_g\vec{u}_{me} \times \vec{\omega}_{Ue}$ where $\vec{u}_{me}$ is the velocity of the test body relative to the earth and $\vec{\omega}_{Ue}$ is the angular rotation of the distant masses around the earth. The effect of this force will be to keep the plane of oscillation of the pendulum rotating together with the fixed stars.[279]

Einstein admitted the same in a June 25, 1913 letter to Ernst Mach:

> Your happy investigations on the foundations of mechanics, Planck's unjustified criticism notwithstanding, will receive brilliant confirmation. For it necessarily turns out that inertia

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[279] Andre K. T. Assis, *Relational Mechanics*, pp. 190-191. See also "As the earth is at rest…we arrive at $\sum_{j=1}^{N} \vec{F}_{jm} - m_g\vec{\omega}_{Ue} \times (\vec{\omega}_{Ue} \times \vec{r}_{me}) = 0$. In this frame there will appear a real centrifugal force of gravitational origin due to the rotation of distant galaxies around the earth. This centrifugal forces flattens the earth at the poles. What would happen if the external galaxies were annihilated or did not exist? According to relational mechanics the centrifugal force would disappear, except for a small value due to the rotation of the earth relative to the sun, planets and stars belonging to our galaxy. The earth would no longer be flattened….If we double the density of galaxies, then the Earth would have a double oblateness…provided it kept the same angular rotation relative to the distant universe….The flattened figure of the Earth or Foucault's pendulum can no longer be utilized as proofs of the earth's real rotation. In relational mechanics, both facts can be equally explained with the frame of distant galaxies at rest (exerting a gravitational force $-\Phi m_g\vec{a}_{mU}$ on bodies at the earth's surface while the earth rotates relative to this frame, or with the earth at rest while the distant galaxies rotate around it exerting a gravitational force $-\Phi m_g$ ($\vec{a}_{me} + 2\vec{u}_{me} \times \vec{\omega}_{Ue} + \vec{\omega}_{Ue} \times (\vec{\omega}_{Ue} \times \vec{r}_{me})$) on bodies at the earth's surface. *Both explanations are equally correct and yield the same effects. It then becomes a matter of convenience or of convention to choose the earth, the distance galaxies or any other body or frame of reference to be considered at rest*" (*Relational Mechanics*, pp. 218-219, 223, my emphasis).

originates in a kind of interaction between bodies, quite in the sense of your considerations on Newton's pail experiment. The first consequence is on p. 6 of my paper. The following additional points emerge: (1) If one accelerates a heavy shell of matter S, then a mass enclosed by that shell experiences an accelerative force. (2) If one rotates the shell relative to the fixed stars about an axis going through its center, a Coriolis force arises in the interior of the shell, that is, the plane of a Foucault pendulum is dragged around.[280]

Although Einstein is supposing that the stars are "fixed" and that the Earth rotates, according to Relativity theory the above paragraph can just as easily be applied to a rotating star-system (the universe) around a fixed Earth. In such a case, the universe would be the "heavy shell of matter S," which, as it rotates, will create "an accelerative force" on the "mass enclosed by that shell," the "mass" being any heavenly body. The "accelerative force" is understood by Einstein to be the "Coriolis force," which is the force commonly cited to explain why "a Foucault pendulum" rotates. In other words, a universe of stars rotating around a fixed Earth will cause the peculiar movement of the Foucault pendulum just as a rotating Earth in a "fixed star" system. Like a leaf in a whirlpool, the pendulum would be carried around and around. It has inertia because it is caught in the gravitational draft of the stars' diurnal circular movement. As Martin Selbrede notes:

> In a letter that Einstein sent to Ernst Mach in 1913, he showed what happened to a Foucault Pendulum in the event that you have a shell of matter rotating around the pendulum, and consequently, he said if it is a relatively small mass, we are going to see drag on the plane of oscillation of the pendulum, and it will start to precess. If the mass is large enough, we eventually get perfect frame-dragging, which is completely in synchronization with the rotating mass. So if the rest of the Universe is, in fact, rotating around us, then the Foucault Pendulum will still stay in synch with it and move its axis along with the Universe. That creates the inertial field, but the inertial field itself is in rotation. We have perfect frame-dragging, because everything out from Saturn and beyond looks like

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[280] A series of four letters compiled by Friedrich Herneck in "Zum Briefwechsel Albert Einsteins mit Ernst Mach," *Forschungen und Fortschritte*, 37:239-43, 1963.

infinite mass to the Earth, since it is traveling faster than the speed of light, so it satisfies the Schwarzschild criterion. It is that inertial field that is interpreted as why we send rockets heading due east from Cape Canaveral because we take advantage of plowing right into that inertial field and maximizing the value of it. It is the reason that north-south train tracks wear on one side more than the other. Again, because this force is a real force. It is not a fictitious force. Now, fictional and fictitious are two different words. I didn't say fictional force, but a fictitious force, one that is described as, it appears to be the case, because of how things are moving. Centrifugal forces and Coriolis forces are alleged to be fictional forces that are due to the alleged rotation of the Earth. But if the Earth is fixed, then modern science, the serious ones that are doctrinaire and hold to the general principle of covariance, those are no longer fictitious forces, but are real forces that are actually present on the Earth's surface that are induced by the rest of the Universe's motion around us.[281]

Under the heading "dragging of inertial frames," Misner, Thorne and Wheeler posit that the angular velocity of the Foucault pendulum would be equal to that of the rotation of the stars. They write:

> Consider a bit of solid ground near the geographic pole, and a support erected there, and from it hanging a pendulum. Though the sky is cloudy, the observer watches the track of the Foucault pendulum as it slowly turns through 360º. Then the sky clears and, miracle of miracles, the pendulum is found to be swinging all the time on an arc fixed relative to the far-away stars. If "mass there governs inertia here," as envisaged by Mach, how can this be?

> Enlarge the question. By the democratic principle that equal masses are created equal, the mass of the Earth must come into the bookkeeping of the Foucault pendulum. Its plane of rotation must be dragged around with a slight angular velocity, ω_{drag}, relative to the so-called "fixed stars"….The distant stars must influence the natural plane of vibration of the Foucault pendulum as the nearby rotating shell of matter does, provided that the stars are not so far away…that the curvature of space begins to

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[281] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2013.

introduce substantial corrections into the calculation of Thirring and Lense. In other words, no reason is apparent why all masses should not be treated on the same footing….Mach's idea that mass there determines inertia here has its complete mathematical account in Einstein's geometrodynamic law. "Point out, please," the anti-Machian critic says, "the masses responsible for this inertia." In answer, recall that Einstein's theory includes not only the geometrodynamic law, but also, in Einstein's view, the boundary condition that the universe be closed….This mass-energy, real or effective, is to be viewed as responsible for the inertial properties of the test particle that at first sight looked all alone in the universe.[282]

It would be no surprise to find the same reasoning in Einstein's thinking. I will interject explanations in brackets so the reader can follow Einstein's flow of thought in concrete terms:

Let K [the universe] be a Galilean-Newtonian coordinate system [a system of three dimensions extending to the edge of the universe], and let K′ [the Earth] be a coordinate system rotating uniformly relative to K [the universe]. Then centrifugal forces would be in effect for masses at rest in the K′ coordinate system [the Earth], while no such forces would be present for objects at rest in K [the universe]. Already Newton viewed this as proof that the rotation of K′ [the Earth] had to be considered as "absolute," and that K′ [the Earth] could not then be treated as the "resting" frame of K [the universe]. Yet, as E. Mach has shown, this argument is not sound. One need not view the existence of such centrifugal forces as originating from the motion of K′ [the Earth]; one could just as well account for them as resulting from the average rotational effect of distant, detectable masses as evidenced in the vicinity of K′ [the Earth], whereby K′ [the Earth] is treated as being at rest. If Newtonian mechanics disallow such a view, then this could very well be the foundation for the defects of that theory…[283]

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[282] Misner, Thorne and Wheeler, *Gravitation*, pp. 547-549. NB: the authors cite the work of Thirring and Lense work of 1918 and 1921 (which Einstein also cited in his book *The Meaning of Relativity*).

[283] Hans Thirring, "Über die Wirkung rotierender ferner Massen in der Einsteinschen Gravitationstheorie," *Physikalische Zeitschrift* 19, 33, 1918,

In other words, Einstein has confirmed that a universe in rotation around the Earth would produce the same centrifugal and Coriolis forces attributed to a rotating Earth in a fixed universe. Advocates of his theory confirm our understanding. C. Møller writes:

> …if we consider a purely mechanical system consisting of a number of material particles acted upon by given forces…Newton's fundamental equations of mechanics may be applied with good approximation in the description of the system. On the other hand, if we wish to describe the system in an accelerated system of reference, we must introduce, as is well known, so-called fictitious forces (centrifugal forces, Coriolis forces, *etc*.) which have no connexion (sic) whatever with the physical properties of the mechanical system itself….It was just for this reason that Newton introduced the concept of absolute space which should represent the system of reference where the laws of nature assume the simplest and most natural form….Therefore Einstein advocated a new interpretation of the fictitious forces in accelerated systems of reference: instead of regarding them as an expression of a difference in principle between the fundamental equations in uniformly moving and accelerated systems he considered both kinds of systems of reference to be completely equivalent as regards the form of the fundamental equations; and the 'fictitious' forces were treated as real forces on the same footing as any other force of nature. The reason for the occurrence in accelerated systems of reference of such peculiar forces should, according to this new idea, be sought in the circumstance that the distant masses of fixed stars are accelerated relative to these systems of reference. The 'fictitious forces' are thus treated as a kind of gravitational force, the acceleration of the distant masses causing a 'field of gravitation' in the system of reference considered….Previously the effect of the celestial masses had been considered to be negligible; now, however, we must included the distant masses in the physical systems considered….It can, however, be assumed that all systems of reference are equivalent with respect to the formulation of the fundamental laws of physics. This is the so-called general principle of relativity.[284]

translated: "On the Effect of Rotating Distant Masses in Einstein's Theory of Gravitation."

[284] *The General Theory of Relativity*, Christian Møller, Oxford, Clarendon Press, 1952, pp. 219-220.

Here is yet another description of how the strong principle of relativity works:

> As an illustration…for the validity of the strong principle of relativity, we consider the Moon orbiting the Earth. As seen by an observer on the Moon both the Moon and the Earth are at rest (disregarding the observed spin of the Earth, which is of no concern here). If the observer solves Einstein's field equations for the vacuum space-time outside the Earth, he might come up with the Schwarzschild solution and conclude that the Moon should fall toward the Earth, which it does not. So it seems impossible to consider the Moon as at rest, which would imply that the strong principle of relativity is not valid. This problem has the following solution. As observed from the Moon the cosmic mass rotates. The rotating cosmic mass has to be included when the Moon observer solves Einstein's field equations. Doing this he finds that the rotating cosmic mass induces the rotational nontidal gravitational field which is interpreted as the centrifugal field in Newtonian theory. This field explains to him why the Moon does not fall toward the Earth. As we have shown above, corresponding results are valid for observers with accelerated translational motion.[285]

As we can see, Einstein's system can have no objection to a geocentric universe. As Fred Hoyle noted, instead of denying geocentrism Relativity actually goes the other way and shows how much better a system it is. This is quite bothersome to those trying to promote the "Copernican Principle." Not surprisingly, attempts have been made to distinguish them. In 1904, August Föppl designed an improvement on the Foucault pendulum experiment by using a carefully suspended gyroscope whose precessional motion would reveal the disposition of an inertial frame of reference. Föppl hoped his experiment would decide whether "…the terrestrial phenomena of motion is itself influenced by the rotation of the earth in such a way that, for these motions, the rotation of the earth does not coincide with that rotation with respect to the fixed star heaven."[286] Föppl believed that the two systems would be different due to a "special influence of the rotation of the earth." But Föppl reported that he could detect no deviation between the two systems within the accuracy of

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[285] "Translational Inertial Dragging," Oyvind Grøn and Erik Eriksen, *General Relativity and Gravitation*, Vol. 21, No. 2, 1989, pp. 117-118.
[286] Essay by John Norton in *Mach's Principle from Newton's Bucket to Quantum Gravity*, eds., Julian Barbour and Herbert Pfister, Vol. 6, Birkhäuser, 1995, p. 31.

his experiment. This, of course, meant that the Foucault pendulum did not prove the Earth rotates but merely that there was relative motion between the Earth and the stars. On November 5, 1904 Föppl concluded that an inertial system "obtains its orientation from the masses of the system of the universe in some kind of law governed manner." The inertial forces are determined by all the bodies in the system which will then be disclosed by rotation, and the rotation will appear as a Coriolis force, which in turn moves the Foucault pendulum.

The Rotating Ether and the Foucault Pendulum

In addition to the principles of motion within modern science that allow a Foucault Pendulum to rotate on a fixed Earth, let's also say that the same ether that caused the 1925 Michelson-Gale experiment to measure an ether-drift of a 24-hour period (see chapter 5) is the same ether that causes a Foucault Pendulum at the North Pole to rotate 360 in a 24-hour period. In other words, if someone objects to using Einstein and Mach and instead presses the geocentrist to explain why, on a physical basis, the Foucault Pendulum turns in a circle at the North Pole but makes no movement at the equator, the reason is that the ether in the daily rotating universe creates a circular force at the North Pole but only a lateral force at the equator.

Let's also say that the reason the Foucault Pendulum rotates in a circle at the North Pole but merely oscillates back and forth with no angular movement at the equator is the same reason that in stellar aberration, over the course of a year, we see a star form a circle at the North Celestial Pole but a straight line (or hyperbola) at the equator. Let us recall this picture of the annual effect from stellar aberration:
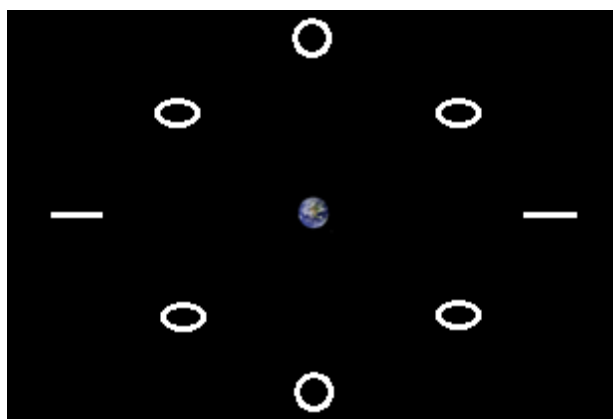
In the above figure, a similar effect from the rotating universe occurs for the Foucault Pendulum at the North Pole and the equator, but at the 45 degree mark the Pendulum will take 1.5 days to complete its revolution instead of forming an elliptical motion. In fact, we can characterize the back-and-forth oscillations of the Pendulum as the continual formation of hyperbolic ellipses, since the Pendulum never swings back to the same absolute spot from which it left. In essence, the Pendulum produces a precession of ellipses, which, at the North Pole, precesses 360 degrees in 24 hours; while at the 45 degree latitude precesses 360 degrees in 36 hours; and at the equator does not precess at all. The reason that the formations from stellar aberration are similar to those of the Foucault Pendulum is that they are both caused by a rotating universe, but for the Foucault Pendulum the circle at the North Pole is caused by the daily rotation of the universe, while the circle at the North Celestial Pole from stellar aberration is caused by the universe's annual precession due its annual rotation.

Objection #5: Doesn't the Bulge at the Equator Prove the Earth is Rotating?

At the Earth's equator, there is a slight increase in the Earth's diameter as compared to the diameter between the Earth's north and south pole. The ratio of this "bulge" is 230:231.

Earth with no inertial forces affecting it
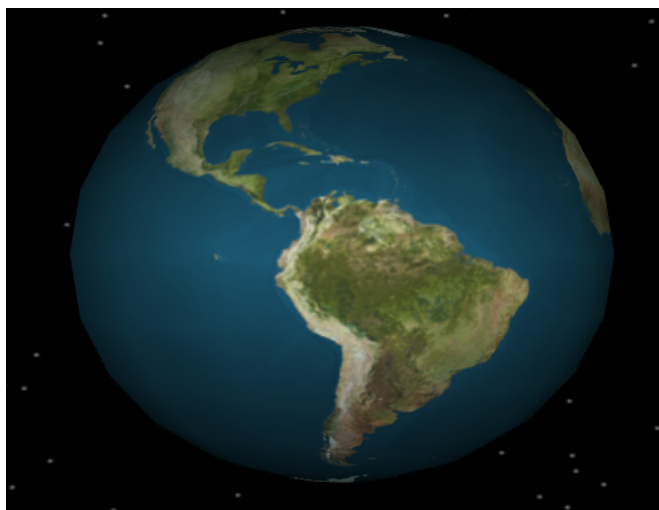
Earth is oblate under influence of inertial forces
(Exaggerated for illustration purposes)

As noted previously, Arthur Eddington already laid out the two possible causes for this phenomenon:

> The bulge of the Earth's equator may be attributed indifferently to the Earth's rotation or to the outward pull of the centrifugal force introduced when the Earth is regarded as non-rotating.[287]

This unique reciprocity, of course, relates back to the principle that the centrifugal and Coriolis forces will result when either the Earth is rotating in a fixed universe or the universe is rotating around a fixed Earth. (See previous sections on the Foucault Pendulum).[288]

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[287] *Space, Time and Gravitation*: *An Outline of the General Relativity Theory*, 1923, pp. 24, 41. Eddington adds: "Some would cut the knot by denying the aether altogether. We do not consider that desirable." (*ibid*., p. 39).
[288] See CDROM for animation of the bulge of the Earth.

Objection #6: Doesn't a Geosynchronous Satellite Prove the Earth is Rotating?

According to Wikipedia, a geosynchronous satellite is one having

…an orbital period the same as the Earth's rotation period. Such a satellite returns to the same position in the sky after each sidereal day, and over the course of a day traces out a path in the sky that is typically some form of analemma. A special case of geosynchronous satellite is the geostationary satellite, which has a geostationary orbit – a circular geosynchronous orbit directly above the Earth's equator. Another type of geosynchronous orbit used by satellites is the Tundra elliptical orbit."[289]
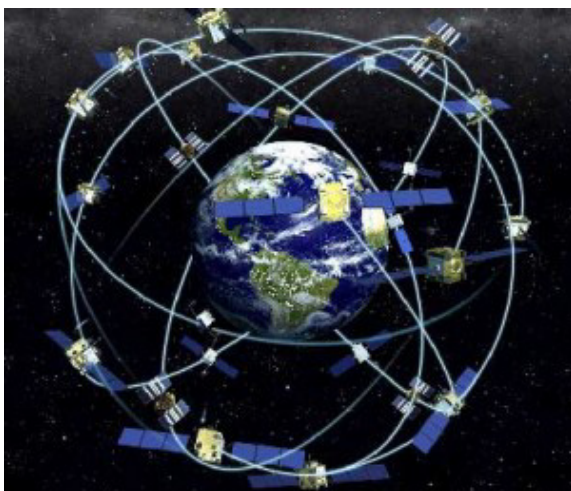
What holds the satellites up?

Depending on how many miles the satellite is placed above the Earth will determine the velocity needed to keep the satellite at the chosen altitude. Due to the pull of gravity, the closer the satellite is to Earth the faster it must move to counteract gravity and maintain its altitude. At a distance of about 22,000 miles (where the gravity and inertial forces of the Earth, the Sun, the Moon, and the stars are apparently balanced), the satellite is "geostationary," since it will remain indefinitely in the same position in space. The heliocentric system explains this phenomenon by

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[289] http://en.wikipedia.org/wiki/Geosynchronous_satellite

viewing the Earth as rotating with a 24-hour period, while the geostationary satellite remains motionless in space. As such, at a specific location on Earth (let's say New York City) one will see the satellite directly overhead at one specific time during the day. In the geocentric system, however, the Earth is not rotating; rather, the whole of space is rotating around the Earth, which carries the satellite with it. In this case we might call it a stellar-stationary satellite instead of a geostationary satellite.

The point in fact remains that geosynchronous satellites do not prove the Earth rotates. These satellites only prove that there is a relative rotation between the Earth and the satellite. The only real difference is in the cause for the inertial forces on the satellite. In the heliocentric system, the "fictitious"[290] centrifugal force is balanced by the gravity of the Earth so that the satellite can remain in the stationary position. In the geocentric system, the rotating universe generates a real centrifugal force on the satellite, but which is balanced by the gravity of the Earth so that the satellite remains in the stationary position.

Objection #7: Don't Space Probes Take Moving Pictures of Earth Over Many Hours and Observe it Rotating?
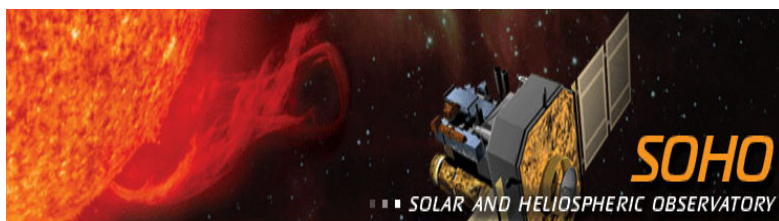
In 1995 the European Space Agency launched the SOHO space probe. Similar to the balancing forces for a geostationary satellite, SOHO is in a halo orbit around a Lagrange point so that the balance of gravity and inertial forces between the Earth, the Sun, the Moon and the stars are such that SOHO can remain in the same relative position in space. From time to time the SOHO will take snapshots and moving pictures of the Earth. In both, the Earth will appear to be rotating with a 24-hour period. This does not prove that the Earth is rotating, however. Similar to the geostationary satellite, it only proves that there is a *relative* rotation between SOHO and

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[290] In Newtonian physics, the centrifugal force is called "fictitious" because the real cause is attributed to the fact that the satellite seeks to move in a straight line as opposed to a curved path. In Machian physics, the satellite is pulled by the gravity of the stars and the gravity of the Earth, resulting in a curved path.

the Earth. In the heliocentric system, SOHO is stationary and the Earth is rotating underneath it. In the geocentric system, the Earth is stationary and SOHO is being carried by the universe that rotates around a fixed Earth. In both, Earth will appear to be rotating.

Objection #8: Doesn't Retrograde Motion Prove the Earth is Moving?

Retrograde motion occurs when a planet that has been traversing the night sky in one direction for several months then appears to reverse its direction for a few weeks, and a few weeks later reverses its direction again, heading back in the same direction it had originally been traveling. In principle, each of the planets, as viewed from Earth, will create a retrograde motion, although some, due to their close proximity to Earth, will have more pronounced retrogrades. This is true of Venus and Mars, the latter's path being the most eccentric. Below are six slides (three heliocentric and three geocentric) depicting what occurs in both models of the relative motions between the Earth and Mars. The red line represents the path that Mars appears to take as viewed from Earth. [291]

Explanation of Retrograde Motion

Since in the heliocentric system the Earth travels faster in its orbit than Mars, at some point Mars, as viewed from Earth, will appear to travel backward during the time Earth is making its closest approach to Mars. Various astronomy texts and other science publications have consistently appealed to this phenomenon as a proof for heliocentrism. Science textbooks illustrate the occurrence with elaborate diagrams, while websites use sophisticated java script animations, both purporting that only the heliocentric model has an explanation for retrograde motion. Rarely will the author educate the public to the fact that both the geocentric model answers the phenomenon of retrograde motion just as well as the Copernican model. Since the Copernican, the Ptolemaic and the Tychonean models can incorporate the same geometrical distances between the planets and the sun, all models, in principle, can account for retrograde motion, and they will do so in identical geometrical proportions.

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[291] See CDROM for animations of the geocentric and heliocentric versions of retrograde motion.

Heliocentric Retrograde Motion
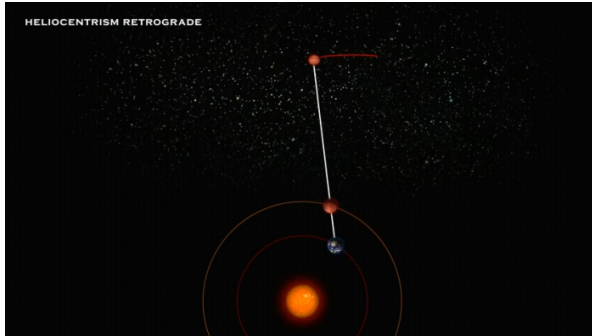
Figure 1: The Earth and Mars are revolving counterclockwise around the sun. The red line represents the appearance of Mars' motion against the fixed stars, as viewed from Earth.
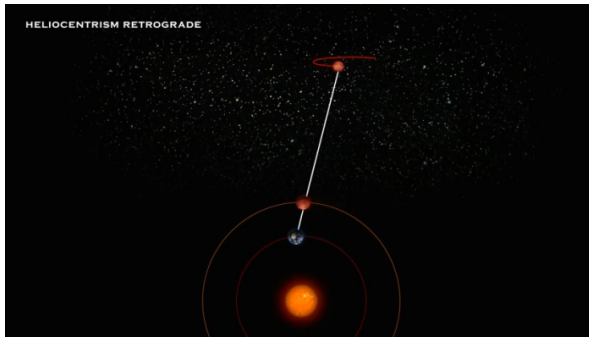
Figure 2: As Earth overtakes Mars in their respective orbits around the sun, Mars appears to move backward against the fixed stars.

Figure 3: As Earth begins to revolve downward, Mars is moving more laterally, giving the appearance that Mars is resuming its forward course against the fixed stars.

Geocentric Retrograde Motion
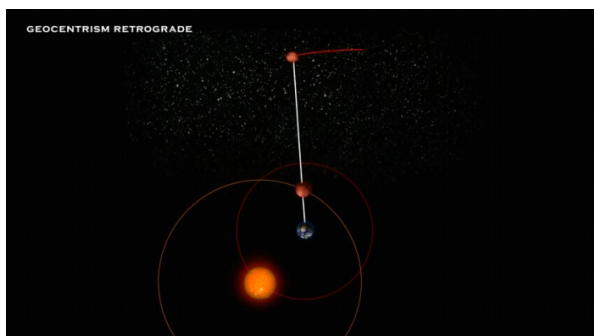
Figure 4: The sun is revolving counterclockwise around the Earth as Mars is revolving around the sun. The red line represents Mars' motion against the fixed stars.
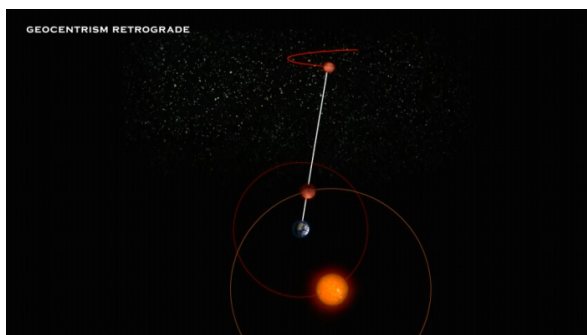
Figure 5: As the sun begins to move further in its orbit and carry Mars with it, Mars will appear to slow its speed and reverse its course against the fixed stars.

Figure 6: As the sun moves even further in its orbit, Mars moves to the left, thereby causing it to appear to resume its forward course against the fixed stars.

Objection #9: Doesn't Star-Streaming Prove the Earth is Moving?

Star-streaming is the optical phenomenon occurring when stars seem either to spread apart from each other or come closer together. It is analogous to a person riding in a car that is parallel to a forest and noticing that as the car moves, the trees seem to spread apart from each other, while other trees seem to come closer together. It is an optical illusion that is caused by the relative movement between the objects and the observer. In 1783 William Herschel discovered that the sun appears to move through the stars. He isolated thirteen such stars and found that as the sun moved through them they were spreading apart from a point in the constellation Hercules. He then isolated thirty-six stars and found similar results. Friedrich Argelander, an assistant to Friedrich Bessel, found similar results with 390 stars in 1830. In 1842 Otto Struve confirmed the results. As in the case of parallax discovered in 1838, these star-streaming results were invariably touted as proof of the heliocentric system. In reality it provides no proof at all. The reason is simple. The optical illusion of the separation of the stars can be caused either by the Earth moving past the stars or the stars moving past a fixed Earth. Both will produce the phenomenon of star-streaming.

Objection #10: Doesn't the Doppler Effect Prove the Earth is Moving?
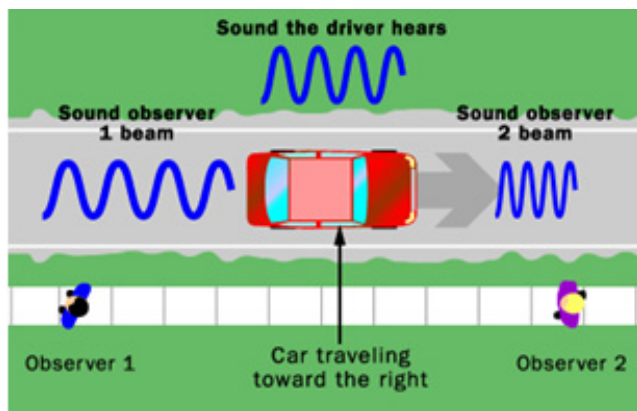
The Doppler Effect (or Doppler Shift) was discovered by Christian Doppler in 1842. This effect occurs when the source of wave emission moves closer or farther away from the observer. The waves are compressed when the source moves closer and stretched when the source moves farther away. This phenomenon does not occur, however, when the receiver moves closer or farther away from a stationary source since the waves coming to the receiver are the same in both cases.

Light acts in a similar manner. If the source of light is moving closer to the observer, the light waves are compressed or "blue-shifted"; while if the source of light is moving farther away from the observer, the light waves are stretched or "red-shifted."
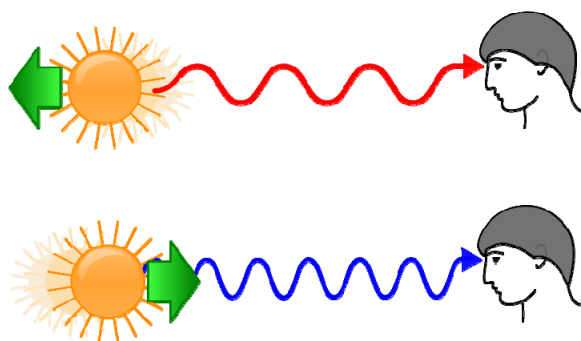
The first blue-shifted or red-shifted stars observed were Aldebaran, Arcturus and Betelgeuse in 1894 by J. E. Keeler. They would produce a spectrum like that in the below graph.[292]

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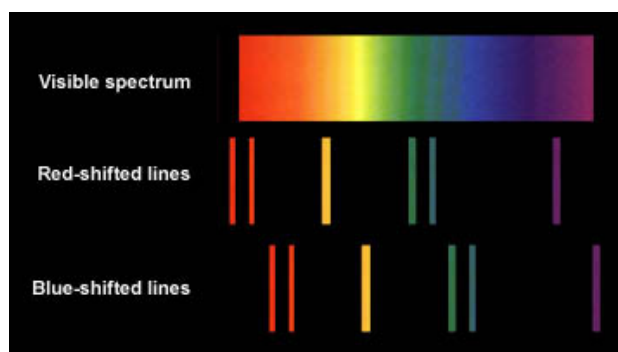
[292] J. E. Keeler, *Publications of the Lick Observatory*, 3:195, 1894, cited in G. Bouw's *Geocentricity*, p. 363.

Heliocentrists have claimed that since the Earth revolves around the sun at about 19 mps, this movement causes the Doppler shift of stars. As one author puts it, "Classical physics, but not Special Relativity, predicts different Doppler shifts for the source moving versus the observer moving, allowing one to 'determine' whether the earth moves or a 'fixed star' moves….To conclude, Mach did not consider the difference between the Copernican and Ptolemaic/Brahean systems and the observations falsifying the latter."[293] The truth is, however, that the Neo-Tychonic geocentric system can easily explain Doppler shift. As we have noted previously, the Neo-Tychonic system has the star field rotating around the Earth on a 1 AU radial hub.

As such, on one hemisphere of the star field the stars will be receding away from the Earth and on the opposite hemisphere the stars will be advancing toward the Earth. Those advancing toward the Earth will create a Doppler blue shift and those receding away from the Earth will create a Doppler red shift.
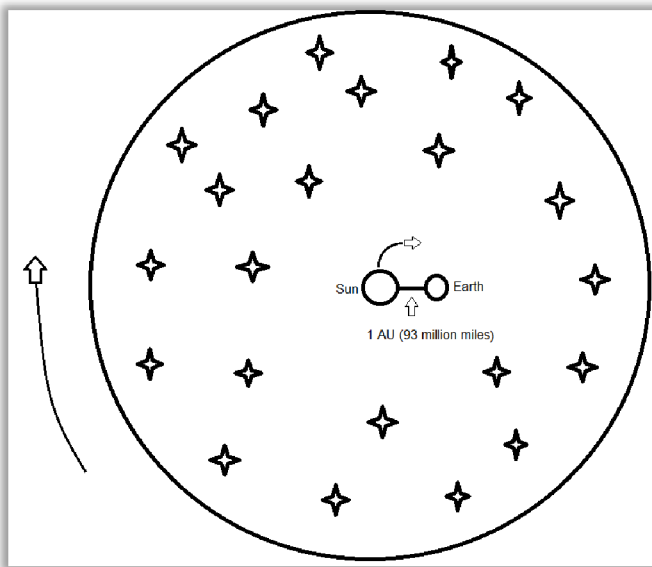
**The Stars are aligned with the sun, and the sun
revolves around the Earth on a 1 AU radial pivot**

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[293] Herbert I. Hartman and Charles Nissim-Sabat, "On Mach's critique of Newton and Copernicus," *American Journal of Physics* 71(11), November 2003, p. 1167.

Objection #11: Isn't the Geometry of Geocentrism More Complicated than Heliocentrism?

A somewhat common objection to geocentrism is that if it were true, the whole geometry of the solar system would be out of whack. Planets would be revolving in different orbits and nothing would look the same in the night sky as it does now. It is further argued that space probes and interplanetary satellites would never be able to get to their charted destination. Some even believe that the planets and asteroids would crash into each other. Suffice it to say, all these objections have no merit. The geocentric and the heliocentric systems share the same distances, geometry and speeds. The only difference is what occupys the center. In the Copernican system the sun is in the center while the Earth and all the planets are revolving around it. The Tychonic system is very similar, except that it puts the Earth in the center instead of the sun but still has the planets revolving around sun while the sun is revolving around the Earth. That the geometry, distances and speeds are identical between the Copernican and Tychonic systems can be seen in the following graphics. We start with the sun in the center. The planets: Mercury, Venus, Earth and Mars are revolving counterclockwise.

The Heliocentric and Geocentric Systems
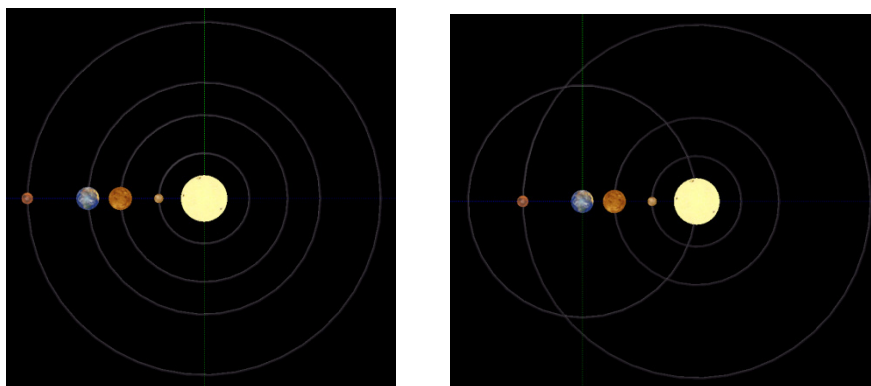
Fig. 1: In the heliocentric system on the left, the sun is in the center of the crosshairs and the planets are at the 9:00 o'clock position. In the geocentric system on the right, the Earth is in the center of the crosshairs. Notice that all the distances and geometry are the same. The only difference is that the center has changed.[294]

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[294] See CDROM for Orrery animations. All movements are counter-clockwise.
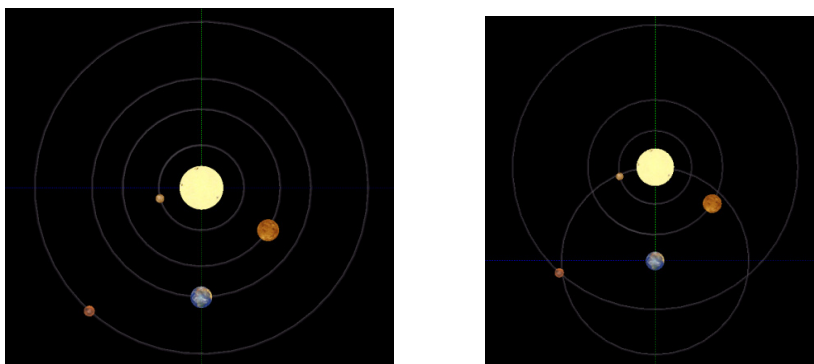
Fig. 2: For the heliocentric system, the Earth has completed one-fourth of its orbit. For the geocentric system, the sun, carrying the planets, has completed one-fourth of its orbit. All the distances and positions of the planets are precisely the same in each system.
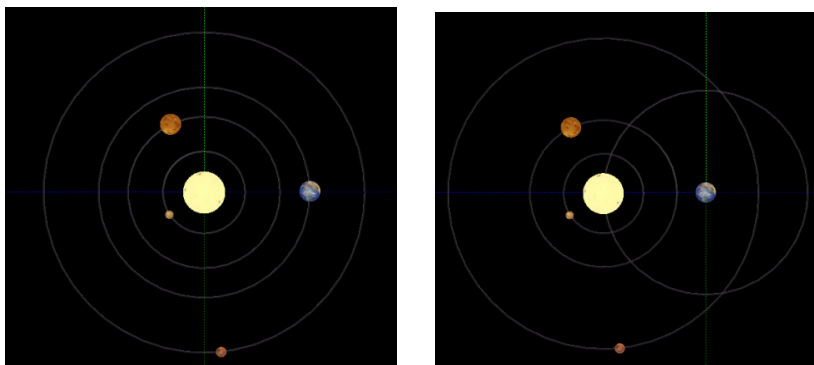
Fig. 3: In the heliocentric system, the Earth has completed half its orbit. In the geocentric system the sun has completed half its orbit.
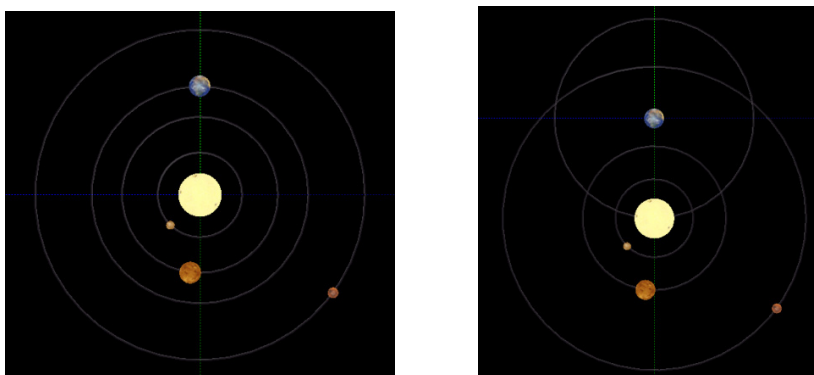
Fig. 4: Both systems have completed ¾ orbit. All distances & positions remain the same.

Objection #12: In the Geocentric System, Why Do the Planets Revolve around the Sun Instead of the Earth?

As we have noted earlier, in the Ptolemaic system the sun and planets revolve around the Earth. In the Tychonic system the sun revolves around the Earth but the planets revolve around the sun. The natural question is: how can the planets revolve around the sun and not the Earth in the Tychonic model? We can answer this best by an illustration from a binary star system. In such a system two stars revolve around a common center of mass. Let's say that one of the stars has a planetary system attached to it. In such a system the planets are held to the star by the force of gravity. The planets do not revolve around the common center of mass between the two stars but only around the center of mass of the star which holds the planets by its gravity. In other words, there are two centers of mass in operation, one for the two stars to revolve around each other, and one for the planets to revolve around one of the stars. The point in fact is that there can be more than one center of mass for a specific system. The same is true with the planets in our system, since some of them have moons revolving around a mutual center of mass, yet the planets are revolving around a mutual center of mass with the sun. As such, the sun and the planets have their own center of mass (which is near the sun), while the Earth, the sun, the moon, and the rest of the universe have another center of mass (which is the Earth in the geocentric system).

Objection #13: Don't the Four Seasons Prove the Earth is Tilted and Revolving around the Sun?

Almost all school children have been taught since third grade that the reason we have four seasons is that the Earth is tilted 23.5 degrees on its axis, which, as it travels around the sun, the tilt will cause the hemispheres of the Earth to alternate in receiving the most direct light from the sun, thereby causing summer in the northern hemisphere while it is winter in the southern hemisphere. One can see these motions in the following graphic sequence:[295]

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[295] See CDROM for animations of the geocentric and heliocentric versions of the seasons.

The Heliocentric Seasons
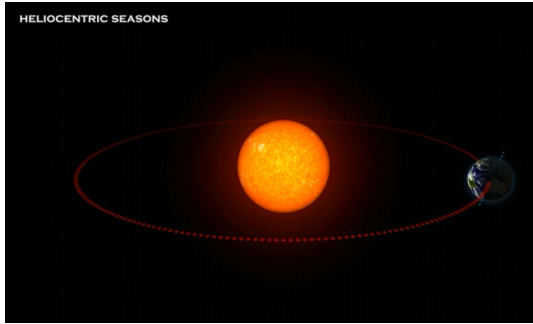
Figure 1: The Earth's northern hemisphere is tilted 23.5 degrees away from the sun and is in winter, while the southern hemisphere is enjoying summer.
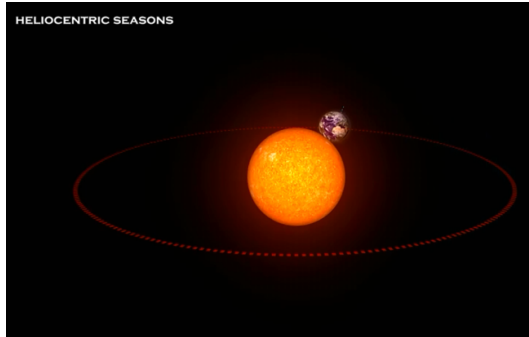
Figure 2: The Earth's northern and southern hemisphere have no tilt toward or away from the sun. Both regions are in spring time.
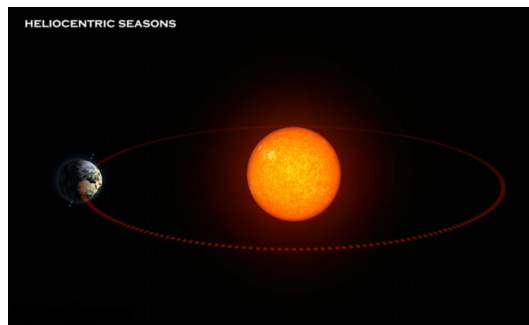
Figure 3: The Earth northern hemisphere is tilted 23.5 degrees toward the sun and is enjoying summer, while the southern hemisphere is in winter.

The Geocentric Seasons

The geocentric seasons are caused by the change in the sun's latitude as it revolves around the Earth.
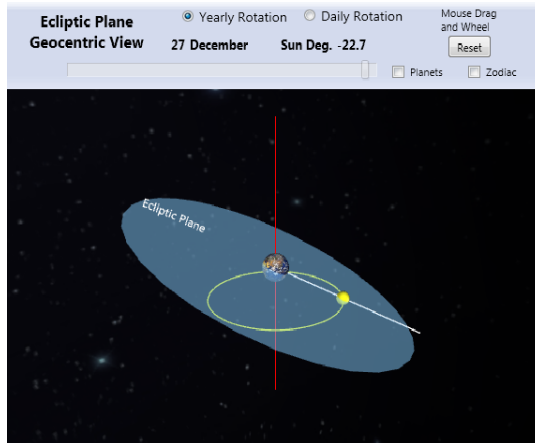
Figure 1: The Earth is in the center and not tilted. The sun is revolving around the Earth daily. At its lowest orbital plane, which is 23.5 degrees below the Earth's equator, it is summer in the southern hemisphere and winter in the northern. After the plane of the sun's orbit reaches 23.5 degrees below the equator, it begins to ascend. As it revolves, it changes the plane of its orbit by 47 degrees over six months, or 0.2575 degrees per day.
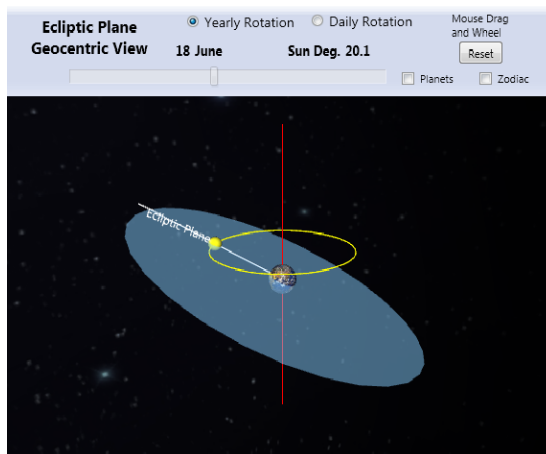
Figure 2: It is summer in the northern hemisphere and the plane of the sun's orbit has reached a height of 23.5 degrees above the Earth's equator. The sun's plane will now begin to descend by 0.2575 degrees per day.

What Causes the Sun to Move up and Down in its Orbit?

The next question concerns how the sun moves up and down during the four seasons. First we note that an isosceles triangle with two sides of 93 million miles (the distance from the Earth to the sun), at an angle of 47 degrees (23.5 in the northern hemisphere and 23.5 in the southern) will require the sun to oscillate between its northern apex and its southern antapex by 74 million miles every six months.
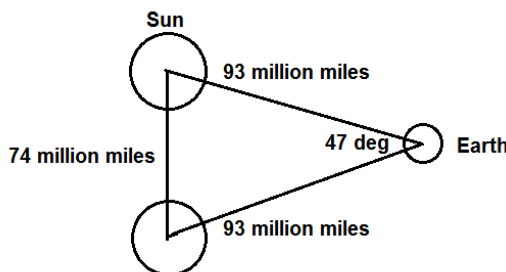
As we noted earlier, the sun moves with the whole star field. This means that the star field is also moving vertically by 74 million miles every six months. The combination of: (1) the star field's rotation around the Earth and (2) its vertical oscillation, is what moves the sun laterally and vertically, and causes our four seasons. In the laboratory, such dual motion causes a progressive wave and/or an inertial oscillation.[296] We sense these movements by the effects of the Coriolis force.

One might ask, if the star field is oscillating vertically by 74 million miles on a semi-annual basis, would we be able to see it move up and down every six months just as we do the sun? The answer is no. The stars are too far away for us to be able to detect a 74 million mile vertical movement. Even for the nearest star, Alpha Centauri, it would be akin to detecting a softball move up and down from a distance of 50 miles. Whereas the sun creates a 47 degree angle with the Earth when it moves vertically by 74 million miles, Alpha Centauri would create only a 0.00019 degree angle – much too small to detect even with a powerful telescope. In fact, the viewing angle is much smaller than the angle of aberration caused by the star field rotating laterally around the Sun-Earth 1 AU pivot. (Refer back to the section on stellar aberration).

Whereas centrifugal force creates a radial/linear direction, the Coriolis force creates a curved direction. In the northern hemisphere, the Coriolis force turns clockwise, while in the southern hemisphere it turns

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[296] See this video for a demonstration of the Coriolis force, and standing and progressive waves: http://www.mechanicalcampus.com/content/410/rotating-flow

counter-clockwise, thus producing opposite forces above and below the equator, respectively.

Coriolis Force - North Clockwise Direction

Equator

Coriolis Force - South Counter-Clockwise
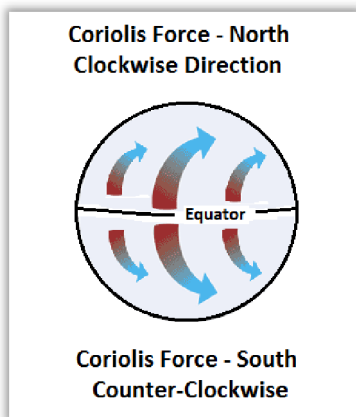
As the star field rotates around the Earth in a clockwise direction, it also oscillates vertically, and both movements create the universal Coriolis force. Since the Earth lies directly in the center of the star field's equatorial plane, the Coriolis, as well as centrifugal and Euler forces, are completely balanced and thus will not move the Earth. In the case of celestial bodies that are already in motion and within the vicinity of Earth, the rotating and oscillating star field will move the sun, which in turn moves the planets by gravitational and inertial forces. The Earth acts as the center of mass for the whole system. All in all, the model is very simple. The gravity of the universe, in conjunction with its rotational and undulating movement, causes and controls all other rotational and oscillating movement. At Earth, all the forces are balanced and thus the Earth does not move.
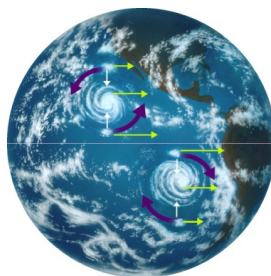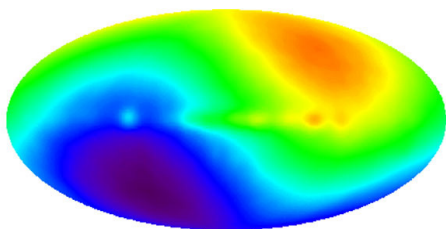
297

The CMB dipoles, divided by Earth's equator into hemispheres, go in opposite directions and extend throughout the entire

Hurricanes, divided by Earth's equator, go in opposite directions in their respective hemispheres

As we will see in Chapter 3, the above model of a rotating and undulating universe fits like a glove with the cosmic microwave

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[297] Image courtesy of http://www.nap.edu/jhp/oneuniverse/motion_32-33.html

background radiation (CMB). Since the whole universe oscillates within the space of our ecliptic and equinoxes, we can now understand why the entire CMB is aligned with the space bordering the ecliptic and equinoxes. In fact, the connection between the CMB and the undulating universe is precisely why the CMB dipole and quadrupole extend from our Sun-Earth region out to the furthest reaches of the known universe. It appears that the universe's all pervasive Coriolis force is causing the CMB to orient itself around the cosmic axis just as, for example, hurricanes orient their spin and direction around the Earth's equator. In the typical picture of the CMB dipole seen above, the two poles resemble the orientations that hurricanes assume in the northern and southern hemispheres of the Earth, respectively.

The Sun's Independent Movement

We also know that the sun moves faster through the stars at various times of the year. As Einstein notes: "To begin with it followed from observations of the sun that the apparent path of the sun against the background of the fixed stars differed in speed at different times of the year…"[298] Kepler believed he solved this mystery by proposing the planets revolved in elliptical orbits. If we transfer elliptical motion to the geocentric system, the sun would travel in an elliptical orbit around the Earth. As such, the sun would be farther away from the Earth in June than it would be in December. It is approximately 94 million miles away in June and 91 million miles in December. Hence the sun's orbital diameter would increase from 182 million miles in December to 188 million miles in June. It would need to travel an additional 18.84 million miles to complete its orbit.[299] In order to do so, the sun must daily increase its speed from December to June; and daily decrease its speed from June to December. At its peak on June 21, the sun is traveling at 18.71 mps or 67,388 mph. On December 21 the sun is traveling at its slowest of 18.21 mps or 65,237 mph.

In Newtonian/Machian dynamics, the increased speed of the sun beginning on December 21 will increase the centrifugal force on the sun and cause it to increase its radius of orbit around the Earth. This radius will

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[298] Albert Einstein, *Ideas and Opinions*, p. 263.
[299] The stars revolve around the Earth on a daily basis of 23 hours, 56 minutes and 4 seconds. The sun revolves around the Earth with the stars but does so at a slightly slower rate, completing its orbit in 24 hours. The difference is thus 4 minutes and 56 seconds on average. On June 21, the sun, because of its faster speed, lags behind the stars less than it does every other day of the year.

increase each day until it reaches a peak on June 21. As the speed begins to decrease after June 21, the centrifugal force will also decrease, thus decreasing the radius of the sun's orbit. If one were to observe this process from outside the solar system so that he could view the sun's up and down movement over the course of the year, he would see the trajectory in the form of a V-shape.

Dynamically speaking, the sun will move up and down over the course of year for the same reason the water in a bucket will rise on the sides of the bucket when it is spun. The faster the bucket spins the greater the centrifugal force, and the more the water will climb the sides of the bucket. Similarly, the faster the sun revolves around the Earth, the greater the centrifugal force and the greater will be the sun's distance from the Earth. The sun is forced to make these changes due to the fact that it is in an inertial field and it must respond to the forces in that field just like a gyroscope. As such, over the course of a year the sun's axis will tilt by about 2.83 degrees since it always keeps the same angle toward the Earth, just as the moon tilts by about 0.6 degrees in order to keep the same face and angle toward the Earth; or as Saturn turns its rings, which are all due to the gyroscopic effect on their movements.

The Newtonian/Machian dynamic has one major drawback, however. It does not have any physical explanation for why the sun increases its speed at certain times of the year (or, in the heliocentric system, it has no explanation why the Earth increases its speed around the sun), except for the fact that whatever celestial body is revolving it is said to obey the "area law" of motion and the law of gravity. But these are merely mathematical equations which calculate the *effects* of the area law and gravity. They do not explain the physical cause of gravity, and thus they do not tell us the physical reason that either the sun in the geocentric system or the Earth in the heliocentric system are, indeed, affected by gravity or are increasing or decreasing their speed in an "area law." As we will see in later chapters, in an alternative geocentric ether-based system, the increase or decrease of the sun's speed, as well as its orbital oscillation, is directly related to the

speed and direction of the ether which surrounds it. In Chapter 5 we will see the experiments of Dayton C. Miller show that the speed of the ether around the Earth is greatest in June and least in December.[300]

The Analemma

Analemma comes from the Greek word ἀνάλημμα meaning "pedestal of a sundial." It appears in time-lapse photography of the sun's yearly position when photographed from the same location and time at various days during the year. These composite pictures were taken in the northern hemisphere at 45 degrees latitude. Of the three position marked, #1 represents the northern solstice about June 21; #2 represents the time near the Vernal and Autumnal equinoxes (March 21 and September 21); and #3 represents the southern solstice about December 21.

[301]
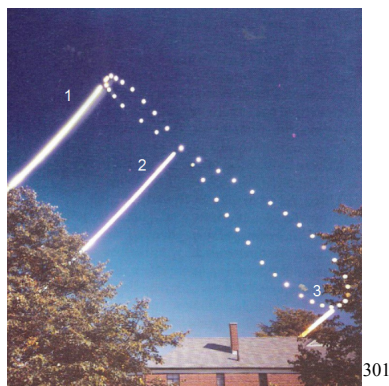
The analemma changes its orientation and shape depending on where it is photographed on the Earth. For example, at the North Pole the analemma would be vertical but with only the small loop of the top half visible. At the equator, the analemma is seen with both loops and directly overhead but in a horizontal position. At the South Pole, the analemma would again be vertical but upside down, with only the large loop visible. These differences are due to how much of the sun can be seen at various locales on the Earth and from which angle the sun is viewed.

We see something similar on a daily basis with geosynchronous satellites.[302] We can use these daily satellite movements since, in certain

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[300] Miller showed the following results: February: 9.8km/s; April: 10.1km/s; June: maximum; August: 11.2km/s; September 9.6km/s; December: minimum.

[301] Picture taken from *Das wahre Weltbild nach Hildegard von Bingen*, by Helmut Posch, p. 136.

respects, the yearly is the daily multiplied by 365 days. Depending on how close to the equator and the initial incline of their trajectory, satellites will produce different ground trackings as observed from Earth. This is due to the fact that the satellite, depending on its initial location and speed, will react against the gravitational and inertial forces in space (whether we use the heliocentric or geocentric system). Note the three different satellite ground trackings in the following sample:
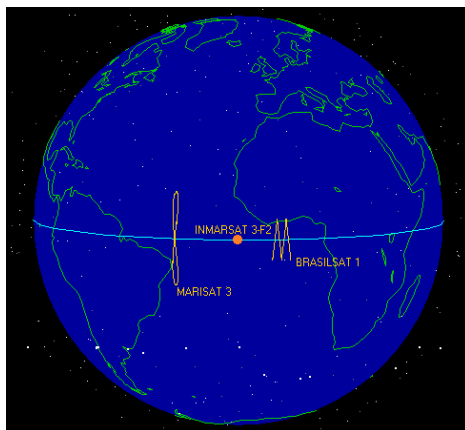
Marisat 3 produces the characteristic figure-8. This is because Marisat 3 is both on an incline and moves in an elliptical orbit. Inmarsat F-32 has no incline and travels in a circle, thus produing the orange dot on the equator. Brasilsat-1 is at an incline and is farther out from Earth than Marisat 3, thus producing the zig-zag line instead of the figure-8. The sun can also be considered a satellite. It has an inclined orbit over a year of 23.5 degrees, which will produce the typical figure-8 pattern. Since it also has either an elliptical orbit and/or travels faster in one part of its orbit than another, this will produce the larger lower loop in the figure-8.

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[302] Geosynchronous refers to a satellite with a 24-hour period, regardless of inclination. Geostationary refers to a satellite with a 24-hour period, in a near-circular orbit, with an inclination of approximately zero. It appears to hover over a spot on the equator as shown by Inmarsat F-32. All geostationary orbits must be geosynchronous, but not all geosynchronous orbits are geostationary. An example of a geosynchronous but non-geostationary satellite would be the Marsat 3 with about a 30° inclination. The ground trace will retrace itself with every orbit, in this case in a figure-8 pattern. The ground trace will also vary between 30° north and 30° south latitude due to its 30° inclination. If the geostationary satellite has an eccentricity near zero and an inclination of 60°, the ground trace would follow a similar, larger figure-8 path between 60° north and 60° south latitude.

Both the heliocentric and geocentric systems can explain the analemma. In the heliocentric system, three factors determine the size and shape of the analemma: obliquity, eccentricity, and the angle between the apse line and the line of solstices. If the Earth had a perfectly circular orbit and no axial tilt, the Sun would always appear at the same point in the sky at the same time of day throughout the year and the analemma would be a dot. If the Earth had a circular orbit and a significant axial tilt, the analemma would be a figure-eight shape with northern and southern lobes equal in size. If the Earth had an elliptical orbit but no axial tilt, the analemma would be a straight east-west line along the celestial equator.

In the geocentric system, the sun has either a slightly elliptical orbit around the Earth and/or it changes its speed at various times during the year due to the inertial forces created by a rotating universe. At the summer solstice (June 21) the sun is 23.5 degrees above the equator but it is about 94 million miles from Earth, and therefore it must travel faster. At the winter solstice, the sun is 23.5 degrees below the equator but about 91 million miles from Earth and therefore it will travel slower. This difference is what causes the smaller and larger loops of the analemma.[303]

Objection #14: Don't Earthquakes and Tsunamis Retard the Earth's Rotation?

Invariably, when major earthquakes or tsunamis occur we are inundated with newspaper articles declaring that the Earth, as a result of the force coming from these catastrophes, was slowed in its rotation rate and/or its axis moved. The rotation rate is said to decrease by microseconds and the axial tilt by inches. The 2011 tsunami that hit Japan brought out numerous articles detailing these events. This one is from the *New York Times*:

> The magnitude-8.9 earthquake that struck northern Japan on Friday not only violently shook the ground and generated a devastating tsunami, it also moved the coastline and changed the balance of the planet.
>
> ...Meanwhile, NASA scientists calculated that the redistribution of mass by the earthquake might have shortened the day by a couple of millionths of a second and tilted the Earth's axis slightly.

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[303] This also answers the objection raised against the geocentric system in the video at http://www.youtube.com/watch?v=wyRJZbNmC7U.

On a larger scale, the unbuckling and shifting moved the planet's mass, on average, closer to its center, and just as a figure skater who spins faster when drawing the arms closer, the Earth's rotation speeds up. Richard S. Gross, a scientist at NASA's Jet Propulsion Laboratory, calculated that the length of the day was shortened by 1.8 millionths of a second.

The earthquake also shifted the so-called figure axis of the Earth, which is the axis that the Earth's mass is balanced around. Dr. Gross said his calculations indicated a shift of 6.5 inches in where the figure axis intersects the surface of the planet. That figure axis is near, but does not quite align with, the rotational axis that the Earth spins around.

Earlier great earthquakes also changed the axis and shortened the day. The magnitude-8.8 earthquake in Chile last year shortened the day by 1.26 millionths of a second and moved the axis by about three inches, while the Sumatra earthquake in 2004 shortened the day by 6.8 millionths of a second, Dr. Gross said. [304]

In another article Gross is quoted as adding:

"This shift in the position of the figure axis will cause the Earth to wobble a bit differently as it rotates, but will not cause a shift of the Earth's axis in space – only external forces like the gravitational attraction of the sun, moon, and planets can do that," Gross said.
This isn't the first time a massive earthquake has changed the length of Earth's day. Major temblors have shortened day length in the past.

The 8.8-magnitude earthquake in Chile last year also sped up the planet's rotation and shortened the day by 1.26 microseconds. The 9.1 Sumatra earthquake in 2004 shortened the day by 6.8 microseconds.

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[304] "Quake Moves Japan Closer to U.S. and Alters Earth's Spin," Kenneth Chang, March 13, 2011, at http://www.nytimes.com/2011/03/14/world/asia/14seismic .html.

And the impact from Japan's 8.9-magnitude temblor may not be completely over. The weaker aftershocks may contribute tiny changes to day length as well.

The March 11 quake was the largest ever recorded in Japan and is the world's fifth largest earthquake to strike since 1900, according to the USGS. It struck offshore about 231 miles (373 kilometers) northeast of Tokyo and 80 miles (130 km) east of the city of Sendai, and created a massive tsunami that has devastated Japan's northeastern coastal areas. At least 20 aftershocks registering a 6.0 magnitude or higher have followed the main temblor.

"In theory, anything that redistributes the Earth's mass will change the Earth's rotation," Gross said. "So in principle the smaller aftershocks will also have an effect on the Earth's rotation. But since the aftershocks are smaller their effect will also be smaller."[305]

From the Jet Propulsion Laboratory report, Gross and Chao added more:

Dr. Richard Gross of NASA's Jet Propulsion Laboratory, Pasadena, Calif., and Dr. Benjamin Fong Chao, of NASA's Goddard Space Flight Center, Greenbelt, Md., said all earthquakes have some affect on Earth's rotation. It's just they are usually barely noticeable.

"Any worldly event that involves the movement of mass affects the Earth's rotation, from seasonal weather down to driving a car," Chao said.

Gross and Chao have been routinely calculating earthquakes' effects in changing the Earth's rotation in both length-of-day as well as changes in Earth's gravitational field. They also study changes in polar motion that is shifting the North Pole. The "mean North pole" was shifted by about 2.5 centimeters (1 inch) in the direction of 145 degrees East Longitude. This shift east is continuing a long-term seismic trend identified in previous studies.[306]

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[305] http://www.space.com/11115-japan-earthquake-shortened-earth-days.html
[306] http://www.jpl.nasa.gov/news/news.cfm?release=2005-009

All of this sounds very technical and convincing, but we shall go through it line by line to determine its validity. First, if we add up all the earthquakes occurring on an annul basis, there are on average 1,450,000 per year. About 90% are in the 2 – 2.9 Rictor scale range; about 9% in the 3 to 3.9 range; and the rest between the 4 to 9.[307] Let's say for the sake of argument about 25,000 significant earthquakes occur per year that affect the Earth's rotation and figure axis the way Dr. Gross claims. Let's say we take the estimates back 10,000 years to 8000 BC. That means 250 million noticeable earthquakes occurred since 8000 BC. Let's also assume, based on present data, that Earth's rotation changes by 0.5 microseconds for significant earthquakes. This means the Earth would have changed its rotation by 125 seconds or 2.08 minutes since 8000 BC. If we go beyond 8000 BC to 108,000 BC, we now have the rotation of the Earth decreased by 20.8 minutes, which yields a rotation of 23 hours, 36.2 minutes. If we use 1 million years, it lessens the rotation by about 200 minutes. If 10 million: 2000 minutes. If 100 million: 20,000 minutes. If 200 million, then 40,000 minutes, which means the Earth would have been rotating in about 12 hours. Anything beyond 86,400 minutes, the Earth will rotate once every second or less. If we use 4.5 billion years (which is the time modern science says the Earth has been in existence), the Earth would be spinning about 10 times every second.

It matters little if we change the 25,000 earthquakes to 15,000; or the 0.5 microseconds to 0.25 microseconds. Over time the Earth's rotation will be dramatically affected, which includes only earthquakes. There are hundreds of aftershocks, tsunamis, atomic and high-powered explosions, hurricanes, tornados, and, as Dr. Chao of NASA said, anything "from seasonal weather down to driving a car" will affect the rotation rate. If we add up all those little forces over thousands of years, the heliocentric system has a very fragile Earth that is easily knocked out of whack and couldn't possibly sustain life.

We can escape this frightening scenario by considering some very important facts. First, most of the so-called changes in the Earth's rotation and figure axis are not actually measured with a yardstick, as it were. Rather, modern geology presumes that the changes in rotation and orientation occur, of necessity, from Newton's laws of motion for a rotating object. In principle, scientists believe that the changes in the Earth's rotation are as calculable as the ice skater who, in a pirouette twirl, suddenly draws in her arms and begins to spin faster. All one needs to do to calculate the effect of the earthquake on Earth's rotation is to plug in the numbers of the mass of the Earth; the force of the earthquake; the velocity

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[307] http://earthquake.usgs.gov/earthquakes/eqarchives/year/eqstats.php

of rotation, *etc.*, into Newton's equations and it will show how much the Earth must change its rotation and axis in order to make the equation balance. Scientists then report this calculated change as a *real* change and a newspaper article is written declaring that the Earth has changed its rotation rate and its axis has shifted. The reality is, the conclusions were made on paper with equations, not by field research and measuring.

Second, although there is a purported method by which scientists could measure changes in Earth's rotation, the method is flawed and presumes the Earth is rotating before it interprets the data. The method commonly used is VLBI or Very Long Baseline Interferometry.[308] In brief, two interferometers (an instrument that can detect slight phase shifts in the wavelengths of light) are placed on either side of the Earth, which would make them 8000 miles apart. Light from a distant stellar object is absorbed by each interferometer, usually waves from a quasar or radio source galaxy. If there is any difference in the phases of the waves between the two interferometers, this means that something has moved. Either the source has moved, the Earth has moved, or even the radiation itself has moved. But because VLBI is commonly used by NASA and JPL under the assumption that the Earth is rotating, they find it perfectly justifiable to obtain the VLBI measurement from only one stellar source. Hence, if there is a difference in how the single stellar source is received by the two interferometers, it is then assumed the difference is because the Earth's rotation changed, not because the source had moved. Essentially, the way in which NASA or JPL have set up the VLBI, they can have no means of determining whether the movement was due to the Earth or the source. This flaw is especially significant since it is already known that stars, quasars and galaxies have "proper motion," that is, each of them have slight independent motion with respect to other stars. In fact, the proper motion of some objects is even greater than their parallax motion.[309] They also have independent "long-term drift motion."[310] Both of these could very easily show up as a phase shift in a VLBI measurement. Consequently, it is absolutely necessary to distinguish whether the phase shift is caused by the source's motion or caused by a modified rotation of the Earth. The only way NASA or JPL could distinguish between the two is for them to allow the VLBI to absorb radiation from at least three

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[308] See following article at Wikipedia for brief summary: http://en.wikipedia .org/wiki/Very_Long_Baseline_Interferometry.

[309] http://en.wikipedia.org/wiki/Proper_motion. Proper motion was suspected by early astronomers but proof was provided in 1718 by Edmund Halley, who noticed that Sirius, Arcturus and Aldebaran were over half a degree away from the positions charted by the Greek astronomer Hipparchus 1850 years earlier.

[310] http://en.wikipedia.org/wiki/Stellar_drift.

sources, if not more. If it is found that all the other sources are moving in the same precise way as the original source, then there is evidence that the Earth is rotating. Without this methodology, all VLBI measurements are invalid to prove whether the Earth is rotating.

Another problem for VLBI measurements is that they are performed using radio wavelengths. These are very long wavelengths compared to X-rays or gamma rays. Longer wavelengths create poor resolution. Hence, what may look like a phase shift in VLBI may, indeed, be only a false reading due to poor resolution.

All in all, we must look in retrospect at this issue. Not only is there no proof from the VLBI that the Earth is rotating, recorded history has shown that there is no evidence of any appreciable difference between solar time and sidereal time. If the theory were correct that the Earth changes its rotation rate every time there is a cataclysmic disturbance on its surface, we would have seen the difference over time. Moreover, we would have seen the effects in the weather, the jet stream, biological rhythms, and just about anything that is dependent on the precision of a sidereal day.

Conversely, the geocentric cosmos has a very stable system that keeps the sidereal clock from changing. There is no fragile Earth that changes its rate for every bump it encounters. Rather, the geocentric cosmos incorporates a whole universe that is rotating around the Earth. Due to the extreme mass of the universe, the tremendous inertia with which it completes its sidereal cycle can neither be increased or decreased. Like a giant flywheel, once pushed the geocentric universe will continue to rotate evenly, *ad infinitum*. In fact, to move the Earth from its fixed position, one would have to move the universe itself. Due to the dense constitution of the universe, the force of any potential axis-changing or rotation-changing disturbance on Earth (*e.g.*, earthquakes) will be transferred and spread out to the entire universe. As such, the force dissipates so much that it has less of an effect than throwing a small stone into the ocean.

Objection #15: Doesn't NASA Use the Heliocentric System for its Probes and Satellites?

In reality, NASA will use whatever system is more convenient, the heliocentric or the geocentric, since NASA's orbital mechanics know that both models are equivalent, geometrically and dynamically. If they are sending probes near the sun, NASA will usually apply a heliocentric model, since it is easier to make calculations when one considers the sun as fixed in space with the planets moving around it. If they are sending up satellites near the Earth, however, NASA will usually apply a geocentric

model, or what is known in the industry as a "fixed-Earth coordinate system." This is because it is much easier to calculate and chart the movements of satellites circling the Earth if the Earth is understood as stationary in space. This fact is easily proven from the space agency's own documentation. For example, in a letter written to the *National Oceanic and Atmospheric Administration* (NOAA) making the following inquiry: "Is the present movement of GOES [Geostationary Satellite] planned and executed on the basis of a fixed earth or a rotating earth?" the answer returned by the department head of GOES/POLAR Navigation, Office of Satellite Operations at the NOAA was very simple: "Fixed earth."[311]

At other times, NASA tries to give the impression that only the heliocentric model will work. Through email correspondence in October 2005, NASA representatives personally invited this author to their on-line *Question and Answer* forum.[312] A few weeks prior to the invitation, the same NASA representatives had answered a question on their forum regarding whether NASA's probes could be sent into space and tracked using the geocentric system rather than the heliocentric. The NASA representatives answered in the negative, stating: "If the universe were geocentric, all of our calculations for space probe trajectories would be wrong." The person who asked the question then sent NASA's answer to this author as proof for the heliocentric system. Accepting NASA's invitation, I then sent a formal question to the NASA website asking them to show proof why a geocentric system would not work. After six weeks of not receiving an answer, I contacted the representatives by private email and asked if they were planning to answer the question. They wrote back to me and stated that they did not plan to answer it. After I tried to convince them that, since in this public forum they had, by their initial assertions against geocentric navigation, already committed themselves and thus had an obligation to the public to defend their position, they still refused to answer. As a rejoinder, I told them that I would be including the entire communication between them and myself in this present book. The NASA representatives then demanded that their names be withheld, stating:

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[311] The original letter was addressed to Charles E. Liddick of the United States Department of Commerce, Office of Satellite Operations, Washington, DC 20233 on November 17, 1989. Mr. Liddick transferred the inquiry to Lee Ranne, from GOES/POLAR Navigation, Office of Satellite Operations at the NOAA offices in the department of National Environmental Satellite Data and Information Service, who then wrote to, the questioner, Marshall Hall, on November 22, 1989, with a copy to Mr. Liddick. Original letters are cited in Marshall Hall's *The Earth is Not Moving*, Cornelia, Georgia, Fair Education Foundation, 1994, p. 261.

[312] (http://imagine.gsfc.nasa.gov/docs/ask_astro/ask_an_astronomer.html).

> We do not give you permission to quote us or use our names in your book or on your website. Although we work at NASA centers, we are not NASA employees and for us to be presented in your work as official representatives of NASA would be inappropriate and misleading.

I have obliged their request, except to quote the above paragraph. To this day there has been no response from them. As one can see quite readily from the above exchanges, although one government agency, at least in a private letter, was willing to divulge the truth about the use of fixed-Earth mechanics, another agency refused to be as forthcoming when the audience included the millions of potential readers on the Internet. This is really no surprise. Those who control our space programs have a vested interest in keeping the public under the illusion of the Copernican Principle, since all their funding and projects are based on Copernican premises, including the quest to find life in other worlds. Only those who are courageous and knowledgeable enough can expose the illusion and allow the public to see the truth.

One such party is the team of Ruyong Wang and Ronald Hatch, two former government satellite engineers who know the truth about the illusion. In investigations on the Global Positioning System they write:

> …NavCom Technology, Inc. has licensed software developed by the Jet Propulsion Lab (JPL) which, because of historical reasons, does the entire computation in the ECI frame. Because of some discrepancies between our standard earth-centered earth-fixed solution results and the JPL results, we investigated the input parameters to the solution very carefully. The measured and theoretical ranges computed in the two different frames agreed precisely, indicating that the Sagnac correction had been applied in each frame.

> As the discussion of the Sagnac effect indicates the fundamental question regarding the speed of light is the following: Is the speed of light constant with respect to the observer (receiver) or is it constant with respect to the chosen inertial ECI frame? Clearly the GPS range equation indicates the speed of light is constant with respect to the chosen frame….The JPL equations, used to track signals from interplanetary space probes, verify that the speed of light is with respect to the chosen frame. In the JPL equations, the chosen frame is the solar system barycentric frame….Clearly, the JPL equations treat the speed of light as

constant with respect to the frame – not as constant with respect to the receivers.[313]

In other words, the Jet Propulsion Laboratory (JPL) employs the Earth Centered Inertial frame (ECI) for probes sent out near the Earth (as does NASA and the GPS), yet the Jet Propulsion Lab claims to use the "solar system barycentric frame" for deep space navigation. Wang and Hatch tell us, however, that "the Jet Propulsion Lab…because of historical reasons, does the entire computation in the ECI frame." Not only does the Jet Propulsion Lab use the ECI frame exclusively, Wang and Hatch tell us that the Lab corrects the calculations in its "solar system barycentric frame" so that they match the ECI frame. We can clearly see that the Earth-centered frame is the standard, and thus, using the 'solar system barycentric frame' is superfluous. Once the Lab's computer makes the corrections to the solar system barycentric frame, in reality the deep space navigation is actually using the ECI frame – a fixed Earth. The public wouldn't have been made privy to this sleight-of-hand manipulation except for the fact that two knowledgeable insiders, Wang and Hatch, have told the real story. In effect, the Earth Centered Inertial frame (*e.g.*, geocentrism) is the only frame that allows the GPS and various space probes to work properly. The significance of these facts will be highlighted when we deal with the Sagnac Effect in Chapter 5.

Objection #16: Don't the Phases of Venus Disprove Ptolemy's Geocentrism?

One of the more popular arguments offered against the geocentric system is the charge that Ptolemy's model could not account for the phases of Venus. Galileo used this very argument against the geocentrists of his day. Since that time, few have examined Galileo's claims with any respectable amount of scrutiny. The issue is a bit more complicated than meets the eye. Even those who see the merits of geocentrism, stumble over the phases of Venus. For example, although scientific writer Kitty Ferguson concedes, on the one hand, that: "…Einstein's theories reveal they may actually slightly favor an Earth-centered model,"[314] and that the only advantage of Copernican theory is it "is more easily falsifiable than Ptolemy's," on the other hand she perpetuates the somewhat misleading

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[313] Ruyong Wang and Ronald R. Hatch, *Conducting a Crucial Experiment of the Constancy of the Speed of Light Using GPS*, ION GPS 58th Annual Meeting / CIGTF 21st Guidance Test Symposium, 2002, p. 500.

[314] Kitty Ferguson, *Measuring the Universe*, 1999, p. 106.

conclusion that Ptolemy could not account for Venus' phases. As she compares her own diagrams of Ptolemy and Copernicus' she concludes:

> It was this line of reasoning that Galileo used in 1610, when he studied the planet Venus through his telescope….In the Ptolemaic system, with Venus always between the Earth and the Sun – traveling on an epicycle on a deferent with the Earth as its center – an observer on Earth would never see the face of Venus anywhere near fully illuminated.[315]
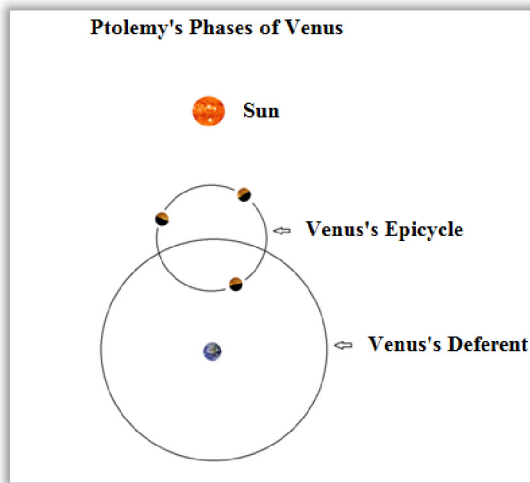
Andrew White, in *A History of the Warfare of Science with Theology in Christendom*, employs his usual sardonic style to make the same point:

> Ten years after the martyrdom of Bruno the truth of Copernicus's doctrine was established by the telescope of Galileo. Herein was fulfilled one of the most touching of prophecies. Years before the opponents of Copernicus had said to him, 'If your doctrines were true, Venus would show phases like the moon.' Copernicus answered: 'You are right; I know not what to say; but God is good, and will in time find an answer to this objection.' The God-given answer came when, in 1611, the rude telescope of Galileo showed the phases of Venus.[316]

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[315] *Ibid.*, pp. 92-93.
[316] Andrew White, *A History of the Warfare of Science with Theology in Christendom*, 1907, p. 130.

Although certain versions of Ptolemy's system seem to demonstrate its inability to account for Venus' phases, the truth is that these versions no more deny the basic model of Ptolemaic geocentrism than the errors in Copernicus' original model (which were based on circles and epicyclets) would discount heliocentrism prior to Kepler's corrections by means of ellipses. Upon close inspection of Ferguson's diagrams, we can understand why so many people have been unduly convinced that Ptolemy's model was lacking. Although Ferguson is kind enough to alert her reader that: "The distances and size of orbits in this drawing do not reflect the actual distances and orbits,"[317] she fails to acknowledge that without accurate scales the diagrams prove nothing, except perhaps a bias against Ptolemy. Ptolemy, of course, had the same problem, but it was inadvertent. He did not know the actual distances to the sun, the planets or the moon, and consequently Venus suffers the most from this lack of knowledge since its epicycle is placed between the sun and the Earth rather than outside the sun.

Using the same logic, modern heliocentrists often accuse Ptolemy of having the moon come too close to the Earth, and thereby appeal to this lopsided orbit as convincing evidence to discredit his system. For example, Stephen Hawking asserts the following:

> Ptolemy's model provided a fairly accurate system for predicting the positions of heavenly bodies in the sky. But in order to predict these positions correctly, Ptolemy had to make an assumption that the moon followed a path that sometimes brought it twice as close to the earth as at other times. And that meant that the moon ought sometimes to appear twice as big as at other times! Ptolemy recognized this flaw, but nevertheless his model was generally, although not universally accepted. It was adopted by the Christian church as the picture of the universe that was in accordance with scripture, for it had the great advantage that it left lots of room outside the sphere of fixed stars for heaven and hell.[318]

Hawking makes his claim, of course, without noting that Ptolemy's model was neither absolute in its distances nor ever adjusted to make it correct, in addition to implying that the Catholic Church knew of Ptolemy's alleged error yet had an ulterior motive for insisting that his

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[317] *Measuring the Universe*, p. 93.
[318] Stephen Hawking and Leonard Mlodinow, *A Briefer History of Time*, 2005, pp. 9-10.

model be preserved. The fault, of course, lies in Hawking's failure to see that if Ptolemy's model had been properly adjusted, it would have shown as much accuracy as the best heliocentric model.

As we noted previously, before Kepler's improvements to the heliocentric model, Copernicus' system was no more accurate than Ptolemy's, despite the fact that Copernicus used more epicycles than Ptolemy. As Copernicus' model was improved, so were the results of calculations to track the orbits of the planets. Yet the same kind of corrections could have been made to the Ptolemaic model to improve its accuracy, including corrections to account for the phases of Venus. The model itself did not have to be scrapped. The distance to the moon and the phases of Venus could have been made as prominent and precise as they appear in the improved Keplerian model if, instead of Ptolemy's circles: (a) the planetary orbits are made into elliptical paths around the sun[319]; (b) the sun's orbit around the Earth is made a deferent and the epicycle's radius is made equal to the actual scalar distance between the sun and planet; (c) the sun's motion is placed in one epicycle and the planets' epicycles are centered on the sun; (d) the Earth is lined up with respect to the stars rather than with respect to the sun. All four solutions would make the paths cycloidal with respect to the Earth and all will account for the phases of Venus. Option (c) is essentially the model proposed by Tycho Brahe. As astronomer Gerardus Bouw notes:

> Even astronomers and historians who should know better claim that Galileo's discovery that Venus exhibits moon-like phases disproved the Ptolemaic model. All that Galileo's observations actually meant insofar as the Ptolemaic model was concerned, was that the radii of the epicycles were much larger than had previously been suspected; and all that Kepler's elliptical orbits

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[319] Applying elliptical orbits to his model might have been something Ptolemy himself once contemplated. As Koestler notes: "A glance at the orbit of Mercury in the Ptolemaic system…shows a similar egg-shaped curve staring into one's face" (*The Sleepwalkers*, pp. 80-81). Others also saw the advantage of elliptical orbits for Ptolemy. In 1080, the Spanish-Muslim astronomer Al-Zarqali (aka Arzachel) became quite famous for his Toledan Tables, the forerunner of the Alfonsine Tables (published in 1252 A.D.), of planetary positions. Originally written in Arabic, only two Latin translations have survived. Along with his six astrolabes, the Toledan Tables reveal Al-Zarqali was aware of the improvements available to the Ptolemaic system by means of elliptical orbits, but at this time in history, deference to the perfect circle was simply too strong to be overcome.

meant to the Ptolemaic model was that two of the epicycles could be combined into one ellipse.[320]

Julian Barbour adds:

> The phases of the planets, visible through the telescope, especially in the case of Venus, provided strong confirmation of the distances that Copernicus had postulated and demonstrated beyond all doubt that Venus orbited the sun….Galileo was convinced that, in confirming Copernicus's prediction, these observations proved the earth's mobility.

But Barbour lets us in on a little known secret of Ptolemy's model:

> In fact, they were still compatible with what one might call the 'essential' Ptolemaic system….The Ptolemaic theory left six free parameters that had to be fixed by guesswork. No violence was done to the essentials of the Ptolemaic theory by fixing these in such a way that the deferents of Mercury and Venus were taken equal to the earth-sun distance and the deferents of the superior planets to their actual distances from the sun. This choice has the consequence that the geometrical arrangement of the Copernican system (when treated as here in the zero-eccentricity approximation) is *exactly* reproduced, the only difference being that in one system the earth is at rest, in the other the sun. This in fact is the system which Tycho Brahe proposed….As far as astronomical observations are concerned, the Tychonic system, which is a *special case* of the Ptolemaic one, is kinematically identical to Copernicus's except in its relation to the distant stars.[321]

In other words, the phases of Venus were no proof for the heliocentric system. The fact that Ptolemy did not know the distances between the heavenly bodies was compensated by the fact that his system incorporated six variables to account for such unknown quantities, thus making his model very pliable to what would actually be observed in the future. The simple fact is, since Copernicus was influenced by many non-scientific factors, he chose not to make those adjustments and instead wanted to

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[320] Gerardus Bouw, *Geocentricity*, 1992, pp. 309-310.
[321] Julian B. Barbour, *Absolute or Relative Motion*, *Vol. 1, The Discovery of Dynamics*, Cambridge University Press, 1989, pp. 224-225, italics his.

throw the baby out with the bath water, as it were. As it stands, there was a lot of room to make adjustments to Ptolemy's model to fit the observations, but no one was willing to do so once Copernicus' system was seized and promoted by the Renaissance and Enlightenment as a means to demote the authority of Scripture and take control away from the Catholic Church to influence the minds of men. As astronomer Ivan King understood it:

> In a single phrase, the God-centered outlook of the middle ages had been replaced by the man-centered outlook of the renaissance. The change had flowed over every aspect of human activity.[322]

Objection #17: The Geocentric Model Includes Ether, but Didn't Einstein's Theory Eliminate Ether?

We will touch on this subject briefly here and then cover it in more detail in chapters 4 through 10. Suffice it to say, Einstein eliminated ether for his theory of Special Relativity in 1905. He did so, by his own admission, in order to have an answer for the 1887 Michelson-Morley experiment which showed the Earth was motionless in space.

Special Relativity did not include gravity, however. When in 1915 Einstein was forced to include gravity and develop his General Theory, he took back the ether he eliminated in Special Relativity, although he limited its properties and effects and expressed it only as a mathematical representation of space (*e.g.*, a metric tensor).

At around the same time, however, Quantum Mechanics discovered that space is not empty but is filled with infinitesimal entities that constitute a medium so dense and energetic that it is literally off-the-charts.[323] Ether thus returned to modern science, but few admitted that science had erred when Einstein had eliminated the ether in 1905. Consequently, ether was identified by other names (*e.g.*, virtual particles, zero-point energy, Higgs field, *etc*.) so as not to contradict Einstein. In

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[322] Ivan R. King, *The Universe Unfolding*, 1976, p. 126.
[323] According to Sean Carroll at California Technical Institute: "You can add up all the effects of these virtual particles…and you get infinity…So we cut things off by saying we will exclude contributions of virtual particles whose energy is larger than the Planck scale…which we have no right to think we understand what's going on…Then you get a finite answer for the vacuum, and answer that is bigger than what you observer by a factor of 10 to the 120th power." (https://www.youtube.com/watch?v=SwyTaSt0XxE &feature=watch-vrec).

fact, since Quantum Mechanics includes physical ether whereas General Relativity does not, the two theories are incompatible. String Theory, which incorporates ether, was advanced as the bridge but without much success, since it requires multiple dimensions (other than the three we have already) to provide even a superficial semblance of unity.

The fact remains that modern science believes in ether, and though its adherents may call it by different names, as Shakespeare said, "that which we call a rose by any other name would smell as sweet."[324] As noted, we will cover this subject in much more detail in the remaining chapters (especially chapter 6), but for now we will quote from one of modern science's more familiar names, Paul C. W. Davies. In an article for *New Scientist* titled "Liquid Space," he elaborates on the new ether:

> Is space just space? Or is it filled with some sort of mysterious, intangible substance. The ancient Greeks believed so, and so did scientists in the 19th century. Yet by the early part of the 20th century, the idea had been discredited and seemed to have gone for good [by Einstein's interpretation of the Michelson-Morley experiment]. Now, however, quantum physics is casting new light on this murky subject. Some of the ideas that fell from favor are creeping back into modern thought, giving rise to the notion of a quantum ether….
>
> If so, we'll have answered a question that has troubled philosophers and scientists for millennia. In the 5th century BC, Leucippus and Democritus concluded that the physical universe was made of tiny particles – atoms moving in a void. Impossible, countered the followers of Parmenides. A void implies nothingness, and if two atoms were separated by nothing, then they would not be separated at all, they would be touching. So space cannot exist unless it is filled with something, a substance they called the plenum.
>
> If the plenum exists, it must be quite unlike normal matter. For example, Isaac Newton's laws of motion state that a body moving through empty space with no forces acting on it will go on moving in the same way. So the plenum cannot exert a frictional drag – indeed, if it did, the Earth would slow down in its orbit and spiral in towards the Sun.

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[324] From the play, *Romeo and Juliet*, II, ii, 1.

Nevertheless, Newton himself was convinced that space was some kind of substance. He noted that any body rotating in a vacuum – a planet spinning in space, for example – experiences a centrifugal force. The Earth bulges slightly at the equator as a result. But truly empty space has no landmarks against which to gauge rotation. So, thought Newton, there must be something invisible lurking there to provide a frame of reference. This something, reacting back on the rotating body, creates the centrifugal force.

The 17th century German philosopher Gottfried Leibniz disagreed. He believed that all motion is relative, so rotation can only be gauged by reference to distant matter in the Universe. We know the Earth is spinning because we see the stars go round. Take away the rest of the Universe, Leibniz said, and there would be no way to tell if the Earth was rotating, and hence no centrifugal force.

The belief that space is filled with some strange, tenuous stuff was bolstered in the 19th century. Michael Faraday and James Clerk Maxwell considered electric and magnetic fields to be stresses in some invisible material medium, which became known as the luminiferous ether. Maxwell believed electromagnetic waves such as light to be vibrations in the ether. And the idea that we are surrounded and interpenetrated by a sort of ghostly jelly appealed to the spiritualists of the day, who concocted the notion that we each have an etheric body as well as a material one.

But when Albert Michelson and Edward Morley tried to measure how fast the Earth is moving through the ether, by comparing the speed of light signals going in different directions, the answer they got was zero.

An explanation came from Albert Einstein: the ether simply doesn't exist, and Earth's motion can be considered only relative to other material bodies, not to space itself. In fact, no experiment can determine a body's speed through space, since uniform motion is purely relative, he said.
Sounds OK so far, but there was one complication: acceleration. If you are in an aeroplane flying steadily, you can't tell that you're moving relative to the ground unless you look out of the

window, just as Einstein asserted. You can pour a drink and sip it as comfortably as if you were at rest in your living room. But if the plane surges ahead or slows suddenly, you notice at once because your drink slops about. So although uniform motion is relative, acceleration appears to be absolute: you can detect it without reference to other bodies.

Einstein wanted to explain this inertial effect – what we might commonly call g-forces – using the ideas of the Austrian philosopher Ernst Mach. Like Leibniz, Mach believed that all motion is relative, including acceleration. According to Mach, the slopping of your drink in the lurching aeroplane is attributable to the influence of all the matter in the Universe—an idea that became known as Mach's principle. Einstein warmed to the idea that the gravitational field of the rest of the Universe might explain centrifugal and other inertial forces resulting from acceleration.

However, when in 1915 Einstein finished formulating his general theory of relativity–a theory of space, time and gravitation – he was disappointed to find that it did not incorporate Mach's principle. Indeed, mathematician Kurt Gödel showed in 1948 that one solution to Einstein's equations describes a universe in a state of absolute rotation—something that is impossible if rotation can only be relative to distant matter. So if acceleration is not defined as relative to distant matter, what is it relative to? Some new version of the ether?

In 1976 I began investigating what quantum mechanics might have to say. According to quantum field theory, the vacuum has some strange properties. Heisenberg's uncertainty principle implies that even in empty space, subatomic particles such as electrons and photons are constantly popping into being from nowhere, then fading away again almost immediately. This means that the quantum vacuum is a seething frolic of evanescent "virtual particles."

Although these particles lack the permanence of normal matter, they can still have a physical influence. For example, a pair of mirrors arranged facing one another extremely close together will feel a tiny force of attraction, even in a perfect vacuum,

because of the way the set-up affects the behaviour of the virtual photons. This has been confirmed in many experiments.

So clearly the quantum vacuum resembles the ether, in the sense that there's more there than just nothing. But what exactly is the new version of the ether like? You might think that a real particle such as an electron moving in this sea of virtual particles would have to batter its way through, losing energy and slowing down as it goes. Not so. Like the ether of old, the quantum vacuum exerts no frictional drag on a particle with constant velocity.

But it's a different story with acceleration. The quantum vacuum does affect accelerating particles. For example, an electron circling an atom is jostled by virtual photons from the vacuum, leading to a slight but measurable shift in its energy.[325]

The ether is composed of at least two substances, one at the Planck scale (discovered by quantum mechanics) and the other at the atomic scale (discovered by experiments on the atomic nucleus). The Planck-scale ether (at 10^{-33}cm) has little effect on material bodies.[326] It travels right through them similar to how neutrinos go through solid matter. In this book we give them the name "plancktons." In contrast to the inside of an atom, they are best be pictured by the irregular shapes in the following image:

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[325] Paul Davies, "Liquid Space," *New Scientist*, Nov. 3, 2001.

[326] Planck particles are usually called "virtual particles," "zero-point energy" (ZPE) or "superstrings," in quantum mechanics since they are under the threshold of the Heisenberg Uncertainty Principle. These particles are called "virtual" because they are said to pop in and out of the universe each Planck second (10^{-44} sec). The "popping" interface is called "spacetime foam." The high energy and randomness in the "popping" predicts things like "wormholes." Craig Hogan of Fermilab is seeking to detect the foam. "Hogan's interferometer will search for a backdrop that is much like the ether—an invisible (and possibly imaginary) substrate that permeates the universe. By using two Michelson interferometers stacked on top of each other, he intends to probe the smallest scales in the universe, the distance at which both quantum mechanics and relativity break down—the region where information lives as bits. The planck scale is not just small—it is the smallest." See *Scientific American*, February 2012, pp. 32-36, and arXiv:1002.4880v27, 7 Feb 2012. Geocentric theory says Planck particles are real and do not pop in and out; the lack of "wormholes" being *prima facie* evidence.
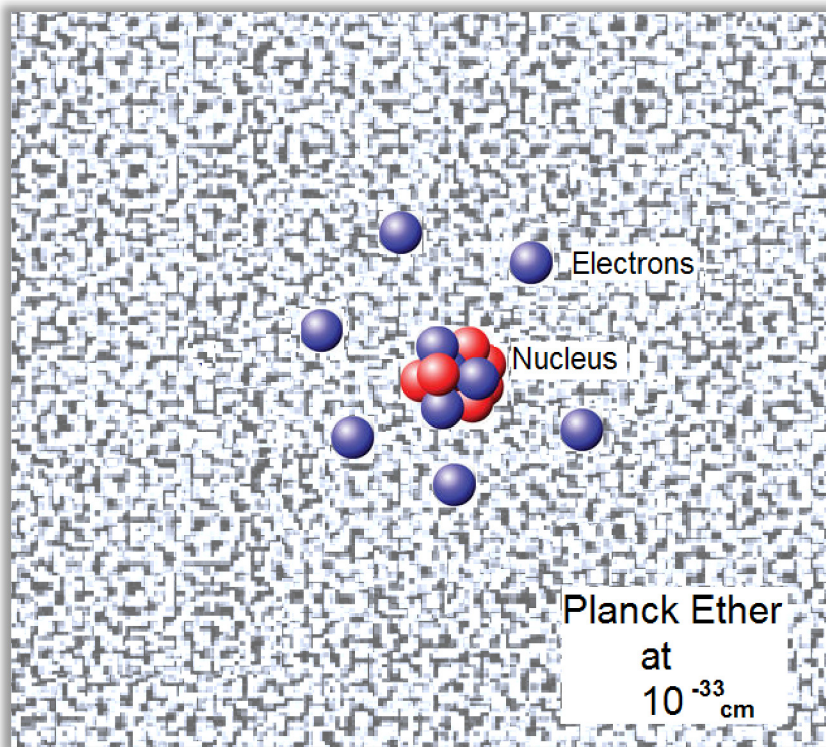
Figure 1: The Planck ether at 10^{-33}cm is represented by the irregular shapes in the background. It permeates all substances, including the atom and its constituent parts, which have dimensions between 10^{-13}cm to 10^{-9}cm.

The second type of ether is on the atomic scale and is composed of electron-positron pairs, which we call electropons. Their dimensions are on the order of 10^{-13}cm.[327] Both the planckton and electropon ethers constitute space, but the planckton ether penetrates all material substance, including the atom. As we have seen partially in this chapter and will see in much more detail in later chapters, it is these ethers which serve as the mediums for all motion, inertial forces, gravity and electromagnetism.

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[327] As we will develop more in Chapter 6, in 1932, Carl Anderson discovered that when gamma radiation of 1.022 million electron volts (MeV) was discharged in any point of space, an electron and positron emerged from that point. He also found that when an electron collides with a positron, the two particles become imperceptible and produce two gamma-ray quanta which disperse in opposite directions, but with a combined energy of 1.022 MeV.
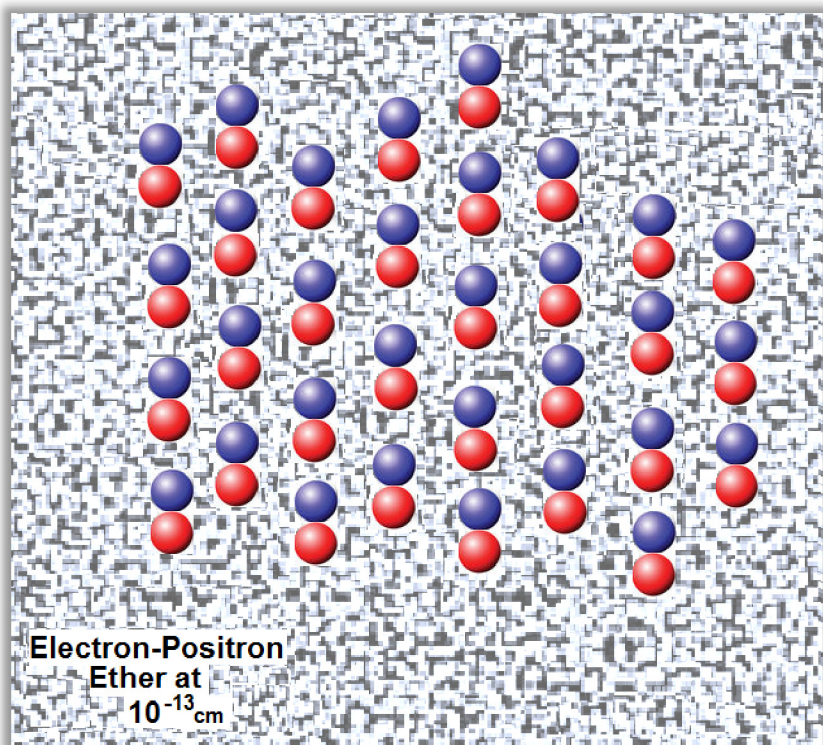
Fig. 2: The electron-positron pairings form a net or lattice in space.

Objection #18: Isn't it Impossible for the Stars to Travel so Fast Around the Earth?

Another common objection to placing the Earth in the center of our local system is that it would also need to be in the center of the universe, and thus, it would be impossible for the stars, being so far away, to revolve around the Earth on a daily basis, since they would be required to travel faster than the speed of light to complete their daily trek. As with all the objections in this section, we will answer them in more detail in later chapters, but for now we can respond in two ways. First, even assuming for the sake of argument that geocentrism holds that the stars travel faster than light (which it does not); still, those who base their objections on the tenets of modern science have little room to mount criticism. As a popular scientist explains, in Relativity theory:

…it is permissible to assume that the Earth is a nonrotating frame of reference. From this point of view, the stars will have a circular velocity around the Earth that is much greater than the speed of light. A star only ten light-years away has a relative velocity around the Earth of twenty thousand times the speed of light.[328]

A more technical book on Relativity written for the scientist admits the same:

Relative to the stationary roundabout [the Earth], the distant stars would have…linear velocities exceeding 3×10^8 m/sec, the terrestrial value of the velocity of light. At first sight this appears to be a contradiction…that the velocities of all material bodies must be less than c [the speed of light]. However, the restriction $u < c = 3 \times 10^8$ m/sec is restricted to the theory of Special Relativity. According to the General theory, it is possible to choose local reference frames in which, over a limited volume of space, there is no gravitational field, and relative to such a reference frame the velocity of light is equal to c…. If gravitational fields are present the velocities of either material bodies or of light can assume *any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout as being at rest, the centrifugal gravitational field assumes enormous values at large distances, and it is consistent with the theory of General Relativity for the velocities of distant bodies to exceed 3×10^8 m/sec under these conditions.[329]

Einstein himself admitted this very principle:

In the second place our result shows that, according to the general theory of relativity, the law of the constancy of the velocity of light *in vacuo*, which constitutes one of the two fundamental assumptions in the special theory of relativity and to which we have already frequently referred, cannot claim any unlimited validity. A curvature of rays of light can only take place when the velocity of propagation of light varies with

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[328] Martin Gardner, *Relativity Explosion*, 1976, p. 68.
[329] *An Introduction to the Theory of Relativity*, William Geraint Vaughn Rosser, 1964, p. 460. Rosser was the senior lecturer in Physics at Exeter University.

position. Now we might think that as a consequence of this, the special theory of relativity and with it the whole theory of relativity would be laid in the dust. But in reality this is not the case. We can only conclude that the special theory of relativity cannot claim an unlimited domain of validity; its results hold only so long as we are able to disregard the influences of gravitational fields on the phenomena (*e.g.*, of light).[330]

Hence, according to Einstein's own words, a limitation on the speed of light is only true when gravity does not affect the light, or, as a corollary point, variations in the gravitational field will allow variations in the speed of light. Since in a rotating universe the gravitational force increases in proportion to the radial distance from Earth, consequently, the farther the distance, the faster light will be able to travel. As we will see many times in this book, the principles of General Relativity invariably support a geocentric universe.

Another aspect of General Relativity that is directly related to whether something can travel faster than light is the so-called "expansion of space" in the Big Bang theory. According to the theory, the universe has always been expanding faster than the speed of light. The first phase came with what is known as "inflation" in which the universe came into being from an infinitesimally small point and blew out into trillions of miles of space in trillionths of a second. As Stephen Hawking describes it:

> …during this cosmic inflation, the universe expanded by a factor of 1×10^{30} in 1×10^{-35} seconds. It was as if a coin 1 centimeter in diameter suddenly blew up to ten million times the width of the Milky Way. That may seem to violate relativity, which dictates that nothing can move faster than light, but that speed limit does not apply to the expansion of space itself….physicists aren't sure how inflation happened….But if you go far enough back in time, the universe was as small as the Planck size, a billion-trillion-trillionth of a centimeter…[331]

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[330] Albert Einstein, *Relativity: The Special and General Theory*, 1920, p. 76; Methuen, London; Albert Einstein, *Relativity: The Special and the General Theory*, authorized translation by Robert W. Lawson, 1961, p. 85. In his first paper on General Relativity in 1912, Einstein stated: "the constancy of the velocity of light can be maintained only insofar as one restricts oneself to spatio-temporal regions of constant gravitational potential…" (Albert Einstein, 1912, Anallen Physik 38, 1059).

[331] *The Grand Design*, pp. 129-131. The theorists hold that the Big Bang started 13.5 billion years ago in the Planck dimensions from a volume of 10^{-40} cubic

After the initial inflation, the universe slowed down to an "expansion," but which is also proceeding much faster than the speed of light.[332] The explanation for this apparent anomaly is that it is not the material substance of the universe that is expanding but only its "space," whatever that is. In fact modern science has a number of reasons why it believes various entities can, indeed, go faster than light – all, of course, being disclaimed as 'not defying the Special Theory of Relativity.'[333] But for the sake of argument, let's limit the discussion to "space" expansion. If space is expanding faster than light, why can't space rotate faster than light? There is simply no reason why the edge of the universe could not

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centimeters with a diameter of 3.14×10^{-13} centimeters, and was filled with particles of 1.62×10^{-33} centimeters packed solidly and having a density of 4.22×10^{93}, and a gravitational attraction between each particle of 1.3×10^{49} dynes (roughly 10^{46} greater than Earth's gravity). These theorists conveniently choose the Planck dimensions in order to avoid the infinite dimensions demanded by a singularity. The advocates postulate that a group of these Planck particles numbering 10^{60} spontaneously broke away, creating a hole of 3.14×10^{-13} centimeters in diameter but which was filled in 2×10^{-23} seconds. For some unexplained reason, the implosion does not reabsorb the 10^{60} particles (even though the gravitational attraction is immense), and the 10^{60} Planck particles do not remember that they are supposed to cease existing in 4×10^{-44} seconds but keep expanding into what we now have as the present universe (satirically described by G. Bouw in *The Biblical Astronomer*, vol. 12, no. 99 & vol. 13, no. 104, 2002). For the record, other physicists say that Inflation occurred by a factor of 10^{50} in 10^{-50} seconds, but with numbers this large, who is counting?

[332] http://en.wikipedia.org/wiki/Inflation_(cosmology).

[333] From Wikipedia: "There are many galaxies visible in telescopes with red shift numbers of 1.4 or higher. All of these are currently traveling away from us at speeds greater than the speed of light....general relativity does allow the space between distant objects to expand in such a way that they have a "recession velocity" which exceeds the speed of light, and it is thought that galaxies which are at a distance of more than about 14 billion light years from us today have a recession velocity which is faster than light" (http://en.wikipedia.org/wiki/Faster-than-light); "While special relativity constrains objects in the universe from moving faster than the speed of light with respect to each other, there is no such theoretical constraint when space itself is expanding. It is thus possible for two very distant objects to be expanding away from each other at a speed greater than the speed of light.... Over time, the space that makes up the universe is expanding. The words 'space' and 'universe', sometimes used interchangeably, have distinct meanings in this context. Here 'space' is a mathematical concept and 'universe' refers to all the matter and energy that exist. The expansion of space is in reference to internal dimensions only; that is, the description involves no structures such as extra dimensions or an exterior universe" (http://en.wikipedia.org/wiki/Metric_expansion _of_space).

rotate at any speed above light if, indeed, modern physics allows it to *expand* at any speed above light. The only difference is that one path is curved and the other is linear.

The Effect of the 1887 Michelson-Morley Experiment

This takes us to another issue concerning the speed of light: what do some modern physicists mean when they say that something cannot exceed the speed of light? It's not what you might logically think. Normally we would interpret the light speed barrier as an inherent property of nature in which, all things being equal, a material object cannot reach the speed of light, since it would actually need to be light in order to travel as fast as light. But this is not how Relativity theory explains it. In a manner of speaking, modern scientists have determined that 'all things are not equal.' The 'inequality' was invented when science had a very difficult time explaining the result of the 1887 Michelson-Morley experiment. As we noted earlier (and will investigate in much more detail in later chapters), in order to provide modern science an escape from having to conclude that the Earth was motionless in space, various scientists explained the Michelson-Morley experiment by postulating that matter compresses when it moves. They committed the most egregious fallacy in logic, *petitio principii*: using as proof that which they had not first proven. To put it bluntly, they assumed the Earth was moving as the basis to interpret an experiment that showed the Earth wasn't moving. As one of the world's premier physicists of that day, Arthur Eddington, put it:

> But it now appears that the allowance made for the motion of the observer has hitherto been too crude – a fact overlooked because in practice *all observers share nearly the same motion, that of the Earth*. Physical space and time are found to be closely bound up with this motion of the observer.[334]

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[334] Arthur Eddington, *Space, Time and Gravitation: An Outline of the General Relativity Theory*, 1923, p. v. Interestingly enough, Eddington later decries man's tendency to assume certain things as true which have not been proven. He writes: "Now the most dangerous hypotheses are those which are tacit and unconscious. So the standpoint of relativity proposes tentatively to do without these hypotheses (not making any others in their place); and it discovers that they are quite unnecessary and are not supported by any known fact" (*ibid.*, p. 28). Unfortunately, Eddington failed to see a moving Earth as one of those beliefs "not supported by any known fact." In various other places, Eddington confirms our suspicions of his predisposition: "It is well to remember that there is reasonable

In this case, Michelson's sensitive instruments, specifically designed to detect the Earth's motion, were said to register a "null" result for such an effect because, due to the pressure generated by the assumed orbit of the Earth, the instruments were said to shrink during the course of the experiment. As Eddington put it: "This would mean that the Earth's diameter in the direction of its motion is shortened by 2½ inches."[335] Having no other way to prohibit the Earth from being motionless in space, most scientists succumbed to the "shrinking matter" hypothesis, and soon it became standard fare in the world of physics. It was dubbed as the "Fitzgerald contraction," and later made into an equation called the "**Lorentz transformation**."[336]

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justification for adopting the principle of relativity even if the evidence is insufficient to prove it" (*ibid.*, p. 21).

[335] *Space, Time and Gravitation*, p. 20. He continues with the same question-begging logic in the next sentence: "The Michelson-Morley experiment has thus failed to detect our motion through the aether, because the effect looked for – the delay of one of the light waves – is exactly compensated by an automatic contraction of the matter forming the apparatus."

[336] In the equation, $L' = L\sqrt{1 - v^2/c^2}$, L' is the length of the object in motion after it is adjusted by the transform $\sqrt{1 - v^2/c^2}$. Where v = the velocity of the object moving and c = the speed of light. (For a mathematical calculator that shows the Lorentz contraction and the Einstein time dilation see: http://hyperphysics.phy-astr.gsu.edu /hbase/relativ/tdil.html). Lorentz created the transform in order to answer the Michelson-Morley experiment. Einstein, also forced by Michelson-Morley, included time in the equation $T' = T/\sqrt{1 - v^2/c^2}$, although here time is divided by the Lorentz transform instead of multiplied since the time is measured from the perspective of the moving clock, not the fixed clock. Changing time also led to changing the mass since inertial mass had to increase for the moving object to $M' = M/\sqrt{1 - v^2/c^2}$, which also led to shortening the distance the object traveled: $D' = D\sqrt{1 - v^2/c^2}$. Einstein fully admitted his use of the Lorentz transform: "The term relativity refers to time and space….This led the Dutch professor, Lorentz, and myself to develop the special theory of relativity" (Lorentz, *The Einstein Theory of Relativity*, 1920, pp. 11-12). Abraham Pais notes of his interview with Einstein: "As he told me more than once, without Lorentz he would never have been able to make the discovery of special relativity" (Pais, *Subtle is the Lord*, 1982, p. 13). In 1912, Einstein admitted: "To fill this gap, I introduced the principle of the constancy of the velocity of light, which I borrowed from H. A. Lorentz's theory of the stationary luminiferous ether…" ("Relativity and Gravitation: Reply to a Comment by M. Abraham," translated by A. Beck, *The Collected Papers of Albert Einstein*, Vol. 4. Doc. 8, 1996, p. 131). In 1935, Einstein admitted again: "…the Lorentz transformation, the real basis of the special relativity theory, in itself has nothing

The "Lorentz Transform"

$$L' = L \sqrt{1 - v^2/c^2}$$

How Did Lorentz Arrive at his "Transform"

Lorentz arrived at his "transform" equation by a very simple means. He used the Pythagorean theorem regarding a right triangle. Here's how:

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to do with the Maxwell theory." ("Elementary Derivation of the Equivalence of Mass and Energy," *Bulletin of the American Mathematical Society*, Series 2, Vol. 41, 1935, p. 230). Although here Einstein is saying that only Michelson-Morley led to Special Relativity, we must point out that Maxwell's equations are not general and invariant since they only work in a uniform ether at rest. In order to make Maxwell's equations invariant for other frames of reference, the Lorentz transform is employed, which then allows Einstein to eliminate Maxwell's ether from Special Relativity. The difference between Einstein's version and Lorentz's version of the transform is explained by Lorentz as: "The experimental results could be accounted for by transforming the co-ordinates in a certain manner from one system of co-ordinates to another. A transformation of time was also necessary. So I introduced the conception of local time, which is different for different systems of reference which are in motion relative to each other. But I never thought that this had anything to do with real time. This real time for me was still represented by the old classical notion of an absolute time, which is independent of any reference to special frames of co-ordinates. There existed for me only this one true time. I considered my time transformation only as a heuristic working hypothesis. So the theory of relativity is really solely Einstein's work. And there can be no doubt that he would have conceived it even if the work of all his predecessors in the theory of this field had not been done at all. His work is, in this respect, independent of the previous theories" ("Conference on the Michelson-Morley Experiment," *The Astrophysical Journal*, Vol. 68, No. 5, Dec. 1928, p. 350). Historian Edmund Whittaker, however, believes that Lorentz and Poincaré were the creators of Relativity (*A History of the Theories of Ether and Electricity*, vol. 1-2, 1953, pp. 27-77).

- A light beam is traveling between point A and point B in one second:

```
          Point B
             |
             |
             |
             |
          Point A
```

- Next, Point B moves to the right while the light from Point A is moving toward Point B. Since the path is longer, it will take more than one second to reach B:

```
          Point B
            /
           /
          /
         /
      Point A
```
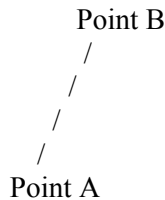
- To measure the alleged time decrease or length decrease, a right angle is made between Point A and Point B

```
        __v__ Point B
           |   /
      a    |  /
           | / c
           |/
         Point A
```
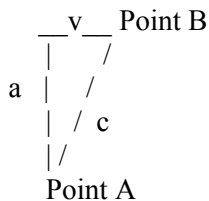
- The hypoteneuse is labeled c. The shorter line is labeled v. The other line is labeled a. The Pythagorean theorem says that the square of c is equal to the square of a + the square of v. Thus we have:

$c^2 = a^2 + v^2$ or we can bring v^2 on the other side for $c^2 - v^2 = a^2$

- Or we can say the square root of $c^2 - v^2 = a$

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$$\text{Thus } a = \sqrt{c^2 - v^2}$$

- If we take out c from the radical we have:

$$a = c\sqrt{1 - \frac{v^2}{c^2}}$$

- This is the basic form of the Lorentz contraction equation for Length (L) and Time (T), which is:

$$L_1 = L\sqrt{1 - \frac{v^2}{c^2}}$$

or

$$T_1 = T\sqrt{1 - \frac{v^2}{c^2}}$$

- For Mass increase, the equation is inverted:

$$M_1 = M \div \sqrt{1 - \frac{v^2}{c^2}}$$

Out of desperation, it was so readily accepted that it became the pat answer to every motion problem in physics. Among those answers was why no object could ever reach the speed of light. As physicist Arthur Eddington explains it:

It is no use trying to overtake a flash of light; however fast you go it is always traveling away from you at 186,000 miles a second. Now from one point of view this is a rather unworthy deception that Nature has practiced upon us. Let us take our favourite observer who travels at 161,000 miles a second and

send him in pursuit of the flash of light. It is going 25,000 miles a second faster than he is; but that is not what he will report. Owing to the contraction of his standard scale his miles are only half-miles; owing to the slowing down of his clocks his seconds are double-seconds. His measurement would therefore make the speed 100,000 miles a second (really half-miles per double-second). He makes a further mistake in synchronizing the clocks with which he records the velocity….This brings the speed up to 186,000 miles a second. From his own point of view the traveler is lagging hopelessly behind the light; he does not realize what a close race he is making of it, because his measuring appliances have been upset.[337]

So here we see that the "traveler" is, as Eddington admits, coming close to, and could possibly match, the speed of light, but because his instruments have shrunk and his clock moves slower due to his excessive speed, it will *only appear* as if it is impossible to catch the light beam. Welcome to the bizarre world of Relativity. On the stage is reality versus illusion, but by the very nature of its principles, Relativity is at a loss to tell us which part is reality and which part is illusion. Perhaps this is why Eddington had few qualms once referring to the Lorentz contraction as: "The shortening of the moving rod is *true*, but it is not *really true*."[338] Of course, we need to remind ourselves that the so-called 'shrinking of the instruments' and 'slowing of the clock' is all the result of the fallacious interpretation of the Michelson-Morley experiment, an interpretation that was forced upon the science establishment in order to keep the Earth from being motionless in space. To this very day, no scientist in the world has ever explained, let alone proven, the precise physical reason why matter should shrink in length when it moves, or how time can dilate in the process, yet they believe it nonetheless, for, as we will see later, it is their only defense against going back to pre-Copernican days. Later we will also see when we cover the 1913 Sagnac and 1925 Michelson-Gale interferometer experiments that were designed to measure absolute rotation between the Earth and the universe, suddenly the Lorentz transform, previously the determining factor to interpret all other interferometer experiments, is totally missing from Einstein's analysis.

We can also answer the objection by noting that, although it is to our advantage to use modern physics against itself as we do when we point out

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[337] Sir Arthur Eddington, *The Nature of the Physical World*, from the 1927 Gifford Lectures, 1929, p. 54. All spellings of words in the quote are from Eddington's British.

[338] Arthur S. Eddington, *The Nature of the Physical World*, pp. 33-34.

that General Relativity permits a body to move faster than the speed of light, the celestial mechanics of geocentrism, in fact, does not claim that the stars move faster than light. Geocentrism says that the universe rotates around the Earth once per day, and in that rotation it carries the stars with it. Thus, compared to the universe within which they are contained, the stars are not moving at all, save for the minuscule movements of their proper motion.

As we saw earlier, the universe is composed of an infinitesimal substance on the Planck scale, which Quantum Mechanics postulates is at least 10^{120} more dense and energetic than ordinary matter. Since that is the case, the universe could spin thousands of times faster than it does presently in about 24 hours and still remain stable.

Additionally, the rotation of the universe is an integral facet of the geocentric system so as to act as a counterbalance to the inward pressure of gravity. It just so happens that the centrifugal force created in the ether medium by a 24-hour rotation period prohibits the stars and other material in the universe from collapsing inward (a problem, incidentally, that Newton and Einstein recognized in their respective universes, and which Newton attempted to answer by opting for an infinite universe, and Einstein by his infamous "cosmological constant," neither of which provided an adequate solution). An advocate of Relativity can raise no objections against geocentrism's rotating universe since Relativity sees no difference, or has no way to distinguish between, a rotating Earth among fixed stars or stars that revolve around a fixed Earth. The two are relativistically equivalent.

Objection #19: Doesn't Redshift Contradict a Smaller and Younger Universe?

Even assuming that redshift is an indicator of age, velocity or distance, it is interesting to see what happens when we use Big Bang cosmology's very own formula for measuring the age and distance of celestial objects. The age is calculated by the formula $t = t_0 (1 + z)^{-3/2}$, where t_0 is the current age of the universe and z is the redshift factor of the object.[339] Most of modern cosmology believes the universe began during a

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[339] This z-factor formula is based on the so-called "dust model" of the universe wherein the major components of the universe do not exert any pressure on their surroundings. But if one were to base the z-factor on the radiation of the CMB in terms of number of particles, the formula would be $t = t_0 (1 + z)^{-2}$. This again, shows the complete arbitrariness of the formulas since they invariably depend on one's unproven assumptions.

Big Bang, and using their own assumptions and scale factors, it believes that this seminal event occurred 13.7 billion years ago, at least according to the latest data from NASA's Wilkinson Microwave Anisotropy Probe.[340] Let's say NASA finds a distant object in the sky and assigns it a z-factor of 1. NASA will then plug in the value for t_0 as 13.7 billion years and will compute a value for t, which is understood as the age of the universe when the radiation emission of the distant celestial object took place. In the case where $z = 1$ then $t = 4,844,413,013$ years. Since using the number 13.7 billion years is completely arbitrary (for it is based on the unproven Big Bang assumptions of the universe), let's say we assume t_0 is 6,000 years instead of 13.7 billion. In this case, where $z = 1$ then $t = 2,121$ years. In other words, when an astronomer sees a star with a z-factor of 1, he might just as well assume the universe was 2,121 years old rather than 4.8 billion years old, since the z-factor is only a function of one's assumption regarding the beginning of the universe. If an astronomer finds an even more distant object that correlates to a z factor of 2, then the age of the universe when the object began radiating was 1,154 on the biblical scale but 2.6 billion years on the Big Bang scale.

Of course, the biblicist does not interpret either the 2,121 years or 1,154 years as the different times that two stars were created, for he holds, on a dogmatic basis, that all the stars were created on the same day. It only means that, as the firmament expanded and carried the variously placed stars within it, their wavelength would be stretched by their medium, the firmament, in proportion to the distance they were originally placed from Earth. (See 1Co 15:41, which teaches that "star differs from star in glory," presumably because of their specific composition and purpose, which required them to be placed at different distances from the Earth). Thus, if we were to understand redshift as a distance indicator, what we see as differences in redshift values today is merely the result of the differences of the original placement of the stars on the Fourth day of creation. The

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[340] According to Stephen Hawking, "…for us to exist the universe must contain elements such as carbon, which are produced by cooking lighter elements inside stars. The carbon must then be scattered through space in a supernova explosion, and eventually condense as part of a planet in a new-generation solar system. In 1961 physicist Robert Dicke argued that the process takes about 10 billion years, so our being here means that the universe must be at least that old. On the other hand, the universe cannot be much older than 10 billion years, since in the far future all the fuel for stars will have been used up, and we require hot stars for our sustenance. Hence the universe must be about 10 billion years old. That is not an extremely precise prediction, but it is true – according to current data the big bang occurred about 13.7 billion years ago" (*The Grand Design*, 2010, p. 154).

stars that were placed closer to Earth will now exhibit lower redshift values today, and vice-versa for the stars placed farther away.

Interestingly enough, if we use modern science's formula for measuring the age of the universe when the cosmic microwave background radiation (CMB) was released, we get very close to the time we have predicted that the firmament would create the 2.73° Kelvin temperature. The formula is $T = T_0 (1 + z)^{-3/2}$. Plugging in a z-factor of 1089 for the CMB, the Big Bang theory arrives at a universe age of 380,711 years after the primordial explosion for the arrival of the CMB, whereas using the same z-factor the biblicist obtains 0.16672 years, which puts the CMB well within the first two months of the first year of creation and after the fall of man when, as we will see in Volume III, Chapter 16, according to Hildegard, the universe began rotating and the firmament needed to be cooled to 2.73° Kelvin.

Objection #20: Don't the Global Positioning Satellites Prove Relativity and Deny Geocentrism?

There is a lot of talk today that the Global Positioning Satellites (GPS) prove both the Special and General theories of Relativity, with the corollary point that the GPS are pre-programmed for an Earth that is rotating on an axis and revolving around the sun. The truth is, the Special and General theories of Relativity are disproven by the GPS; and the GPS use a non-moving Earth as its base for the mathematical calculations that keep the GPS working properly.

The GPS system is approximately 24,000 km (app. 14,900 miles), above the Earth. When an electromagnetic signal is sent from the ground station to the GPS, the signal takes 0.080 seconds to arrive based on the terrestrial speed of light at 186,000 miles per second.

To keep the GPS within at least a meter of determining a designated location on Earth, the GPS clock must be accurate to within 4 nanoseconds, which requires a time stability ratio on the order of $1:10^{13}$, and thus atomic clocks are employed for this purpose (*e.g.*, cesium clocks). Still, the GPS requires frequent uploads of "clock corrections" to keep everything in synch. Even when making adjustments for the Doppler effect and gravitational redshift, there still remains a margin of error. If these factors are not taken into account, a GPS could be off by as much as 11 km (6.8 miles) in one day.

More interesting is the fact that since the whole GPS system is revolving around the Earth, the signals sent from the ground arrive either at an approaching or a receding GPS satellite. As such, the microwave

beams sent to an approaching GPS satellite take 50 nanoseconds less time to reach the satellite than beams sent to a receding satellite. The 50-nanosecond difference is built into the computer programs of the GPS since each satellite must, without exception, take into account the Sagnac effect (*i.e.*, that electromagnetic waves in a moving device do not travel the same distance in the same time if they are sent out in opposite directions) in order for the GPS to keep accurate time and determine proper coordinates on Earth. Although the Sagnac effect will be covered more in detail in chapter 5, suffice it to say for now it demonstrates that electromagnetic beams traveling in opposite directions will not travel at the same speed. The GPS engineers admit this fact. As one states it:

> One of the most confusing relativistic effects – the Sagnac effect – appears in rotating reference frames. The Sagnac effect is the basis of ring-laser gyroscopes now commonly used in aircraft navigation. In the GPS, the Sagnac effect can produce discrepancies amounting to hundreds of nanoseconds.[341]

> The Sagnac effect is particularly important when GPS signals are used to compare times of primary reference cesium clocks at national standards laboratories far from each other….A Sagnac correction is needed to account for the diurnal motion of each receiver during signal propagation. In fact, one can use the GPS to observe the Sagnac effect.[342]

In another paragraph the technician, **Neil Ashby**, explains why the Sagnac effect occurs:

> …this creates some subtle conceptual problems that must be carefully sorted out…For example, the principle of the constancy of *c* [speed of light] cannot be applied in a rotating reference frame, where the paths of light rays are not straight.[343]

Although Ashby is somewhat forthcoming in his article concerning the difficulty the GPS has with the Sagnac effect, what he doesn't reveal is that since the GPS computers are pre-programmed to take account of the Sagnac effect, it is misleading for him or his colleagues to then claim that

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[341] Neil Ashby, "Relativity and the Global Positioning System," *Physics Today*, May 2002, p. 5.
[342] *Ibid*., p. 6. Ronald Hatch notes: "all high precision GPS applications correct for the Sagnac effect" ("Relativity and GPS," *Galilean Electrodynamics*, 6, 3, 1995).
[343] *Ibid*., p. 5.

the GPS is a demonstration of either Special or General Relativity, as he states in the following paragraph:

> Relativistic coordinate time is deeply embedded in the GPS. Millions of receivers have software that applies relativistic corrections. Orbiting GPS clocks have been modified to more closely realize coordinate time. Ordinary users of the GPS, through they may not need to be aware of it, have thus become dependent on Einstein's conception of space and time.[344]

> Another popular Relativity writer puts it this way:

> GPS accounts for relativity by electronically adjusting the rates of the satellite clocks, and by building mathematical corrections into the computer chips which solve for the user's location. Without the proper application of relativity, GPS would fail in its navigational functions within about 2 minutes.[345]

Propping up Special Relativity and dismissing the GPS's difficulty with the Sagnac effect is accomplished by claiming, as Ashby puts it, that

> In the rotating frame of reference, light will not appear to go in all directions in straight lines with speed *c*. The frame is not an inertial frame, so the principle of the constancy of the speed of light does not strictly apply. Instead, electromagnetic signals

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[344] *Ibid.*, p. 10.

[345] Clifford M. Will, "Einstein's Relativity and Everyday Life," http://www. physicscentral.com/explore/writers /will.cfm. See also *Scientific American*, Philip Yam's article titled *Everyday Einstein*," September 2004, p. 54: "Today most store-bought GPS receivers can pin down your position to within about 15 meters. Accuracy of less than 30 meters, notes physicist Neil Ashby of the University of Colorado at Boulder, assuredly means that a GPS receiver incorporates relativity. 'If you didn't take relativity into account, then the clocks up there would not be in sync with the clocks down here,' elaborates Clifford Will….Relativity states that fast-moving objects age more slowly than stationary ones. Each GPS satellite zips along at about 14,000 kilometers per hour, meaning that its onboard atomic clock lags the pace of clocks on the earth by about seven microseconds per day, Will calculates. Gravity, however, exerts a greater relativistic effect on timing. At an average of 20,000 kilometers up, the GPS satellites experience one fourth of the gravitational pull they would on the ground. As a result, onboard clocks run faster by 45 microseconds per day. An overall offset of 38 microseconds thus has to be figured into GPS."

traversing a closed path will take a different amount of time to complete the circuit.[346]

Much of this selective approach to dealing with the mechanics of the GPS will probably go unnoticed by the general public except for the fact that its anomalies sooner or later need to be dealt with in everyday life. For example, farmers use the GPS to guide their tractors over fields. The farmers hire companies that specialize in writing computer programs for their tractors that coordinates with the GPS system. One such company is NavCom Technology Inc. in California.[347] According to its leading physicist, Ronald Hatch, it is apparent that Ashby's dealing with the Sagnac effect is fallacious. He writes:

In point of fact, rotation is only incidentally involved with the Sagnac effect. The Sagnac effect is the result of a non-isotropic speed of light and arises any time an observer or measuring instrument moves with respect to the frame chosen as the isotropic light-speed frame. And it is here that the Sagnac effect runs into trouble with the special theory. The special theory by postulate and definition of time synchronization requires that the speed of light always be isotropic with respect to the observer. And this is where the special theory is in error—the Sagnac effect illustrates that error.[348]

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[346] "Relativity and GPS," Part I, Galilean Electrodynamics, 6, 3, 1995.

[347] http://www.navcomtech.com.

[348] "Relativity and GPS," Part I, Galilean Electrodynamics, 6, 3, 1995. Hatch continues: "Since relativists do not like to admit that non-isotropic light speed exists, they attempt to explain the effect by other mechanisms. The most commonly referenced paper on the Sagnac effect is by E. J. Post. He claims: 'Thus in order to account for the asymmetry [between the clockwise and counterclockwise beams] one has to assume that either the Gaussian field identification does not hold in a rotating frame or that the Maxwell equations are affected by rotation. All existing evidence for the treatment of non-reciprocal phenomena in material media points in the direction of modified constitutive relations, not in modified Maxwell equations.' Thus, Post claims the effect is caused by some underlying property of space which arises during rotation. As we shall see, this is an inadequate explanation. To his credit, Post also said: 'The search for a physically meaningful transformation for rotation is not aided in any way whatever by the principle of general space-time covariance, nor is it true that the space-time theory of gravitation plays any direct role in establishing physically correct transformations.' In this quote, Post clearly excludes the general theory as a source of explanation for the Sagnac effect."

Special Relativity (SRT) claims the Sagnac effect is due to the rotation. Since rotation is not relative, the Sagnac effect can be due to non-isotropic light speed [*i.e.*, varying light speed] and still be consistent with Special Relativity. The effect of the movement of the receiver during the transit time of a GPS signal is referred to in the GPS system as the one-way Sagnac effect. However, it is not at all evident that the Sagnac effect is due to rotation…the Sagnac effect exists not only in circular motion, but also in translational motion.[349]

This observation validates Ives' claim that the Sagnac effect is not caused by rotation. In 1938 Ives showed by analysis that the measured Sagnac effect would be unchanged if the Sagnac phase detector were moved along a cord of a hexagon-shaped light path rather than rotating the entire structure. Thus, he showed the effect could be induced without rotation or acceleration.[350]

In other words, Special Relativity is not exempt from maintaining its principle postulate (*i.e.*, that the speed of light is constant) when rotation is involved since the Sagnac effect does not depend on rotation. This is a clear case of GPS engineers trying to pull the wool over the public's eyes.

Hatch further states:

We have even more convincing data that Ashby's claim is false. NavCom Technology, Inc. has licensed software developed by the Jet Propulsion Lab (JPL) which, because of historical reasons, does the entire computation in the ECI frame. Because of some discrepancies between our standard earth-centered earth-fixed solution results and the JPL results, we investigated the input parameters to the solution very carefully. The measured and theoretical ranges computed in the two different frames agreed precisely, indicating that the Sagnac correction had been applied in each frame.

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[349] Ruyong Wang and Ronald R. Hatch, *Conducting a Crucial Experiment of the Constancy of the Speed of Light Using GPS*, ION GPS 58th Annual Meeting / CIGTF 21st Guidance Test Symposium, 2002, p. 500. Hatch is a former president of the Institute of Navigation and current Director of Navigation Systems Engineering of NavCom Technologies. He has spent his whole career as a leader in satellite navigation systems and is one of the world's foremost authorities on the GPS. He also holds many patents on GPS-related hardware.

[350] "Relativity and GPS," Part I, Galilean Electrodynamics, 6, 3, 1995.

In other words, JPL technicians pre-program the GPS computers with the Sagnac effect in order to compensate for a speed of light that varies between advancing and receding satellites in the GPS system.

> As the discussion of the Sagnac effect indicates, the fundamental question regarding the speed of light is the following: Is the speed of light constant with respect to the observer (receiver) or is it constant with respect to the chosen inertial ECI frame? Clearly the GPS range equation indicates the speed of light is constant with respect to the chosen frame….The JPL equations, used to track signals from interplanetary space probes, verify that the speed of light is with respect to the chosen frame. In the JPL equations, the chosen frame is the solar system barycentric frame….Clearly, the JPL equations treat the speed of light as constant with respect to the frame – not as constant with respect to the receivers.[351]

In other words, contrary to the claims of Special Relativity, the speed of light is not constant with respect to all observers. The speed of light is not c but $c + v$ or $c − v$, which explains why there is a 50 nanosecond difference from electromagnetic beams sent from GPS ground stations to receding or advancing GPS satellites, respectively. In the end, the GPS does not support Special Relativity.

Interestingly enough, advocates of Relativity theory employ the same fudge factor for the Sagnac effect that they do with the Michelson-Morley effect – the handy mathematical fix-it called the "Lorentz transform," invented in the late 1800s to allow modern science to escape the evidence revealing the Earth was motionless in space. As Hatch notes:

> Thus, with the help of this additional postulate, acceleration within the special theory can be handled by successive infinitesimal Lorentz transformations (Lorentz boosts)….It is not valid to perform instantaneous Lorentz boosts per the special theory to keep the speed of light isotropic with respect to the Sagnac phase detector. The Sagnac effect on GPS signals in transit proves that the special theory magic does not keep the light speed isotropic relative to the moving receiver.[352]

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[351] *Ibid*., p. 500.

[352] *Ibid*., Hatch adds: "…no Sagnac effect can be expected. Specifically, since the detector is always in an instantaneous inertial frame (with isotropic light speed),

What, then, is the reason for the 50 nanosecond difference between moving GPS satellites, and why, for example, do atomic clocks tick faster at higher altitudes? It is the same reason why Michelson-Morley in 1887 and Georges Sagnac in 1913 saw corresponding effects in their independent experiments. The effects were caused by the presence of ether. When electromagnetic waves move through ether, whether they move rotationally or linearly, they will be impeded to a certain degree. In the case of the GPS, it is a 50 nanosecond difference. Relativity theory seeks to compensate for the 50 nanosecond difference by changing the dimensions, the mass, the space, and the time between GPS satellites. But the Sagnac effect simply will not support such manipulation of nature's essences. It is precisely because these essences cannot be changed that the GPS system is pre-programmed with the Sagnac effect before launch. In reality, moving clocks run slower simply because they meet resistance from the ether, the very ether Relativity theory denies. As Hatch notes: "The general theory ascribes a change in the rate at which clocks run to a change in the flow of time. By contrast, the ether theory ascribes the clock rate-change to an environmental effect."[353]

The reason that the speed of light in the Earth's atmosphere is either $c + v$ or $c - v$ is due to the ether which rotates around the Earth, east to west, with the rest of the universe on a 23 hour, 56 minute and 4 second sidereal rate. Hence, GPS electromagnetic signals sent east-to-west travel at $c + v$;

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the velocity of light arriving at the detector from both directions ought to be the same at all times."

[353] "Relativity and GPS," Part I, Galilean Electrodynamics, 6, 3, 1995. Relativists are divided as to whether General Relativity can explain the Sagnac effect. E. J. Post says no; it is due to some physical aspect of space itself: "Thus in order to account for the asymmetry [between the clockwise and counterclockwise beams] one has to assume that either the Gaussian field identification does not hold in a rotating frame or that the Maxwell equations are affected by rotation. All existing evidence for the treatment of non-reciprocal phenomena in material media points in the direction of modified constitutive relations, not in modified Maxwell equations….The search for a physically meaningful transformation for rotation is not aided in any way whatever by the principle of general space-time covariance, nor is it true that the space-time theory of gravitation plays any direct role in establishing physically correct transformations" (E. J. Post, "Sagnac Effect," *Review of Modern Physics*, Vol. 39, pp. 475-493, 1967). Other Relativists (*e.g.*, Ashtekar and Magnon) say the Sagnac effect is due to acceleration and thus solvable by General Relativity but, ironically, they start from the fact that light speed is not isotropic relative to the receiver at all times! (Abhay Ashtekar and Anne Magnon, "The Sagnac effect in general relativity," Journal of Mathematical Physics, Vol. 16, No. 2, Feb. 1975, pp 341-344). See Hatch's "GPS and Relativity" paper for more information.

while those sent west-to-east travel at $c - v$. This difference in the speed of light is known as the Sagnac effect. Modern cosmologists and technicians compensate for the difference by employing the Lorentz transform ($\sqrt{1 - v^2/c^2}$), but then claim that the GPS works on the principle of Relativity. This is a classic case of bait and switch.

Objection 21: Doesn't Dark Matter Prove Earth Isn't Special?

Today we hear a lot of talk in cosmological circles about Dark Matter. All kinds of claims are being made as to what it is and what it does. Take, for example, the words of Michio Kaku. In one interview he says:

> Believe it or not, the Hubble Space telescope over the last several years has been giving us maps of something called dark matter. Dark matter makes up most of the universe. It's not made out of atoms. Your chemistry teacher was wrong in saying that the universe is mainly made out of atoms…. Whole generations of textbooks have now had to be thrown out….It's invisible. You cannot photograph dark matter. We know it's there because of its gravitational presence.[354]

Kaku is very clever in his choice of language. When he says, "we know it's there because of its gravitational presence" he is really saying 'although we have no observational evidence it exists, it must exist because present theories about gravity cannot work without it.'

How did this come about? In the 1970s, **Vera Rubin** of Cal Tech discovered that galaxies do not rotate according to Newton's laws.[355] The outer rims of spiral galaxies are rotating too fast for the amount of matter its spiral arms contain – about ten times too fast. Instead

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[354] Michio Kaku, interviewed on "Parallel Universes" on the BBC February 14, 2002. http://www.bbc.co.uk/ science/horizon/2001/parallelunitrans.shtml. In his book, *Parallel Worlds*, p. 11, Kaku states: "After thousands of painstaking experiments, scientists had concluded that the universe was basically made of about a hundred different types of atoms, arranged in an orderly periodic chart....The WMAP has now demolished that belief."

[355] Kaku states in *Parallel Worlds*, pp. 72-73: "In 1962, the curious problem with galactic motion was rediscovered by astronomer Vera Rubin. She studied the

of revolving like the planets do around the sun wherein the outer planets travel much slower than the inner planets, the outer arms of spiral galaxies travel only a little less than the inner arms. This presents a huge problem for the Big Bang advocates who claim that the universe is 13.7 billion years old. If these fast spinning spiral galaxies are going to survive 13.7 billion years without wrapping themselves up into a compact ball, they are going to need an external force to stop the collapse. Enter Dark Matter. To conform to Newtonian formalism, the galaxies need about 23% more matter than they presently contain, and the matter needs to be properly distributed around the galaxy.[356] Below is an illustration of how today's scientists believe Dark Matter exists within and around a typical galaxy.

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rotation of the Milky Way galaxy…she found that the stars rotated around the galaxy at the same rate, independent of their distance from the galactic center (which is called a flat rotation curve), thereby violating the precepts of Newtonian mechanics. In fact, she found that the Milky Way galaxy was rotating so fast that, by rights, it should fly apart….By 1978, Rubin and her colleagues had examined eleven spiral galaxies; all of them were spinning too fast to stay together, according to the laws of Newton." In "How to See the Invisible: 3 Approaches to Finding Dark Matter," *Discover*, Feb. 22, 2012, it states: "Rubin found that stars far from the luminous central matter rotated with the same velocity as stars one-tenth the distance from the galaxy's center. This implied that the mass density did not fall off with distance, at least to the distances Rubin observed. Astronomers concluded that galaxies consisted primarily of unseen dark matter." One explanation from a geocentric system for the flat rotation curves of galaxies is that the diurnally spinning universe creates slight but noticeable vortices around galaxies that push them beyond their normal $F = ma$ limits. A related issue notes that galaxies have a preferred left-handed spin to an excess of 7%, which then translates into a preferred axis and a residual angular momentum for the whole universe. In Longo's words, "the universe was born spinning." Longo also found that the spin axis is directly related to the "axis of evil" in the CMB which is aligned with our ecliptic and equinoxes. ("Evidence for a Preferred Handedness of Sprial Galaxies," Michael Longo, *Physics Letters B* 10.1016, 2009; http://arxiv.org/ftp/arxiv/papers/ 0904/0904.2529.pdf).

[356] The problem is that astronomers are finding more mass per star count and luminosity than is allowed by Newton's laws. The Milky Way is off by about 10% and clusters of galaxies are off by more than 100%. There is generally an increase in a galaxy's radial velocity from the center, but at a certain distance from the center the velocity suddenly decreases and continues to decrease. Some rotation curves, such as the Milky Way, start from zero at the center and then increase very steeply, but then decrease very sharply and drop to about half of its original peak rotation speed, but then increases more slowly than expected in Newtonian mechanics. To give an analogy, the stars in galaxies rotate much like a tea cup in a Tilt-Ta-Whirl amusement ride. The tea cup sometimes moves slow, sometimes fast, and everywhere in between; and each tea cup moves differently. These erratic

Speed of
Phonograph Record Speed of
Spiral Galaxy Speed of Planets
Around the Sun
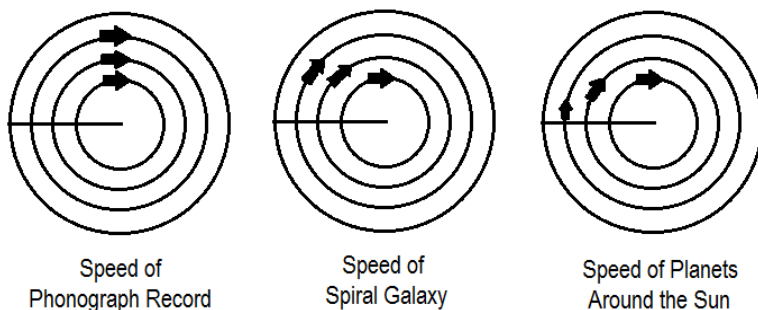
The other issue with Dark Matter is the formation of galaxies. As Marcus Chown of *New Scientist* puts it:

Dark matter has become an essential ingredient in cosmology's standard model. That's because the big bang on its own fails to describe how galaxies could have congealed from the matter forged shortly after the birth of the universe. The problem is that gas and dust made from normal matter were spread too evenly for galaxies to clump together in just 13.7 billion years. Cosmologists fix this problem by adding to their brew a vast amount of invisible dark matter which provides the extra tug needed to speed up galaxy formation.
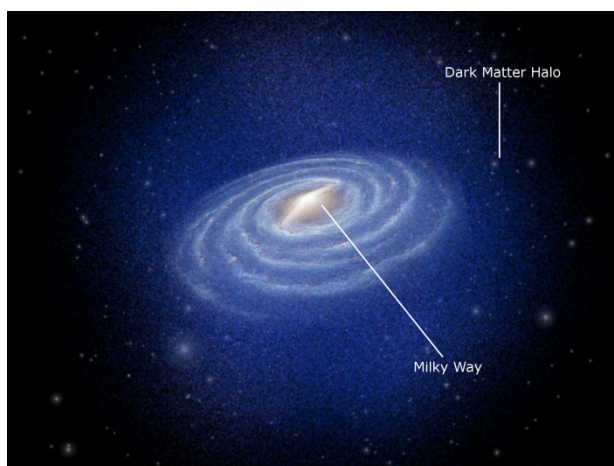
Artist's conception of a Dark Matter halo

rotation curves are more compatible with Kepler's gravity, which uses the mean density interior to the orbit instead of presuming all the mass is concentrated at the center of the orbit as in Newtonian mechanics.

The same gravitational top-up helps to explain the rapid motion of outlying stars in galaxies. Astronomers have measured stars orbiting their galactic centres so fast that they ought to fly off into intergalactic space. But dark matter's extra gravity would explain how the galaxies hold onto their speeding stars. Similarly, dark matter is needed to explain how clusters of galaxies can hold on to galaxies that are orbiting the cluster's centre so fast they ought to be flung away.

But dark matter may not be the cure-all it seems, warns Scarpa. What worries him are inconsistencies with the theory. "If you believe in dark matter, you discover there is too much of it," he says. In particular, his observations point to dark matter in places cosmologists say it shouldn't exist. One place no one expects to see it is in globular clusters, tight knots of stars that orbit the Milky Way and many other galaxies. Unlike normal matter, the dark stuff is completely incapable of emitting light or any other form of electromagnetic radiation. This means a cloud of the stuff cannot radiate away its internal heat, a process vital for gravitational contraction, so dark matter cannot easily clump together at scales as small as those of globular clusters.

Scarpa's observations tell a different story, however. He and his colleagues have found evidence that the stars in globular clusters are moving faster than the gravity of visible matter can explain, just as they do in larger galaxies. They have studied three globular clusters, including the Milky Way's biggest, Omega Centauri, which contains about a million stars. In all three, they find the same wayward behaviour. So if isn't dark matter, what is going on?

Scarpa's team believes the answer might be a breakdown of Newton's law of gravity, which says an object's gravitational tug is inversely proportional to the square of your distance from it. Their observations of globular clusters suggest that Newton's inverse square law holds true only above some critical acceleration. Below this threshold strength, gravity appears to dissipate more slowly than Newton predicts.

Exactly the same effect has been spotted in spiral galaxies and galaxy-rich clusters. It was identified more than 20 years ago by Mordehai Milgrom at the Weizmann Institute in Rehovot, Israel,

who proposed a theory known as Modified Newtonian Dynamics (MOND) to explain it. Scarpa points out that the critical acceleration of 10-10 metres per second per second that was identified for galaxies appears to hold for globular clusters too. And his work has led him to the same conclusion as Milgrom: "There is no need for dark matter in the universe," says Scarpa.[357]

Although the above picture shows the Dark Matter as a halo around the galaxy,[358] in reality modern cosmology believes that Dark Matter pervades the whole universe. For example, Kaku states: "The recent discovery of dark matter and dark energy underscores the fact that the higher chemical elements that make up our bodies comprise only 0.03 percent of the total matter/energy content of the universe."[359] How this pervasiveness allows the individual arms of the galaxy to have disproportionate rotation rates is not explained.

Instead of modifying either the concept of galaxies and what makes them spin, or even Newton's laws (as they once changed because of the perihelion of Mercury) and questioning the basis of the Big Bang,[360] modern cosmology invented the matter it needed without the slightest observational evidence for its existence.[361] As such, when Prof. Kaku says

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[357] "Did the big bang really happen," Marcus Chown, *New Scientist*, July 2, 2005, p. 4.

[358] In *Parallel Worlds*, p. 12, Kaku states: "According to the WMAP, 23 percent of the universe is made of a strange, undetermined substance called dark matter, which has weight, surrounds the galaxies in a gigantic halo, but is totally invisible." Kaku also claims: "Although invisible, this strange dark matter can be observed indirectly by scientists because it bends starlight" (p. 73); and says, "in 1979, the first partial evidence of lensing was found by Dennis Walsh…who discovered the double quasar Q0957+561. In 1988, the first Einstein ring was observed from the radio source MG1131+0456" (p. 264). See Appendix 3: "Gravitational Lensing: Real or Imagined?" for a refutation of this claim concerning the double quasar and Einstein's Cross.

[359] *Parallel Worlds*, p. 347.

[360] Kaku states: "An alternative theory, first proposed in 1983, tried to explain the anomalous orbits of stars in the galaxies by modifying Newton's laws themselves. Perhaps dark matter did not really exist at all but was due to an error within Newton's laws. The survey data cast doubt on this theory" (*Parallel Worlds*, p. 270).

[361] The precise word "invented" was used by Sean Carroll, astrophysicist at California Technical Institute: "We have very good limits from Big Bang nucleosynthesis…on the total amount of ordinary matter in the universe. It is not nearly enough to account for the gravitational fields in galaxies and clusters of

that he knows Dark Matter exists by its "gravitational presence" he is merely referring to the fact that the gravity of galaxies doesn't work unless science arbitrarily adds Dark Matter in by hand. To cover up the fact that the matter is neither empirically verified nor falsifiable, Kaku claims that it is a wholly different substance than ordinary baryonic matter and thus it is undetectable (*i.e.*, "invisible because light goes beneath it") yet Newton's law (*F = ma*) acts as if the Dark Matter was normal baryonic matter. Hence, Dark Matter can change its spots depending on its environment. In all this conjecture, not the slightest shame is admitted in calling this "science." The conjectures of modern cosmology to make Dark Matter appear is no different than a magician pulling a rabbit out of a hat. It is a classic case of the tail wagging the dog.

The main reason for this desperate sprinkling of Dark Matter into the celestial soup is that modern cosmologists despise the fact that Earth and its environs seem to be working under different physical laws than the rest of the universe. This makes the Earth special, which is the last thing Big Bang science wants. Dark Matter was invented as the great equalizer, the pixie dust that makes everything homogeneous.

The hard truth is that the empirical evidence reveals a whole different reality. For example, a recent study by Chilean astronomers shows, once again, that Dark Matter is a figment of modern cosmology's imagination. The report in *ScienceDaily* states:

> The most accurate study so far of the motions of stars in the Milky Way has found no evidence for dark matter in a large volume around the Sun. According to widely accepted theories, the solar neighbourhood was expected to be filled with dark matter, a mysterious invisible substance that can only be detected indirectly by the gravitational force it exerts. But a new study by a team of astronomers in Chile has found that these theories just do not fit the observational facts. This may mean that attempts to directly detect dark matter particles on Earth are unlikely to be successful. A team using the MPG/ESO 2.2-metre telescope at the European Southern Observatory's La Silla Observatory, along with other telescopes, has mapped the motions of more than 400 stars up to 13,000 light-years from the Sun. From this new data they have calculated the mass of material in the vicinity of the Sun, in a volume four times larger than ever considered

galaxies. In order to make sense of this, *we need to invent dark matter*, some kind of matter that is not ordinary, that is not found in the standard model. There is about five times as much dark matter in the universe as there is ordinary matter" (https://www.youtube.com/watch?v=SwyTaSt0XxE&feature=watch-vrec).

before. "The amount of mass that we derive matches very well with what we see – stars, dust and gas – in the region around the Sun," says team leader Christian Moni Bidin (Departamento de Astronomía, Universidad de Concepción, Chile). "But this leaves no room for the extra material – dark matter – that we were expecting. Our calculations show that it should have shown up very clearly in our measurements. <u>But it was just not there!</u>"

Dark matter is a mysterious substance that cannot be seen, but shows itself by its gravitational attraction for the material around it. This extra ingredient in the cosmos was originally suggested to explain why the outer parts of galaxies, including our own Milky Way, rotated so quickly, but dark matter now also forms an essential component of theories of how galaxies formed and evolved. Today it is widely accepted that this dark component constitutes about the 80% of the mass in the Universe, despite the fact that it has resisted all attempts to clarify its nature, which remains obscure. All attempts so far to detect dark matter in laboratories on Earth have failed. By very carefully measuring the motions of many stars, particularly those away from the plane of the Milky Way, the team could work backwards to deduce how much matter is present. The motions are a result of the mutual gravitational attraction of all the material, whether normal matter such as stars, or dark matter. Astronomers' existing models of how galaxies form and rotate suggest that the Milky Way is surrounded by a halo of dark matter. They are not able to precisely predict what shape this halo takes, but they do expect to find significant amounts in the region around the Sun. But only very unlikely shapes for the dark matter halo – such as a highly elongated form – can explain the lack of dark matter uncovered in the new study.

The new results also mean that attempts to detect dark matter on Earth by trying to spot the rare interactions between dark matter particles and "normal" matter are unlikely to be successful. "Despite the new results, the Milky Way certainly rotates much faster than the visible matter alone can account for. So, if dark matter is not present where we expected it, a new solution for the missing mass problem must be found. Our results contradict the currently accepted models. The mystery of dark matter has just become even more mysterious. Future surveys, such as the ESA

Gaia mission, will be crucial to move beyond this point," concludes Christian Moni Bidin.[362]

There is one interesting irony of the Dark Matter issue. Whereas Vera Rubin's discovery of the anomalous nature of galaxy rotation showed how easily modern cosmology will abandon the empirical approach in order to save their cherished Big Bang paradigm, another discovery of Rubin's provided science with the solution to the Dark Matter problem, but it was summarily ignored. Rubin discovered that if we add all the known motions in the galactic plane, the sum of motion is zero in the Earth's vicinity. This finding amounts to the Earth being in the center and was the very reason Rubin said before her research, "Hopefully, it will not force a return to the pre-Copernican view of a hierarchy of motions whose sum is zero at the Sun."[363] The irony of the matter is that modern science has discovered that if the Earth were in the center, there would be no need for such "dark" fudge factors.[364]
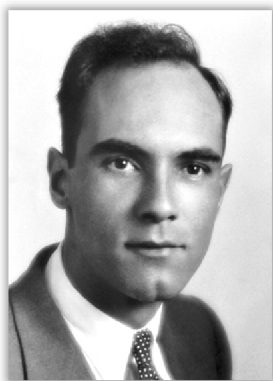
Still they try. The latest claim for possibly discovering Dark Matter hails from the Alpha Magnetic Spectrometer, a particle collector mounted on the outside of the International Space Station. MIT physicist, Samuel Ting, AMS's principle investigator, believes that Dark Matter annihilates itself and forms electrons and positrons. If there are more positrons than expected or their distribution is isotropic, Ting believes it may indicate the prior presence of Dark Matter.[365] Besides the fact that it is speculation, it resembles the same misinterpretation that occurred in 1932 when **Carl Anderson** discovered the positron (which was previously

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[362] "Serious Blow to Dark Matter Theories? New Study Finds Mysterious Lack of Dark Matter in Sun's Neighborhood," *ScienceDaily*, Apr. 18, 2012. The Chilean group of Astronomers consists of: C. Moni Bidin (Departamento de Astronomía, Universidad de Concepción, Chile), G. Carraro (European Southern Observatory, Santiago, Chile), R. A. Méndez (Departamento de Astronomía, Universidad de Chile, Santiago, Chile) and R. Smith (Departamento de Astronomía, Universidad de Concepción, Chile).

[363] Vera C. Rubin, Norbert Thonnard and W. Kent Ford, Jr., "Motion of the Galaxy and the Local Group determined from the velocity anisotropy of distant Sc I galaxies," *The Astronomical Journal*, vol. 81, No. 9, Sept. 1976, p. 735.

[364] See chapter 3's coverage of Oxford scientist Timothy Clifton in the subtitled section "Dark Energy or Geocentrism?"

[365] http://www.space.com/19845-dark-matter-found-nasa-experiment.html

theorized by Paul Dirac in 1928). Anderson found that when gamma radiation of no less than 1.022 million electron volts (MeV) was discharged at any point of space in his laboratory, an electron and positron emerged from that point.[366] He also found the converse, that is, when an electron collides with a positron, the two particles disappear, as it were, and produce two gamma-ray quanta which disperse in opposite directions, but with a combined energy of 1.022 MeV. In the heyday of Einstein's E = mc^2, this phenomenon was interpreted to be proof that matter could be created and annihilated out of thin air. The same appears to be the case in Ting's theory, since the AMS is based on detecting gamma radiation that produces positrons. Unfortunately, these scientists forgot to consider that electron/positron pairings may fill all of space and that sufficient gamma radiation releases the pairings. But, of course, if that were true than Einstein's etherless space would have been nullified, and so would both Special and General Relativity.

Objection #22: Doesn't Dark Energy Prove the Earth is Expanding Outward Along with Everything Else?

Dark Energy is simply another fudge-factor of modern Big Bang cosmology. Like Dark Matter, they cannot see, hear, feel, taste or touch it, but they "know" it is there. Why? Because the acceleration needed for the Big Bang expansion could not occur without it. It would be the same as if you put a gallon of gas in a car to take you on a trip that you know requires twenty gallons. Instead of going on the trip, you sit at your desk and work out a mathematical formula that contains that extra nineteen gallons, and then you advertise the formula as if it is the reality. As Kaku puts it:

> The greatest surprise of the WMAP data…was that 73 percent of the universe…is made of a totally unknown form of energy called dark energy….Introduced by Einstein himself in 1917…is now believed to create a new antigravity field which is driving the galaxies apart.[367]

Suffice it to say, "WMAP" showed no such thing. WMAP merely showed a universe that had too little energy to do what modern cosmology desperately needed it to do, so they invented the needed energy and called it "dark" because this would give the impression it really exists even

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[366] 1.022 MeV equals 3.9 × 10^{-19} calories.
[367] *Parallel Worlds*, p. 12.

though it cannot be detected. Similar to Kaku, other cosmologists make it appear as if the seeds of "dark energy" were already in Einstein's theories. For example, Brian Greene says:

> What force could be driving every galaxy to rush away from every other faster and faster? The most promising answer comes to us from an old idea of Einstein's….But in Einstein's general theory of relativity, gravity can also do something else: it can push things apart….Einstein's equations show that if space contains something else – not clumps of matter but an invisible energy, sort of like invisible must that's uniformly spread through space – then the gravity exerted by the energy mist would be repulsive. Which is just what we need to explain the observations. The repulsive gravity of an invisible energy must filling space – we now call it dark energy – would push every galaxy away from every other, driving the expansion to speed up, not slow down.[368]

The draw to Einstein is very great in modern cosmology. Since he is propped up as such an authority, the temptation to trace current theories to his theoretical foundations is quite common. The truth is, however, that the only commonality that modern Dark Energy theorists have with Einstein is that both invented what they needed to permit their theories to work as

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[368] "New Secrets of the Universe," Brian Greene, *Newsweek*, May 28, 2012, p. 23. Elsewhere Greene makes it appear as if Dark Energy has actually been discovered (e.g., "why do we humans find ourselves in a universe with the particular amount of dark energy we've measured" p. 24). Greene is referring to the fact that Big Bang cosmology has taken Einstein's original Λ (*i.e.*, the "cosmological constant" to keep the universe static) and put it on the other side of his tensor equation to represent Dark Energy so that the universe will expand at the needed accelerated rate. So, what was Einstein's $G_{\mu\nu} - \Lambda g_{\mu\nu} = 8\pi G T_{\mu\nu}$ is now the Big Bang's $G_{\mu\nu} = 8\pi G T_{\mu\nu} + \Lambda g_{\mu\nu}$. The term $G_{\mu\nu}$ is the curvature tensor, which is the geometry of Einstein's 'spacetime.' The term $T_{\mu\nu}$ is the stress- or energy-momentum tensor, which represents the precise distribution of matter and energy in the universe. In other words, the geometry of space is curved based on the amount of matter and energy it contains. The term G is the universal gravitational constant. The term $g_{\mu\nu}$ is the spacetime metric tensor that defines distances. The 8π is the factor necessary to make Einstein's gravity reduce to Newton's gravity in the weak or minimal field limit. As it stands, in the equation $G_{\mu\nu} = 8\pi G T_{\mu\nu} + \Lambda g_{\mu\nu}$, the $\Lambda g_{\mu\nu}$ is Dark Energy and $8\pi T_{\mu\nu}$ is baryonic matter and Dark Matter. Often the term $\Lambda g_{\mu\nu}$ is replaced by $\rho_{vac} g_{\mu\nu}$, which more accurately represents the energy of the quantum vacuum, whereas $\Lambda g_{\mu\nu}$ is more accurately General Relativity's concept of spacetime.

they wanted them to work; and both were motivated to do so in order to preserve the reigning cosmological paradigm from which they were spawned, the Copernican Principle. The real truth is that Einstein's classical General Relativity can only account for the 4% of the universe. Since the universe is now claimed to be 96% Dark Energy and Dark Matter, and if they still wanted Einstein to be their mentor, they needed to make Einstein's theory come up to snuff. They then decide to inject it with a booster shot called Lambda, which is 73% of the 96%, and the two are given the acronym LCDM or ΛCDM (which stands for Lambda plus Cold Dark Matter). However, adding Lambda to General Relativity's original tensor equation caused a huge problem. It required that they redefine General Relativity, since it does not work with Lambda. That is, unless Lambda equals zero, General Relativity cannot add up its tensors.[369]

This takes us back to the basic problem with modern cosmology. The Big Bang, in opposition to Steady State cosmology, believes in a beginning to our universe – an explosion of some undefined infinitesimal entity that occurred 13.7 billion years ago. This entity is said to have been

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[369] As Misner, *et al*, put it: "The only conceivable modification that does not alter vastly the structure of the theory is to change the lefthand side of the geometrodynamic law $G = 8\pi T$. Recall that the lefthand side is *forced* to be the Einstein tensor, $G_{\alpha\beta} = R_{\alpha\beta} - \frac{1}{2}R_{\alpha\beta}$, by three assumptions: (1) G vanishes when spacetime is flat; (2) G is constructed from the Riemann curvature tensor and the metric and nothing else; (3) G is distinguished from other tensors that can be built from **Riemann** and g by the demands (1) that it be linear in Riemann, as befits any natural measure of curvature; (2) that, like T, it be symmetric and of second rank; and (3) that it have an automatically vanishing divergence, $\nabla \cdot G \equiv 0$. Denote a new, modified lefthand side by "G," with quotation marks to avoid confusion with the standard Einstein tensor. To abandon $\nabla \cdot G \equiv 0$ is impossible on dynamic grounds (see §17.2). To change the symmetry or rank of "G" is impossible on mathematical grounds, since "G" must be equated to T. To let "G" be nonlinear in **Riemann** would vastly complicate the theory. To construct "G" from anything except **Riemann** and g would make "G" no longer a measure of spacetime geometry and would thus violate the spirit of the theory. After much anguish, one concludes that the assumption which one might drop with least damage to the beauty and spirit of the theory is assumption (1), that "G" vanish when spacetime is flat. But even dropping this assumption is painful: (1) although "G" might still be in some sense a measure of geometry, it can no longer be a measure of curvature; and (2) flat, empty spacetime will no longer be compatible with the geometrodynamic law ($G \neq 0$ in flat, empty space, where $T = 0$). Nevertheless, these consequences wee less painful to Einstein than a dynamic universe. The only tensor that satisfies conditions (2) and (3) [with (1) abandoned] is the Einstein tensor plus a multiple of the metric "$G_{\alpha\beta}$" = $R_{\alpha\beta} - \frac{1}{2}g_{\alpha\beta} + \Lambda g_{\alpha\beta} = G_{\alpha\beta} + \Lambda g_{\alpha\beta}$....Thus was Einstein (1917) led to his modified field equation $G + \Lambda g = 8\pi T$." (*Gravitation*, p. 410).

spawned from a previous universe, and that universe from an even earlier universe (which, as will see in chapter 3, is the same mysticism inherent in ancient Indian cosmology that believed the world rested on the backs of successive turtles).

As if getting something from nothing is not enough of a problem, the second thorn in the side for the Big Bang appears when the rate of the explosion must be determined. If it's too slow, the universe will go into what is called the "Big Crunch," that is, gravity will pull all the exploding parts back together before it can evolve into the organized biophilic system we see today. If it's too fast, the universe will be diffuse and likewise will not be able to produce galactic structure and biological life. Like Goldilocks and her porridge, the expansion must be just right otherwise life couldn't exist (at least under modern science's illusory belief in evolution as the mechanical process that produces life). Too boot, the amount of matter in the explosion must also be just right. Too much and the universe will not expand. Too little and no complex structures will be formed. As one scientist put it, it's like trying to balance a pencil on its point.

As one can see, modern cosmology is in a real pickle. But it didn't start here. When Newton discovered gravity, one of his first problems was having to deal with Copernicus' limited universe. Newton realized that the very gravity he discovered would eventually pull the stars into one massive ball. In order to compensate for this problem, Newton opted for an infinite universe. As time went by, science realized there were too many problems with an infinite universe, so Einstein tried to compensate for gravity by introducing an opposing force, which he called the "cosmological constant." As Misner, et al, describe it:

> In 1915, when Einstein developed his general relativity theory, the permanence of the universe was a fixed item of belief in Western philosophy. "The heavens endure from everlasting to everlasting." Thus, it disturbed Einstein greatly to discover that his geometrodynamic law $\mathbf{G} = 8\pi\mathbf{T}$ predicts a *non*permanent universe; a dynamic universe; a universe that originated in a "big-bang" explosion, or will be destroyed eventually by contraction to infinite density, or both. Faced with this contradiction between his theory and the firm philosophical belief of the day, Einstein weakened; he modified his theory.[370]

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[370] Misner, Thorne and Wheeler, *Gravitation*, pp. 409-410.

His new theory would reverse the effects of gravity and keep the universe from falling in on itself. The universe would remain static, not expanding or contracting. It would also follow Mach's prionciple, wherein space was defined by the matter within it. But Wilhelm de Sitter didn't follow Mach's rules and created a variation for Einstein's cosmological constant. De Sitter ignored all the matter of the universe and only concentrated on its quantum energy, an energy that would be enough to propel the expansion of the universe. So the choice was between Einstein's static but matter-filled universe and de Sitter's expanding but matter-deficient universe. Next, Alexander Friedmann then fiddled with Einstein's math and eliminated the cosmological constant and produced an expanding universe still under the constraints of General Relativity.[371] But this required that he make the equations produce a universe whose matter was spread out evenly and was the same everywhere (*i.e.*, isotropic and homogeneous), otherwise known as the "cosmological principle." This made Arthur Eddington backtrack to point out that, even with the cosmological constant, an Einstein-type universe was not really static or balanced. Since gravity and Einstein's cosmological constant (Λ) had to be balanced so perfectly (*e.g.*, like balancing a pencil on its point), even minute fluctuations would produce a runaway expansion or an unstoppable contraction. The best Friedmann could do was propose a universe with enough matter (what he called "the critical density") that would allow the universe to expand for eternity but at an ever decreasing rate, even though this solution itself was counterintuitive. As NASA puts it:

> Einstein first proposed the cosmological constant…as a mathematical fix to the theory of general relativity. In its simplest form, general relativity predicted that the universe must either expand or contract. Einstein thought the universe was static, so he added this new term [(Λ) lambda] to stop the expansion. Friedmann, a Russian mathematician, realized that this was an unstable fix, like balancing a pencil on its point, and proposed an expanding universe model, now called the Big Bang theory.[372]

In retrospect, when Hubble relieved some of the problem by interpreting the redshift of galaxies as a sign that the universe was expanding, still, in order to have the matter move yet remain homogeneous

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[371] For a good analysis of Friedmann's five equations, see http://nicadd.niu.edu/~bterzic/PHYS652/Lecture_05.pdf

[372] "Dark Energy: A Cosmological Constant?" http://map.gsfc.nasa.gov /universe/uni_matter.html

(as required by Friedmann's equation), the value of its rate of expansion (H); as well as the value of its density (Ω); and the energy to propel the expansion (Λ), had to fulfill the Goldilocks rule – it had to be just right or there would be no universe. Various scientists have spent their entire careers trying to figure out the perfect combination to these three numbers, but to no avail. Again, it is like trying to balance a pencil on its point. This is what happens when the universe is made to start from a big bang instead of creative fiat – the math never produces what we actually see. Postulating a big bang is easy. Making it work with all the other laws of science is impossible.[373]

Another problem arose at the tail end of the twentieth century. Observations of class 1a supernovae, which are used as measuring devices for time and distance in Big Bang cosmology, revealed that the universe wasn't slowing down in its expansion but was speeding up.[374] This meant that there was no possibility this new acceleration (H_2) could be accounted

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[373] One of those "laws of science" cropped up in what was known as the "horizon problem." If the speed of light is limited (and thus the spread of information from one end of the Big Bang to the other is also limited), how could the right hand of the explosion know what the left hand was doing? This problem was solved by the imposition of yet another fudge factor – the inflation theory. Designed by Alan Guth of MIT, it postulates that the Big Bang exploded 10^{50} times faster than previously thought, which then allowed the information to travel 10^{50} times faster.

[374] The 1a Supernovae explosions were dimmer than expected, which, based on redshift values, translated into them being farther away from Earth than what astronomers previously believed. Since their light has taken longer to reach Earth, Big Bang cosmologists assume the universe must have taken longer to grow to its current size. Consequently, the expansion rate must have been slower in the past than previously thought. Hence, the supernovae are dim enough that the expansion must have accelerated to have caught up with its current expansion rate. Yet the universe's matter should have slowed the expansion. So what is making it speed up? If the cosmological principle is accepted such that the acceleration occurs evenly and smoothly for the entire universe, it forces the introduction of "dark energy" to sustain the acceleration. See "Observational Evidence from Supernovae for an Accelerating Universe and a Cosmological Constant," Adam G. Riess, et al, 1998. The abstract concludes: "A Universe closed by ordinary matter (*i.e.*, $\Omega_M = 1$) is formally ruled out at the 7σ to 8σ confidence level for the two different fitting methods." (http://arxiv.org/pdf/astro-ph/9805201v1.pdf). See also "Surveying Spacetime with Supernovae," Craig J. Hogan, *et al.*, *Scientific American*, January 1999. See also Marie-Noëlle Célérier who concludes: "The interpretation of recently published data from high redshift SNIa surveys…It has been shown that a straight reading of these data does not exclude the possibility of ruling out the Cosmological Principle" ("Do we really see a Cosmological Constant in the Supernovae data?" *Aston. & Astro*. Feb. 2008, p. 9.

for by the present amount of energy and baryonic matter ($\Lambda + \Omega$) in the Big Bang universe.

A related problem arose when the 2001 Wilkinson Microwave Anisotropy Probe (WMAP) apparently found that the geometry of the universe is "flat,"[375] which Big Bang advocates prefer because it is the only one which will allow the negative energy of gravity to balance out the positive energy of matter so that the net energy is zero.[376] Big Bang

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[375] A "flat" universe is a Euclidean 3-dimensional universe as opposed to a Reimann curved universe. Taken as a whole, the universe is Euclidean. In a "flat" universe, if one were to inscribe a giant triangle in a circle in outer space, the value would be π (3.14). Another way to describe it is to say that light travels in straight lines in a flat universe. In Big Bang cosmology, the "flatness" of the universe is determined by its energy density (Ω). If Ω is > 1 or < 1, then the universe is curved or non-Euclidean and the above triangle would be > or < π, and light would travel a curved directions. Big Bang cosmologists prefer a "flat" universe so that it can expand forever (as opposed to curving back in on itself). It is believed that the distribution of the cosmic microwave radiation (CMB) found by the 2001 WMAP showed a density fitting a "flat" universe.

[376] Krauss claims that WMAP determined the universe is "flat" by the following reasoning: The energy at the very beginning of the Big Bang was not zero, so one needs to arrive at zero sometime in the aftermath of the Big Bang. This was accomplished by finding a measurement in space that appeared to be zero. A triangle is drawn in space as the measuring device and applied as follows: if the universe is 13.78 billion years old, one should be able to see the beginning of the Big Bang (looking backwards into time, as it were). But one cannot see all the way back to the Big Bang because there is an opaque wall in the way. This wall is due to the fact that the temperature at the Big Bang was hot enough (3000K) to break apart hydrogen atoms to produce protons and electrons, which is a 'charged plasma' that is opaque to radiation. One cannot see past this part of the universe since it is opaque. But light bounces off the surface of the opaque wall and is radiated back to Earth (See Figure 2). This light is the CMB at 2.73K (instead of the original 3000K), so the protons have captured the electrons and made space transparent instead of opaque, and thus one can see this part of space from Earth. Moreover, the radiation should be coming to Earth from all directions since the wall surrounds earth like a sphere. Then, if one takes 1 arc second on the wall of the CMB (where it is opaque), it represents 100,000 light years in distance. Since Einstein said no information can be transferred faster than light, this means that anything that happened on one side of the CMB could not affect anything on the other side. Thus, big lumps of matter (bigger than 100,000 light years across) could not collapse because gravity, which Einstein limited to the speed of light, could not go across them. Lumps that collapsed had to be 100,000 light years or less in size. Since 100,000 light years equals one arc second for the base of the triangle; and the distance to the "opaque wall" provides the two other sides of the isosceles triangle (and since light rays travel in straight lines in the "transparent" part, then the sides of the triangle are straight), Viola! the needed "triangle" is

advocates want a zero energy sum because they believe it will answer the haunting question concerning the origins of the Big Bang, with the answer being "it came from nothing." As Lawrence Krauss puts it: "The laws of physics allow the universe to begin from nothing. You don't need a deity. You have nothing, zero total energy, and quantum fluctuations can produce a universe."[377] In the same video, the crass Krauss also says:

> You are all stardust. You couldn't be here today if stars hadn't exploded…because the elements…carbon, nitrogen, oxygen, iron, all the things that matter for evolution weren't created at the beginning of time, they were created in the nuclear furnaces of stars, and the only way they could get into your body is if the stars were kind enough to explode. *So forget Jesus. The stars died so you could be here today.*

To arrive at zero energy to counterbalance the negative energy of gravity, our universe has only 4% of the needed matter. Additionally, if they were going to use Friedmann's equations, then a "flat" universe requires that the "critical density" must be equal to the average density. But even adding in 23% Dark Matter and 4% normal matter, this left 73% positive energy still required to counterbalance gravity.

Yet another problem was the time needed for the formation of stars and galaxies. Under present calculations it appeared that the age of the universe was younger than the age of its oldest stars! NASA describes the dilemma and the proposed solution:

> Many cosmologists advocate reviving [Einstein's] cosmological constant term on theoretical grounds, as a way to explain the rate of expansion of the universe….The main attraction of the cosmological constant term is that it significantly improves the

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produced to "measure" the energy. In an Open universe the light rays will diverge as one looks back into time, so the distance across the "lump" (the "ruler") will look smaller, perhaps half an arc second. In a Closed universe the light rays look bigger as one looks back into time so the distance across the lump would be bigger than 1 arc second. The lumps are measured to see if they are a half, one, or 1.5 arc seconds. Boomerang and WMAP took a picture of the opaque wall and found the separation of the lumps was about 1 arc second, which matches a "flat" universe. Using a computer generated lump-picture in which the lump is less than 1 arc second produces a "Closed" universe. If the lumps are larger than one, they get an "Open" universe. (See Figure 1). As Krauss puts it: "the universe is flat, it has zero total energy, and it could have come from nothing."
[377] http://www.youtube.com/watch?v=7ImvlS8PLIo

agreement between theory and observation….For example, if the cosmological constant today comprises most of the energy density of the universe, then the extrapolated age of the universe is much larger than it would be without such a term, which helps avoid the dilemma that the extrapolated age of the universe is younger than some of the oldest stare we observe![378]
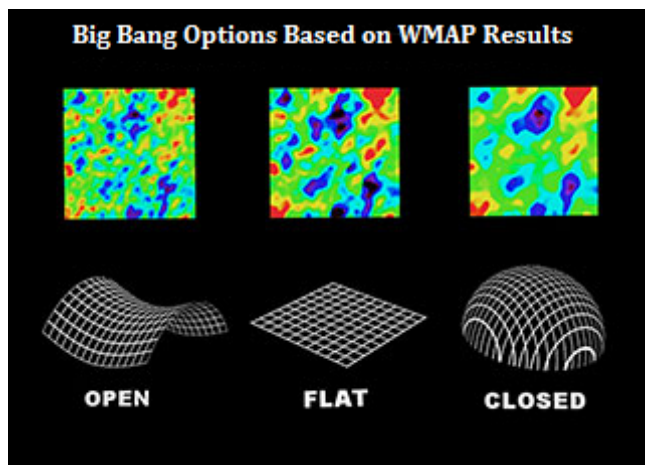
Figure 1: Moderate distribution of CMB (as opposed to confined or sparse) is said to produce a "flat" universe
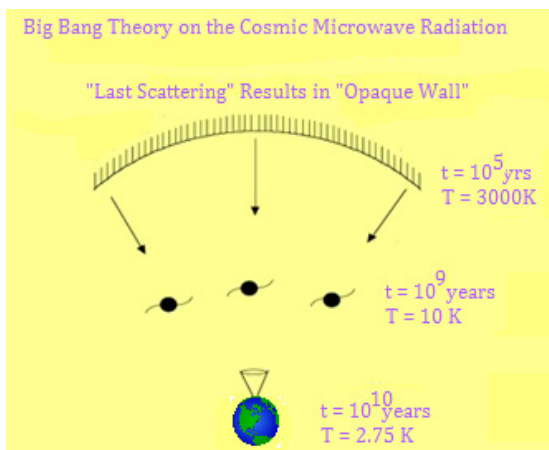
Figure 2: Light is said to reflect off of "Opaque Wall"

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[378] "Dark Energy: A Cosmological Constant?" http://map.gsfc.nasa.gov/universe /uni_matter.html

So what is a Big Bang cosmologist to do? If he has no energy source for the accelerating universe and is missing more than two-thirds of the needed "critical density" for a flat universe, then he would have to abandon the Big Bang theory and perhaps start reading Genesis 1 with a little more open-mindedness. But he will have none of that. So he does the same thing with this problem that he did with the spiral galaxies that were spinning too erratically to fit Newton's and Einstein's laws of motion – he simply invents the energy he needs. This time it is called Dark Energy, but he can't see, hear, feel, taste or smell it. How much does he need? According to the equations, about 73% of the universe must be composed of Dark Energy to make the Big Bang conform to 1a supernovae requirements. This invention then allows the universe to be 13.7 billion years old (so that it is older than the stars) and give enough energy to reach the needed "critical density."

The proponents of this convenient manipulation of data seem oblivious to their ploys. But George Ellis is not ashamed to admit that the whole thing is based on wishing or presuming that the Copernican Principle is true:

> Additionally, we must take seriously the idea that the acceleration apparently indicated by supernova data could be due to large scale inhomogeneity with no dark energy. Observational tests of the latter possibility are as important as pursuing the dark energy (exotic physics) option in a homogeneous universe. Theoretical prejudices as to the universe's geometry, and our place in it, must bow to such observational tests. Precisely because of the foundational nature of the Copernican Principle for standard cosmology, we need to fully check this foundation. And one must emphasize here that standard CMB anisotropy studies do not prove the Copernican principle: they assume it at the start….The further issue that arises is that while some form of averaging process is in principle what one should do to arrive at the large scale geometry of the universe on the basis of observations, in practice what is normally done is the inverse. One assumes a priori a FLRW model as a background model, and then uses some form of observationally-based fitting process to determine its basic parameters.[379]

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[379] "Inhomogeneity effects in Cosmology," George F. R. Ellis, March 14, 2011, University of Cape Town, pp. 19, 5; http://arxiv.org/pdf/1103.2335.pdf).

Michio Kaku is a perfect example of cosmology not heeding Ellis' warning:

> No one at the present time has any understanding of where this 'energy of nothing' comes from….If we take the latest theory of subatomic particles and try to compute the value of this dark energy, we find a number that is off by 10^{120}.[380]

As Kaku's admits that modern theory is "off by 10^{120}" he is referring to the discovery by Russian physicist Yakov Zel'dovich, and later established in quantum electrodynamics (QED) or quantum field theory (QFT), that empty space has an energy of 10^{120} more than the Dark Energy needed to propel the proposed "accelerating expansion of the universe."[381] The 10^{120} excess energy is the only source available but it cannot be cut up into slices. It is all or nothing. This is precisely why Big Bang advocates invented "Dark Energy" – a hoped for source of energy that is more than the miniscule energy created by baryonic matter but less than the 10^{120} excess energy given by quantum theory.

Here is an even bigger problem. Since Big Bang cosmologists believe space contains 10^{120} more energy than what we have detected; and since Einstein's General Theory of Relativity requires that all forms of energy (even the 10^{120}) function as a source of gravity; and since Einstein's equations require that the "curvature" of the universe depends on its energy content, then, since the energy content is 10^{120} more than what Einstein proposed, the whole universe should presently be curled up into a space smaller than the dot on this i. Obviously it isn't. As we can see, the Big Bang universe simply does not work under present empirical evidence.

Noted physicist Paul Steinhardt of Princeton has gone on record against the present Big Bang theory. He opts for what can best be called the Big Brane theory. In a recent lecture, Steinhardt says the following of the Big Bang:

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[380] *Parallel Worlds*, p. 12.
[381] The actual number is 1.38×10^{123}. But this is only after any energy greater than the Planck scale is excluded. According to Sean Carroll at California Technical Institute: "You can add up all the effects of these virtual particles….and you get infinity….So we cut things off by saying we will exclude contributions of virtual particles whose energy is larger than the Planck scale…which we have no right to think we understand what's going on…Then you get a finite answer for the vacuum, and answer that is bigger than what you observer by a factor of 10 to the 120th power." (https://www.youtube.com/watch?v=SwyTaSt0XxE &feature =watch-vrec). This is one of the reasons Carroll runs the website titled: "The Preposterous Universe" at http://preposterousuniverse.com.

So, the first point I want to make about the Big Bang model is that the Big Bang model of 2011…that model I just described, definitely fails….We have to fix the Big Bang model, we have to add things to it to make it work.[382]

Indeed, things like Inflation, Dark Matter, Dark Energy, Lambda values and Hubble "constants" of which the only thing constant is that they are constantly being changed to accommodate the next fudge factor that will prop up the Big Bang. Along these lines, Richard Lieu submitted a scathing critique of the ΛCDM [Big Bang] model in a 2007 paper:

> …Cosmology is not even astrophysics: all the principal assumptions in this field are unverified (or unverifiable) in the laboratory, and researches are quite comfortable with inventing unknowns to explain the unknown. How then could, after fifty years of failed attempts in finding dark matter, the fields of dark matter and now, dark energy have become such lofty priorities in astronomy funding, to the detriment of all other branches of astronomy?…ΛCDM cosmology has been propped by a paralyzing amount of propaganda which suppress counter evidence and subdue competing models….I believe astronomy is no longer heading towards a healthy future….Charging under the banner of Einstein's extreme eminence and his forbidding theory of General Relativity, have cosmologists been over-exercising our privileges?...Could this be a sign of a person (or camp of people in prestigious institutes) who become angry because they are embarrassed?[383]

In 2006 NASA organized the Dark Energy Task Force in order to bring the problems to the fore and to seek for some answers. Answer, however, were hard to come by. If anything, the Task Force realized how little modern science knows about the universe, much less how it is going to fit its theories into the anomalous evidence it sees. In the first pages of the 80-page report, the summation of the Task Force's findings are quite revealing.

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[382] http://www.youtube.com/watch?v=IcxptIJS7kQ.
[383] "ΛCDM cosmology: how much suppression of credible evidence, and does the model really lead its competitors, using all evidence," Richard Lieu, Dept. of Physics, Univ. of Alabama, May 17, 2007. Although Lieu presents equally flawed models due to the fact that all cosmologists are searching in vain for how the universe started and develops, he candidly admits "Perhaps all models are equally poor" (p. 12).

Report of the Dark Energy Task Force

Report to HEPAP
6 July 2006
Rocky Kolb
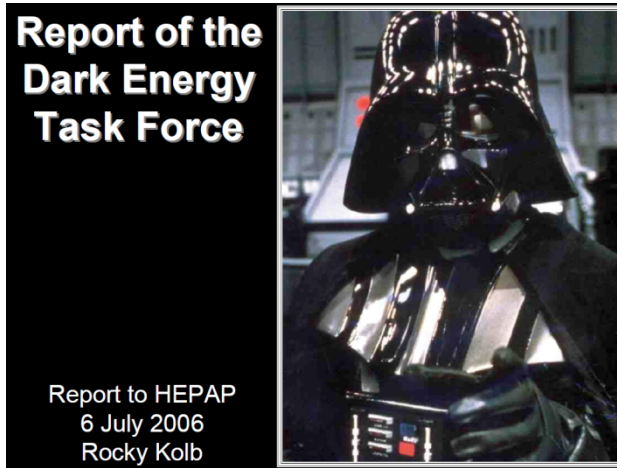
They are as follows:

- "Dark energy appears to be the dominant component of the physical Universe, yet there is no persuasive theoretical explanation."
- "The acceleration of the Universe is, along with dark matter, the observed phenomenon which most directly demonstrates that our fundamental theories of particles and gravity are either incorrect or incomplete."
- "Most experts believe that nothing short of a revolution in our understanding of fundamental physics will be required to achieve a full understanding of the cosmic acceleration."
- "For these reasons, the nature of dark energy ranks among the very most compelling of all outstanding problems in physical science."
- "These circumstances demand an ambitious observational program to determine the dark energy properties as well as possible."[384]

In other words, modern cosmology doesn't know what the blazes it is doing today. It is at a total loss to explain the universe, more so than it was a hundred years ago. And whereas General Relativity was considered the solution to cosmology's major problems in the 1920s, the Task Force concludes "Possibility: GR or standard cosmological model incorrect."[385]

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[384] Dark Energy Task Force, 2006, at http://science.energy.gov/~/media /hep/pdf/files/pdfs/kolb_hepap_07_06.pdf. Page 53 of the report reveals how much the Task Force estimates they will need to do further investigation into the mystery of Dark Energy – "2.4 billion dollars."
[385] *Ibid*., p. 7.

How Does Modern Cosmology Deal With These Problems?

The new means by which many modern cosmologists seek to deal with these intractable anomalies is by creating the Multiverse. This allows the modern cosmologist to create any universe he desires so that all the numbers can fit the way he wants them to fit. In the words of the popular cosmologist, Brian Greene:

> In seeking an explanation for the value of dark energy, maybe we've been making a mistake analogous to Kepler's. Our best cosmological theory – the inflationary theory – naturally gives rise to other universes. Perhaps, then, just as there are many planets orbiting stars at many different distances, maybe there are many universes containing many different amounts of dark energy. If so, asking the laws of physics to explain one particular value of dark energy would be just as misguided as trying to explain one particular planetary distance. Instead, the right question to ask would be: why do we humans find ourselves in a universe with the particular amount of dark energy we've measured, instead of any of the other possibilities?

> This is a question we can address. In universes with larger amounts of dark energy, whenever matter tries to clump into galaxies, the repulsive push of the dark energy is so strong that the clump gets blown apart, thwarting galactic formation. In universes whose dark-energy value is much smaller, the repulsive push changes to an attractive pull, causing those universes to collapse back on themselves so quickly that again galaxies wouldn't form. And without galaxies, there are no stars, no planets, and so in those universes there's no chance for our form of life to exist.

> And so we find ourselves in this universe and not another for much the same reason we find ourselves on earth and not on Neptune—we find ourselves where conditions are ripe for our form of life. Even without being able to observe the other universes, their existence would thus play a scientific role: the multiverse offers a solution to the mystery of dark energy, rendering the quantity we observe understandable.

> Or so that's what multiverse proponents contend. Many others find this explanation unsatisfying, silly, even offensive, asserting

that science is meant to give definitive, precise, and quantitative explanations, not "just so" stories. But the essential counterpoint is that if the feature you're trying to explain can and does take on a wide variety of different mathematical values across the landscape of reality, then seeking a definitive explanation for one value is wrongheaded. Just as it makes no sense to ask for a definitive prediction of the distance at which planets orbit their host stars, since there are many possible distances, if we're part of a multiverse it would make no sense to ask for a definitive prediction of the value of dark energy, since there would be many possible values.[386]

In the hands of inflation, string theory's enormously diverse collection of possible universes become actual universes, brought to life by one big bang after another. Our universe is then virtually guaranteed to be among them. And because of the special features necessary for our form of life, that's the universe we inhabit.[387]

As we will see in more detail in Chapter 3, modern cosmology's answer to unsolvable problems in their theory, and its answer to the unfathomable precision with which our universe is made, is to fantasize that an infinite variety of universes exist and, just by time and chance, we have somehow stumbled upon the only one that we can live in. Cosmology has now turned into metaphysics. The empirical approach does not provide the answers they desire so science now opts to make its scientists into philosophers who can create their own universes at will.

Objection #23: Didn't WMAP Prove the Big Bang?

In 2010, the National Aeronautical and Space Administration (NASA) website[388] included a list of the "Top Ten" accomplishments of the 2001 Wilkinson Microwave Anisotropy Probe (WMAP) findings. Suffice it to say, each of NASA's claims are presumptuous. Our response is given to each.

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[386] Brian Greene, "Welcome to the Multiverse," The Daily Beast, May 21, 2012, http://www.thedailybeast.com /newsweek/2012/05/20/brian-greene-welcome-to-the-multiverse.html.
[387] "New Secrets of the Universe," *Newsweek*, May 28, 2012, p. 25.
[388] http://map.gsfc.nasa.gov

Claim 1: *NASAs Wilkinson Microwave Anisotropy Probe (WMAP) has mapped the Cosmic Microwave Background (CMB) radiation (the oldest light in the universe) and produced the first fine-resolution (0.2 degree) full-sky map of the microwave sky.*

Response: In reality, the results of WMAP were so disturbing for NASA and the rest of the scientific world that the European Space Agency decided to launch another satellite, the *Planck Probe*, in 2009 to determine whether the data from WMAP was accurate. The results of the *Planck Probe* released in March 2013. The results are precisely the same as WMAP, only in more detail.[389]

Claim 2: *WMAP definitively determined the age of the universe to be 13.75 billion years old to within 1% (0.11 billion years) - as recognized in the Guinness Book of World Records!*

Response: WMAP did not determine anything, since it is merely an instrument that collects data. NASA scientists "determine" the results of WMAP data, and they do so only through their biased presuppositions that accord with the Big Bang theory, a failed theory that is dependent on invented props such as Dark Energy, Dark Matter, and Inflation; a theory which fails to provide answers for anomalies such as disparate redshift values for quasar-connected galaxies; shifting Hubble, Omega and Lambda values; and the incongruity of quantum mechanics and general relativity. Despite these anomalies, NASA systematically excludes all other interpretations of WMAP's data. (See the answer to Objection #15 for more information on how the age of the universe is calculated). In actuality, NASA chooses an age close to 13 billion years because its scientists naively believe that "carbon scattering" from supernovas created biological life; and they estimate that such a process would take at least 10 billion years. However, it cannot be much more than 10 billion years because by then all the stars would have used up their fuel and would cease to exist. So, 13.75 billion years is their safest bet.

Claim 3: *WMAP nailed down the curvature of space to within 0.6% of "flat" Euclidean, improving on the precision of previous award-winning measurements by over an order of magnitude.*

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[389] http://www.esa.int/Our_Activities/Space_Science/Planck/Planck_reveals_an_almost_perfect_Universe

Response: WMAP didn't "nail down" anything. NASA scientists have predetermined that a flat Euclidean space is needed for the Big Bang since they cannot get it to work with the two other Friedmann models available (*e.g.*, an "open" universe that expands forever, or a "closed" universe that expands but eventually collapses in on itself). As physicist Andrei Linde admits:

> A second trouble spot [for the Big Bang] is the flatness of space. General Relativity suggests that space may be very curved, with a typical radius on the order of the Planck length, or 10^{-33} centimeters. We see, however, that our universe is just about flat on a scale of 10^{28} centimeters, the radius of the observable part of the universe. This result of our observation differs from theoretical expectations by more than 60 orders of magnitude.[390]

Since General Relativity cannot give them the universe they need, the Big Bang model can only have some semblance of feasibility if, after the phantom props of Dark Energy and Dark Matter are added, the resulting "balloon" universe (that Hubble invented to remove Earth from the center of the universe) is as "flat" as it can be so that it can expand, slow down, but never stop. In the minds of NASA scientists, the universe is a two-dimensional inflating balloon, but no longer has the curved surface commonly associated with balloons, but a flat surface (more commonly associated with popped balloons, we suppose).

Claim 4: *The CMB became the "premier baryometer" of the universe with WMAP's precision determination that ordinary atoms (also called baryons) make up only 4.6% of the universe (to within 0.2%).*

Response: WMAP made no such "determinations." WMAP merely showed a huge amount of empty space in the universe and, consequently, did not provide NASA with the matter and energy it needed for the Big Bang. The reality is, NASA scientists claim there is only 4.6% baryonic matter in order to make it appear as if WMAP provided data agreeing with NASA when, in reality, WMAP flatly denied NASA's dream universe. The reality is that NASA needs 95.4% more energy to fit its theory that the universe is expanding at an accelerated rate (an acceleration determined by their idiosyncratic interpretation of 1a supernovas), but since there isn't enough matter and energy for the universe to behave as NASA wants it to

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[390] Andre Linde, "The Self-Reproducing Inflationary Universe," Magnificent Cosmos, *Scientific American*, 1998, p. 99.

(*i.e.*, there is only 4.6% available), NASA simply invents the matter and energy it needs and makes it appear as if the WMAP data supports it.

Claim 5: *WMAP's complete census of the universe finds that dark matter (not made up of atoms) make up 22.7% (to within 1.4%).*

Response: WMAP took no "census of the universe." It merely showed anomalous galaxy rotation curves that don't fit with NASA's use of either Einstein or Newton's laws of gravity. In order to make it appear as if those laws are operable in deep space, NASA invented 22.7% of the matter it needed to have the galaxies rotate as Einstein and Newton's laws dictate. It is dubbed "Dark Matter." In reality, there is no empirical evidence that it exists. NASA needs it because if it cannot show why the galaxies are rotating as they do, then the Big Bang could not occur. The galaxies would either fall apart or collapse long before 13.7 billion years.

Claim 6: *WMAP's accuracy and precision determined that dark energy makes up 72.8% of the universe (to within 1.6%), causing the expansion rate of the universe to speed up. "Lingering doubts about the existence of dark energy and the composition of the universe dissolved when the WMAP satellite took the most detailed picture ever of the cosmic microwave background (CMB)." Science Magazine 2003, "Breakthrough of the Year" article.*

Response: WMAP is certainly "accurate and precise," but it made no "determination" that "dark energy makes up 72.8% of the universe." This is a classic case of putting the cart before the horse. The reality is that NASA's theory (based on its interpretation of 1a supernovas) claims the universe is accelerating, but NASA can find no matter or energy in deep space to propel the acceleration. Consequently, if NASA wants to give any semblance of credibility for the Big Bang it must invent the 72.8% energy it needs, and then display it to the world as if the energy actually exists. It is conveniently called "Dark Energy" because, like Dark Matter, it has never been detected and only exists in the dark mind of the NASA theorist.

Claim 7: *WMAP has mapped the polarization of the microwave radiation over the full sky and discovered that the universe was reionized earlier than previously believed. – "WMAP scores on large-scale structure. By measuring the polarization in the CMB it is possible to look at the amplitude of the fluctuations of density in the universe that produced the first galaxies. That is a real breakthrough in our understanding of the*

origin of structure." – ScienceWatch: *"What's Hot in Physics,"* Simon Mitton, Mar./Apr. 2008.

Response: This is NASA's version of trying to turn lemons into lemonade. Whereas the Big Bang theory predicted complete isotropy and homogeneity for the universe, WMAP found some anisotropy and inhomogeneity. More astounding was the fact that WMAP showed the anisotropy (*i.e.*, the dipole, quadrupole and higher multipole values of the CMB) were aligned with the Sun-Earth ecliptic and equinoxes. This means that the Earth is at or near the center of the entire universe – a fact totally against the Copernican and Cosmological Principles that form the basic presuppositions of NASA's cosmology. Above, we see NASA avoiding this reality by trying to turn the anisotropies of the CMB into midwives for the universe's galaxies. But as George F. R. Ellis has admitted: "And one must emphasize here that standard CMB anisotropy studies do not prove the Copernican principle: they assume it at the start."[391]

Claim 8: *WMAP has started to sort through the possibilities of what transpired in the first trillionth of a trillionth of a second, ruling out well-known textbook models for the first time.*

Response: WMAP did no such thing. It merely collected data. NASA wants the data from WMAP to conform to its Inflation model of the Big Bang, otherwise NASA would be saddled with the infamous "horizon problem," which failure would nullify the Big Bang before its gets out of the starting blocks. The horizon problem is caused by limiting the speed of light to c (300,000 km/sec), as dictated by Einstein's theory of Special Relativity. If light is limited to c, then one side of the expanding Big Bang cannot communicate with the other side, since they are separated by thousands of light years. NASA fixed this problem by adopting the theory of Inflation invented, with pure imagination, by MIT physicist Alan Guth. Inflation claims that the "space" of the Big Bang exploded by a factor of 10^{30} in 10^{-35} seconds. As the theory goes, this super-fast expansion of "space" allowed the light within it to be stretched from one end of the Big Bang to the other, without, of course, exceeding Special Relativity's speed limit for light within space. There is not the slightest scientific evidence that such a scenario occurred, but NASA needs it to make their theory have any semblance of plausibility with their already "established laws of physics." Additionally, one of the reasons that String Theory needs at least

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[391] "Inhomogeneity effects in Cosmology," George F. R. Ellis, March 14, 2011, University of Cape Town, pp. 19, 5; http://arxiv.org/pdf/1103.2335.pdf).

ten dimensions is that it is hampered by a speed of light limited to c (3×10^8 m/sec) by Special Relativity. The extra dimensions allow light to travel at superluminal speeds in some sort of hyperspace, but is required to remain at c in our common Euclidean space of three dimensions.

Regarding the horizon problem, as one author puts it: "The 'cosmological principle' was set up early without realizing its implications for the horizon problem." He adds that it is "dealt with by the 'duct tape' of inflation…and almost entirely without support from observational data"[392] For a description, we will quote a popular internet site:

> The horizon problem is a problem with the standard cosmological model of the Big Bang which was identified in the 1970s. It points out that different regions of the universe have not "contacted" each other because of the great distances between them, but nevertheless they have the same temperature and other physical properties. This should not be possible, given that the exchange of information (or energy, heat, etc.) can only take place at the speed of light. The horizon problem may have been answered by inflationary theory, and is one of the reasons for that theory's formation. Another proposed, though less accepted, theory is that the speed of light has changed over time, called variable speed of light.
>
> When one looks out into the night sky, distances also correspond to time into the past. A galaxy measured at ten billion light years in distance appears to us as it was ten billion years ago, because the light has taken that long to travel to the viewer. If one were to look at a galaxy ten billion light years away in one direction, say "west," and another in the opposite direction, "east," the total distance between them is twenty billion light years. This means that the light from the first has not yet reached the second, because the 13.7 billion years that the universe has existed simply isn't a long enough time to allow it to occur. In a more general sense, there are portions of the universe that are visible to us, but invisible to each other, outside each other's respective particle horizons.
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> In standard physical theories, no information can travel faster than the speed of light. In this context, "information" means "any

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[392] John P. Ralston, "Question Isotropy," Dept. of Physics and Astronomy, Univ. of Kansas, Nov. 2010, p. 1, arXiv:1011.2240v1.

sort of physical interaction." For instance, heat will naturally flow from a hotter area to a cooler one, and in physics terms this is one example of information exchange. Given the example above, the two galaxies in question cannot have shared any sort of information; they are not in "causal contact." One would expect, then, that their physical properties would be different, and more generally, that the universe as a whole would have varying properties in different areas.[393]
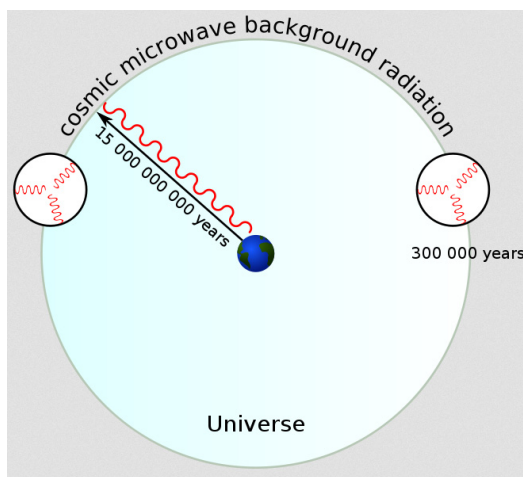
The Horizon problem[394]

As noted, modern cosmology seeks to answer the anomaly of light's speed by adding Inflation into the Big Bang scenario. The theory was invented by MIT physicist Alan Guth in the 1980s.[395] It maintains that

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[393] http://en.wikipedia.org/wiki/Horizon_problem.

[394] The above diagram is explained as "When we look at the CMB it comes from 46 billion comoving light years away. However when the light was emitted the universe was much younger (300,000 years old). In that time light would have only reached as far as the smaller circles. The two points indicated on the diagram would not have been able to contact each other because their spheres of causality do not overlap" (http://en.wikipedia.org/wiki/Horizon_problem).

[395] "In physical cosmology, cosmic inflation, cosmological inflation or just inflation is the theorized extremely rapid exponential expansion of the early universe by a factor of at least 10^{78} in volume, driven by a negative-pressure vacuum energy density. The inflationary epoch comprises the first part of the electroweak epoch following the grand unification epoch. It lasted from 10^{-36} seconds after the Big Bang to sometime between 10^{-33} and 10^{-32} seconds.

inflation expands space faster than the speed of light (instead of increasing the speed of light inside space). As it is decribed in the literature, regions of the universe already in light-speed contact individually, suddenly expand into each other's territory thereby allowing their individual boundaries ("horizons") to overlap and consequently allow causal contact with each other. Whatever was on one side of the universe expands into the other side of the universe, and vice-versa. So the apparent solution to the Horizon problem is that the two baseball-like circles in the foregoing diagram expand and overlap into each other at t = 10^{-35} seconds after the initial explosion. Essentially, whether they know it or will admit it, Big Bang proponents have invoked instantaneous creation, similar to that described in Genesis, to answer the anomalies of their theory.

Claim 9: *The statistical properties of the CMB fluctuations measured by WMAP appear "random"; however, there are several hints of possible deviations from simple randomness that are still being assessed. Significant deviations would be a very important signature of new physics in the early universe.*

Response: "Randomness" is precisely what the Big Bang theory did not predict. It predicted isotropy and homogeneity, especially since these two factors would preserve the cherished Copernican Principle. In reality, the "randomness" (*i.e.*, the anisotropy and inhomogeneity of the universe) is what makes the CMB align itself with the Earth. This result is anathema to NASA. To preserve its Big Bang paradigm, it must have a completely different interpretation of the WMAP data – an interpretation that will conform to the Copernican Principle. In the end, NASA admits that it needs non-random events to coincide with its theory, which is why it says they "are still being assessed" (in other words, "we can't explain them from the Big Bang model so we must make up some other solution to make it fit").

Claim 10: *WMAP has put the "precision" in "precision cosmology" by reducing the allowed volume of cosmological parameters by a factor in excess of 30,000. The three most highly cited physics and astronomy papers published in the new millennium are WMAP scientific papers – reflecting WMAP's enormous impact.*

Following the inflationary period, the universe continued to expand, but at a slower rate" (http://en.wikipedia.org/ wiki/Inflation_(cosmology))

Response: In reality, WMAP's "precision" has presented such astounding anomalies to the Big Bang theory that NASA should be holding its head in shame. That NASA has wiped its website clean of anything even remotely suggestive of WMAP's real findings (*viz.*, that the whole universe is oriented around the Earth, as represented by the multipoles of the CMB), shows that its goals are not to do good science but to promote its atheistic philosophical presuppositions by distorting the scientific data.

Objection #24: Doesn't the Speed of Light Contradict Genesis 1?

Here we will tackle one of the most common objections raised against a literal reading of Genesis 1. The objection concerns the apparent anomaly regarding the creation of the stars and speed of light. It is argued that, since it is established from modern science that the stars are very far away, so far away that light from the nearest star, *Proxima Centauri*, presently takes four years to reach the Earth as it travels 300,000 km/sec, it would have been impossible for the light from stars, which were made on the Fourth Day of creation, to reach Earth on that very day; and, in fact, *Proxima Centauri* would not have been seen until at least four years after Adam was created. It could further be argued that if the other stars are hundreds of thousands of light-years from Earth, then the age of the universe could not be anywhere close to the 6000 years that a literal reading of the biblical text demands, otherwise, we would not be seeing the light from these most distant stars today.[396]

On the surface this seems to be a very logical and worthy objection, and as a result, it has perplexed and paralyzed not a few biblical scholars. Their reactions to this apparent problem are many and varied. Some have been persuaded to abandon a literal reading of Genesis 1 altogether, or at the least, have tried to advance alternative literal renderings.[397] Some have moved to a theistic evolutionary interpretation of Genesis. Others have proposed using the time-warping principles of Special and General Relativity to answer the anomaly;[398] while still others are so bothered by

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[396] A time span of 6000 years (~ 4000 B.C. to 2000 A.D.) is produced from interpreting the ancestral lines of Genesis 5 and 11 as strictly father-son relationships. See my book, *The Book of Genesis: Chapters 1-11* for a detailed study of this issue.

[397] Fr. Stanley L. Jaki, *Genesis 1 Through the Ages*, 1992.

[398] In particular, D. Russell Humphreys in the book *Starlight and Time: Solving the Puzzle of Distant Starlight in a Young Universe*, Green Forest, AR, Master Books, 1994. Humphreys' bottom line is that "God used relativity to make a

the anomaly that they are willing to rearrange the whole chronology of Genesis 1.[399]

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young universe" as he sides with what he calls "the experimentally well-established general theory of relativity." He further suggests, "the universe started as either a black hole or white hole. I suggest here that it was a black hole, and that God let gravity take its course" (pp. 128, 127, 123, quoted in order). In other words, General Relativity's dilation of time through gravity is the basis of Humphreys' theory. Hence, a clock on Earth would measure the Earth's present age as 6000 years, whereas a clock at the edge of the universe would measure 13 billion years. In essence, Humphreys uses the mathematics of General Relativity to posit that the 13 billion years commonly associated with the age of the universe is an illusion created, but allowed, by the principles of General Relativity. Ironically, however, someone else who also employed Relativity's principles came to the exact opposite opinion of Humphreys, which is not surprising, since in Relativity everything is "relative" (G. L. Schroeder, "The Universe – 6 Days and 13 Billion Years Old," *Jerusalem Post*, September 7, 1991). Humphreys can have little argument against it since according to General Relativity, a person standing at the edge of the universe would think that his immediate vicinity is 6000 years old and the Earth is 13 billion.

[399] In particular, Gorman Gray in the book *The Age of the Universe: What are the Biblical Limits?*" Washington, Morning Star Publications, 2005, in which he argues that the clause in Gn 1:1, "In the beginning God created the heavens," denotes that at that time the sun and the stars must have been created, and that the text allows for an indefinite time-gap between the appearance of the stars/sun and the creation of the Earth. During this "indefinite time," starlight is said to be traveling to Earth and, based on a speed of 186,000 miles per second, would have had enough time to make the multi-million year journey. To substantiate this interpretation, Gray further argues that the Hebrew עשה (*asah*) appearing in Genesis 1:16 and normally translated "made" really means "brought forth," such that the light of the sun and stars is now allowed to penetrate to Earth, having previously been obscured by a "cloud of thick darkness" (*cf.* Jb 38:9) that has since been removed. This is similar to the view propounded by Hugh Ross (see Volume 3, Chapter 15 of *Galileo Was Wrong:The Church Was Right*), yet it must be rejected for the same reasons. There is absolutely no indication in the Genesis text that stars were created before the Earth, and it is likewise exegetically presumptuous to limit the definition of Gn 1:1's "heavens" to the existence of stars in the heavens as opposed to the heavens itself. According to Gn 1:14-16, the sun and stars are placed "in the heavens," that is, they are not *the* heavens but are attached to the heavens. The Hebrew phrase is מארת ברקיע השמים which translates as "lights in the firmament of the heavens," with the preposition "in" denoted by the consonant "ב" prefixing the word רקיע "firmament." This phrase is repeated in Gn 1:17 ("And God set them in the firmament of the heavens") with the addition of the word נתן ("set") to reinforce that the sun and stars are distinct from the firmament in which they are set. In addition, there is no "firmament" on the first day of creation, there is only the heavens that are filled with the water

At the outset we must note that it makes little difference if one bases his argument on the idea that the stars are billions of light years or just four light years from Earth. In either case, if the speed of light is given an unchanging value of 300,000 km/sec, yet it is agreed that when the stars were created on the Fourth day an observer on Earth would have seen their light immediately, then the light of the stars must have reached Earth either instantaneously or sometime before the close of the Fourth day. Even if we give light an extra day or two to arrive on Earth such that it would have appeared on the Fifth or Sixth days of creation, this does not provide an adequate solution to the problem, since the nearest star is, at least according to modern astronomy, four light years away. As such, the light from *Proxima Centauri* would have arrived four years after Adam was created, and light from stars that are farther away than 6,000 light years would not yet have reached the Earth, according to the biblical timetable.

One counterargument is that after the stars are mentioned in Gn 1:16, they are not mentioned again in the biblical text until Gn 15:5, when God tells Abraham to look up at the stars and count them. The time period between Gn 1:16 and Gn 15:5 would allow star light to travel for the whole time from the creation week to the time of Abraham's old age. As such, the total time of travel could have been two thousand years (4,000 B.C. to 2,000 B.C.). If we assume light's speed has always been the same, then, at the maximum, the total miles traveled would have been 3.5×10^{16} miles in 6,000 years, or 3.5 quadrillion miles. This distance could accommodate quite a few stars in the universe. In fact, it would more than satisfy the only empirical method of determining the distance to the stars, namely, stellar parallax, which, beyond 100 parsecs or 1.92 quadrillion miles, cannot be applied as an accurate means of measuring distance.

It could further be argued that the alternative and more common method of measuring the distance to the stars beyond the limits of parallax, that is, the redshift of light, is simply an unproven scientific hypothesis

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surrounding the Earth, and as such, the heavens waiting to be refilled by both the firmament and the celestial bodies, on the Second and Fourth Days, respectively. Moreover, Gray's contention that "brought forth" is a clearer translation than "made" of the Hebrew *asah* is untenable. Although *asah* has some variation in its contextual meaning, when it appears in creation contexts, its meaning is closer to "made" than it is to "brought forth." For example, Psalm 33:6 [32:6] states: "By the word of the Lord the heavens were *made* [asah], and by the breath of His mouth all their host." Here *asah* is used in the almost identical wording that appears in Gn 1:1 ("In the beginning God *created* the heavens…") although in that case the Hebrew ברא (*bara*) is used instead of *asah*, which shows that the words are exegetically interchangeable.

that remains in the throes of controversy, and therefore no biblical scholar is required to accept or apply a redshift/distance relationship as an irrefutable scientific fact. Modern scientists are not even sure what light is or how it travels.

Two astrophysicists have proposed a mathematical model for a much shorter travel time for light in the universe. Parry Moon of M.I.T. and Domina Spencer of the University of Connecticut introduced the idea in a paper titled "Binary Stars and the Velocity of Light." The authors state:

> The acceptance of Riemannian space allows us to reject Einstein's relativity and to keep all the ordinary ideas of time and all the ideas of Euclidean space out to a distance of a few light years. Astronomical space remains Euclidean for material bodies, but light is considered to travel in Riemannian space. *In this way the time required for light to reach us from the most distant stars is only 15 years.*[400]

The problem with all the above proposals, however, is that they will not allow light from the stars to appear on Earth on precisely the Fourth day of creation, yet the text of Genesis insists the opposite is true since the stars are included among the celestial bodies given the task of time-keeping (Gn 1:14: "and let them be for signs and for seasons and for days and years"; Gn 1:18: "and to govern the day and the night"). We know the stars' role in time keeping today as "sidereal time," and it is an essential ingredient in chronology for it allows us to have a contrasting background in order to measure the sun's path around the Earth. So precise is this star/sun relationship that the sidereal day is always 4 minutes and 56 second shorter in length than that which we keep by the sun on a 24-hour-per-day clock.

Although we are not compelled to include distances beyond 100 parsecs, still, since there certainly could be stars that are farther away than the limits our present parallax capabilities can judge, we look to additional solutions to the starlight problem. In other words, if there is a star beyond

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[400] Parry Moon and Domina Spencer, "Binary Stars and the Velocity of Light," *Journal of the Optical Society of America*, Vol. 43, No. 8, August 1953, p. 635, emphasis added. By an exhaustive study of the binaries, Moon and Spencer concluded: "Velocity of light in free space is always c with respect to the source, and has a value for the observer which depends on the relative velocity of source and observer. True Galilean relativity is preserved, as in Newtonian gravitation" (*ibid*., p. 641). Perry Phillips has critiqued Moon and Spencer's proposal in "A History and Analysis of the 15.7 Light-Year Universe," American Scientific Affiliation, 40.1:19-23(3/1988).

the round figure of 6,000 light years away from Earth, biblical chronology (at least based on an unchanging speed of light) seems to have no way of explaining how that star's light reached Earth during the Earth's biblical time of existence.

In searching for a solution, we must keep two things in mind:

(1) We must never discount the possibility that the stars could have been created many thousands of light years from the Earth and their light could have been brought to Earth instantaneously by an act of creative fiat. It would certainly be illogical to argue, on the one hand, that God created the stars instantaneously, but then argue, on the other hand, that He could not perform a creative miracle and allow their light to stretch instantaneously to the Earth. If one accepts a divine intrusion for the former, on what basis can he deny it for the latter? God himself determines the boundary line for how and when His miraculous intrusion ceases and natural processes take over. None of us can set arbitrary limits on when the crossover should take place, especially in the very beginnings of creation when most events are dependent on God's miraculous direction. One of the main reasons that modern atheistic science believes the universe is 13.7 billion years old is that it denies a creative fiat *at any time*, insisting that everything, from the appearances of matter to starlight, respectively, must occur by natural processes. At some point, the biblicist must deny the premise of naturalism, whether he decides to do so on the Fourth Day of creation or at the so-called Big Bang, for even the most liberal-minded biblical scholar knows that something cannot come from nothing. Hence, it is no great stretch for the conservative biblicist to include the creative fiat not only of the stars themselves but also of the light intervening between them and the earth.

(2) After we recognize that God could have made starlight appear on Earth miraculously, other biblicists may feel compelled to at least offer some naturalistic explanation for the starlight's reaching Earth, if for no other reason than to cover all the bases and convince the opponent that there is no escape for those looking for a more naturalistic approach to Genesis 1 (*e.g.*, evolutionists). As such, we refer ourselves to the events of the Second Day of creation, when God created the firmament. The firmament includes both the expanse of space to the limits of the universe (Gn 1:6-9, 14-19) as well as the space in the immediate vicinity of Earth in which "the birds fly" (Gn 1:20). The Hebrew word רקיע *raqia* (firmament) denotes something hard and dense like metal but it also describes something ethereal and penetrable. Fitting the firmament between those two extremes means that we have a truly amazing substance in our universe. The best way to incorporate the two extremes is to understand

the firmament as an extremely fine yet dense particulate substance that is frictionless and which permeates every part of the universe and constitutes its vast internal substructure.

Scripture speaks of the firmament being transformed from its original dimensions to an "expanded" state. For example, Psalm 104:2 says that God is "stretching out heaven like a curtain." Depending on the Hebrew passage cited, the expansion of the firmament is an event that: (a) occurred once in the past; (b) occurred in the past but was also a progressive event for a certain period of time; or (c) occurred in the past and is still continuing.[401] Of these grammatical possibilities, the scientific evidence shows that either (a) or (b) is correct since (c) would require that the galaxies must expand at the same rate as the space between them expands, but we do not see that phenomena in today's astronomical data. Big Bang cosmologists who believe the universe is expanding do not have a good explanation for why the galaxies themselves are not also expanding.[402]

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[401] Based on the stipulation in Gn 1:8 that "God called the firmament heaven," the term "heaven" is often interchangeable with "firmament." In regard to the "expansion," Jb 9:8 contains the Qal participle נטה which can refer to a progressive "stretching out," and matches the progressive speech in the preceding verse: "the One speaking to the sun, and it does not rise and to the stars he sets a seal." The same Qal participle appears in Ps 104:2 and Is 42:5 in a similar context of progressive action, whereas Is 44:24 uses the same Qal participle but could refer to a single act or a progressive action. Isaiah 45:12 uses the Qal perfect נטו referring to a past act, as does Jr 51:15. In Is 51:13 the Qal participle is coupled with a past act ("founded the Earth"), yet Zc 12:1 uses the Qal participle coupled with two other Qal participles ("founding the Earth" and "forms the spirit of man within him," the latter of which is a continuing action). All in all, the evidence leans towards the "stretching out" as an event with a definitive beginning in the past but in continual progress, at least for some indefinite period of time, and thus a process that did not cease on Day Two of creation week.

[402] For example, Stephen Hawking states: "It is important to realize that the expansion of space does not affect the size of material objects such as galaxies, stars, apples, atoms, or other objects held together by some sort of force. For example, if we circled a cluster of galaxies on the balloon, that circle would not expand as the balloon expanded. Rather, because the galaxies are bound by gravitational forces, the circle and the galaxies within it would keep their size and configuration as the balloon enlarged. This is important because we can detect expansion only if our measuring instruments have fixed sizes. If everything were free to expand, then we, our yardsticks, our laboratories, and so on would all expand proportionately and we would not notice any difference" (*The Grand Design*, 2010, pp. 125-126). This is little more than a special pleading. Hawking is admitting that he must limit the expansion to the space outside of matter instead of including the space inside of matter, otherwise his Big Bang will not work. But if the gravity of a single galaxy can stop the space within it from expanding, why

Additionally, if, as modern cosmology believes, the speed of gravity is limited to the speed of light (3×10^8 km/sec), a universe expanding faster than the speed of light would have no gravity in most of its expansion area.

Back to Genesis. The first question regarding the expansion concerns how fast it occurred. Since the sun and stars were placed "in the firmament of the heavens," the firmament would need to be big enough at the dawn of the Fourth Day to house the sun and all the stars. As the celestial bodies were placed in the firmament, it would have continued to expand away from the Earth, and in the process it would have carried the stars with it to the outer-most recesses of the universe.

If, for the sake of argument, we limit the speed of light to 186,000 miles per second (= 3×10^8 km/sec) at the time the stars are placed in the firmament, and also limit ourselves to affirming that their light reached Earth on the Fourth Day, this means that the size of the firmament at the end of its expansion on the Fourth Day would be no bigger than the allowable distance light could travel in 24 hours (*i.e.*, the 24 hours from the beginning of the Fourth day to the end of the Fourth day). As such, the radius of the firmament would have been no bigger than 1.6×10^{10} miles (or 16 billion miles); and its volume would have been 1.256×10^{31} cubic miles. If, as we will postulate momentarily, the celestial speed of light is much faster than its terrestrial speed, the volume into which the stars and galaxies would fit on the Fourth Day is very much bigger than a 16 billion mile radius.

Within the distance of 16 billion miles, the light from the stars travels to Earth in a period of 24 hours or less. As such, we have satisfied the objection concerning how starlight could appear on Earth on the Fourth Day of creation. All that is needed now is to add the subsequent events. Consequently, as the starlight reaches Earth on the Fourth Day, the expansion of the firmament continues. The rate of expansion could then be accelerated in order to arrive at the size the universe is today. In any case, the expansion will cease once the universe reaches it optimal size, but we do not know when that termination point occurs. As the firmament continues to expand beyond the radius of the Fourth Day it will carry the newly created stars with it. The major point is made that, within the context of the expanding firmament, the Bible places no limitations on starlight reaching Earth on the Fourth Day.

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doesn't the combined gravity of all the universe's galaxies stop the space in the universe from expanding? The Big Bang allows the expansion of the universe's space to overtake gravity for billions of years, yet it doesn't allow this same expansion to overtake the gravity of a single galaxy for any length of time. This is much too convenient. It shows once again how Big Bang theorists fudge their numbers to make it appear to work.

Some might venture to say that a rapidly expanding universe would later cause havoc with today's redshift values. That might only be true if redshift is proven to be an indicator of velocity and distance, but even then, modern cosmology does not see a problem with redshift values.[403] Today, all indications are that redshift is being touted as a velocity indicator merely because that particular interpretation is required of the expansion needed for the Big Bang theory. In fact, the discoverer of redshift, Edwin Hubble, originally rejected that redshift is a measure of velocity. Since the time of Hubble, a 2010 paper by Louis Marmet catalogues sixty different theories for the cause of redshift.[404] One of the more challenging hypotheses for redshift is that it represents the energy level of the source of the light rather than the energy level after the light leaves the source and is disturbed by the environment. Astronomer Halton Arp has shown convincing evidence that redshifts are intrinsic to the object emitting the radiation and thus cannot be indicators of velocity or expansion of the universe.[405] Corroboration for Arp comes from a recent paper by C. S. Chen, *et al*, in which it was found that "redshifts of spectral

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[403] As Hartnett notes: "The expansion redshift is the redshift that according to General Relativity results from the stretching of space itself and is usually defined by $R_0/R = 1 + z$, where R_0 is the scale factor of the universe now, and R at some time in the past. According to the Friedmann-Lemaître solution of Einstein's field equations, the expansion redshift only depends on the scale factor of the universe at the time the light was emitted and the time it was received. The fabric of space itself stretches between emission and reception. This is what is usually referred to as Hubble flow. The expansion redshift doesn't depend on the rate of this expansion" (John G. Harnett, "Is there any evidence for a change in c?: Implications for creationist cosmology," *Technical Journal* 16(3) 2002, pp. 91-92).

[404] "On the Interpretation of Redshift: A Quantitative Comparison of Red-shift Mechanisms," Louis Marmet, Dec. 3, 2011. His abstract states: "This paper gives a compilation of physical mechanisms producing red-shifts of astronomical objects. Over sixty proposed mechanisms are listed here for the purpose of quantitative comparisons." See also "A review of redshift and its interpretation in cosmology and astrophysics," R. Gray and J. Dunning-Davies, June 2088, Dept. of Physics, Univ. of Hull, England.

[405] Arp has shown, for example, that high redshift quasars are attached to low redshift galaxies, thus showing that redshift cannot be due solely to velocity or distance. See chapter 8 in this volume for detailed information on Arp's work and the ostracizing he has received for it from the Big Bang establishment. Arp proposes that quasars have an intrinsic red shift because they are surrounded by a cloud of electrons, which produces a red shift when light travels through it since the light loses energy to the electrons by means of the Compton Effect. Hence quasars may be much nearer to us than reported by Big Bang cosmology and, in fact, they have exhibited proper motion.

lines…are influenced by electron density." More specifically, Chen found that

> when the electron density increases, the difference of the atomic energy level is reduced, and then the redshift is raised. The Hg atomic levels embedded in a density environment are influenced by the free electrons density. The electronic fields generating from free electrons compressed inside an atom screen the Coulomb potential of the atomic nuclear. Then the nucleus' forces to the bound electrons are diminished, while the repulsion of free to bound electrons are raised and the intervals of excited energy levels $7s^3S$ to $6p^3P_1^0$ are diminished. Accordingly, the increase in density will have a substantial impact on redshifts – that is, the shielding to a nucleas is intensified by the strengthened electric field, then the attraction of the nucleus to its bound electrons is declined, followed by the decrease of energy level differences and redshifts.[406]

Interestingly enough, Hubble found that a non-velocity interpretation of redshift would also nullify Special and General Relativity. As he puts it:

> On the other hand, if the recession factor is dropped, if redshifts are not primarily velocity-shifts, the picture is simple and plausible. There is no evidence of expansion and no restriction of the time-scale, no trace of spatial curvature, and no limitation of spatial dimensions.[407]

Radial Translation and Centrifugal Force as Possible Causes for Redshift

The radial translation of the universe carrying the stars as well as the centrifugal force of a rotating universe on the light emanating from the stars also presents a most plausible reason for redshift. It has the distinct advantage of being able to incorporate the popular distance/redshift relationship as well as Arp's discovery of quasar-connected galaxies

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[406] "Investigation of the mechanism of spectral emission and redshifts of atomic line in laser-induced plasmas," C. S. Chen, X. L. Zhou, B. Y. Man, Y.Q. Zhang, J. Guo, College of Physics and Electronics, Shandong Normal University, Jinan 250014, PR China, accepted 1 Dec. 2007, p. 477.

[407] *The Observational Approach to Cosmology*, p. 63. See more on Hubble's analysis in chapter 8.

(QCG) that appear to have an intrinsic redshift. It also explains why our sun has a redshift. Redshift in this model is due to the stretching effect that a continual radial movement of the star's light around a central Earth will create on its wavelength, as well as the stretching effect that the centrifugal force of the universe's rotation will have on the light. In both cases, the longer the radius of rotation, the greater the radial speed and centrifugal force.[408] Hence, the farther a star is from the Earth in the rotating universe, the greater the forces on the star's light and the greater the redshift. In this sense, redshift is related to distance. (It could also be said that redshift is related to expansion, since the centrifugal force can be understood to be stretching out the medium through which light travels, although this is not related to the theory of "inflation" in Big Bang cosmology). Additionally, Arp's discovery of high-redshift quasars connected to low-redshift galaxies presents no problem to this model since the quasars initially possess and emit an intrinsically higher energy than galaxies. The geocentric model predicts that the greater the distance a QCG is from Earth, the greater the redshift will be for both the quasar and its connected galaxy, and their redshifts will be proportional to their energy output.

This model of redshift also predicts that stars at or near the north/south celestial pole will either have a very low or zero redshift, or even be blue-shifted. Such would be the case since the universe's axis of rotation is the north/south celestial pole where little or no centrifugal force is present. As it stands, the star Polaris, commonly called the North Star, is precisely on the north celestial pole and it has a blueshift of -16.85 km/sec.[409] Other stars on the north/south celestial pole need to be analyzed in order to verify this model's prediction.

By abandoning the popular "Big Bang" interpretation of redshift, consequently, there is no need for an expanding universe (and thus no need for the undetected Dark Energy or Dark Matter to propel it); there is no need for the universe to be 13.7 billion years old; there is no need to figure out the balance between gravity and expansion in order to keep the universe from collapsing on itself; and there is no need to abandon Euclidean space since there would be no need for curved space. In the end, it is no exaggeration to say that all of modern cosmology is built on the unproven assumption that redshift is a velocity indicator of the universe's presumed expansion.

Edwin Hubble, because he rejected the geocentric universe due to his philosophical convictions, opted for the equally dubious static and infinite

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[408] The equation for centrifugal force is $F = mv^2/r$.

[409] The hydrogen spectral line of Polaris has a wavelength of 6562.48Å and lab wavelength of 6562.85Å, with a difference of -0.37Å. Using the equation $\Delta\lambda/\lambda \times c$ we have -0.37Å$/6562.85$Å $= (-5.638 \times 10^{-5}) \times 2.99 \times 10^8$ m/s$) = -16.85$ km/sec.

universe in place of the finite and expanding Big Bang. In reality, the geocentric universe takes the best of both Hubble and the Big Bang to produce a much more logical and stable system (a) a universe that is finite because it was created by God to last a determined time; (b) static because it is not expanding and therefore is not dependent on the anomalies of Big Bang inflation and redshift values; and (c) rotating and thus creating inertial forces that counteract the force of gravity and prevents collapse of the universe. There is one more important thing the geocentric universe allows, as we will see below.

Distant Events: Are They Past or Present?

Some people object that celestial events observed on Earth, such as a distant supernova, happened a very long time ago but are now just being seen on Earth. In other words, we have the problem of determining whether the event occurred in real time (Earth time) or thousands or millions of years ago (*i.e.*, the length of time it would take light from the supernova to reach Earth). If the latter is true, then the universe must be much older than the 6000 years allowed by a strict biblical timetable. This objection is based on the supposition that the speed of light cannot exceed 3×10^8 km/sec. This speed, normally designated c in mathematical equations, is a postulate of the Special Theory of Relativity, but by no means is it a proven scientific fact. As we will see in stark detail in Chapter 4, Albert Einstein limited light's speed based on his particular interpretation of the Michelson-Morley experiment and Maxwell's equations, but his interpretation was not only biased against geocentrism, it was based only on the terrestrially tested speed of light. The speed of light outside our immediate environment has never been tested or proven to be limited to 3×10^8 km/sec.

Quite ironic is the fact that later in his career Einstein himself admitted to an unlimited celestial light speed ten years after he claimed it was constant. He writes:

> In the second place our result shows that, according to the general theory of relativity, the law of the constancy of the velocity of light *in vacuo*, which constitutes one of the two fundamental assumptions in the special theory of relativity and to which we have already frequently referred, cannot claim any unlimited validity. A curvature of rays of light can only take place when the velocity of propagation of light varies with position. Now we might think that as a consequence of this, the special theory of relativity and with it the whole theory of

relativity would be laid in the dust. But in reality this is not the case. We can only conclude that the special theory of relativity cannot claim an unlimited domain of validity; its results hold only so long as we are able to disregard the influences of gravitational fields on the phenomena (*e.g.*, of light).[410]

This begs the question as to how much "gravitational fields" can affect the speed of light. A popular book on Relativity provides an answer.

If gravitational fields are present the velocities of either material bodies or of *light can assume any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout [earth] as being at rest, the centrifugal gravitational field assumes enormous values at large distances, and it is consistent with the theory of General Relativity for the velocities of distant bodies to exceed 3×10^8 m/sec under these conditions.[411]

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[410] Albert Einstein, *Relativity: The Special and the General Theory*, translation by Robert W. Lawson, 1961, p. 85.

[411] *An Introduction to the Theory of Relativity*, William G. V. Rosser, 1964, p. 460, emphasis added. Einstein was criticized on this very point by Philip Lenard in a 1917 open debate, later published in 1920. Lenard stated: "Superluminal velocities seem really to create a difficulty for the principle of relativity; given that they arise in relation to an arbitrary body, as soon as they are attributed not to the body, but to the whole world, something which the principle of relativity in its simplest and heretofore existing form allows as equivalent" ("Allgemeine Diskussion über Relativitätstheorie," *Physikalische Zeitschrift*, 1920, pp. 666-668, cited in Kostro's *Einstein and the Ether*, p. 87). Rosser notes that "It has often been suggested that a direct experimental check of the principle of the constancy of the velocity of light is impossible, since one would have to assume it to be true to synchronize the spatially separated clocks" (p. 133). Rosser also adds a note on the viability of the geocentric universe: "Relative to an inertial frame the 'fixed' stars are at rest or moving with uniform velocity. However, relative to a reference frame accelerating relative to an inertial frame the stars are accelerating. It is quite feasible that accelerating masses give different gravitational forces from the gravitational forces due to the same masses when they are moving with uniform velocity. Thus the conditions in an accelerating reference frame are different from the conditions in inertial frames, since the stars are accelerating relative to the accelerating reference frame. It seems plausible to try to interpret inertial forces as gravitational forces due to the accelerations of the stars relative to the reference frame chosen" (p. 460).

In the geocentric system, a diurnally rotating universe creates tremendous centrifugal forces which, according to Einstein's own covariance equations, are equivalent to the force of gravity. As such, light traveling in this kind of superdynamic environment can easily exceed 3×10^8 m/sec. As Rosser notes "light can assume *any numerical value depending on the strength of the…centrifugal gravitational field*" which has "enormous values at large distances." In the Planck-ether medium of geocentrism, the speed of a transverse wave, such as light, depends on the tension between the Planck particles.[412] The greater the centrifugal force, the greater the tension and thus the greater the speed of light. The inertial force of a rotating universe increases as the distance from the center of mass increases. Consequently, the farther from Earth a star is in a rotating universe, the faster its light can travel toward Earth, the center of the universe. By the time the light reaches the environs of Earth, however, it will be traveling at the minimum speed of 3×10^8 m/sec since the surface of the Earth is at or near the neutral point of the centrifugal force created in a rotating universe. Outside of this locale, light can travel at much greater speeds than 3×10^8 m/sec. Since that is the case, we may be looking at the explosion of supernovae precisely when they occur in deep space.

We can grasp this phenomenon intuitively by illustrating the stretching of a metal spring. If we hit the end of an unstretched spring, the vibration will travel to the other end of the spring in a certain time and velocity. If we stretch the spring to about three times its original length, the vibration will travel proportionately faster due to the increased tension in the spring.[413] Likewise, if we whirl the spring around in a circle, the

centrifugal force stretches the spring. Similarly, a rotating universe stretches the ether medium within it. The greater the radius of the rotation, the greater the centrifugal force, and thus the greater the tension in the ether medium. This will result in a greater speed for light traveling through

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[412] http://en.wikipedia.org/wiki/Planck_particle.

[413] The equation for determining the velocity of the vibration is $v = \sqrt{T/\mu}$ where v is the velocity of the vibration, T is the tension of the spring and μ is the mass of the spring divided by its length.

that medium. For example, if at a certain distance away from Earth the tension of the ether is 100 times greater than it is near the Earth, this will increase the speed of light by $\sqrt{100}$ or 10 times c. If the tension is 1,000,000 times greater, the speed of light will increase to $\sqrt{1,000,000}$, or 1,000 times c.

For illustration purposes, let's use a star, Alpha Centauri, that astronomers believe is "four light years" (or 23.2 trillion miles) from Earth.[414] According to the above equation, in order for light from Alpha Centauri to reach Earth in one day, the light needs to travel at $4,508 \times 10^8$ m/sec, which is 1,502 times greater than c. This would require a tension of $\sqrt{2,256,004}$. Are such tensions possible? Yes, indeed. In fact, a Planck-ether medium could sustain tensions that are millions of orders of magnitude greater. Although the Planck-ether, at 1.61×10^{-33} cm per particle, is incompressible in our environs, in outer space it can be stretched to very great dimensions and remain completely stable. But since it is so strong, it would take a tremendous amount of centrifugal force to stretch it. To measure the centrifugal force (CF) of a rotating universe, the equation is $CF_{newtons} = mv^2/r$. For the distance from Earth to the distance between Alpha Centauri and the maximum for stars measured by stellar parallax, the centrifugal force is about 10^{68} to 10^{69} newtons; and proportionately different for stars at greater distances. Interestingly enough, using the $v = \sqrt{T/\mu}$ equation for tension, to increase c ten orders of magnitude (3×10^{16} m/sec), it would require T to be 10^{61} or so.[415] We

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[414] With the advent of the Hipparcos satellite launched in 1989 by the European Space Agency, its telescopes gathered 3.5 years worth of data on stellar positions and magnitudes, which were eventually published in 1997. Viewing the stars through two telescopes 58 degrees apart, Hipparcos measured the parallax of 118,000 selected stars within an accuracy of 0.001 seconds of arc. This accuracy is comparable to viewing a baseball in Los Angeles from a telescope in New York. Another mission, named Tycho (after Tycho de Brahe) measured the parallax of a million stars, but only to an accuracy of 0.01 seconds of arc. As accurate as these measurements appear to be, the reality is, beyond 100 light years, it is hardly possible to measure an accurate parallax. Even within 20 light-years, parallax measurements are accurate only to within one light-year. At 50 light-years from Earth the error could be as high as 5-10 light-years in distance. All in all, within a 10% margin of error, Hipparcos measured the parallaxes of about 28,000 stars of up to 300 light-years from Earth. For any star beyond 300 light years, scientists are forced to estimate its distance from Earth by other means, none of which are proven methods of measurement (e.g., redshift).

[415] A Planck particle has a mass of 2.2×10^{-5} grams over a length of 1.6×10^{-33} centimeters, giving a value for μ of 1.375×10^{28} gm/cm. Additionally, since the Planck length is defined by the equation $\ell_P = \sqrt{hG/c^3} \approx 1.616 \times 10^{-33}$cm, where

note here, however, that it is not the stars themselves that are experiencing centrifugal force since such inertial forces are only induced if the rotation is with respect to the gravitational or inertial field. In this case, it is the Planck medium that contains the gravitational or inertial field, and it carries that field in its rotation. Only if the stars were rotating independently of the Planck medium would they experience centrifugal force. In fact, the Planck medium has such high granularity that it does not interact with baryonic matter. It only reacts with electromagnetic and gravitational activity. [416] Local phenomenon, however, such as binary stars or moons circling planets, experience local inertial forces due to the dynamics of a two+ body model.

Other Attempts to Solve the Star Light Problem

Along these lines of argument we must also point out that other scientific biblicists who have tried to find a solution to the starlight problem have been unsuccessful because they have rejected the geocentric universe. For example, John G. Hartnett, a physicist from the University of Western Australia, outlines the possible solutions for the starlight problem as follows: (1) "the language of Genesis is phenomenological…stars were made millions and billions of years before Day 4, but…the light…arrived at the Earth on Day 4"; (2) "clocks in the cosmos in the past have run at much higher rates than clocks on Earth"; (3) "clocks on Earth in the past have run at much slower rates than clocks in the cosmos"; (4) "the speed of light was enormously faster in the past, of the order of $10^{11}c$ to $10^{12}c$"; (5) "the Creator God revealed in the Bible is a God of miracles." We can add (6) to the above, since Harnett also includes Russell Humphreys' "White-hole cosmology," which says that "due to gravitational time dilation, clocks on Earth near the centre of this spherically-symmetric bounded and finite distribution of matter ran slower than clocks throughout the cosmos." In another paper, Hartnett highlights the new theory (7) of Jason Lisle, which holds that "the stars really were made on the fourth day of Creation Week, and that their light reached Earth instantaneously due to the way clocks are synchronized." Known as the Anisotropic Synchrony Convention model, it holds that "in a galaxy far, far away, the biblical text

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h is the reduced Planck constant and G is the gravitational constant, then a higher value for c, the lower the Planck length, which creates more tension between Planck particles when they are stretched.

[416] Interestingly enough, one might say that geocentrists have a Euclidean hyperspace, since a stretching of Planck particles by centrifugal force to allow superluminal speeds is really a hyperextension of space.

must mean that the first four days occurred, in our usual way of thinking about time, a long, long time ago" so that "the most distant galaxies were first created tens of billions of years before the first day of creation of Genesis 1, and subsequently created closer and closer towards Earth at the constant speed of light c such that the light from all the galaxies arrived at the earth on the fourth day, for the first time."[417]

Harnett finds flaws in each of these proposals and then offers his own, which is a variation of #3. We will call it (3a). He states:

> During Creation Week, all clocks on Earth, at least up to Day 4, ran about 10^{-13} times the rate of astronomical clocks….During this time the rotation speed of the newly created Earth was about 10^{-13} times the current rotation speed as measured by astronomical clocks, but normal by Earth clocks. By the close of Day 4 the clock rates on Earth rapidly speeded up to the same rate as the astronomical clocks. All of this was maintained under God's creative power before He allowed the laws of physics to operate 'on their own' at the end of Creation Week.[418]

The common factor in most of these models (except #4) is that time is understood to be flexible. Since in these scenarios time is understood as a calibration of the interval between one event and another, then it can change depending on one's point of view of the interval. The opposite concept (and the one that Newton maintained) is that time is absolute and does not change due to different methods of calibration or points of view. Essentially, as time is understood as merely a calibration issue, the more pliable it becomes. The real prize, however is that making time flexible allows one to abide by Einstein's postulate of Special Relativity that the speed of light always remains c (300,000 km/sec), and thus the theory will be more acceptable by mainstream science.

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[417] "The Anisotropic Synchrony Convention model as a solution to the creationist starlight-travel-time problem," John G. Hartnett, *Journal of Creation* 25(3) 2011, p. 56.

[418] "A new cosmology: solution to the starlight travel time problem," John G. Hartnett, *Technical Journal* 17(2) 2003, pp. 99-100. Hartnett notes that Humphreys' model (#3, which uses relativistic time dilation), and by implication Hartnett's own model which is a variation of Humphreys', "requires that the universe have a preferred frame of reference. There is evidence that this is the case and it appears the Earth is actually near the centre of the universe" and supports this galacto-centric model by quoting from Humphreys' paper, "Our galaxy is the centre of the universe, 'quantized redshifts show" (*Technical Journal* 16(2):95-104, 2002).

In addition to making time flexible, some of the theories make the text of Genesis flexible. They do so by claiming that the stars were made millions or billions of years before the Creation began in Genesis 1:1. Their light, then, has time to travel at speed c and reach the Earth millions or billions of years later. Obviously, this theory alters the Genesis account by having the stars created before the events of Genesis 1 instead of on Day Four of Genesis 1.

Recapping the theories we have:

View	Time	c speed	Genesis
#1	Altered	Fixed	Altered
#2	Altered	Fixed	Same
#3	Altered	Fixed	Same
#3a	Altered	Fixed	Same
#4	Fixed	Altered	Same
#5	Altered	Fixed	Same
#6	Altered	Fixed	Same
#7	Altered	Fixed	Altered

As noted, the problem with these theories is the assumption that time is malleable since its calibration is assumed to be dependent on one's point of view, a principle stemming from Einstein's principle of relativity. Theory #4 is the only one that alters the speed of light, but it does so based on the supposition that light's speed has been steadily decaying since Creation and has presently reached its lowest level of 3×10^8 km/sec.[419] Conversely, our theory proposes that the speed of light is 3×10^8 km/sec only in the environs of Earth, but is many orders of magnitude greater in the recesses of space due to the centrifugal force generated by a rotating universe. As such, only a geocentric system can explain the starlight

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[419] According to Hartnett, there is no justifiable evidence for this theory, which is held by Setterfield and Norman (http://www.youtube.com/watch?v=xjqxvpFn-Gs&feature=related and http://www.youtube.com/watch?v=uU5YB4E-GXU&feature=relmfu). Hartnett critiques the theory in "Is there any evidence for a change in c?: Implications for creationist cosmology," *Technical Journal* 16(3) 2002, pp. 89-94.

problem of Genesis, while the failure of each of the above theories stems from their opposition to geocentrism.

Objection #25: Doesn't a Rotating Universe Cause the Earth to Rotate in the Same Direction?

A logical objection to a fixed Earth in a rotating universe is that the tidal force of the latter would eventually cause the former to turn at the same speed. By analogy, a rotating whirlpool of water would seem to require whatever was placed in the center to rotate with the water. Galileo raised the same issue in his now famous *Dialogue of the Two Great World Systems*. Galileo took the part of Salviati so that he could present a conundrum to the geocentric system: "…if the heavens really revolved with enough force to propel the vast bodies of the innumerable stars, how could the puny Earth resist the tide of all that turning?" Salviati replies for the Copernican system: "We encounter no such objections if we give the motion to the Earth, a small and trifling body in comparison with the universe, and hence unable to do it any violence."[420]

Galileo, of course, lived in a time that was at least two centuries before science discovered gravity and its center of mass. We noted previously that, according to Newton's laws of motion, the center of mass will experience no inertial forces. Although the center of mass is an infinitesimal point, we can safely argue that compared to the size of the universe the Earth can well be considered such an infinitesimal point.

While geocentrism has the non-moveability of the center of mass to support its position, heliocentrism has a reciprocal problem. For the same reason that one might question whether the Earth would be forced to rotate with the rotation of the universe, one can also question why, in the heliocentric system, the Earth maintains a sidereal rate of 23 hours, 56 minutes and 4 seconds, each and every day, without fail for as long as records have been kept (barring millisecond variations that swing back and forth). Why doesn't the Earth's rotation rate slow down as it moves against a stationary universe? Although some would claim that space is a vacuum and thus exhibits no forces on the Earth to slow its rotation, the same argument could be advanced for why the Earth doesn't rotate with a rotating universe. For both systems, the recent findings of Gravity Probe B for the Lense-Thirring effect have shown that inertial dragging from relative motion is almost non-existent.

But the heliocentric system has a bigger problem, however. Recently it has been discovered that the rotation rate of some of the planets has

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[420] Dava Sobel, *Galileo's Daughter*, 1999, p. 156.

decreased significantly over a short period of time. Venus, for example, has slowed its rotation rate by 6.5 minutes in the last ten years. Saturn is also suspected of a reduced rotation.[421] We can also make an educated guess that if Venus and Saturn's rotation rate is changing, then some of the other planets may be changing as well. What is the cause for this decrease? Current astronomy is dumbfounded, since it was believed that the "vacuum of space" would allow the inertia of rotation (or angular momentum) to proceed indefinitely without variation. Internal disturbances on Venus itself could not provide an answer, since they would not be strong enough to account for a 6.5 minutes decrease in ten years. Even heliocentrists argue that huge earthquakes and tsunamis on Earth can only cause millisecond variations in the Earth's rotation, but even then it always averages out to our present sidereal rate, without fail. The question remaining for the heliocentric camp is why other planets can vary significantly in their rotation rate but Earth has never done so. If the Earth had a 6.5 minute decrease in its rotation rate it would heat up very fast and most of the land would be flooded by melting polar caps.

As we noted earlier in Objection #14, the geocentric system is very stable. It does not have a fragile Earth that could change its rotation and position in space for every cosmological bump it encounters. The reason is simple. The geocentric system has the whole universe rotating around a central point. Due to the inertial mass of the universe, the tremendous inertia with which it completes its 23 hour, 56 minute and 4 second cycle can neither be increased nor decreased. Like a giant flywheel, once pushed it will continue to rotate evenly, *ad infinitum*. In fact, to move the Earth from its fixed position one would have to move the universe itself.

Mass as a Function of Compton and deBrogli Wavelength

One reason why the Earth remains fixed in a rotating universe is based on the idea that the universe is a standing Compton wave[422] created by the fact that the Earth and the universe share the same center of mass. If the universe were a standing wave and the Earth were the node of that wave,

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[421] "The European Space Agency, ESA, says Venus appears to be rotating on its axis slightly slower than it did in the early 1990s, adding 6.5 minutes to the length of the planet's day." (http://www.voanews.com/content/rotation-of-venus-might-be-slowing-139254678/173773.html). Saturn is also slowing (http://www.you tube.com /watch?v=Logz_EKCYaE).

[422] The Compton wavelength (λ) is the wavelength of a body that is not moving. It is a product of Planck's constant (*h*) divided by the mass of the particle (*m*) times the speed of light (*c*). My thanks to Dr. Gerhardus Bouw for sharing these insights with me.

the universe's wavelength would be the diameter of the universe (assuming 93 billion light years, according to modern astronomy). This means its Compton mass would only be 10^{-66} grams. This is an infinitesimally small amount of pressure on the Earth and thus the universe would have no power to turn or move the Earth. In fact, since the Earth at rest can be considered a standing wave, its Compton mass would be 10^{-46} grams, which is twenty orders of magnitude larger than the universe's Compton mass. Analogously, it would be comparable to trying to turn or move a 1.6 quintillion pound bowling ball by an air current that circles the bowling ball once every 24 hours. Moreover, since the universe is much less massive than the Earth in terms of wavelength, the universe can respond very quickly to compensate for disturbances that might otherwise move the Earth. For example, the revolving moon, the revolving sun, the planets that revolve around the sun, or an asteroid that collides with the Earth, could create inertial forces and/or momentum that seek to move the Earth. But because the universe's Compton mass is so small, it acts like a vacuum to absorb all these forces.

Interestingly enough, the deBroglie wavelength[423] for an object moving at 66,000 mph around a circumference of 5.8×10^8 miles (which is the sun's orbit around the Earth in the geocentric system) equates to a deBroglie mass of 10^{-46} grams, which, as noted above, is identical to the Compton mass of the Earth at rest. This makes the sun and the Earth somewhat of an inseparable tandem in relation to the rest of the universe. Not only does the 10^{-46} gram equivalence of a moving sun and a fixed Earth confirm that the Earth is the universe's center of mass, it shows that the sun-earth distance acts as a pivot point for the universe. As we will see in Chapter 3, recent studies of the cosmic microwave background radiation (CMB) from the 2001 WMAP and 2009 Planck probes have revealed that the whole universe is aligned with the ecliptic (the plane formed by the distance between the sun and the Earth) and the equinoxes (the two points that determine the axes of the universe's rotation around the Earth).

Fluid Dynamics and a Non-Moving Earth

Another possibility occurs under fluid dynamics. Let's suppose that space is not a "vacuum," *per se*, but contains a discrete material substance, which we call ether. (As we noted in answer to Objection #17, modern science has discovered that space contains ether). This ether is carried with

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[423] The deBroglie wavelength (λ) is the wavelength of a body in motion. It is a product of Planck's constant (h) divided by the mass of the moving object (m) times its velocity (v).

the universe as it rotates around the Earth. From what we know in modern physics, is it necessarily the case that the ether will drag the surface of the Earth and force the Earth to rotate? The answer is no. Using modern physics, Martin Selbrede explains it as follows:

> It is often objected that if geocentricity were true, and the rotating heavens were dragging Foucault pendula and weather systems around, why doesn't that force pull on the Earth itself and drag it along, causing it to eventually rotate in sync with the heavens? It appears that this straightforward application of torque to the Earth should cause it to rotate in turn, but this turns out to be an oversimplification. As the heavens rotate, and the firmament rotates on an axis through the Earth's poles, each firmament particle…also rotates with the same angular velocity. Ironically, this is precisely the reason the Earth can't be moved.[424]

Selbrede goes on to explain the validity of above proposition by appealing to an illustration of the same principle crafted by L. I. Schiff and reproduced by Misner, Thorne and Wheeler in the 1973 book *Gravitation*. The authors state:

> The gyroscope is rotationally at rest relative to the inertial frames in its neighborhood. It and the local inertial frames rotate relative to the distant galaxies with the angular velocity Ω because the Earth's rotation "drags" the local inertial frames along with it. Notice that near the north and south poles the local inertial frames rotate in the same direction as the Earth does (Ω parallel to J), but near the equator they rotate in the opposite direction (Ω antiparallel to J; compare Ω with the magnetic field of the Earth!).[425]

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[424] Martin Selbrede, "Geocentricity's Critics Refuse to Do Their Homework," *The Chalcedon Report*, 1994, p. 11, emphasis added. In this 12–page rebuttal of Michael Martin Nieto of Los Alamos National Laboratory, who was hired by Gary North (a Reconstructionist-Theonomist) to attempt to refute geocentrism, Selbrede has written one of the best defenses of geocentrism, using the very principles of Relativity. See Appendix 2 for the full paper.

[425] The formula to which Misner, *et al*. refer is stated on the same page (p. 1119), which is: $\Omega = -\frac{1}{2} \nabla \times g = \left(\frac{7}{8}\Delta_1 + \frac{1}{8}\Delta_2 \right) \frac{1}{r^3} \left[-J + \frac{3(J \cdot r)r}{r^2} \right]$

Misner, *et al*. offer an analogy that explains the relationship, along with adding that "This analogy can be made mathematically rigorous":

> Consider a rotating, solid sphere immersed in a viscous fluid. As it rotates, the sphere will drag the fluid along with it. At various points in the fluid, set down little rods, and watch how the fluid rotates them as it flows past. Near the poles the fluid will clearly rotate the rods in the same direction as the star [*i.e.*, sphere] rotates. But near the equator, because the fluid is dragged more rapidly at small radii than at large, the end of a rod closest to the sphere is dragged by the fluid more rapidly than the far end of the rod. Consequently, the rod rotates in the direction opposite to the rotation of the sphere.[426]

The description of the above phenomenon is illustrated in Fig. 1 and Fig. 2. In place of rods we have used corrugated rings. The sphere in the middle represents the Earth in counter-clockwise rotation. At the north and south pole the rings will rotate in the same counter-clockwise direction as the Earth. At the equatorial plane, however, the red rings will rotate in the clockwise direction. Fig. 2 shows the same rotations from the top-down viewpoint.
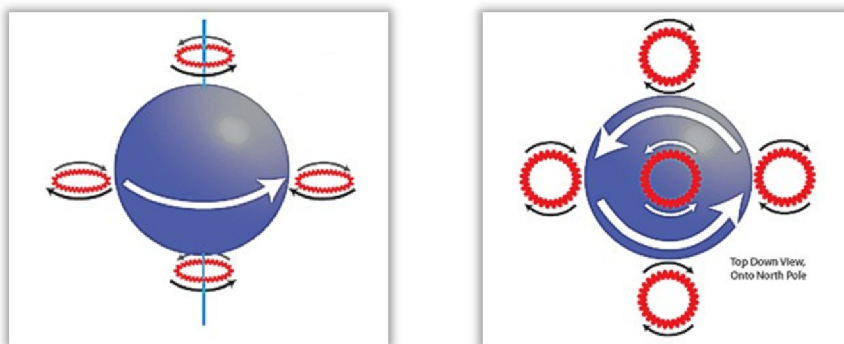
Fig. 1: Earth is rotating counter-clockwise; rings at north and south poles are rotating counter-clockwise; rings at equator are rotating clockwise.

Fig. 2: A top-down view of Fig. 1's motions

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[426] Misner, Thorne and Wheeler, *Gravitation*, p. 1120. When the authors say "the fluid is dragged more rapidly at small radii than at large," they are referring to a rod positioned perpendicular to the tangent of the sphere, wherein the part of the rod closest to the sphere's tangent is the "small radii" while that farther away is the large radii.

Following this model, Selbrede shows how it confirms the geocentric model:

> Now reverse the situation. If we want to cause the sphere to rotate clockwise, we would need to turn the rods at the poles clockwise, and the ones at the equators counter-clockwise….This picture is clear then: to turn the sphere, the rotation of the particles (MTW's "rods") at the poles must be the opposite of that at the equator….However, in the case of a rotating firmament, all the particles are rotating in the same direction, with the angular velocity common to the entire firmament. The equatorial inertial drag is in the opposite direction as that acting near the poles. (See Fig. 3)

Fig. 3: Depicts the Geo-Lock Position. As opposed to Fig. 2, all of the red rings are rotating in the same clockwise direction, which represents the daily rotation of the universe around the Earth. The four outside red rings represent the universe's rotation around the Earth's equator, while the red ring in the center represents the universe's rotation around the Earth's north or south poles. The four red rings represent the universe's counter-clockwise force at the Earth's equator, but the red ring in the center represents the universe's clockwise force on the Earth's north and south poles. As Selbrede notes, "The opposing forces are situated within the on-axis body, the Earth, rather than in contra-rotating equatorial and polar frames." The result is a neutralizing of forces to zero, namely, the Geo-Lock Position.

> Using calculus, one integrates the effect from the center of the Earth outward in infinitesimal shells, showing that the Earth is in fact locked in place, the resulting inertial shear being distributed throughout the Earth's internal volume. It could be demonstrated that were the Earth to be pushed out of its "station keeping" position, the uneven force distribution would return it to its equilibrium state.[427]

Additionally, such a force would be more than enough to counter-balance any torque from the moon, the sun, or the planets as they revolve around the Earth.

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[427] Martin Selbrede, "Geocentricity's Critics Refuse to Do Their Homework," *The Chalcedon Report*, 1994, pp. 11-12.

"Concepts that have proved useful in ordering things can easily gain such a hold over us that we forget their mortal origin and accept them as unalterable facts….The path of scientific progress is often blocked for long periods by such errors."

Albert Einstein[428]

"I also fear for the soul of the scientific enterprise if we persist in ignoring the elephant in the room. Are we scientists able to follow the scientific method and admit we're wrong when the data say so? Or are we just middling priests of some Cold Dark Religion ushering in another millennium of epicycles"

Stacy McGaugh [429]

"I know that most men…can seldom accept even the simplest and most obvious truth if it be such as would oblige them to admit the falsity of conclusions which they have delighted in explaining to colleagues, which they have proudly taught to others, and which they have woven, thread by thread, into the fabric of their lives."

Leo Tolstoy[430]

"All knowledge is interpretation."   Karl Jaspers[431]

"The trouble ain't that people are ignorant, it's just that they know so much that ain't so."

Josh Billings[432]

"The question of all questions for humanity, the problem which lies behind all others and is more interesting than any of them, is that of the determination of man's place in Nature and his relation to the Cosmos."

Thomas H. Huxley[433]

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[428] Albert Einstein, 1916 obituary for E. Mach, *Physikalische Zeitschrift* 17, 101

[429] Stacy McGaugh, Department of Astronomy, University of Maryland (http://www.astro.umd.edu/~ssm/mond/stakes.html)

[430] Attributed, not verified.

[431] Quoted by W. Kaufmann in *Existentialism from Dostoevsky to Sartre*, p. 33.

[432] "Josh Billings" was the pen name of American humorist Henry Wheeler Shaw (d. 1885), attributed, not verified.

[433] *Evidence as to Man's Place in Nature*, 1863.

Chapter 3

Evidence Earth is in the Center of the Universe

Edwin Hubble's "Intolerable" Observation

T he possibility that Earth is at the center of the universe was swirling in the minds of scientists for quite a while in the last century. Edwin Hubble, who is one of the 20th century's most famous and celebrated astronomers and for whom the *Hubble Space Telescope* is named, was in utter consternation in the 1930s and 40s when he discovered through his work with the 100-inch telescope at Mount Wilson, California, that Earth was in the center of the universe.

As he examined the light coming from stars and galaxies, Hubble concluded that the spectrum of light, particularly the shift toward the red end of the spectrum, indicated Earth's centrality quite clearly. Since Hubble was an avowed Copernican, he dismissed the geocentric evidence and countered with the following obstinate alternative:

Edwin Hubble
1889 – 1993

…Such a condition would imply that we occupy a unique position in the universe, analogous, in a sense, to the ancient conception of a central Earth.…This hypothesis cannot be disproved, but it is unwelcome and would only be accepted as a last resort in order to save the phenomena. Therefore we disregard this possibility...the unwelcome position of a favored location must be avoided at all costs...such a favored position is intolerable….Therefore, in order to restore homogeneity, and to escape the horror of a unique position…must be compensated by spatial curvature. There seems to be no other escape.[434]

…there must be no favored location in the universe [*i.e.*, no central Earth], no center, no boundary; all must see the universe

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[434] *The Observational Approach to Cosmology*, 1937, pp. 50, 51, 58-59.

alike. And, in order to ensure this situation, the cosmologist postulates spatial isotropy and spatial homogeneity....[435]

Fig. 1: Hubble interpreted the redshift of galaxies as caused by their velocities away from a central Earth

Notice Hubble's highly charged language. Although he admits it cannot be disproved, an Earth-centered universe is not only "unwelcome" but "must be avoided at all costs" and, in fact, it is a "horror" that is "intolerable." As noted earlier, one scientist even calls it a "depressing thought."[436] Notice also Hubble candidly revealing to us that "space curvature" was invented (by Einstein) in order to escape the geocentric implications from the evidence in his telescope of Earth's centrality. Let's look at his sentence again: "Therefore, in order to restore homogeneity, and to escape the horror of a unique position…must be compensated by spatial curvature. There seems to be no other escape." How does "homogeneity" help Hubble? It is best understood by noting what Hubble initially saw in his telescope as opposed to what he wanted to see. Hubble initially saw that the universe was isotropic, that is, one observes from a defined position and sees that in whichever direction he looks the landscape is the same. This means that the "defined position" is in the center, where the observer is, as if one were standing on a hill in the middle of a desert and turning around to look at the whole landscape.

In the below picture, Earth represents the hill and the galaxies represent the landscape in an isotropic universe. Hubble didn't want an

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[435] *Ibid*., p. 63.
[436] Donald Goldsmith, *The Evolving Universe*, 1985, p. 140.

isotropic landscape, however. He knew the implications of the observation, *i.e.*, that Earth would be in the center of the isotropy. So Hubble proposed to eliminate Earth from the center by "restoring homogeneity," *i.e.*, taking away the hill from which the observations are made and making the entire landscape look the same.

Fig. 2: Isotropic: looks the same in every direction as if one were standing on a hill and turning around 360 degrees to observe the landscape.

Fig. 3: Homogeneous: looks the same in all directions and one is *not* standing on a hill to observe the landscape.

Hubble needed one more adjustment to make his no-Earth-in-the-center universe complete. Since his telescope did, indeed, show a unilateral movement away from Earth in any direction he looked, he had to remove any notion that the Earth was somehow in the center of this movement. Thus he added "spatial curvature" and placed the Earth on the rim of the curvature, far away from the center, so to speak.

Fig. 4: Homogeneity & Spatial Curvature: all space is the same and is curved into a sphere that is expanding outward

Imagine that the above two-dimensional disc is a three dimensional sphere, but there is no inside or center, only a surface where everything looks the same, as if it were an inflated balloon.[437] This is the curvature that Hubble invented in order to take Earth out of the center. Space could be "curved" as such based on Einstein's theory of General Relativity, which said that the gravity of matter pulled space inward (or, as Einstein called it, "the warping of spacetime"). Hubble claimed there was no matter in the center since he saw everything expanding away from him in his telescope. All the matter in the universe would be on the surface of the curved space and expanding outward. Even though this concept is

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[437] Above picture courtesy of R. Humphrey's article "Our Galaxy is at the Centre of the Universe, 'Quantized' Redshifts Show" in *Journal of Creation* 16(2):95–104, August, 2002.

counterintuitive, it was the only concept available to Hubble and his like-minded colleagues to remove Earth from the center. It still survives today as the only explanation for the Copernican Principle.
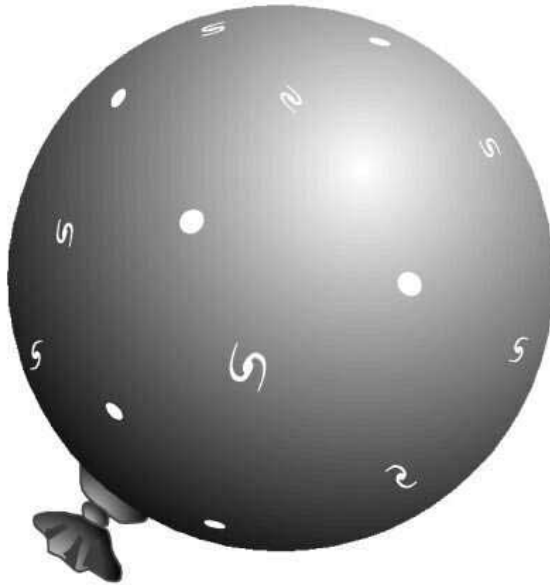
Fig 5: Hubble's idea of space expanding like a balloon

It is not difficult to conclude that the most gifted scientists of our day simply cannot overcome their prejudices and presuppositions when examining evidence that upsets their world-view. The thought of having to make an apology for the fact that science has misled the world for so many years is, indeed an "intolerable…horror" for today's academics as well as it was for Hubble. As Van der Kamp observes:

> For theoretical thinking and concluding are not self-sufficient. When – as it has happened! – a prominent astronomer tells us that scientifically the Tychonean [geo-centric] system of the world cannot be disproven, but that philosophically it is unacceptable, then he bares thereby the pre-rational foundation of all human thought to be the starting point of his convictions. And that starting point determines his approach to his scientific labors, whether he is fully aware of it or not…his faith in human

thinking's self-sufficiency misleads him into believing that this thinking can provide him with an unassailable truth.[438]

Mighty telescopes and super-sensitive scanners may deliver reams and reams of data – they deliver not a syllable of unassailable interpretation. At bottom we always see, as Wittgenstein put it, what we want to see. That is in astronomy: either a closed finite, an open finite, or a curved unbounded cosmos.[439]

James Burke, in his book describing how Galileo changed our whole outlook on the world, states:

Today we live according to the latest version of how the universe functions. This view affects our behavior and thought, just as previous versions affected those who lived with them. Like the people of the past, we disregard phenomena which do not fit our view because they are 'wrong.' Like our ancestors we know the real truth.

Has the course of learning about the universe been, as science would claim, a logical and objective search for the truth, or is each step taken for reasons related only to the theories of the time? Do scientific criteria change with changing social priorities? If they do, why is science accorded its privileged position? If all research is theory-laden, contextually determined, is knowledge merely what we decided it should be? Is the universe what we discover it is, or what we say it is?[440]

To the question of what a geocentric universe would look like, Burke adds:

The point is that it would look exactly the same. When we observe nature we see what we want to see, according to what we believe we know about it at the time.[441]

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[438] *De Labore Solis*, p. 56.
[439] *De Labore Solis*, p. 80.
[440] James Burke, *The Day the Universe Changed: How Galileo's Telescope Changed the Truth and Other Events in History That Dramatically Altered Our Understanding of the World*, 1985, preface.
[441] James Burke, *The Day the Universe Changed*, p. 11.

Perhaps feeling the pressure in light of the overwhelming evidence in his telescope, just prior to the end of his book Hubble took a cosmic swipe at Relativity and Dark Matter, and the universe that both envision:

> Thus the theory might be valid provided the universe were packed with matter to the very threshold of perception. Nevertheless, the ever-expanding model of the first kind seems rather dubious. It cannot be ruled out by the observations, but it suggests a forced interpretation of the data. The disturbing features are all introduced by the recession factors, by the assumption that red-shifts are velocity-shifts. The departure from a linear law of red-shifts, the departure from uniform distribution, the curvature necessary to restore homogeneity, the excess material demanded by the curvature, each of these is merely the recession factor in another form…if the recession factor is dropped, if red-shifts are not primarily velocity-shifts, the picture is simple and plausible. There is no evidence of expansion and no restriction of the time-scale, no trace of spatial curvature, and no limitation of spatial dimensions. Moreover, there is no problem of inter-nebular material ["Dark Matter"].[442]

> If the redshifts are a Doppler shift...the observations as they stand lead to the anomaly of a closed universe, curiously small and dense, and, it may be added, suspiciously young. On the other hand, if redshifts are not Doppler effects, these anomalies disappear and the region observed appears as a small, homogeneous, but insignificant portion of a universe extended indefinitely in both space and time.[443]
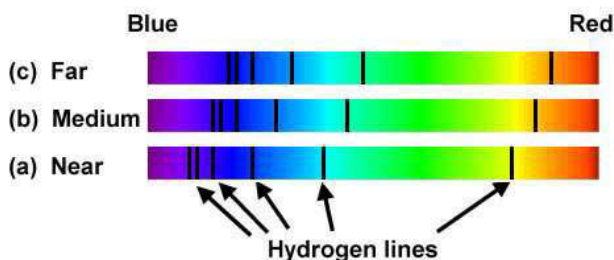
Fig. 6: Redshift: The spectrum is shifted to the red end of the seven-color spectrum

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[442] *The Observational Approach to Cosmology*, p. 63.
[443] *Monthly Notices of the Royal Astronomical Society*, 17, 506, 1937.

Cluster nebula in	Distance in light-years	Redshifts
Virgo	78,000,000	1,200 km s⁻¹
Ursa Major	1,000,000,000	15,000 km s⁻¹
Corona Borealis	1,400,000,000	22,000 km s⁻¹
Bootes	2,500,000,000	39,000 km s⁻¹
Hydra	3,960,000,000	61,000 km s⁻¹
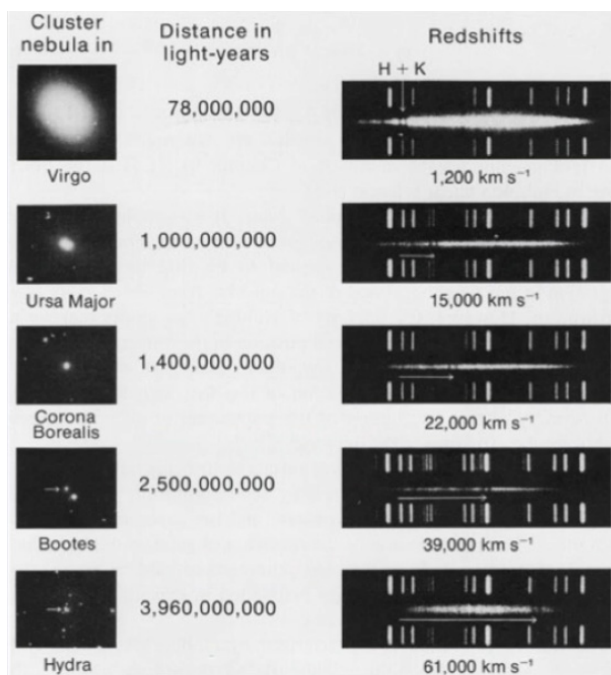
Fig 7: Redshifts of various stars and galaxies

To use an old cliché, we might say that Hubble was caught between a rock and a hard place. If he admits that redshift is a Doppler effect, then he is forced to an Earth-centered universe that is "closed, small, dense and young." If he opts for the position that redshift is not a Doppler effect, he is left with an infinite universe that does not run by the Big Bang theory or even the theory of General Relativity. The bare truth is, here we have one of the greatest astronomers the world has ever known admitting possibilities from his telescopic observations that are completely opposed to the views held today by modern astronomy. Of course, the first view suggesting an Earth-centered universe was "intolerable" for Hubble, which is probably the reason that just before his death in 1953 he confided to Robert Millikan (1923 Nobel Prize winner) that redshift should not be interpreted as a Doppler shift, and thus Hubble led the way for the emergence of the Steady State theory in the 1960s.

Stephen Hawking, probably the world's most famous living physicist, found himself in the same dilemma as did Hubble regarding the position of the Earth in the universe. He writes:

...all this evidence that the universe looks the same whichever direction we look in might seem to suggest there is something special about our place in the universe. In particular, it might seem that if we observe all other galaxies to be moving away from us, then we must be at the center of the universe.[444]

Stephen Hawking, b. 1942

Since Hawking must give equal credibility to Alexander Friedmann's first assumption (*i.e.*, that the universe looks identical in whichever direction we look), he cannot deny the clear implications of that assumption – that the Earth is in the center of it all. In order to attempt an escape from this implication, Hawking proposes an "alternate explanation":

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[444] *A Brief History of Time*, 1988, p. 42. Hawking says the same on page 47: "This could mean that we are at the center of a great region in the universe…" The book was published on April Fool's Day in 1988, six years after he started writing it. Since then it has been translated into thirty languages and has sold close to 10 million copies. A film has also been made as well as another book, *A Brief History of Time: A Reader's Companion*. The latest edition, *The Illustrated A Brief History of Time*, has been translated into forty different languages and sold more than 10 million copies. This book was on the *London Sunday Times* Best Seller list for a record two hundred and thirty-seven weeks, longer than any other book. Hawking adds, however, that this does not include Shakespeare or the Bible. Hawking recently published his updated sequel: *A Briefer History of Time*, 2005.

There is, however, an alternate explanation: the universe might look the same in every direction as seen from any other galaxy, too. This, as we have seen, was Friedmann's second assumption. We have no scientific evidence for, or against, this assumption. We believe it only on grounds of modesty: it would be most remarkable if the universe looked the same in every direction around us, but not around other points in the universe.[445]

Paul Davies has also admitted the metaphysical and personal dimensions of the issue. He writes:
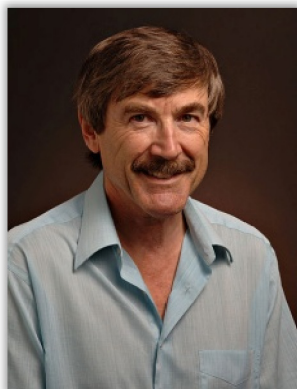
"All cosmological models are constructed by augmenting the results of observations by a philosophical principle. Two examples from modern scientific cosmology are the principle of mediocrity and the so-called anthropic, or biophilic, principle. The principle of mediocrity, sometimes known as the Copernican principle, states that the portion of the universe we observe isn't special or privileged, but is representative of the whole. Ever since Copernicus demonstrated

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[445] *A Brief History of Time*, p. 42. Hawking is not the first to appeal to the "modesty" position. Hawking's dependence on the "Cosmological Principle" to vindicate his position was appropriately critiqued by Van der Kamp: "…the cosmological principle…has about the same logical status as the view of an Indian in the Amazon jungles who concludes that, since he sees parrots in the palms, there must be parrots at the Poles" (*Bulletin of the Tychonian Society*, Jan-Feb, 1979, p. 7). Hawking suggests there is a mysterious connection to the fact that he was born three hundred years, to the day, after Galileo's death. Accordingly, he is profuse with his admiration of Galileo: "Galileo, *perhaps more than any other single person*, was responsible for the birth of modern science. His renowned conflict with the Catholic Church was central to his philosophy, for Galileo was *one of the first to argue* that man could hope to understand how the world works, and, moreover, that we could do this by observing the real world" (*ibid*., p. 179, emphasis added). It was Hawking's desire to emulate his three favorite scientists in *A Brief History of Time*, and thus he writes three short essays on Einstein, Galileo, and Newton, respectively. In each, Hawking reveals a deep-seated, ideological motivation, treating the three scientists as if they were persecuted saints.

that Earth does not lie at the centre of the universe, the principle of mediocrity has been the default assumption; indeed, it is normally referred to as simply "the cosmological principle." This principle underpins the standard Friedmann-Robertson-Walker cosmological models.[446]

Since Hawking admits he has no irrefutable evidence for his alternative, his resorting to Friedmann's second assumption rather than the first assumption is obviously an arbitrary decision. The criterion for his choice, he says, is based on "modesty." In other words, Hawking wants us to believe that, of the two assumptions, he
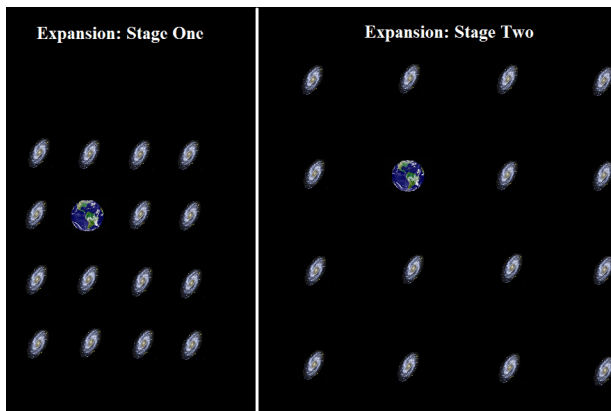
The expanding universe without a center[447]

is purposely choosing the one that removes Earth from the center of the universe based on what he understands as the human virtue of taking the most humble position. This has become a common apologetic among secular cosmologists. Hawking isn't the first. In 1972, W. B. Bonnor, faced with deciding between a non-centered homogeneous as opposed to a centered inhomogeneous universe, stated:

It seems that [$\rho\%(distance)^{-1.7}$], if extrapolated indefinitely, is at variance with the Cosmological Principle as ordinarily under-

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[446] Paul C. W. Davies, "Multiverse Cosmological Models," p. 1. Australian Centre for Astrobiology, Macquarie University, New South Wales, Australia 2109, pdavies@els.mq.edu.au.
[447] See CDROM for animation of the Big-Bang expanding universe model.

stood, since it implies that the Universe has a center at the present time….Nevertheless, that we happen to find ourselves so near the center is uncomfortable for human modesty.[448]

In reality, this is merely a feigned humility; an attempt to engender the sympathies of the human audience so that the astronomer can appear noble and self-depreciating, and therefore more convincing; a way of making oneself appear gallant by choosing the less ingratiating option when in reality the choice is made simply in order to avoid the divine implications and harsh demands of an Earth in the center of everything. As we noted earlier from the remarks of Stephen Gould, man has been on a relentless quest since the days of Copernicus to keep Earth away from center of the universe, for the science community knows full well that admitting to a special place for the Earth means that Someone higher than us must have deliberately put it in that privileged position. Hawking more or less admits his motivations when he writes elsewhere:

We could still imagine that there is a set of laws that determines events completely for some supernatural being, who could observe the present state of the universe without disturbing it. However, such models of the universe are not of much interest to us ordinary mortals.[449]

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[448] W. B. Bonnor, "A Non-Uniform Relativistic Cosmological Model," *Monthly Notices of the Royal Astronomical Society*, 1972, 159, p. 261. Bonnor was reacting to the article written by Gerard de Vaucouleurs titled: "The Case for a Hierarchial Cosmology," *Science*, February 27, 1970, vol. 167, No 3922, pp. 1203-1213, arguing that the position of galaxies in the universe is no accident, but follows a hierarchial pattern, implying creation by design.

[449] *Ibid*., p. 55. Interestingly enough, Stephen Hawking sees in the Big Bang an affiliation with religion, since it implies a beginning to the universe. He writes: "Many people do not like the idea that time has a beginning, probably because it smacks of divine intervention. (The Catholic Church, on the other hand, seized on the big bang model and in 1951 officially pronounced it to be in accordance with the Bible.)" Suffice it to say, we will deal with Hawking's claims about "official" teachings of the Catholic Church in the third volume, *Galileo Was Wrong: The Church Was Right*. For now, we can say that his claims are fallacious. In order to escape the notion of a beginning, Hawking has invented the "no boundary" cosmos, wherein the universe is a "wave-function" that merely "popped" into existence. Hawking arrives at this understanding by the use of "imaginary" time, although he admits that "When one goes back to the real time in which we live…there will still appear to be singularities….In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science break down" (*ibid*., p. 139). This is the kind of dream

Still, Hawking is not completely comfortable with the position he has adopted. Like a boy who steals from his mother's cookie jar and gorges himself in the serene satisfaction that he was able to outsmart her, he soon discovers that his stomach is upset and his whole body racked with pain. So Hawking second guesses his own philosophy:

> It was quite a shift in our view of the universe: If we are not at the center, is our existence of any importance? Why should God or the laws of nature care about what happens on the third rock from the sun, which is where Copernicus has left us? Modern scientists have out-Copernicused Copernicus by seeking an account of the universe in which man (in the old pre-politically correct sense) played no role. Although this approach has succeeded in finding objective impersonal laws that govern the universe, it has not (so far at least) explained why the universe is the way it is rather than being one of the many other possible universes that would also be consistent with the laws…. Many people (myself included) feel that the appearance of such a complex and structured universe from simple laws requires the invocation of something called the anthropic principle, which restores us to the central position we have been too modest to claim since the time of Copernicus.[450]

Perhaps, as the old saying goes, Hawking wants to have his cake and eat it, too. He doesn't want to accept that the Earth is in the center of the universe, but he would like it just the same if science could figure out some way of *restoring* it to the center without it actually *being* in the center. Until that wishful thinking becomes a reality, the "alternate" explanation for what scientists of his imagination see in their telescopes seems to be the mantra they have all adopted to escape an Earth-centered cosmology.

For the record, however, as recent as 2008, it was discovered that Lorentzian– and Hubble–related mathematics disqualifies Hawking's non-centered alternative. Yukio Tomazawa of the Michigan Center for Theoretical Physics demonstrated that in Hawking's attempt to escape a center "there is no cosmic microwave background (CMB) dipole even in the presence of a peculiar velocity. In other words, the observation of a

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world in which today's scientists dabble, and yet they write about it in their books as if it is a reality all to itself; and the gullible audience accepts it with little question, for they also, having removed God from the picture, have no other choice but to accept the fantasies of modern science.

[450] *On the Shoulders of Giants*, ed., Stephen Hawking, 2002, pp. xi-xii.

CMB dipole excludes such an interpretation of the coordinates for the Friedman universe."[451]

Eerily similar to Stephen Hawking are the inner motivations and cosmological rationalizations of astronomer Robert Dicke:

Particularly significant in the distribution of galaxies about us is uniformity and isotropy. The galaxies appear to be uniformly distributed about us. Not only is the distribution uniform but the above described motions with respect to us represent a uniform dilation. How is this to be interpreted? We might be tempted to conclude that man occupies some special central point in the Universe, that galaxies

Robert Dicke, 1916 – 1997

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[451] "The CMB dipole and existence of a center for expansion of the universe," Yukio Tomazawa, University of Michigan, February 2, 2008, p. 2. Tomazawa writes: "Lemma: There is no CMB dipole at any point of the universe in a cosmology without a center, in the absence of a peculiar velocity. Proof: This is almost self-evident. In any direction from a point in the universe, the distance l_0 from a CMB emitter to a selected point becomes l after expansion and the redshift factor is given by $1 + z = l/l_0$ and this value is the same for all directions. Of course, differences in the redshift or the temperature distribution in the CMB measurement come from the structure variation of the emitters, which is the whole issue of the CMB phenomenon….Theorem 1: There is no CMB dipole at any point in the universe in a cosmology without a center, even in the presence of a peculiar velocity v_p. Proof I: Seen from the rest frame of a peculiar velocity, both l_0 and l are Lorentz contracted by the same factor $\sqrt{1-(v_p\cos\theta/c)^2}$, where θ is the angle between the emitter and the peculiar velocity, and their ratio in $1 + z = l/l_0$ is unchanged.This is true for all directions Proof II: Relating the equivalent velocity of the CMB emitter v to the expansion rate $1 + z$ by $\sqrt{1 + v/c}/1 - v/c = 1 + z$, one gets $v/c = (1 + z)^2 - 1/(1 + z)^2 + 1 = 1 - 2\, 1/(1 + z)^2 = 1 - 2 \times 10^{-6}$ for z = 1000. The relative velocity of the emitter and the peculiar velocity v_p in the direction of the emitter is $v - v_p\cos\theta/1 - vv_p\cos\theta/c^2 = v - v_p\cos\theta + (v/c)^2 v_p\cos\theta = v - O(4 \times 10^{-6} v_p\cos\theta)$. It is easy to see that this result is valid in any direction. Proof III: An object that moves with peculiar velocity v_p is at rest with respect to an object at a distance of v_p/H_0, where H_0 is the Hubble constant, which does not have a CMB dipole by the Lemma. Therefore, an object with a peculiar velocity should not have a CMB dipole. All three proofs give the same result. Another way to look at this theorem is that the equivalent speed of a CMB emitter is close to that of light and the speed of light is identical for moving frames. We have reached the important conclusion that in a cosmology without a center there is no CMB dipole" (pp. 2-3).

move away from *us*. An alternative interpretation is that the Universe is uniform in structure and that all points are similar. Thus the Universe might appear isotropic from any particular galaxy in which man happened to be living….The mathematical transformation is easily carried out and leads to the conclusion that in the average the Universe would appear the same when seen from other galaxies. This is consistent with the assumption that the Universe is uniform and that man does not occupy a preferred central galaxy.[452]

Notice that in the last sentence Dicke bases his alternative explanation on the "assumption…that man does not occupy a preferred central galaxy," rathr than any hard evidence at his disposal. The only thing he possesses that can give pause to examine his "alternative" is that he can produce a "mathematical transformation" that will make it a possibility. As we will see many times in this discourse, the pliable world of mathematics comes to the rescue for those who are looking for an escape from the observational evidence that places Earth in the center of the universe. Mathematically speaking, one could make Jupiter the center of the solar system and the universe, or Venus or Mars or Proxima Centauri, and have everything meet the mathematical specifications. Newtonian relativity, because it holds that everything is in motion, allows for any object to serve as the center insofar as the physical motions are involved.[453]

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[452] Robert H. Dicke, *Gravitation and the Universe*, Jayne Lectures for 1969, 1970, p. 55. Later, Dicke continues to puzzle over galaxy distribution: "There are peculiar puzzles about this Universe of ours. As it gets older, more and more of the Universe comes into view, but when new matter appears it is isotropically [evenly] distributed about us, and it has the appropriate density and velocity to be part of a uniform Universe. How did this uniformity come about if the first communication of the various parts of the Universe with each other first occurred long after the start of the expansion?…The puzzle here is the following: how did the initial explosion [the Big Bang] become started with such precision, the outward radial motion became so finely adjusted as to enable the various parts of the Universe to fly apart while continuously slowing in the rate of expansion. There seems to be no fundamental theoretical reason for such a fine balance" (*ibid*., pp. 61-62). We, of course, would answer that the galaxies appear as they are because they were created in that state, since it is quite apparent that science has no explanation how they could have evolved to their present state. Later Dicke admits that his Big Bang hypothesis could be "completely wrong" since "the observational basis for the analysis is meager" (*ibid*., p. 72).

[453] As Fred Hoyle reminds us: "Let it be understood at the outset that it makes no difference, from the point of view of describing planetary motion, whether we take the Earth or the Sun as the center of the solar system. Since the issue is one of

In addition, Dicke's physical explanation is certainly not convincing. He states: "Not only is the distribution uniform but the above described motions with respect to us represent a uniform dilation." Analogously, place yourself in the middle of a carousal. You will observe all the horses equidistant from your central location. Now imagine the horses expanding outward away from you, at the same speed, in concentric circles. It is precisely this pattern and distribution that Dicke sees in his telescope when he looks at the galaxies. But now, place yourself on the outer rim of the carousal. Since you are no longer in the center, you will be expanding away from the center with the horses. Will you see all the horses equidistant from you, and will they all be expanding away from you at the same speed? Obviously not. There is only one place, the center, in which equidistance and equal velocity can be satisfied together, and that is what Dicke saw in the lens of his Earth-based telescope. The conclusion is inescapable but Dicke, not willing to accept the face-value evidence, desperately seeks for an alternative.

A few pages later, Hawking is again confronted with evidence that places Earth in the center of the universe. In the early 1960s a group of astronomers known as the Cambridge group, led by Martin Ryle, examined sources of radio waves from outer space. They found a variety of intensities. Their results led Hawking to conclude: "This could mean that we are at the center of a great region in the universe in which the sources are fewer than elsewhere." Of course, as he did with the previous evidence, Hawking gives himself an "alternative" to the data, stating: "Alternatively, it could mean that the sources were more numerous in the past, at the time that the radio waves left on their journey to us, than they are now."[454]

That these kinds of decisions are based on Hawking's ideology is confirmed in his book *The Large Scale Structure of Space-Time*, in which he and co-author George F. R. Ellis admit the driving force leading to their conclusions. They write:

> However we are not able to make cosmological models without some admixture of ideology. In the earliest cosmologies, man placed himself in a commanding position at the center of the

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relative motion only, there are infinitely many exactly equivalent descriptions referred to different centers – in principle any point will do, the Moon, Jupiter….So the passions loosed on the world by the publication of Copernicus' book, *De revolutionibus orbium caelestium libri VI*, were logically irrelevant…" (*Nicolaus Copernicus*, 1973, p. 1). Once, however, there is an immobile object in the mix, then there can only be one mechanical and mathematical center.

[454] *A Brief History of Time*, 1988, p. 47.

universe. Since the time of Copernicus we have been steadily demoted to a medium sized planet going round a medium sized star on the outer edge of a fairly average galaxy, which is itself simply one of a local group of galaxies. Indeed we are now so democratic that we would not claim that our position in space is specially distinguished in any way. We shall, following Bondi (1960), call this assumption the Copernican principle.[455]

George F. R. Ellis, b. 1939

Downright fearful of geocentrism and desiring to keep the *status quo*, Ellis stated in 1979: "Any weakening at all of the homogeneity principle implies a preferred position for our world – which is what the [cosmological] principle was designed to avoid."[456] Hence, the "Copernican principle," nowadays camouflaged by the term "cosmological principle," is a driving force among today's agnostic scientists. It is taken as an *a-priori* truth to which the rest of cosmology must conform. All evidence must be interpreted in light of this principle. One author put it this way:

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[455] Hawking, S. W. And Ellis, G. F. R., *The Large Scale Structure of Space-Time*, 1973, p. 134. Bondi, Hermann, *Cosmology*, 1960. Bondi is very important to Hawking since, as we will see later, Bondi was the first to realize the implications of the Stefan-Boltzmann law concerning radiation emission, which, in turn, denied the possibility of an infinite universe, since radiation would also be infinite. Bondi's model, which held that energy creates matter, was proposed in 1960 to satisfy the Stefan-Boltzmann law, and became known as the "steady-state" theory. By the same token, however, Bondi denied that there is no privileged position in the universe (*i.e.*, there is no center which is distinguished from other points in the universe).

[456] George Ellis, "The Homogeneity of the Universe," paper submitted to Gravity Research Foundation, Mar. 1979, p. 2.

The concept that underlies much of modern cosmology is called the Copernican principle. Its origins can be traced to the assertion made in 1543 by Nicolaus Copernicus that the Earth is not the center of the universe. The modern, extended form of the principle was not stated explicitly, however, until 1948 by Hermann Bondi of the University of Cambridge….A generalization of the Copernican principle has come to be known as the cosmological principle. It states that not only is the position of the solar system without privileged status but furthermore no position anywhere in the universe is privileged.[457]

There may be no privileged observers. Cosmology was not to repeat the pre-Copernican mistake of placing humans in the center of things….The large scale look of things from every point in the cosmos must in general resemble ours, that in any plausible model of the cosmos our perspective must be assumed ordinary.[458]

Two decades later, the same George Ellis, while allowing for at least the possibility of an Earth-centered cosmology, reinforced the fact that one's philosophical persuasion plays the major role in deciding between the two. In an interview with *Scientific American* he states:

People need to be aware that there is a range of models that could explain the observations. For instance, I can construct [for] you a spherically symmetrical universe with Earth at its center, and you cannot disprove it based on observations. You can only exclude it on philosophical grounds. In my view there is absolutely nothing wrong in that. What I want to bring into the open is the fact that we are using philosophical criteria in choosing our models. A lot of cosmology tries to hide that.[459]

In a 1995 paper, however, Ellis seems to have been sufficiently dismayed by the confusion caused by General Relativity's allowance of

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[457] George Gale, "The Anthropic Principle," *Scientific American*, vol. 245, December 1981, p. 154.
[458] Timothy Ferris, *The Red Limit: The Search for the Edge of the Universe*, 1983, p. 160.
[459] "Profile: George F. R. Ellis," W. Wayt Gibbs, *Scientific American*, October 1995, Vol. 273, No. 4, p. 55.

alternate cosmologies that he suggested physicists "should reconsider and perhaps refine the dogma of General Covariance." In brief, Ellis argues:

> The essential point is that while all coordinate systems are mathematically allowed, most of them are far too wiggly and unruly to be of any physical interest; for purposes of application, it makes sense, and indeed is desirable, to restrict coordinates to those that are suitably 'smooth' from a physical and geometric viewpoint…there is a preferred rest frame and time coordinate in standard cosmology, and using any other coordinates simply obscures what is happening. The Cosmic Microwave Background Radiation determines the preferred rest frame (and associated time coordinate) to high accuracy….The subject is completely opaque if other, ill-adapted coordinates are used.[460]

Here we see that Relativity's builders cannot live comfortably in the house they have framed, and thus they seek to alleviate the difficulty by taking a page from geocentric cosmology, only in Ellis' universe the Earth is not allowed to be the "preferred rest frame" for reasons he does not reveal, and thus the CMB becomes his crutch of choice. But it makes little difference upon which crutch Ellis props himself, despite the fact that he picks a rest frame that is, ironically, moving at the speed of light. He has shown us once again that Relativity is a contradiction in terms. Pure Relativity won't allow "rest frames," and if Ellis insists upon creating them, he merely exposes Relativity's inherent weakness, that is, its mathematics proves nothing about physical reality.

Still, although Ellis made at least some concessions based on "philosophical grounds," Stephen Hawking, with the whisk of his ideological wand, turned the "Copernican Dilemma" into the "Copernican Principle." It is obvious that he has no intentions of viewing the cosmos as an Earth-centered universe, despite the lack of scientific evidence for his own view. A special place for Earth is as distasteful to him as it was an "intolerable horror" to Edwin Hubble. Going a step beyond Hubble, Hawking tries to promote his view by making it sound as if, of the two cosmologies, his is the more "modest," and thus the more legitimate. With all that we know about Hawking's philosophy, it is not difficult to see past this smoke screen. He is merely using the cosmos as a mirror to reflect his own agnosticism. In the end, Hawking's "Copernican principle" is based

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[460] G. F. R. Ellis and D. R. Matravers, "General Covariance in General Relativity?" in *General Relativity and Gravitation*, Vol. 27, No. 7, 1995, pp. 778, 781.

on false modesty, for although he gives the impression that his choice is from humility, in reality, it is based on a desire to escape from having to submit himself to a divine being who, his own evidence shows, placed Earth at the center of the universe.[461]

Although we must at least give credit to Hawking for admitting that recent cosmological evidence shows Earth as the center of the universe, it becomes obvious that he has admitted this information only to deny it later, with the sole purpose to educate people to his personal opinion that the Earth is nothing but a speck of dust whirling around in a cold and impersonal universe. His bias is confirmed by the fact that, although his 1988 book *A Brief History of Time* makes a painstaking effort to list and explain all the notable scientists and their discoveries leading to modern science's present views of cosmology, Hawking makes absolutely no effort at listing the scientists who have given extensive astronomical evidence of an Earth-centered universe, even though he admitted such evidence existed. This is rather surprising since Hawking admits to the vicissitudes of current cosmology in his book, namely, that his theories have led him away from the concept of the Big Bang as an explanation for the origin of the universe.

Carl Sagan

Following suit, Carl Sagan, who wrote the *Foreword* to Hawking's best-seller, *A Brief History of Time*, engages in the same false humility which, in reality, is a clever attempt to rid himself of having any responsibility to a supreme Creator. In his book, *Pale Blue Dot*, these precise sentiments are summed up very concisely in the following sentences:

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[461] Although he denies being an atheist, he does admit to being an agnostic. He writes: "These laws [physical laws] may have originally been decreed by God, but it appears that he has since left the universe to evolve according to them and does not now intervene in it" (*A Brief History of Time*, p. 122). As noted previously, however, according to one biography, Hawking and his wife, Jane, separated based in part because she, as a devout Christian, could not tolerate his atheism any longer (as cited by John Horgan's *The End of Science*, pp. 94-95, from Michael White's and John Gribbon's, *Stephen Hawking: A Life in Science*, (Penguin Books, 1993). It is certainly surprising that Hawking is permitted to hold a seat on the Pontifical Academy of Science in Rome. The Academy, which houses 80 members, nominates those whom it desires, but the Vatican must approve all nominees. In 1975, Hawking received the "Pius XII medal" from Pope Paul VI as "a Young Scientist for distinguished work." In 1986, Hawking met with the Pope again, where he was admitted to the Pontifical Academy of Science.

The Earth is a very small stage in a vast cosmic arena.…Our posturings, our imagined self-importance, the delusion that we have some privileged position in the Universe, are challenged by this point of pale light. Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there I see no hint that help will come from elsewhere to save us from ourselves.[462]
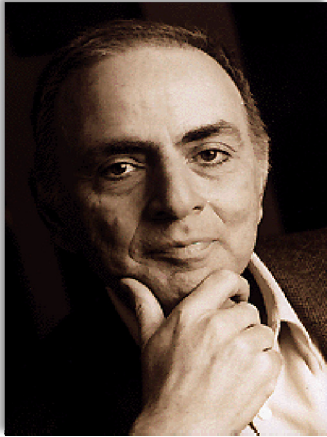
Carl Sagan: 1934 – 1996

From an article in *Time* magazine:

As long as there have been humans we have searched for our place in the cosmos. Where are we? Who are we? We find that we live on an insignificant planet of a humdrum star lost in a galaxy tucked away in some forgotten corner of a universe in which there are far more galaxies than people.[463]

To Sagan, "we are, all of us, descended from a single and common instance of the origin of life in the early history of our planet."[464] We are "only custodians for a moment of a world that is itself no more than a mote of dust in a universe incomprehensively vast and old."[465] He concludes: "neither we nor our planet enjoys a privileged position in nature."[466] In his latest posthumous publication, *The Varieties of Scientific Experience*,[467] Sagan continues the same drumbeat. A chapter titled; *The Retreat from Copernicus: A Modern Loss of Nerve* displays Sagan's fear and consternation that modern science may have to turn back the clock on Copernicus because of all the new scientific data indicating that the Earth is, indeed, the central and significant part of the cosmos.

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[462] *Pale Blue Dot: A Vision of the Human Future in Space*, 1977, p. 9.
[463] "A Gift for Vividness," Carl Sagan, *Time Magazine*, Oct. 20, 1980, p. 61.
[464] Carl Sagan, *Cosmos*, 1980, p. 38.
[465] Carl Sagan and Ann Druyan, *Comet*, 1985, p. 367.
[466] Carl Sagan, *Cosmos*, p. 190.
[467] Carl Sagan, *The Varieties of Scientific Experience: A Personal View of the Search for God*, ed. Ann Druyan, 2006, pp. 33-62.

J. Richard Gott

This glum picture of Earth as a lost child in a thick forest of galaxies is the preference of almost all scientists today. Another is astrophysicist J. Richard Gott III from Princeton University. Gott more or less admits that Copernicanism and Darwinism are the two pillars that hold up agnostic science today. Mimicking the wording and cadence of Sagan, he writes:

> The Copernican revolution taught us that it was a mistake to assume, without sufficient reason, that we occupy a privileged position in the universe. Darwin showed that, in terms of origin, we are not privileged above other species. Our position around an ordinary star in an ordinary galaxy in an ordinary supercluster continues to look less and less special. The idea that we are not located in a special spatial location has been crucial in cosmology....In astronomy the Copernican principle works because, of all the places for intelligent observers to be, there are by definition only a few special places and many nonspecial places, so you are likely to be in a nonspecial place.[468]
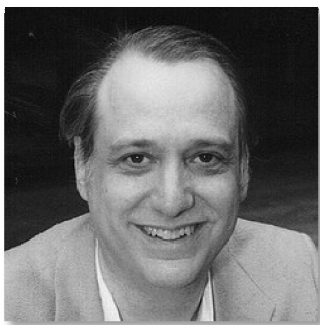
J. Richard Gott, b. 1947

Richard Feynman, one of the more famous of modern physicists, admits much the same:

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[468] J. Richard Gott III, "Implications of the Copernican Principle for our Future Prospects," *Nature*, May 27, 1993, vol. 363, p. 315. The ellipse contains: "...leading directly to the homogeneous and isotropic Friedmann cosmological models in general relativity theory which have been remarkably successful in predicting the existence and spectrum of the cosmic microwave background radiation." In his five-page article Gott goes into a long pedantic calculation of how long the human species will last. Remarking on Brandon Carter's introduction of the idea in 1983, Gott writes: "Interestingly, Carter's argument depends implicitly on the idea presented formally here: that according to the Copernican principle, among all intelligent observers (including those not yet born) you should not be special....Let us formalize this as the 'Copernican anthropic principle" (*ibid*., p. 316).

I suspect that the assumption of uniformity of the universe reflects a prejudice born of a sequence of overthrows of geocentric ideas. When men admitted the earth was not the center of the universe, they clung for a while to a heliocentric universe, only to find that the sun was an ordinary star much like any other star, occupying an ordinary (not central!) place within a galaxy which is not an extraordinary galaxy….It would be embarrassing to find, after stating that we live in an ordinary planet about an ordinary star in an ordinary galaxy, that our place in the universe is extraordinary….To avoid embarrassment we cling to the hypothesis of uniformity.[469]

We see that Copernicanism has developed into far more than identifying the one particular celestial body that revolves around another celestial body. Copernicanism is nothing less than the foundation for modern man's view of himself: a lonely being who, by time and chance, is placed on a remote island in space with no more thought about his reason for existence and ultimate destiny than the stars from which he thinks he evolved. Rather than taking joy in the fact that God made man in his own image and placed him at the center of his creation, today's atheists and agnostics seek to remove man to the remote parts of the universe and place him on the same level as star dust. Copernicus has, indeed, turned the world upside down, both literally and figuratively. Fortunately, as we shall see, the same science that was used to promote Copernicus now seeks to dethrone him, and it is only a matter of time until that happens.

The Big Bang Dilemma: Dark Energy or Geocentrism? Modern Science at a Crossroads

The most significant scientific evidence that is challenging Copernican cosmology hails from that gathered by astronomers themselves. In short, they are increasingly confronted with evidence in their own Big Bang model that is forced to put the Earth in the center of the universe in order to escape the physical anomalies. For example, in a 2008 paper written by three astrophysicists from Oxford, a centrally located Earth was far simpler and practical than the "Dark Energy" model

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[469] Richard Feynman, et al, *Feynman Lectures on Gravitation*, Addison-Wesley, 1995, p. 166.

currently being used to sustain the Copernican model. *ScienceDaily* put it in simple terms for the layman:

Dark energy is at the heart of one of the greatest mysteries of modern physics, but it may be nothing more than an illusion, according to physicists at Oxford University. The problem facing astrophysicists is that they have to explain why the universe appears to be expanding at an ever increasing rate. The most popular explanation is that some sort of force is pushing the acceleration of the universe's expansion. That force is generally attributed to a mysterious dark energy. Although dark energy may seem a bit contrived to some, the Oxford theorists are proposing an even more outrageous alternative. They point out that it's possible that we simply live in a very special place in the universe – specifically, we're in a huge void where the density of matter is particularly low. The suggestion flies in the face of the Copernican Principle, which is one of the most useful and widely held tenets in physics. Copernicus was among the first scientists to argue that we're not in a special place in the universe, and that any theory that suggests that we're special is most likely wrong. The principle led directly to the replacement of the Earth-centered concept of the solar system with the more elegant sun-centered model. Dark energy may seem like a stretch, but it's consistent with the venerable Copernican Principle. The proposal

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470 Picture courtesy of *New Scientist* magazine at http://www.newscientist .com/blog/space/2008/07/are-we-living-in-giant-cosmic-void.htm.

that we live in a special place in the universe, on the other hand, is likely to shock many scientists.[471]

With the same vigor as Edwin Hubble, recently deceased astrophysicist, Hermann Bondi, had also tried to stem the tide of geocentric cosmology by stating in his 1952 book, *Cosmology* (published by Oxford's rival, Cambridge University Press): "the Earth is not in a central, specially favored position." Bondi hadn't proved this view; rather, it was merely a scientific presupposition, a foundation from which to interpret all the data that telescopes were gathering, known simply as the "Cosmological Principle" or what is sometimes called the "Copernican Principle." There was also a second thesis at work, what we might call the "Einsteinian Principle," that is, the universe obeyed the Special and General Relativistic equations of Albert Einstein.[472] In this model, the universe has been expanding since the proposed Big Bang occurred 13.7 billion years ago. Based on both the Copernican and Einsteinian principles, a grid to measure the universe's expansion was invented by three physicists, which became known as the "Friedmann-Walker-Robertson (FRW) metric,"[473] but the expansion is only possible, as Clifton, *et al*, say,

> …if a fraction of ρ is in the form of a smoothly distributed and gravitationally repulsive exotic substance, often referred to as Dark Energy. The existence of such an unusual substance is unexpected, and requires previously unimagined amounts of fine-tuning in order to reproduce the observations. Nonetheless,

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[471] "Dark Energy: Is it Merely an Illusion?" *ScienceDaily*, Sept. 29, 2008, citing the article by Timothy Clifton, Pedro G. Gerreira, and Kate Land, "Living in a Void: Testing the Copernican Principle with Distant Supernovae," *Physical Review Letters*, 101, 131302 (2008) DOI: 10.1103/PhysRevLett.101.131302.

[472] As Clifton notes: "Another possibility is that dark energy is an artifact of the mathematical approximations that cosmologists routinely use. To calculate the cosmic expansion rate, we typically count up how much matter a region of space contains, divide by the volume of the region and arrive at the average density. We then insert this average density into Einstein's equations for gravity and determine the averaged expansion rate of the universe….The problem is that solving Einstein's equations for an averaged matter distribution is not the same as solving for the real matter distribution and then averaging the resulting geometry. In other words, we average and then solve, when really we should solve and then average" ("Does Dark Energy Really Exist," *Scientific American*, April 2009, p. 55).

[473] $H^2 = 8\pi G\rho/3 - k/a^2$, where H is the Hubble rate, ρ is the energy density, k is the curvature of space. The scale factor can then be determined by observing the luminosity distance of astrophysical objects: $H_O D_L \cong cz + \frac{1}{2}(1 - q_O)cz^2$, where q is the deceleration rate and subscript O denotes the value of a quantity today (*ibid*).

dark energy has been incorporated into the standard cosmological model, known as ΛCDM.

Clifton then shows that the tweaking required to get the Dark Energy model working is wholly unnecessary if one simply rejects the first principle of cosmology, the Copernican principle:

> An alternative to admitting the existence of dark energy is to review the postulates that necessitate its introduction. In particular, it has been proposed that the SNe observations could be accounted for without dark energy if our local environment were emptier than the surrounding Universe, i.e., if we were to live in a void.[474] This explanation for the apparent acceleration does not invoke any exotic substances, extra dimensions, or modifications to gravity – but it does require a rejection of the Copernican Principle. We would be required to live near the center of a spherically symmetric under-density, on a scale of the same order of magnitude as the observable Universe. Such a situation would have profound consequences for the interpretation of all cosmological observations, and would ultimately mean that we could not infer the properties of the Universe at large from what we observe locally.
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> Within the standard inflationary cosmological model the probability of large, deep voids occurring is extremely small. However, it can be argued that the center of a large underdensity is the most likely place for observers to find themselves.[475] In this case, finding ourselves in the center of a giant void would violate the Copernican principle, that we are not in a special place…[476]

New Scientist wasted no time in laying out the cosmological and historical implications of this study:

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[474] Here Clifton, *et al*. cite: S. Alexander, T. Biswas and A. Notari at [arXiv:0712.0370]; and H. Alnes, M. Amarzguioui and Ø. Grøn in *Physical Review* D73, 083519 (2006); and J. Garcia-Dellido & T. Jaugboelle in *Journal of Cosmology and Astroparticle Physics* 04, 003 (2008).

[475] Here Clifton, *et al*. cite A. D. Linde, D. A. Linde and A. Mezhlumian in *Physical Letters* B345, 203 (1995).

[476] "Living in a Void: Testing the Copernican Principle with Distant Supernovae," *Physical Review Letters*, 101, 131302 (2008) DOI: 10.1103/PhysRevLett. 101.131302.

It was the evolutionary theory of its age. A revolutionary hypothesis that undermined the cherished notion that we humans are somehow special, driving a deep wedge between science and religion. The philosopher Giordano Bruno was burned at the stake for espousing it; Galileo Galilei, the most brilliant scientist of his age, was silenced. But Nicolaus Copernicus's idea that Earth was just one of many planets orbiting the sun – and so occupied no exceptional position in the cosmos – has endured and become a foundation stone of our understanding of the universe. Could it actually be wrong, though? At first glance, that question might seem heretical, or downright silly….And that idea, some cosmologists point out, has not been tested beyond all doubt – yet.

When we add to this the fact that no one has ever found physical evidence of the much needed Dark Energy to make the Copernican/Einsteinian model work, it is clear that current cosmology is merely a desperate attempt to avoid the simplest solution to their own Big Bang data – a geocentric universe. Lawrence Krauss reluctantly admitted the geocentric implications when he commented in *USA Today* on a paper by Temple & Smoller showing equations that make Dark Energy superfluous. **Krauss** concluded that the only way the equations could work is if earth is "literally at the center of the universe, which is to say the least, unusual."[477] In another article Clifton and Ferreira

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[477] Dan Vergano, "Mystery Solved: Dark Energy Isn't There", *USA Today*, *Science and Space News* (Aug 2009). Temple and Smoller posit that our galaxy sits inside an expansion wave or ripple of space with a very low density. The wave is said to be caused by the Big Bang which, when it moved through the universe, created a low density ripple several tens of millions of light years across and which now envelops the Milky Way. The matter trapped in the front of the wave was pushed outward, which later formed stars and galaxies. When light from these stars reaches Earth, it appears much dimmer than expected because the stars are farther away from us than they would have been if the density wave had not pushed them outward. This model is then used to explain why, without the benefit of an accelerated universe courtesy of Dark Energy to propel it, the distance of supernovae measured in 1998 was so much greater than expected. (Proceeding of the National Academy of Sciences, August 2009). Our interest here is twofold. First, despite the Big Bang origin of the Temple and Smoller void area, the geocentric model is very favorable to the void area concept. Second, we note the adversity to their theory from notable cosmologists simply because it does not

add: "To entertain the notion that we may, in fact, have a special location in the universe is, for many, unthinkable."[478] Indeed. These sentiments were precisely what Edwin Hubble expressed when he actually saw a low-density matter distribution around the earth in 1929. He exclaimed:

> Such a condition would imply that we occupy a unique position in the universe, analogous, in a sense, to the ancient conception of a central Earth.…This hypothesis cannot be disproved, but it is unwelcome and would only be accepted as a last resort in order to save the phenomena.[479]

Another commentator put it this way:

> Astronomers will find it hard to settle that troubling sensation in the pit of their stomachs. The truth is that when it comes to swallowing uncomfortable ideas, dark energy may turn out to be a sugar-coated doughnut compared to a rejection of the Copernican principle."[480]

New Scientist shows why even this sugar-coated phase gives astronomers a queasy feeling:

> This startling possibility can be accommodated by the standard cosmological equations, but only at a price. That price is introducing dark energy – an unseen energy pervading space that overwhelms gravity and drives an accelerating expansion. Dark Energy is problematic. No one really knows what it is. We can make an educated guess, and use quantum theory to estimate how much of it there might be, but then we overshoot by an astounding factor of 10^{120}. That is grounds enough, says George Ellis…to take a hard look at our assumptions about the universe

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follow the dogmas of the Copernican Principle and the Friedmann "homogeneity" solutions to Einstein's equations. As Dragan Huterer of the University of Michgan complained: "We want homogeneity in the equations, because that's what we observe in the sky…You have to wonder why we are in the middle of this [ripple]? Why not somebody else." Alexey Vikhlinin of Harvard-Smithsonian Center for Astrophysics stated: "The price that has to be paid is a violation of the Copernican Principle…" (Ker Than, "Dark Energy's Demise? New Theory Doesn't Use the Force," *National Geographic News*, August, 18, 2009).
[478] "Does Dark Energy Really Exist," *Scientific American*, April 2009, p. 48.
[479] *The Observational Approach to Cosmology*, 1937, pp. 50, 51, 58-59.
[480] "Dark Energy and the Bitterest Pill," July 14, 2008 at the Physics arXiv blog.

and our place in it. "If we analyse the supernova data by assuming the Copernican principle is correct and get out something unphysical, I think we should start questioning the Copernican principle….Whatever our theoretical predilections, they will in the end have to give way to the observational evidence."

So what would it mean if…the outcome were that the Copernican principle is wrong? It would certainly require a seismic reassessment of what we know about the universe….If the Copernican Principle fails, all that goes with that [the Big Bang] goes out the window too….Cosmology would be back at the drawing board. If we are in a void, answering how we came to be in such a privileged spot in the universe would be even trickier.[481]

Actually, it's not really that "tricky." As Robert Caldwell of Dartmouth College said in remarking on the crossroads at which modern cosmology finds itself: "It would be great if there were someone out there who could look back at us and tell us if we're in a void."[482] The truth is, Someone has already told us the Earth was in a privileged spot, many years ago in a book, oddly enough, called *Genesis*, but that is a subject treated in Volume II of this series.

Discovery of the Cosmic Microwave Background Radiation; Isotropy and Earth-Centeredness

In 1965, Arno Penzias and Robert Wilson discovered the Cosmic Microwave Background Radiation (CMB).[483] It was hailed as one of the greatest discoveries of mankind, for it was interpreted to be the residual energy left over from the Big Bang that was said to have occurred billions of years earlier. The original temperature of the Big Bang explosion was

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[481] Marcus Chown, "Is the Earth at the Heart of a Giant Cosmic Void? *New Scientist*, Nov. 12, 2008, pp. 32-35.

[482] *Ibid*., p. 33.

[483] Arno A. Penzias and Robert W. Wilson, *Astrophysical Journal*, 142: 419-427 (1965). The Cosmic Microwave Background Radiation (CMB) is radiation in the form of microwaves (the same as are produced in a microwave oven) which has been found to pervade all of outer space. The wavelength of the microwaves is 7.3 centimeters, and the temperature is just slightly above absolute zero, registering at 2.728° Kelvin (approximately -272° Celsius or -458° Fahrenheit).

believed to have been about 3000° Kelvin and this is said to have cooled down to the present 2.75° Kelvin of the CMB 13.7 billion years later as the universe expanded.

Arno Penzias, b. 1933   **Robert Wilson b.1936**

It was a happy ending to a nice story that started about 30 years earlier when Fr. Georges Lemaître first introduced the Big Bang concept into modern science.

Fr. Georges Lemaître
1894 – 1966

First, let's take a closer look at the "discovery" of the CMB. Pensias and Wilson were not the first to discover the CMB. That honor should go to Grote Reber (d. 2002) whose discoveries in the early 1940s of the CMB

were widely published in many peer-reviewed journals.[484] Around the same time (1941), Canadian astronomer Andrew McKellar discovered interstellar gas radiating at 3° Kelvin. It appears that Penzias and Wilson received credit for the discovery probably because, after receiving advice from astronomer Robert Dicke, they interpreted the CMB in line with the burgeoning field of Big Bang cosmology initiated in the 1930s that claimed the universe came into being by a primordial explosion 10-20 billion years ago. In a way, it might be said that Penzias and Wilson's aspirations went from the Big Doo-Doo to the Big Bang since, before they consulted with Dicke, they guessed that one possible cause for the "radiation" in their instruments was due to bird droppings.[485]

One of the main theses of the Big Bang theory is that the 2.728°K temperature is the result of radiation released in the reaction of electrons and protons that were in the process of forming hydrogen about one million years after the initial explosion. Since the temperature during this reactive state is said to have been 3,000 °K, the resulting 2.728°K is said to be the result of a hydrogen flash redshift factor of $z = 1,000$, although few have an explanation why there were no objects in the cosmos with z factors between 10 and 1000. In any case, some time later Sir Fred Hoyle dubbed the theory "The Big Bang" in order to register his skepticism regarding its scientific validity, although Hoyle tenaciously held to an equally weak view called "The Steady State" theory, which holds that the universe is infinite yet comes into being little by little. Under Dicke's direction, Penzias and Wilson claimed the CMB was the remnant of the Big Bang, whereas Reber made it known he was vehemently against the Big Bang all the way to his death in 2002, and his work was consequently ignored.[486]

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[484] Some of Reber's work in this area includes the following: "Cosmic Static at 144 meters wavelength," *Journal of the Franklin Institute*, vol. 285 (Jan. 1968), pp. 1-12; "Cosmic Static," *Proc. IRE*, 28, 68 (1940); "Cosmic Static," *Astrophysical Journal*, 91, (1940) p. 621; "Cosmic Static," *Proc. IRE*, 30, 367 (1942); "Cosmic Static," *Astrophysical Journal*, 100, 279 (1944); "Cosmic Radio Noise," *Radio-Electronic Engineering*, July 1948; "Cosmic Static," *Proc. IRE*, 36, 1215, (1948); "Cosmic radio-frequency radiation near one megacycle," G. Reber and G. R. Ellis, *Journal of Geophysical Research*, 61, 1 (1956).

[485] Karen Fox, *The Big Bang Theory – What It Is, Where It Came from and Why It Works*, 2000, p. 78.

[486] "Big bang creationism," *Physics Today*, 35, p. 108, Nov. 1982; 1989: "Cosmic matter and the nonexpanding universe," Paul Marmet, Grote Reber, *IEEE Trans. Plasma Science*, 17, no.2, 264 (1989); The Non-expanding universe: H. Reeves, *Journal of the Royal Astronomical Society*, 83, 223 (1989).

Although Big Bang advocates claim that their theory predicted the existence of the CMB, their prediction was quite higher than the present 2.728° Kelvin.[487] Few dispute the clear fact that the CMB exists, but what is highly disputed is precisely why it exists. C. E. Guillaume, proposing it to be 5° or 6° K, made estimates of the universe's ambient temperature as early as 1896.[488] In 1926 Sir Arthur Eddington posited that the space between the heated bodies of the universe would cool down to a temperature slightly above absolute zero, and his chosen figure was between 2.8° and 3.18° K.[489] Seven years later, Erhard Regener obtained the figure of 2.8° Kelvin, and stipulated that it was a homogeneous energy field.[490] Nernst posited 0.75° Kelvin in 1938; Herzberg 2.3° K in 1941; Finlay-Freundlich, using the theory of "tired light" said it should be between 1.9° to 6° K. All in all, there is little to persuade us that a Big Bang produces the CMB as opposed to merely the natural minimum of heat expected in a universe at equilibrium. As Andre Assis puts it:

> Usually it is claimed that the CBR is a proof of the big bang and of the expansion of the universe as it had been predicted by Gamow and collaborators….However, we performed a bibliographic search and found something quite different from this view….we have found several predictions or estimations of this temperature based on a stationary universe without expansion, always varying between 2 K and 6 K. Moreover, one of these estimates [C. E. Guillaume] was performed in 1896, prior to Gamow's birth in 1904!....The conclusion is that the discovery of the CBR by Penzias and Wilson in 1965 is a decisive factor in favor of a universe in dynamical equilibrium without expansion, and against the big bang.[491]

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[487] George Gamow is said to have predicted anywhere from 5° to 50° K in the late 1950s. *The Creation of the Universe*, New York: Viking Press, 1961. Van Flandern disputes this figure stating: "The Big Bang made no quantitative prediction that the 'background' radiation would have a temperature of 3 degrees Kelvin (in fact its initial prediction was 30 degrees Kelvin; whereas Eddington had already calculated that the 'temperature of space' produced by the radiation of starlight would be found to be 3 degrees Kelvin. And no element abundance prediction of the Big Bang was successful without some ad hoc parameterization to 'adjust' predictions that otherwise would have been judged as failures" (*Dark Matter, Missing Planets and New Comets*, 1993, pp. 399-400).

[488] C. E. Guillaume, *La Nature* 24, 2, 234, 1896.

[489] Arthur S. Eddington, *The Internal Combustion of the Stars*, 1926.

[490] E. Regener, *Zeitschrift fur Physik*, 106:633-661, 1933.

[491] Andre K. T. Assis, *Relational Mechanics*, pp. 189-190.

So not only can the CMB be shown to be unsupportive of the Big Bang theory, we see that the low Kelvin temperature is consistent with non-expanding models of the universe, *e.g.*, geocentric models of the universe.

Isotropy versus Anisotropy

A few decades later it began to sink into the minds of certain scientists that all was not well with the "residual energy" CMB interpretation. Joseph Silk of the University of California (Berkeley) put it this way:

> Studies of the cosmic background radiation have confirmed the isotropy of the radiation, or its complete uniformity in all directions. If the universe possesses a center, we must be very close to it…otherwise, excessive observable anisotropy in the radiation intensity would be produced, and we would detect more radiation from one direction than from the opposite direction.[492]

In other words, the isotropy of the CMB can only be true from an Earth-centered location. If observed anywhere else in the universe the CMB will appear heavily anisotropic. Hence, because of the CMB's geocentric fingerprints, there have been various attempts to dismiss its isotropy. This is accomplished by presuming, in addition to its isotropy, the universe is also homogeneous, since all Big Bang and Steady-State cosmologies require both isotropy and homogeneity. For example, we noted earlier that Stephen Hawking readily admitted his reluctance to entertain a non-homogeneous universe for fear of its "Earth-centered" implications. His co-author in the 1973 book *The Large Scale Structure of Spacetime*, **George F. R. Ellis**, admits the same:

> Models of the sort described here have not been considered previously because of the assumption – made at the very beginning in setting up the standard models – of a principle of

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[492] Joseph Silk, *The Big Bang: The Creation and Evolution of the Universe*, 1980, p. 53.

uniformity [homogeneity]… This is assumed for *a priori* reasons and not tested by observations. However, it is precisely this principle that we wish to call into question. The static inhomogeneous model discussed in this paper shows that the usual unambiguous deduction that the universe is expanding is a consequence of an unverified assumption, namely, the uniformity [homogeneity] assumption. *This assumption is made because it is believed to be unreasonable that we should be near the center of the Universe*.[493]

As we noted previously, Ellis had once shaken the halls of modern science with what other scientists said was "an earthquake that made Copernicus turn in his grave." In a lengthy article in *New Scientist* in 1978, Ellis' own General Relativity theory forced him to conclude that our galaxy is located near one of "two centers" in the universe that are in an antipodal relation.[494] Although Ellis allows that his observations and calculations may be the result of a wrong interpretation, no one has since discovered any such errors, including Ellis. In fact, the then editor of *Nature*, Paul C. W. Davies, admitted that Ellis' theory did not contain any logical errors and that in every aspect seems to be in agreement with observed facts. Under the article title "Cosmic Heresy," he writes:

> Often the simplest of observations will have the most profound consequences. It has long been a cornerstone of modern science, to say nothing of man's cosmic outlook, that the Earth attends a modest star that shines in an undistinguished part of a run-of-the-mill galaxy. Life arose spontaneously and man evolved on this miscellaneous clump of matter and now directs his own destiny without outside help. This cosmic model is supported by the Big-Bang and Expanding Universe concepts, which in turn are buttressed by the simple observation that astronomers see redshifts wherever they look.

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[493] George F. R. Ellis, "Is the Universe Expanding?" *General Relativity and Gravitation*, vol. 9, no. 2, 1978, p. 92, emphasis added. Ellis proceeds to argue: "…where would one be likely to find life like that we know on Earth? The answer must be, where conditions are favorable for life of this kind; but in the model we are considering, the conditions for life would be most favorable near the center, where the universe is cool." See also: G. F. R. Ellis, R. Maartens and S. Nel, "Is the Universe Expanding – But Maybe We're Near Its Center?" *Monthly Notices of the Royal Astronomical Society*, 154:187-195, 1978.

[494] *New Scientist*, May 25, 1978, p. 507.

These redshifts are due, of course, to matter flying away from us under the impetus of the Big Bang. But redshifts can also arise from the gravitational attraction of mass. If the Earth were at the center of the universe, the attraction of the surrounding mass of stars would also produce redshifts wherever we looked! The argument advanced by George Ellis in this article is more complex than this, but his basic thrust is to put man back into a favored position in the cosmos. His new theory seems quite consistent with our astronomical observations, *even though it clashes with the thought that we are godless and making it on our own*.[495]

Davies ends his evaluation with the leading question: "Is the Copernican revolution maybe out of date?" A reporter registered the same sentiments for the *Vancouver Sun*:

Copernicus must be orbiting in his grave. Five hundred years after he laid to rest the idea that Man is the center of the universe, another cosmologist is seriously suggesting that the center of the universe is exactly where we are….No heresy now, the Copernican view is dogma. And it is a dogma that University of Capetown mathematician George Ellis is questioning…. The idea is a modern heresy. It violates a principle of Cosmic Democracy that says that our corner of the universe is no different from any other….Ellis proposes that it is all an illusion.[496]

The geocentric implications of the cosmological evidence are not merely a blip on the radar screen. Whole symposiums have been dedicated to answering the mounting evidence. In September 1973, Cracow, Poland, hosted "Copernicus Symposium II," sponsored by the International Astronomical Union. One of the addresses at the symposium was titled: "Confrontation of Cosmological Theories with Observational Data" denoting, of course, that current findings in cosmology are showing mounting evidence of a non-Copernican universe.[497]

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[495] Paul C. W. Davies, "Cosmic Heresy?" *Nature*, 273:336, 1978, emphasis added.
[496] Reporter Tim Padmore, "A Great Theory Once – Now It's Been Recycled," *Vancouver Sun*, Vancouver, Canada, October 2, 1973.
[497] M. S. Longair, editor, Dordrecht, Holland and Boston, D. Reidel Publishing Co., 1974. See especially Brandon Carter's, "Large Number Coincidences and the Anthropic Principle," pp. 291-298, in Longair's work.

Similarly, in a paper titled: "Geocentrism Re-Examined," the authors admit:

> Observations show that the universe is nearly isotropic on very large scales. It is much more difficult to show that the universe is radially homogeneous…. This is usually taken as an axiom, since otherwise we would occupy a special position.[498]

By "special position," of course, he means Earth in the center of the universe. In order to avoid putting Earth at these privileged coordinates, the author tells us that modern cosmologists have presumed the universe is "homogeneous" but no one has proven it to be so, and the author will thus "…consider several empirical arguments for radial homogeneity, all of them based on the cosmic microwave background (CMB)." His conclusion for homogeneity is less than stellar as he admits, after 10 pages of calculus, that "…the bookkeeping is not yet accurate enough to yield a 10% limit on the radial homogeneity of the CMB temperature."[499]

Those who have not yet been enlightened to the idea that Earth could be in the center have at least understood that the evenly spread and universally pervasive CMB could even serve as an absolute frame of reference. As V. J. Weisskopf states:

> It is remarkable that we now are justified in talking about an absolute motion, and that we can measure it. The great dream of Michelson and Morley is realized….It makes sense to say that an observer is at rest in an absolute sense when the 3K radiation appears to have the same frequencies in all directions. Nature has provided an absolute frame of reference. The deeper significance of this concept is not yet clear.[500]

Going even deeper, Weisskopf ties the CMB evidence to the opening chapter of Genesis:

> Indeed, the Judeo-Christian tradition describes the beginning of the world in a way that is surprisingly similar to the scientific model. Previously, it seemed scientifically unsound to have light

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[498] Jeremy Goodman, "Geocentrism Re-examined," Princeton University Observatory, Peyton Hall, Princeton, NJ, June 9, 1995, p. 1.
[499] *Ibid*., p. 11.
[500] V. J. Weisskopf, *American Scientist*, 71, 5, 473 (1983). See also George Smoot and Keay Davidson, *Wrinkles in Time*, 1993, p. 117; George Smoot, et al., *Physical Review Letters* 39: 898. 1979; *Astrophysical Journal*, 234: L83.

created before the sun. The present scientific view does indeed assume the early universe to be filled with various kinds of radiation long before the sun was created. The Bible says about the beginning: "And God said, 'Let there be light'; and there was light. And God saw the light, that it was good."[501]

Arno Penzias voiced a similar opinion to Weisskopf's, stating:

The thing I'm most interested in now is whether the universe is open or closed. If it is open, and the data seems to indicate that it is open, this is precisely the universe that organized religion predicts, to put it in crude terms. A closed universe, one that explodes, expands, falls back on itself and explodes again, repeating the process over and over eternally, that would be a pointless universe….A theologian friend of mine who is a priest told me once he could not conceive of Calvary happening twice.

He said his faith as a Christian would be shaken if it could be proven to him that the universe, with its finite number of particles, could be reconstituted an infinite number of times….In other words, a closed universe would be pointless as the throw of dice. But it seems to me that the data we have in hand right now clearly show that there is not nearly enough matter in the universe, not enough by a factor of three, for the universe to be able to fall back on itself ever again. *My argument is that the best data we have are exactly what I would have predicted, had I nothing to go on but the five books of Moses, the Psalms, the Bible as a whole*.[502]

Another example is **Bernard Haisch**, editor of the prestigious *Astrophysical Journal*, who holds that the Casimir Effect reveals the existence of a "zero-point field," that is, that space is not a vacuum but is filled with infinitesimally small particles (which we will examine in depth later), which he envisions as the scientific fulfillment of Genesis 1:3's "Let there be light," constituting "the background sea of light whose total energy is enormous."[503]

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[501] V. J. Weisskopf, *American Scientist*, 71, 5, 473 (1983).

[502] Interview by Malcolm W. Browne appearing in *The New York Times*, March 12, 1978, emphasis added. Penzias and Wilson won the Nobel Prize for their discovery of the CMB in 1978.

[503] Haisch's proposal of the zero-point field in the Casimir Effect was considered worthy enough to be published by *Physical Review* (B. Haisch, A. Rueda, and

On the one hand, it is admirable to see these famous scientists attempt to relate their cosmological discoveries to the opening chapters of Genesis. On the other hand, such efforts demonstrate science's biased presuppositions both in cosmology and in exegeting Genesis. What is either casually overlooked or purposely ignored in these overtures toward Genesis is that Moses' first words did not posit a great light exploding into existence; rather, he is very explicit about Earth's primal existence. Moses' description of the Earth as being a formless and unadorned mass shrouded in darkness with its surface covered by water is stated in Genesis 1:1-2 for the express purpose of indicating that the Earth existed *before* the light came into being. The light had a function, which was to dispel the darkness from the Earth, a simple cause-and-effect relationship. If Weisskopf, Penzias, Haisch or any other scientist wishes to crown his theory with divine favor, then he must adhere to the precise words that "the five books of Moses, the Psalms, the Bible as a whole" have given to us rather than foist their biased eisegesis on the biblical text. As it stands, Genesis 1, literally interpreted, is diametrically opposed to the Big Bang theory, since the latter holds that the Earth did not come into existence until some 8 billion years after the "light." Moreover, "…the Psalms *and* the Bible as a whole" do not speak of the CMB as the absolute reference point, since Scripture already granted that privileged position to the Earth (*cf.* 1Ch 16:30; Ps 96:10; Ec 1:5); and it was the firmament that was then expanded and made to rotate with the heavenly bodies around the Earth. Of course, if the above

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H.E. Puthoff, *Physical Review* A, 49, 678, 1994). In an article in *Science and Spirit Magazine* titled "Brilliant Disguise: Light, Matter and the Zero-Point Field," Haisch holds that the zero-point energy field results when, due to the Heisenberg *Uncertainty Principle* (which says that there will be continual random movement in electromagnetic waves), all the energy in the random movements are added up producing the "background sea of light whose total energy is enormous: the zero-point field. The 'zero-point' refers to the fact that even though this energy is huge, it is the lowest possible energy state." Other articles include: "BEYOND E=mc²: A First Glimpse of a Post-modern Physics in Which Mass, Inertia and Gravity Arise from Underlying Electromagnetic Processes," B. Haisch, A. Rueda and H.E. Puthoff, *The Sciences*, November/December, Vol. 34, No. 6, pp. 26-31, 1994. B Haisch and A. Rueda, "Electromagnetic Zero-Point Field as Active Energy Source in the Intergalactic Medium," presented at 35th Jet Propulsion Conference, June 1999. "Vacuum Zero-Point Field Pressure Instability in Astrophysical Plasmas and the Formation of Cosmic Voids," A. Rueda, B. Haisch and D. C. Cole, *Astrophysical Journal*, 445, 7, 1995.

named scientists, because of this disagreement with Scripture, were to disown Moses as their ultimate guide and instead insist on the CMB as the absolute frame of reference, this should serve as the death-knell for Relativity theory (which claims there is nothing even resembling an absolute reference frame in space), but that implication was quietly suppressed with Penzias' discovery in 1965 and was, shall we say, hushed up in polite society.

Back we go to the "Copernican Dilemma." The foregoing scientists are not the only ones to conclude that the evidence shows Earth as the center of the universe. In 1995, G. J. Fishman and C. A. Meegan, after analyzing a number of gamma-ray bursts, came to the only logical conclusion: "The isotropy and inhomogeneity of the bursts show only that we are at the center of the apparent burst distribution."[504] During the same time, S. E. Woolsey's review of gamma radiation stated the logical conclusion even more directly: "The observational data show conclusively that the Earth is situated at or very near the center of the gamma-ray burst universe."[505]

CMB Anisotropy and Earth-Centeredness

Modern science was about to be stuck between the proverbial rock and a hard place. While the CMB's isotropy put the Earth in the center of the universe, one might conjecture that any discovery of anisotropy in the CMB would do just the opposite. As it turned out, this was not to be the case. In order to take the Earth out of the center, the anisotropy would have to be pervasive and random. What was discovered, however, was that the CMB, although mostly isotropic, was anisotropic in very specific and, we might say, in very calculated "geocentric" places.

In the same year that Penzias and Wilson received their Nobel Prize for discovering the CMB (1978) and putting the presumed capstone on the Big Bang universe, scientific papers were submitted showing that the CMB contained significant anisotropies. [506] If true, this was a big blow to

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[504] *Ann. Rev. of Astronomy and Astrophysics* 33, 415, 1995.

[505] "Gamma-Ray Bursts: What Are They?" in *Seventeenth Texas Symposium on Relativistic Astrophysics and Cosmology*, 1995, p. 446.

[506] Richard A. Muller, UC Berkeley, "The cosmic background radiation and the new aether drift," *Scientific American*, vol. 238, May 1978, pp. 64-74, the abstract stating: "U-2 observations have revealed anisotropy in the 3 K blackbody radiation which bathes the universe. The radiation is a few millidegrees hotter in the direction of Leo, and cooler in the direction of Aquarius. The spread around the mean describes a cosine curve. Such observations have far reaching

the Big Bang theory. In 1925, Alexander Friedmann had already adjusted Einstein's field equations (popularly known as the FLRW equations) and he provided a perfectly isotropic and homogeneous universe that would expand indefinitely without distinction and thereby bolster the Big Bang and negate a special location for the Earth.

About ten years later, in 1989, NASA launched the Cosmic Background Explorer (COBE), also referred to as Explorer 66, to investigate the CMB more closely.
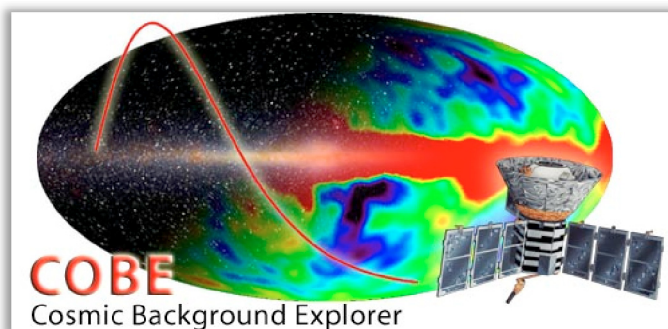
According to Wikipedia, "This work provided evidence that supported the Big Bang theory of the universe: that the CMB was a near-perfect black-body spectrum and that it had very faint anisotropies" and it was considered "the starting point for cosmology as a precision science."[507] The COBE project was prompted by the discovery in 1981 by David Wilkinson of Princeton and Francesco Melchiorri of the University of Florence who, using balloon-borne instruments, detected a quadrupole distribution of the CMB. This meant that the CMB had four pockets of temperature that deviated from the established figure of 2.725°K. Most astounding was that these four pockets were situated in the universe such that they straddled the ecliptic plane of the Sun and Earth (although this fact is left out of the Wikipedia article). The alignment of the ecliptic with the CMB can be seen in the official sky map below. The thick red line in the middle is the Milky Way, but the dark blue and light red portions above and below the middle make up the CMB quadrupole that aligns with the Sun-Earth ecliptic.

The shocking fact about the CMB is that it is aligned with our solar system, but our solar system is inside a 93 billion light-years universe, thus

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implications for both the history of the early universe and in predictions of its future development."

[507] http://en.wikipedia.org/wiki/Cosmic_Background_Explorer.

our solar system is only 10^{-17}% of the size of the universe. How could such a tiny region be the hub for the rest of the universe? It is comparable to a pea being the hub of the Milky Way. Rather than probe this astounding mystery, attempts were made to make COBE fit the Big Bang theory which, although it formerly predicted a smooth and random distribution of the CMB (isotropy) was now saying that the CMB's temperature fluctuations (anisotropy) was "intrinsic" and allowed the Big Bang to have a vehicle for galaxy formation, yet with no explanation from particle physics how such a mechanism originates within the parameters of Big Bang theory. Instead, it is preempted by the conclusion that "Data from COBE showed a perfect fit between the black body curve predicted by big bang theory and that observed in the microwave background."[508]
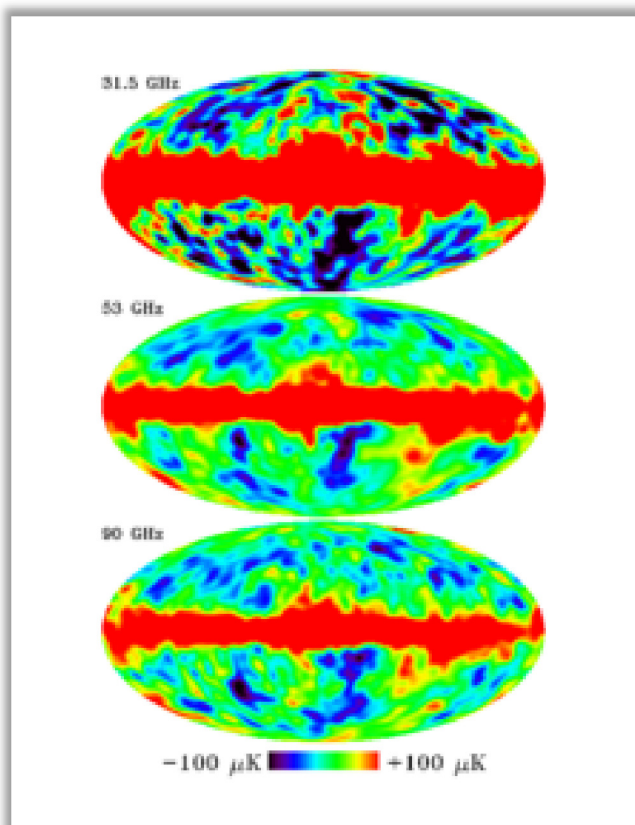
COBE's 1990 Mapping of the CMB (red band is the Milky Way)

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[508] http://en.wikipedia.org/wiki/Cosmic_Background_Explorer.

Other attempts at redefining the anisotropy of the CMB come from the highest echelons of modern cosmology. For example, Brian Greene relates the anisotropy of the CMB to the as yet unfound Dark Energy, and concludes that both work together to form galaxies and planets:

> In universes with larger amounts of dark energy, whenever matter tries to clump into galaxies, the repulsive push of the dark energy is so strong that the clump gets blown apart, thwarting galactic formation. In universes whose dark-energy value is much smaller, the repulsive push changes to an attractive pull, causing those universes to collapse back on themselves so quickly that again galaxies wouldn't form. And without galaxies, there are no stars, no planets, and so in those universes there's no chance for our form of life to exist.[509]
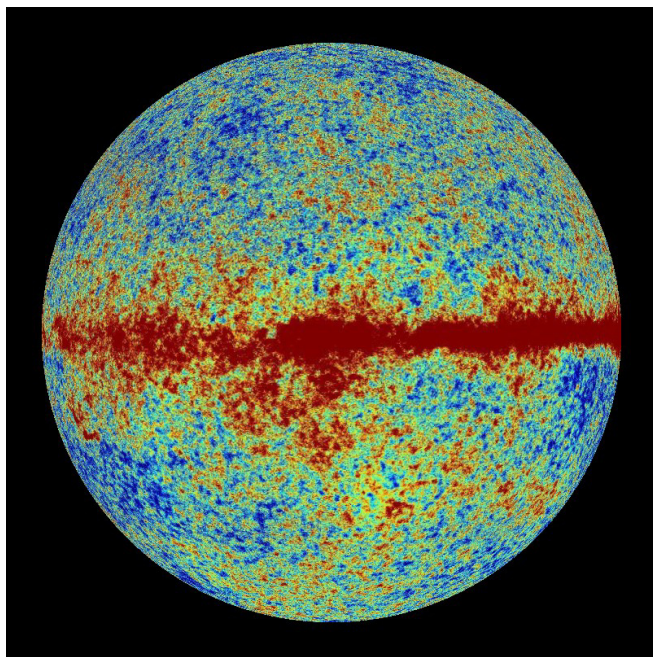
COBE's results on the sphere of the universe

Stephen Hawking is a little more specific:

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[509] Brian Greene, "Welcome to the Multiverse," The Daily Beast, May 21, 2012, http://www.thedailybeast.com   /newsweek/2012/05/20/brian-greene-welcome-to-the-multiverse.html.

But according to the theory, the expansion caused by inflation would not be completely uniform, as predicted by the traditional big bang picture. These irregularities would produce minuscule variations in the temperature of the CMBR in different directions. The variations are too small to have been observed in the 1960s, but they were first discovered in 1992 by NASA's COBE satellite, and later measured by its successor, the WMAP satellite, launched in 2001.[510]
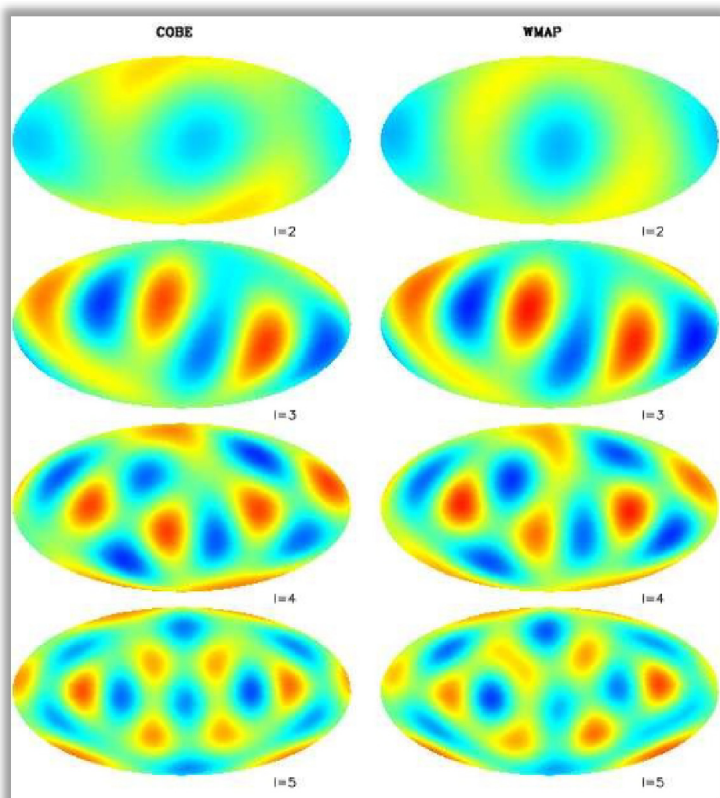
Comparison of the 1989 COBE Results with 2001 WMAP Results[511]

Hawking ignores the astounding fact that the anisotropy of the CMB is aligned with our solar system, and instead turns the anisotropy into a cause for the galaxies and planets to form from the Big Bang. This shows

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[510] *The Grand Design*, 2010, pp. 129-130.
[511] Graph taken from Kate Land's seminar at: http://www.cita.utoronto.ca /TALKS/Land-Nov23.pdf

once again that modern science will avoid interpretations of the data that go against the Copernican Principle and instead put forth *ad hoc* interpretations to preserve their paradigms.

The fact remains, however, that the Big Bang theory predicted isotropy, not anisotropy. In fact, in 1973 Misner, Thorne and Wheeler had previously attributed the aforementioned blackbody curve to the isotropy of the CMB. They write:

> The expansion of the universe has redshifted the temperature of the freely propagating photons in accordance with the equation T % $1/a$. As a consequence, today they have a black-body spectrum with a temperature of 2.7 K....Because it is initially in thermal equilibrium with matter, this primordial radiation initially has a Planck black-body spectrum...that radiation with a Planck spectrum as viewed by one observer has a Planck spectrum as viewed by all observers... [512]

Others also noted the difficulty of fitting the COBE results with Big Bang theory. Jeremy Goodman of Princeton, presuming like Misner, *et al* that "the isotropy of the universe on large scales is well established..."

> Results from the Cosmic Background Explorer Satellite (COBE) show that the temperature of the microwave background (CMB) deviates slightly from isotropy, but only at the level $(\Delta T/T)_{rms} \approx 1.1 \times 10^{-5}$ on angular scales $\geq 10°$, apart from a dipole pattern that is conventionally attributed to the peculiar velocity of the Sun and the Galaxy....There may exist 'standard candles' at $z/1$, such as Type I supernovae. Among homogeneous Friedmann models, unfortunately, the shape of the magnitude-redshift relation for standard candles already depends on two parameters: the density parameter, Ω, and the cosmological constant, Λ. Only superb data will permit one to fit for a third parameter and thereby constrain the homogeneity of the universe on the scale of the present horizon.[513]

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[512] Charles W. Misner, Kip S. Thorne and John A. Wheeler, *Gravitation*, 1973, pp. 766, 779, in general pages 764-797.

[513] Jeremy Goodman, "Geocentrism Re-examined," Princeton University Observatory, Princeton, NJ, June 9, 1995, p. 2. Others have interpreted the anisotropy of the CMB as indicating it is Euclidean (*i.e.* has dimensions), thus allowing a center Paolo de Bernardis, et al., "A flat universe from high-resolution maps of the cosmic microwave background radiation," *Nature* 404, 955–959, 2000; and V. G. Gurzadyan and S. Torres, "Testing the effect of geodesic mixing

2001 Wilkinson Microwave Anisotropy Probe (WMAP)
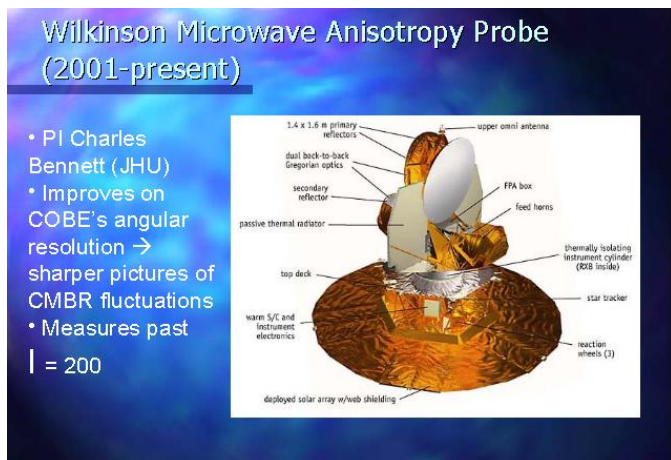
Although the science community tried to put a lot of cosmetic makeup over the anisotropies of the CMB to make them presentable to the Copernican Big Bang audience,[514] the gnawing feeling persisted that all was not well. Trying to avoid the alignment of the universe with the tiny ecliptic of the Sun-Earth was like trying to avoid the rain without an umbrella. Plans were then made in the late 1990s to test whether the anisotropies of COBE were, indeed, the reality. The new project was named after the original discoverer of the CMB anisotropies in 1981, David T. Wilkinson. The name *Wilkinson*
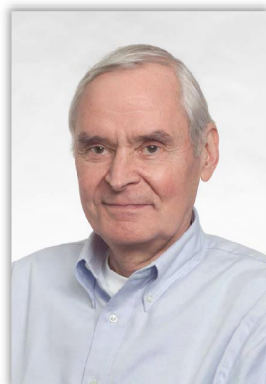
David Wilkinson
1935 – 2002

with COBE data to reveal the curvature of the universe," *Astronomy and Astrophysics.* 321:19–23, 1997, which abstract reads: "If the detected eccentricity of anisotropy spots can be attributed to the effect of mixing it implies the negative curvature of the Universe and a value of $\Omega < 1$."

[514] Which is still the case since the WMAP 7-year results, which were released in 2011says that "WMAP now places 50% tighter limits on the standard model of cosmology (Cold Dark Matter and a Cosmological Constant in a flat universe), and there is no compelling sign of deviations from this model" (http://map.gsfc.nasa.gov/news) but the reality is that "Cold Dark Matter" has not been found, and the Cosmological Constant is merely a fudge factor to make the Big Bang expansion work as desired.

Microwave Anisotropy Probe showed that the main quest was to search out the extent and meaning of these bothersome and unpredicted temperature fluctuations of the universe's design. The results were nothing less than astounding. WMAP produced even clearer confirmation that the universe was aligned with the Earth as its hub.

Max Tegmark, b. 1967

Max Tegmark of the Massachusetts Institute of Technology was the first to see these results. As he relates the story of his discovery, it was late in the evening and he was about ready to retire for the night but decided to press the final button that gave the clearest image of the WMAP results. The first words out of his mouth were "wow!" followed by a long pause of amazement.[515] His findings were reported by the BBC:

> "We found something very bizarre; there is some extra, so far unexplained structure in the CMB. We had expected that the microwave background would be truly isotropic, with no preferred direction in space but that may not be the case." [BBC: Looking at the symmetry of the CMB - measures technically called its octopole and quadrupole components - the researchers uncovered a curious pattern. They had expected to see no pattern at all but what they saw was anything but random]. "The octopole and quadrupole components are arranged in a straight line across the sky, along a kind of cosmic equator. That's weird.

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[515] This is Tegmark's recounting of his experience during his interview with Stellar Motion Pictures' producer Richard Delano in August 2011 for the scientific documentary, *The Principle*.

We don't think this is due to foreground contamination," Dr Tegmark said. "It could be telling us something about the shape of space on the largest scales. We did not expect this and we cannot yet explain it."[516]

The WMAP image showed the exact same results as the COBE image, only with more clarity. The Sun-Earth ecliptic plane (the black line) was precisely in the center, between the red poles (hotter regions) and the blue poles (colder regions) – a difference of 50mK or 50 millionths of a degree Kelvin from the 2.725°Kelvin of the remaining CMB. In Tegmark's words: "Intriguingly, both the quadrupole and the octopole are seen to have power suppressed along a particular spatial axis, which lines up between the two, roughly towards $(l, b) \sim (-110\circ, 60\circ)$ in Virgo."[517] Just like COBE, the WMAP showed that the 93 billion light year diameter universe was in direct alignment with the 93 million mile distance between the sun and the Earth – a ratio of 10^{-17} to 1.
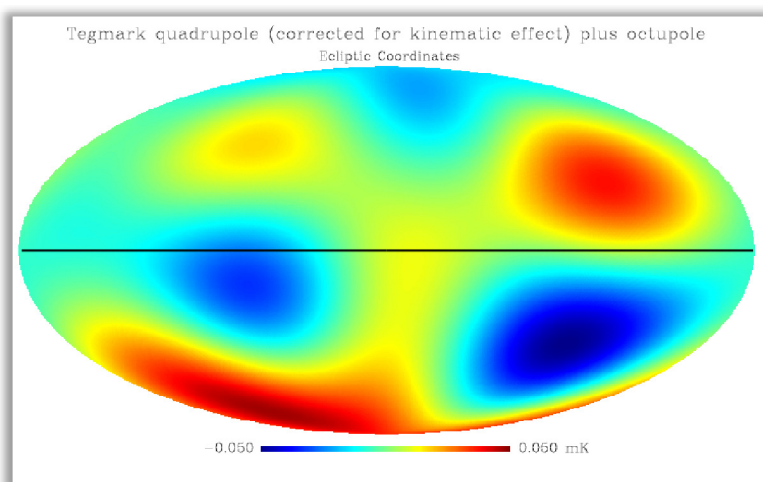
Tegmark's Original WMAP Image

In a 2004 publication, the team of Dominik Schwarz, Glenn Starkman, Dragan Huterer and Craig Copi admitted that the CMB poles were not

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[516] http://news.bbc.co.uk/2/hi/science/nature/2814947.stm, March 3, 2003.

[517] Max Tegmark, Angélica de Oliveira-Costa and Andrew J. S. Hamilton, "A high resolution foreground cleaned CMB map from WMAP," Dept. of Physics and Astronomy, University of Pennsylvania, July 26, 2003, abstract, arXiv:astro-ph/0302496v4.

only aligned with the Sun-Earth ecliptic, but also hint that they are aligned with the Earth's equinoxes:
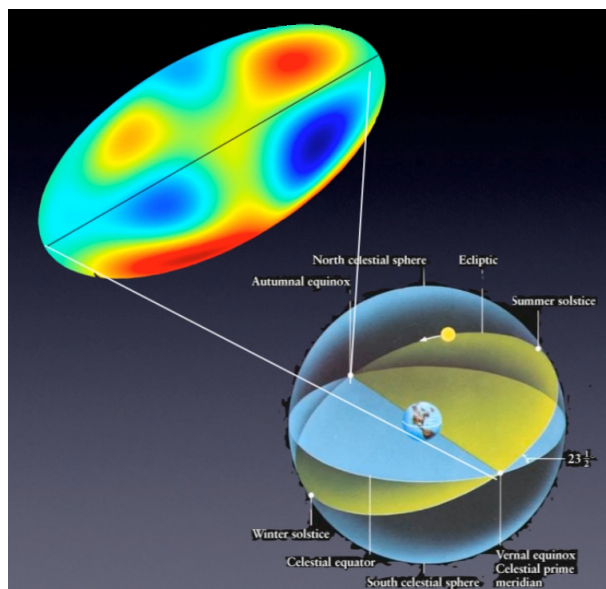
The CMB Dipole is aligned with the Earth's equinoxes

The large-angle correlations of the cosmic microwave background exhibit several statistically significant anomalies compared to the standard inflationary cosmology…the quadrupole-octopole correlation is excluded from being a chance occurrence in a gaussian random statistically isotropic sky at >99.87%….The correlation of the normals [perpendicular vectors] with the ecliptic poles suggest an unknown source or sink of CMB radiation or an unrecognized systematic. If it is a physical source or sink in the inner solar system it would cause an annual modulation in the time-ordered data….Physical correlation of the CMB with the equinoxes is difficult to imagine, since the WMAP satellite has no knowledge of the inclination of the Earth's spin axis.[518]

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[518] Dominik J. Schwarz, Glenn D. Starkman, Dragan Huterer and Craig J. Copi, "Is the Low-*l* Microwave Background Cosmic?" *Physical Review Letters*, November 26, 2004, pp. 221301-1 to 4. The same phenomenon is reiterated in their 2005 paper, "On large scale anomalies of the microwave sky," *Monthly Notices of the Royal Astronomical Society*; and their 2010 paper, "Large-angle

In a 2010 paper, the team is even more astounded at the Earth-centered results of WMAP. In this study, galactocentrism (of the Milky Way) is eliminated in favor of an Earth-centered explanation:

> Particularly puzzling are the alignments with solar system features. CMB anisotropy should clearly not be correlated with our local habitat. While the observed correlations seem to hint that there is contamination by a foreground or perhaps by the scanning strategy of the telescope, <u>closer inspection reveals that there is no obvious way to explain the observed correlations</u>. Moreover, if their explanation is that they are a foreground, then that will likely exacerbate other anomalies that we will discuss in section IVB below. Our studies indicate that <u>the observed alignments are with the ecliptic plane, with the equinox or with the CMB dipole, and not with the Galactic plane</u>: the alignments of the quadrupole and octopole planes with the equinox/ecliptic/dipole directions are much more significant than those for the Galactic plane. Moreover, it is remarkably curious that it is precisely the ecliptic alignment that has been found on somewhat smaller scales using the power spectrum analyses of statistical isotropy.[519]

anomalies in the CMB," and begin it with an obvious reaffirmation that all data will be interpreted through the grid of the "Copernican Principle…that the Earth does not occupy a special place in the universe…" (p. 1), but at the same time admit: "These apparent correlations with the solar system geometry are puzzling and currently unexplained…the quadrupole and octopole are orthogonal to the ecliptic at the 95.9% CL [confidence level]…a systematic that is indeed correlated with the ecliptic plane…the normals to these four planes are aligned with the direction of the cosmological dipole (and with the equinoxes) at a level inconsistent with Gaussian random, statistically isotropic skies at 99% CL" (p. 5).

[519] "Large-angle anomalies in the CMB," Craig J. Copi, D. Huterer, D. Schwarz, and G. Starkman, Nov. 12, 2010, arXiv:1004.5602v2. A Wikipedia article tries to pin the anomalies on foreground contamination: "Later analyses have pointed out that these are the modes most susceptible to foreground contamination from synchrotron, dust, and free-free emission, and from experimental uncertainty in the monopole and dipole. A full Bayesian analysis of the WMAP power spectrum demonstrates that the quadrupole prediction of Lambda-CDM cosmology is consistent with the data at the 10% level and that the observed octopole is not remarkable. Carefully accounting for the procedure used to remove the foregrounds from the full sky map further reduces the significance of the alignment by ~5%" (http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation). This still leaves the fact that the Big Bang model is only consistent with CMB anisotropy by, at most, 15%, which leaves 85% non-

Finally, in a 2012 paper, there appears to be no deviation from their previous conclusions, although perhaps some hand-wringing.

> We will discover that if one uses the full-sky ILC map then one finds very odd correlations in the map, that correlate unexpectedly to the Solar System….Looking into this anomaly more deeply we will find that it remains robust through all seven years of published WMAP data…
>
> …quadrupole planes and the three octopole planes, implying that not only are these four planes aligned but they are nearly perpendicular to the ecliptic. Furthermore the normals [perpendicular vectors] are near the dipole, meaning that the planes are not just aligned and perpendicular to the ecliptic but oriented perpendicular to the Solar System's motion through the Universe….However one does the statistical analysis, these apparent correlations with the Solar System geometry are puzzling. They do not seem to reflect the Galactic contamination that we might have expected from residual foreground contamination in the ILC map….For one, the observed quadrupole and octopole are aligned….This makes it difficult to explain them in terms of some localized effect on the sky….The best one can say is that these full-sky solar-system correlations remain unexplained.

The CMB anisotropies are analogous to the warm and cool spots in the Earth's ocean being aligned with the Earth's equator and its 23.5

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consistent. This is nothing to brag about, especially since it would require the Big Bang model to be based on nothing more than foreground contaminated evidence. Moreover, the Wikipedia sources for foreground contamination (footnotes 71-75) are old, ranging from 2004 to 2006. Since then, foreground contamination has been ruled out, as noted in Copi's *et al*., 2010 paper. As for percentages, Copi shows they are worse than 85% for the Big Bang: "The study of alignments in the low-£ CMB has found a number of peculiarities. We have shown that the alignment of the quadrupole and octopole planes is inconsistent with Gaussian, statistically isotropic skies at least at the 99% confidence level. Further a number of (possibly related) alignments occur at 95% confidence levels or greater" (*ibid*., p. 6). Hence, Copi's 2010 paper answers the 2005 paper by Chris Vale titled, "Local Pancake Defeats Axis of Evil," who claims the Axis is the result of "weak lensing of the CMB dipole by large magnitude." See also "Significant Foreground Unrelated Non-Acoustic Anisotropy on the 1 Degree Scale in WMAP Probe 5-Year Observations," Bi-Zhu Jiang, et al., Jan. 2010.

ecliptic angle, except in this case we are speaking of the whole universe, an astounding phenomenon, predicted by no model, except the Tychonic.

The same team emphasizes several times in their paper that the CMB anisotropy does not match that which is predicted or accepted in the Big Bang model.

> …and furthermore that it is very difficult to explain within the context of the canonical Inflationary Lambda Cold Dark Matter of cosmology [*i.e.*, the Big Bang]….Our first observation is that none of those data curves look like the [LCDM] theory curve….It is extremely difficult to arrange for the C_ℓ to have particular relative values in the context of the standard inflationary model…the observed sky, at least the part outside the Galaxy cut, seems not to respect the fundamental prediction of the standard cosmological model that the $a_{\ell m}$ are independent random variables…for the lowest multipoles and the largest angular skies, the observations disagree markedly with the predictions of the [Big Bang] theory.[520]

The harmonic multipoles of the CMB are analogous to the harmonics of musical vibrations. When a string on a violin is plucked it vibrates very fast. In turn, the air molecules vibrate and sound waves travel to our ear. But the note made by the violin makes the string vibrate in a very complex manner. First, is the basic or fundamental note, but many other notes appear that, when all the notes are combined, makes the sound that is unique to a violin as opposed to a cello. For example, the note A above middle C vibrates at 440 hertz or 440 times per second, which is the "fundamental" or "first harmonic." The second harmonic vibrates twice as fast at 880 hertz or a 2:1 ratio, which is the A an octave higher. The third harmonic vibrates at 1320 hertz or with a ratio of 3:2, which will be the E an octave and a fifth above the fundamental note. So on and so on the harmonics are created. The higher the harmonic the quieter the note, but the ratio to create a harmonic is always a whole number.

In a similar way, the CMB monopole is the fundamental note, but can then be divided into higher harmonics, such as dipole, quadrupole and octupole. Whereas the various harmonics of musical notes will create a different tone, the CMB harmonics will create different orientations or

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[520] "The Oddly Quiet Universe: How the CMB Challenges Cosmology's Standard Model," Glenn D. Starkman, Craig J. Copi, Dragan Huterer, Dominik Schwarz, January 12, 2012, acXiv:1201.2459v1.

directions for the microwaves. The astounding fact for the CMB harmonics is that all of them point to ecliptic and equator of the Earth.
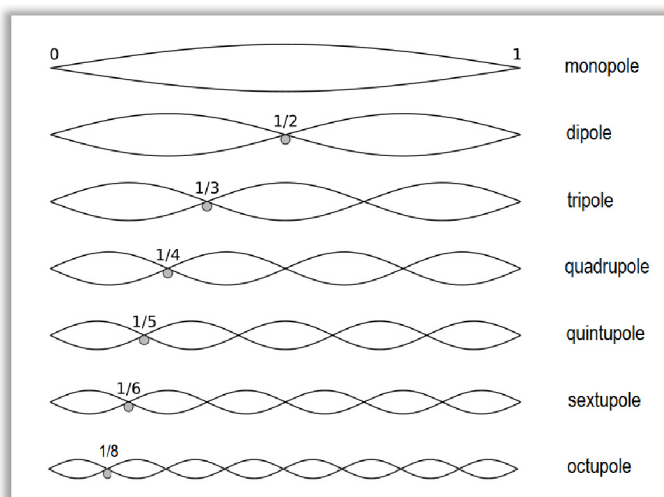
Harmonics of musical notes analogous to CMB harmonics

CMB: ℓ = 1 (dipole)
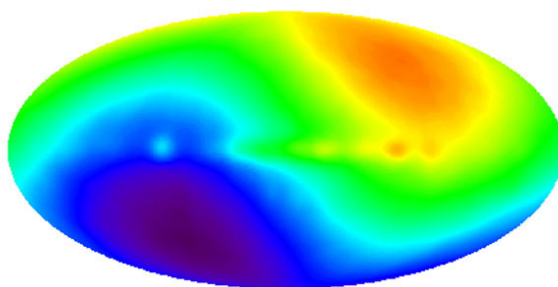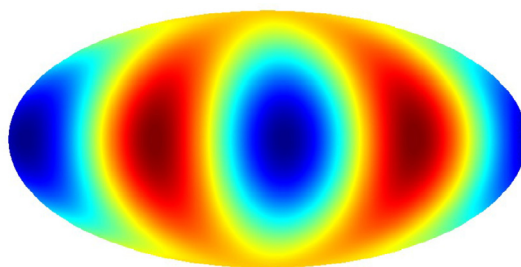
CMB: ℓ = 2 (quadrupole); m = 2 (shape); ratio = 0.957
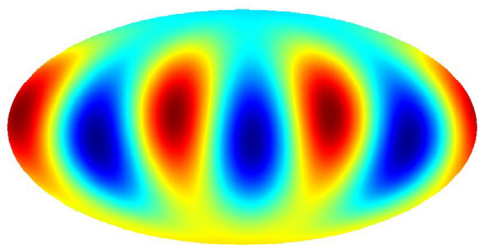
CMB: ℓ = 3 (octopole); m = 3 (shape); ratio = 0.942
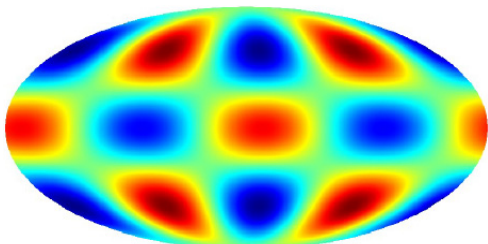
CMB: ℓ = 4; m = 2; ratio = 0.875
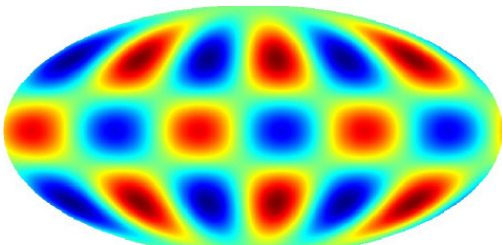
CMB: ℓ = 5; m = 3; ratio = 0.895
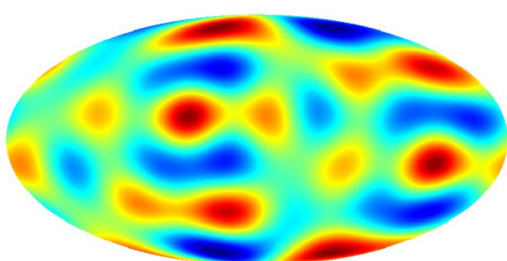
CMB: ℓ = 6; m = 1; ratio = 0.802[521]

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[521] Graphs taken from Kate Land's seminar at: http://www.cita. utoronto.ca/TALKS/Land-Nov23.pdf

All in all, the cosmological statistics show that an alignment of the CMB quadrupole and octupole with the Earth is a 0.1% chance. That the normals [perpendicular vectors] are aligned with the Earth's equinoxes and dipole is a 0.4% chance. That three of the normals are orthogonal [perpendicular] to the Earth's ecliptic is a 0.9% chance. In light of the fact that these universal alignments could not have happened by chance, in an article for *Scientific American*, Schwarz and Starkman also admit that the CMB data does not fit with the Big Bang since, as we noted earlier, Big Bang cosmology did not predict the CMB large scale anisotropies. Comparing the CMB temperature differences to the sounds of an orchestra, they find that "Certain of those harmonics are playing more quietly than they should be….These bum notes mean that the otherwise very successful standard model of cosmology [the Big Bang] is flawed – or that something is amiss with the data."[522] Toward the end of the article Schwarz and Starkman more or less discount that something is wrong with the data, leaving the Big Bang theory itself as the culprit:

> Yet the WMAP team has been exceedingly careful and has done numerous cross-checks of its instruments and its analysis procedure. It is difficult to see how spurious correlations could accidentally be introduced. Moreover, we have found similar correlations in the map produced by the COBE satellite….The results could send us back to the drawing board about the early universe.[523]

Schwarz and Starkman refer to the study of Tegmark and Oliveira-Costa we covered above, noting that the "preferred axes of the quadrupole modes…and the octupole modes…were remarkably closely aligned" (*i.e.*, geocentric), and they add the study of Hans Kristian Eriksen in 2003 at the University of Oslo, citing that:

> What they found contradicted the standard inflationary cosmology – the hemispheres often had very different amounts of power. But what was most surprising was that the pair of hemispheres that were the most different were the ones lying above and below the ecliptic, the plane of the earth's orbit around the sun. This result was the first sign that the CMB fluctuations, which were supposed to be cosmological in

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[522] Glenn Starkman and Dominik Schwarz, "Is the Universe Out of Tune," *Scientific American*, August 2005, p. 50.
[523] *Ibid.*, p. 55.

origin…have a solar system signal in them – that is, a type of observational artifact.[524]

[525]
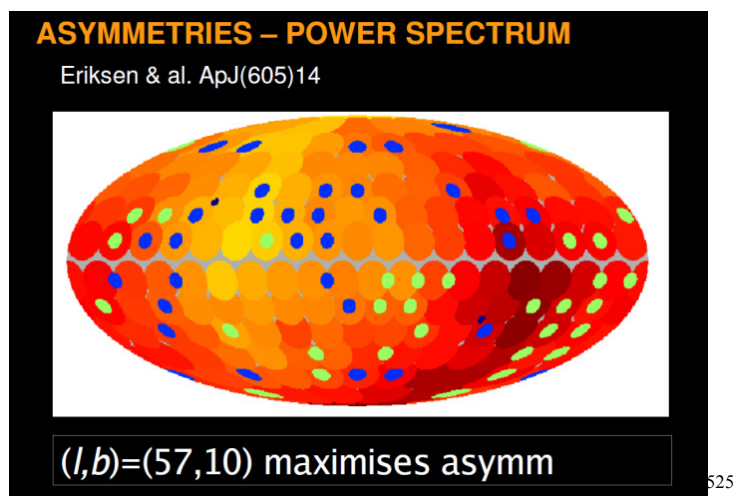
The significance of Eriksen's finding may go over the heads of most people not familiar with astrophysical language, but the simple interpretation is that all the radiation in the universe, whether it is symmetric or asymmetric, is centered around the Earth. This is confirmed when Schwarz, *et al*., state later: "Within that plane, they sit unexpectedly close to the equinoxes – the two points on the sky where the projection of the earth's equator onto the sky crosses the ecliptic." In other words, all the data show that, as far out as our telescopes can see, space is oriented geocentrically. What are the chances that this could happen by accident? The team of Copernicans had to admit that the "combined chance probability is certainly less than one in 10,000." So upsetting is this evidence to the scientific *status quo* that another magazine, *New Scientist*, labeled the same universal orientation around Earth's equatorial plane as, "THE AXIS OF EVIL," since this geocentric picture virtually destroys its cherished Copernican principle.[526] This phrase was taken by a paper written by Kate Land and João Magueijo in a 2005 paper appropriately titled, "The Axis of Evil."

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[524] *Ibid*., p. 52.

[525] Graph taken from Kate Land's seminar at: http://www.cita.utoronto .ca/TALKS/Land-Nov23.pdf

[526] "Axis of Evil Warps Cosmic Background," Marcus Chown, *New Scientist*, October 22, 2005, pp. 19ff, emphasis in original.

Almost as if they know that Copernicanism is about to be overturned by the CMB evidence, they begin the paper assuring their audience that "The homogeneity and isotropy of the Universe – also known as the Copernican principle – is a major postulate of modern cosmology….One may expect that the ever improving observations of CMB fluctuations should lead to the greatest vindication of this principle." But in the same breath they admit "there have been a number of disturbing claims of evidence for a preferred direction in the Universe" (*i.e.*, geocentric) and that "These claims have potentially very damaging implications for the standard model of cosmology" (*i.e.*, the Big Bang). They add that they hope "the observed 'axis of evil' could be the result of galactic foreground contamination" but in the end admit they were "unable to blame these effects on foreground contamination or large-scale systematic errors" and are desperately hoping to find an answer to this "anomaly" in order to save the Copernican principle.[528]

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[527] Graph taken from Kate Land's seminar at: http://www.cita.utoronto .ca/TALKS/Land-Nov23.pdf

[528] Kate Land and João Magueijo, "The axis of evil," Theoretical Physics Group, Imperial College, London, Feb. 11, 2005, p. 1.
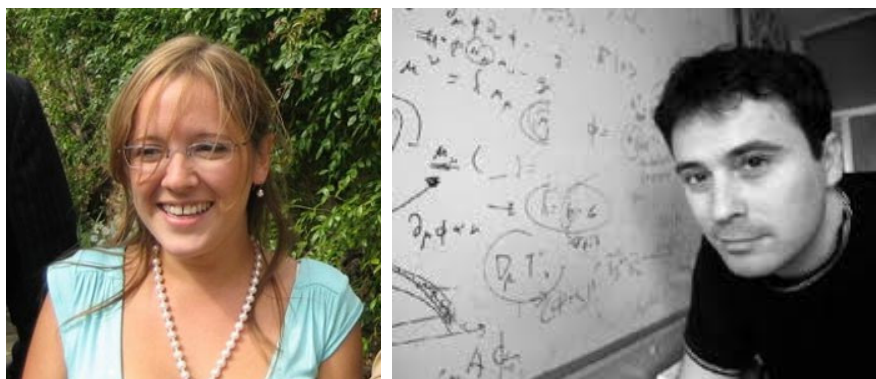
Kate Land and João Magueijo[529]

In a *New Scientist* article of July 2005 with what many would consider a career-ending title, "Did the big bang really happen?" Marcus Chown covered Land and Magueijo's "Axis of Evil" paper in great detail. The implications are staggering for modern cosmology. Chown writes:

> Yet there is more evidence that there could be something wrong with the standard model of cosmology. And it is evidence that many cosmologists are finding harder to dismiss because it comes from the jewel in the crown of cosmology instruments, the Wilkinson Microwave Anisotropy Probe. "It could be telling us something fundamental about our universe, maybe even that the simplest big bang model is wrong," says João Magueijo of Imperial College London. Since its launch in 2001, WMAP has been quietly taking the temperature of the universe from its vantage point 1.5 million kilometres out in space. The probe measures the way the temperature of the cosmic microwave background varies across the sky.
>
> …because the cosmic background radiation is a feature of the universe as a whole rather than any single object in it, none of the hot or cold regions should be aligned with structures in our corner of the cosmos. Yet this is exactly what some researchers are claiming from the WMAP results.
>
> Earlier this year, Magueijo and his Imperial College colleague Kate Land reported that they had found a bizarre alignment in

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[529] Land's doctoral thesis: "Exploring anomalies in the Cosmic Microwave Background," 2006, won the RAS Michael Penston Astronomy thesis prize.

the cosmic microwave background. At first glance, the pattern of hot and cold spots appeared random, as expected. But when they looked more closely, they found something unexpected. It is as if you were listening to an anarchic orchestra playing some random cacophony, and yet when you picked out the violins, trombones and clarinets separately, you discovered that they are playing the same tune.

Like an orchestral movement, the WMAP results can be analysed as a blend of patterns of different spatial frequencies. When Magueijo and Land looked at the hot and cold spots this way, they noticed a striking similarity between the individual patterns. Rather than being spattered randomly across the sky, the spots in each pattern seemed to line up along the same direction. With a good eye for a newspaper headline, Magueijo dubbed this alignment the axis of evil. "If it is true, this is an astonishing discovery," he says.

That's because the result flies in the face of big bang theory, which rules out any such special or preferred direction. So could the weird effect be down to something more mundane, such as a problem with the WMAP satellite? Charles Bennett, who leads the WMAP mission at NASA's Goddard Space Flight Center in Greenbelt, Maryland, discounts that possibility. "I have no reason to think that any anomaly is an artefact of the instrument," he says.

"The big question is: what could have caused it," asks Magueijo. One possibility, he says, is that the universe is shaped like a slab, with space extending to infinity in two dimensions but spanning only about 20 billion light years in the third dimension. Or the universe might be shaped like a bagel.

Interestingly enough, Magueijo concludes by showing how a geocentric cosmology with a rotating universe is one viable solution to the WMAP evidence:

Another way to create a preferred direction would be *to have a rotating universe*, because this singles out the axis of rotation as different from all other directions.[530]

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[530] "Did the big bang really happen," M. Chown, *New Scientist*, July 2, 2005, p. 6.

Earlier in the article **Chown** shows additional implications for WMAP's discoveries against the Big Bang.

> What if the big bang never happened?...“Look at the facts,” says Riccardo Scarpa of the European Southern Observatory in Santiago, Chile. “The basic big bang model fails to predict what we observe in the universe in three major ways.” The temperature of today's universe, the expansion of the cosmos, and even the presence of galaxies, have all had cosmologists scrambling for fixes. “Every time the basic big bang model has failed to predict what we see, the solution has been to bolt on something new - inflation, dark matter and dark energy,” Scarpa says…

> “This isn't science,” says Eric Lerner who is president of Lawrenceville Plasma Physics in West Orange, New Jersey, and one of the conference organizers. “Big bang predictions are consistently wrong and are being fixed after the event.” So much so, that today's “standard model” of cosmology has become an ugly mishmash comprising the basic big bang theory, inflation and a generous helping of dark matter and dark energy.

Chown adds Magueijo's comment to this conclusion:

> Clearly, such a universe would flout a fundamental assumption of all big bang models: that the universe is the same in all places and in all directions. “People made these assumptions because, without them, it was impossible to simplify Einstein's equations enough to solve them for the universe,” says Magueijo. And if those assumptions are wrong, it could be curtains for the standard model of cosmology. That may not be a bad thing, according to Magueijo. “The standard model is ugly and embarrassing,” he says. “I hope it will soon come to breaking point.” But whatever replaced it would of course have to predict

all the things the standard model predicts. "This would be very hard indeed," concedes Magueijo.[531]

99.99% certainty of the "Axis of Evil" [532]

Attempted Explanations

In an attempt to lessen the severity of the *Axis of Evil* against the Copernican Principle, some try to separate the dipole from higher ℓ values (quadrupole, octuopole, *etc*.) and claim that the dipole is caused by "the peculiar velocity of the Earth relative to the co-moving cosmic rest frame as the planet moves at some 371 km/s towards the constellation Leo."[533]

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[531] *Ibid*., pp. 1-3. Chown adds: "Last year they wrote an open letter warning that failure to fund research into big bang alternatives was suppressing free debate in the field of cosmology (*New Scientist*, 22 May 2004, p 20)."

[532] Graph taken from Kate Land's seminar at: http://www.cita.utoronto. ca/TALKS/Land-Nov23.pdf

[533] http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation. Another source has the Earth moving toward Virgo: "After the dipole anisotropy, which is due to the Doppler shift of the microwave background radiation due to our peculiar velocity relative to the co-moving cosmic rest frame, has been subtracted out. This feature is consistent with the Earth moving at some 627 km/s towards the constellation Virgo" (http://en.wikipedia.org/wiki/CMB_cold_spot).
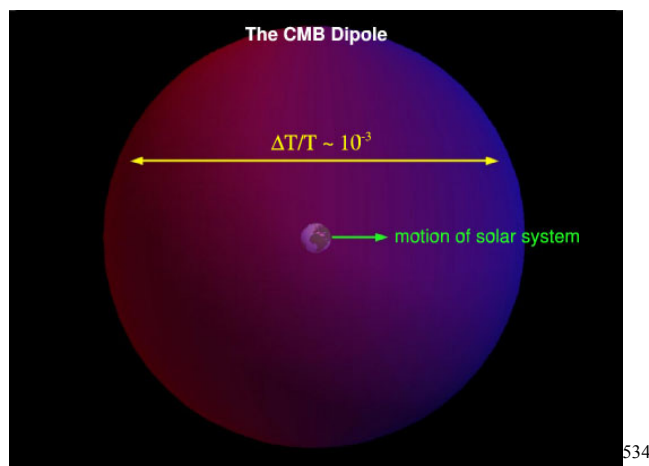
There are two glaring anomalies in this claim. First, as John Ralston points out, in such solutions they are "forgetting there is an unknown cosmological piece," namely, "By an apparently random accident the dipole happens to lie in the plane of the ecliptic, and point along Virgo. This is accepted with very little discussion, and nobody disbelieves the dipole."[535] In other words, attributing the dipole to a movement of the Earth through the CMB is convenient enough, but it becomes a little too convenient when that movement is pointing to Virgo, which just happens to be in the same direction as the "Axis of Evil." Even if it were true that the Earth is moving against the CMB (and not vice-versa, as in the geocentric system), still, this explanation misses the elephant in the room, *i.e.*, that the entire universe, as represented by the CMB dipole, is aligned with the tiny Earth. One has to be blind or biased to miss this.

The discrepancy of using Virgo as opposed to Leo is that the two constellations are next to each other in the Zodiac, and the dipole axis is between them, although closer to Leo. The 371km/s is the net speed of the sun minus any galactic movement toward Leo.

[534] Image from Cal Tech lecture on the CMB at http://ned.ipac.caltech.edu /level5/Sept02/Kinney/Kinney3.html.

[535] John P. Ralston, "Question Isotropy," Dept. of Physics and Astronomy, Univ. of Kansas, Nov. 2010, pp. 4-5. Ralston adds: "All are again *well-aligned with the axis of Virgo*. A subsequent study in 2008 diluted by higher values of ℓ does not change this conclusion. And so if there is a local effect or bias producing the (many) alignments, it affects much of the actual power in the CMB, which then would not be 'pristine'" and concluding with "*our studies fine there is nothing supporting isotropy of the CMB, and everything about the data contradicting it.*"
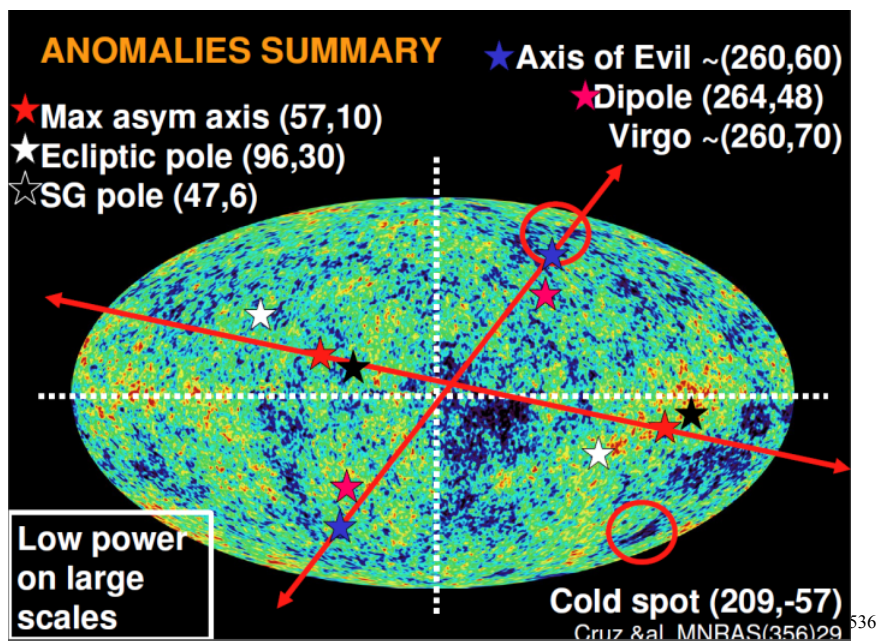
—**Double arrow at 7:00 o'clock to 1:00 o'clock is the Axis of Evil and the CMB Dipole, with upper arrow pointing to Virgo-Leo and about 23.5 degrees off center.**

—**Double arrow at 10:00 o'clock to 4:00 o'clock is Asymmetric Axis aligned with the Sun-Earth ecliptic and is formed by the CMB quadrupole and octupole**

Second, we will notice from the graphs that the dipole axis is almost perpendicular to the quadrupole/octupole axis. Big Bang cosmology claims that the dipole axis is created by the sun-earth system moving through the CMB, which creates a Doppler blue shift. But how does Big Bang cosmology then explain the quadrupole/octupole axis, which is perpendicular to the dipole axis? It cannot be created by a movement of the sun-earth system through the CMB since, obviously, the sun-earth system cannot be going in one direction to create the dipole and, at the same time, going in an orthogonal direction to create the quadrupole and octupole. Something is definitely amiss here.[537]

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[536] Graph taken from Kate Land's seminar at: http://www.cita.utoronto. ca/TALKS/Land-Nov23.pdf

[537] Ralston, "Question Isotropy," p. 5. Ralston may have made the same point when he says, "However the alignment of the quadrupole and octupole happens to

Dipole axis runs between Leo and Virgo
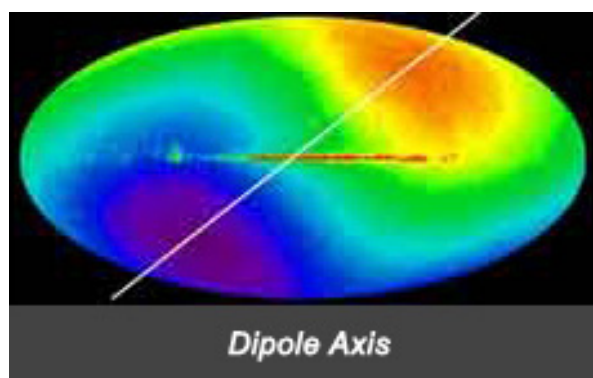
The Axis connecting the two largest CMB formations

be right along the dipole, and point along Virgo. Some use this as a reason to dismiss the quadrupole and octupole, while retaining the rest of the CMB as 'pristine,'" but he made a mistake in saying that the quadrupole/octupole "point along Virgo" (since it is obvious that the quad- and octupole axis is perpendicular to the dipole axis).
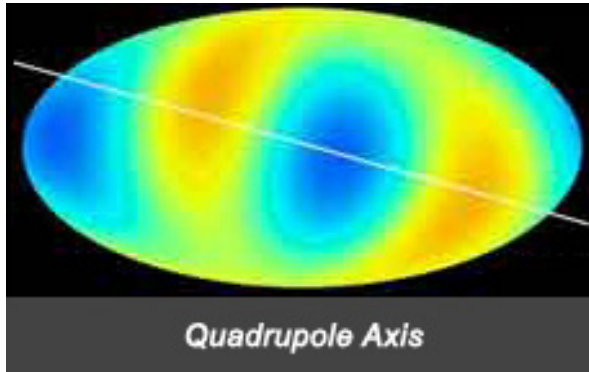
The Axis connecting the four major CMB formations
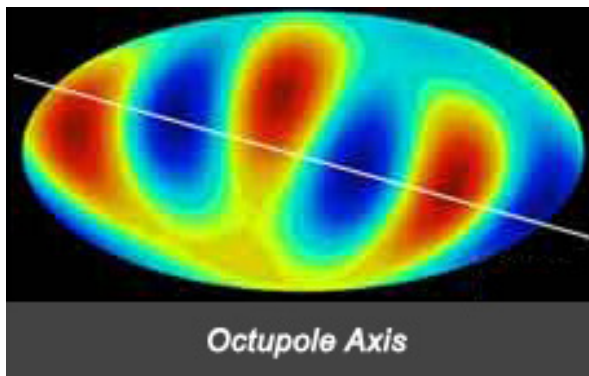
The Axis connecting the eight major CMB formations

In 2006, one of the more notable modern cosmologists, Lawrence Krauss of Arizona State University, wrote a paper titled "The Energy of Empty Space is Not Zero," which made this startling conclusion:

But when you look at CMB map, you also see that the structure that is observed, is in fact, in a weird way, correlated with the plane of the earth around the sun. Is this Copernicus coming back to haunt us? That's crazy. We're looking out at the whole universe. There's no way there should be a correlation of

structure with our motion of the earth around the sun — the plane of the earth around the sun — the ecliptic. <u>That would say we are truly the center of the universe</u>….The new results are either telling us that all of science is wrong and we're the center of the universe, or maybe the data is simply incorrect, or maybe it's telling us there's something weird about the microwave background results and that maybe, maybe there's something wrong with our theories on the larger scales.[538]

Lawrence Krauss, b. 1954, Professor of Cosmology, Arizona State University

In 2007, **Dragan Huterer** of the University of Michigan published a paper in *Astronomy* titled, "Why is the solar system cosmically aligned."[539] Huterer, although speaking with Copernican glasses, writes of the startling data found by the Wilinson Microwave Anisotropy Probe (WMAP):

Developing the multipole vectors allowed us to examine how the CMB's large-scale features align with each other and the ecliptic – the plane of Earth's orbit around the sun….Not only are the quadrupole and octopole planar, but the planes are nearly perpendicular to the ecliptic….The likelihood of these alignments happening by chance is less than 0.1 percent….Why

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[538] "The Energy of Empty Space is not Zero. http://www.edge.org/3rd _culture/krauss06/krauss06.2 _index.html
[539] Dragan Huterer, *Astronomy*, Dec. 2007, pp. 38-43.

CMB patterns are oriented to the solar system is not at all understood at this time.[540]

That **Huterer** and his colleagues do not understand why the CMB is oriented to our solar system is quite an understatement. It makes it appear that merely because they don't understand it, then it is not significant. In reality, it is the most astounding fact that modern cosmology has discovered. As one scientist said, "it should make the hair stand up on the back of your neck." That the whole universe is aligned with our solar system is like saying the Milky Way is aligned with a pea. Be that as it may, Huterer is also rather casual about the fact that the quadrupole and octopole are planer and nearly perpendicular to the ecliptic. In reality this means that we possess the X and Y coordinates of a universal graph with our solar system at point 0, 0. All that is needed now is the Z axis to show that our system is in the exact center of the universe (but which is not possible with only two-dimensional plotting afforded by WMAP). As it turns out, the dipole is aligned with the Earth's equinoxes and the quadrupole and octopoles are aligned with the Earth's ecliptic. Even more amazing is the fact that the alignment of the CMB with the Earth's ecliptic and equinoxes will be seen from any observation point in space. In other words, if an observer were stationed on a galaxy 50 million light years from Earth, he would see the CMB aligned with only one region in the universe – the Earth's ecliptic and equinoxes.

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[540] *Ibid*., p. 43. See also *Scientific American*, December 9, 2011 article titled "Universal Alignment: Could the Cosmos Have a Point" by Michael Moyer, which makes reference to Huterer's findings, stating: "The universe has no center and no edge, no special regions ticked in among the galaxies and light. No matter where you look, it's the same – or so physicists thought…hot and cold spots speckle the sky….Cosmologists have called it the 'axis of evil.'" Likewise, Federico Urban and Ariel Zhitnitsky state "Similarly, one can employ different vectorial and tensorial decompositions of the multipoles to see that there is a very easily identifiable preferred axis, the cosmological dipole once again; that is, the normal vectors to the planes determined by the quadrupole and the octopole (there are four of them) point all in the same direction, that of the ecliptic and equinox" "The *P*-Odd Universe," University of British Columbia, July 13, 2011, p. 2.
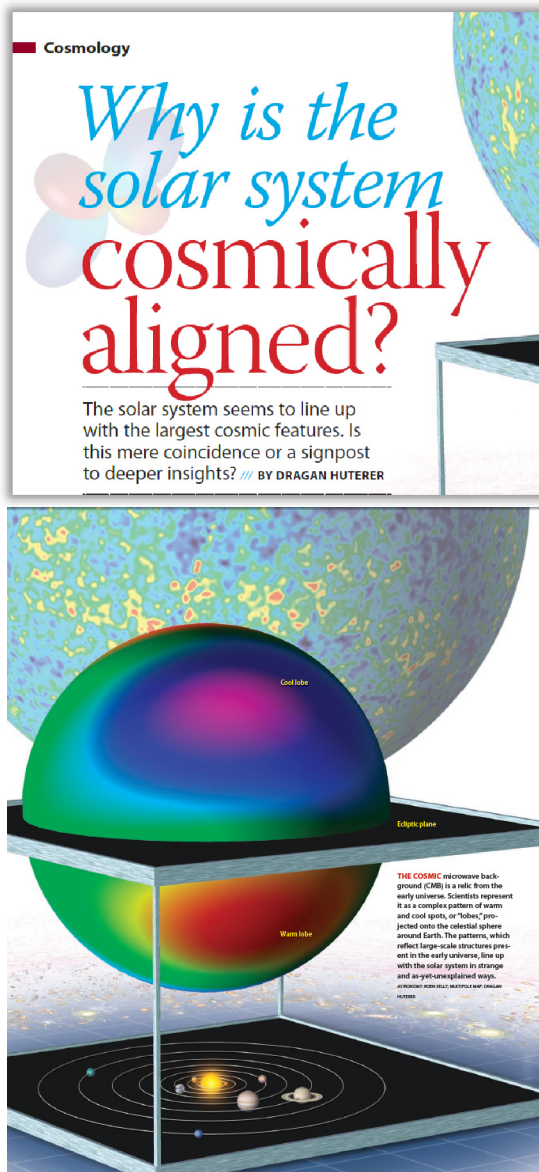
"The solar system seems to line up with the largest cosmic features. Is this mere coincidence or a signpost to deeper insights?"
Dragan Huterer, *Astronomy*, December 2007, pages 38-39
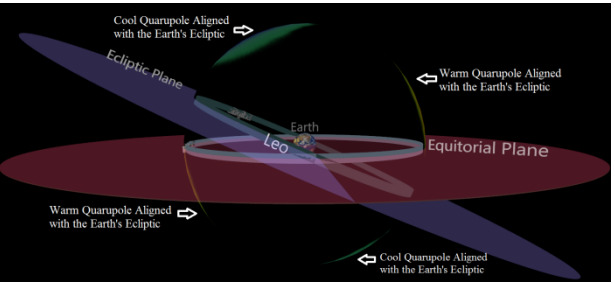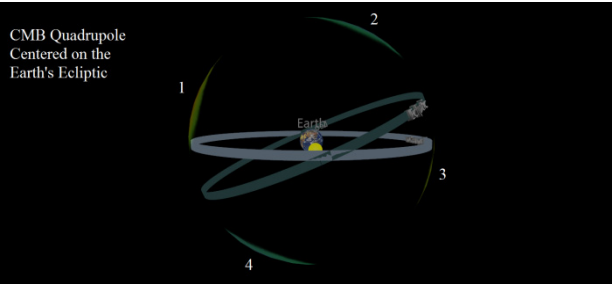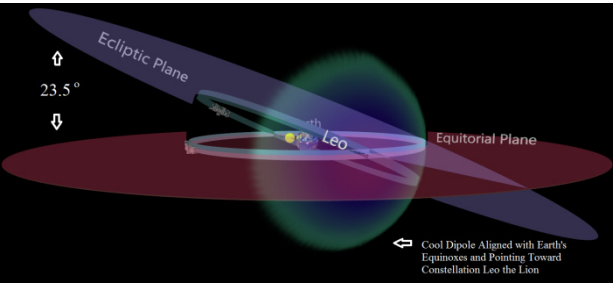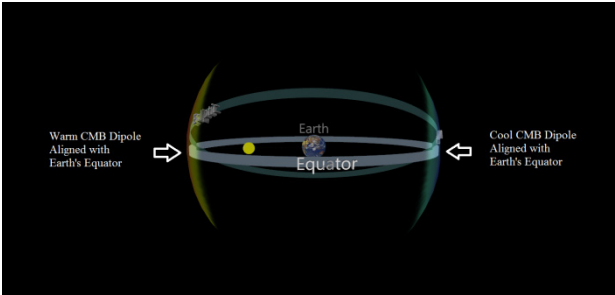
The CMB Dipole

With all this amazing evidence of a central Earth before him, what should Professor Huterer have concluded? He should have concluded the same that Dr. Lawrence Vescera concluded after he read Huterer's 2007 article. In "The Discovery that Dare Not Speak its Name" he writes:

> Steven Hawking, arguably the world's greatest living astrophysicist, called it "the discovery of the millennium, if not all time." Hawking was referring to the anisotropies of the Universe. Anisotropies are variations or inhomogeneities in a structure. The anisotropies referred to here are the temperature variations in the Cosmic Microwave Background (CMB) radiation distributed across the Universe. These temperature variations were left behind by the original creation event: they are the after glow of The Big Bang from which the Universe emerged. These variations are tiny, amounting to only about 1/40,000 of a degree Celsius, but they are enormously consequential. It is from these minute variations that the current Universe developed its large scale structure of Galaxy Clusters and Super Clusters. This structure is also essential for the Universe to be able to support life.
>
> This of course is all quite interesting, but a shocking new set of findings has emerged from the study of the CMB. It has been discovered that the CMB, which pervades the entire Universe, is aligned to the Solar System. This means that, the original creation event, which produced all of space, time, matter, and energy, was precisely fine tuned so that it is aligned with the location and direction of the Solar System in which we live.
>
> This discovery has been so disturbing to some scientists that it has been most inappropriately labeled "The Axis of Evil." Since this discovery was first made in 2003, many scientists have been trying to disprove it. Researchers have been studying the CMB since 1965 when it was first found to exist. Through the years, more sensitive instruments have been developed which have allowed ever more accurate maps of the CMB to be drawn. The best known of these were the 1992 COBE and the 2003 WMAP satellite-based probes. The initial shock came when one alignment was discovered, but as work has progressed, instead of going away, at least three more of these "Cosmic Alignments" between the CMB and the Solar System have been uncovered.
>
> The first discovery was that the original Creation Event was divided into two hemispheres, called a Dipole, with one warm lobe and one cool lobe. What researchers were shocked to find

was that the plane of the Solar System sits at the exact division point, right in the middle of these two lobes. <u>This means that the plane of the Earth's orbit around the Sun exactly divides these two hemispheres</u>. It was further discovered that the direction of the Sun's motion around the center of our Galaxy is also closely aligned with this plane.

Within each of the lobes of the dipole there are other cool and warm areas that have been located. There are a quadrupole (four lobes) and an octopole (eight lobes). To the researchers amazement, it has also been discovered that these mulitpoles are also planar and additionally are perpendicular to the Earth's path around the sun. The likelihood of any of these alignments arising by chance is less than 1 in 1000.

One of the Primary Axioms of Materialist Philosophy is the Copernican Principle, sometimes known as the Mediocrity Principle. Simply stated, it is the opinion that humans are not privileged as observers or in anyway. Therefore, there should be nothing special about where we live in the Universe, about our Galaxy, Solar System, or Planet. The Copernican Principle was offered as a counter to the widely asserted medieval beliefs that the Earth was at the center of the Universe, that man was in an exalted place, and that God's existence was proved by these facts. Medieval scholars did not actually believe anything like this, but that is another story.

<u>The discovery that the CMB is cosmically aligned to the Earth should make the hair on the back of your neck stand up.</u> It points to the fact that the Earth is at a special place in the Universe and that God wants it to be known. In the source listed below, it is interesting to observe how the writers try to dance around this implication (the elephant in the room) without actually coming out and directly admitting the clear implication of these discoveries. We read for example, "The solar system seems to line up with the largest cosmic features. Is this mere coincidence or a sign post to deeper insight?" "Careful analysis have confirmed these alignments exist. But we don't know whether they are bizarre coincidences or if something more fundamental is at work." As similar "coincidences" from every field of science are piling to the sky for all to see, the only ones who will not see are those who refuse to see.[541]

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[541] Lawrence Vescera, Nov. 9, 2007, http://www.idscience.org/ 2007/11/09/the-discovery-that-dare-not-speak-its-name/

Perhaps the astounding realization that the whole universe was aligned with the Earth was just too much for some scientific researchers. We see this phenomenon, for example, in the image released in 2004 by the Michigan university team of Schwarz, Starkman, Huterer and Copi. The black ecliptic line across the middle (from Tegmark's original 2003 image) is replaced with a looping S-type line. Hence, in Schwarz's altered version, the plane of the Milky Way is now in the middle of the image, while the sun-earth ecliptic plane is removed from the center.
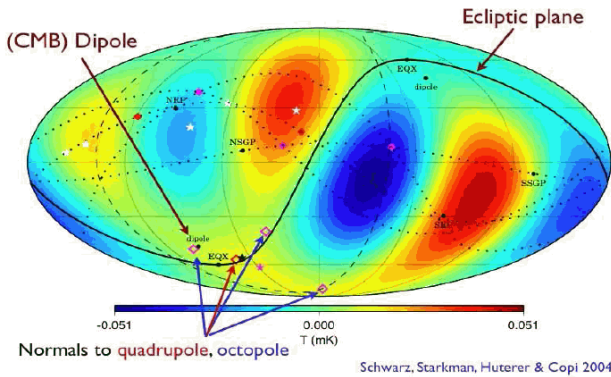
Now let's look at this Schwarz image with more defined labels for easier viewing.
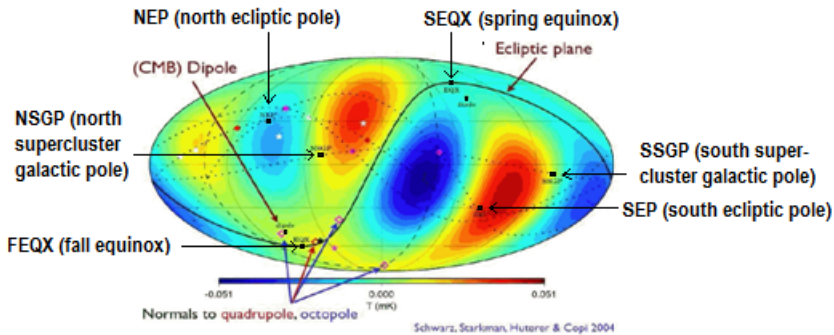
(modified CMB map using larger labels for illustration purposes)

The north and south poles of the local galactic supercluster are represented by the NSGP (north supercluster galactic pole) and the SSGP (south supercluster galactic pole), respectively, while the north ecliptic pole is represented by NEP (upper left) and the south ecliptic pole by SEP (lower right). But there is really no reason to display the CMB in this way since it doesn't add any precision to the actual state of affairs and, in fact,

shows that demonstrating the CMB by galactic coordinates is much less remarkable than using geocentric coordinates. This is noted by the dash-perforated line (as opposed to the dot-perforated line) which represents the equator of the supergalatic cluster. As one can see, the attempt to put the CMB in galactic coordinates resulted in an equatorial line that is off-center and has less geometrical relation to the dipole or quadrupole/octopole. This configuration is puzzling since in their 2010 paper they admit: "Our studies indicate that the observed alignments are with the ecliptic plane, with the equinox or with the CMB dipole, and not with the Galactic plane." Perhaps by 2010, after many studies over six years of the CMB's alignment with the Earth, they realized their 2004 galactic alignment would no longer suffice and a much more precise truth needed to be told – the whole universe was aligned with the Earth.

Another way to understand Schwarz's change is to note that Tegmarks original image would need to be tilted in order to have approximately the same S-line.
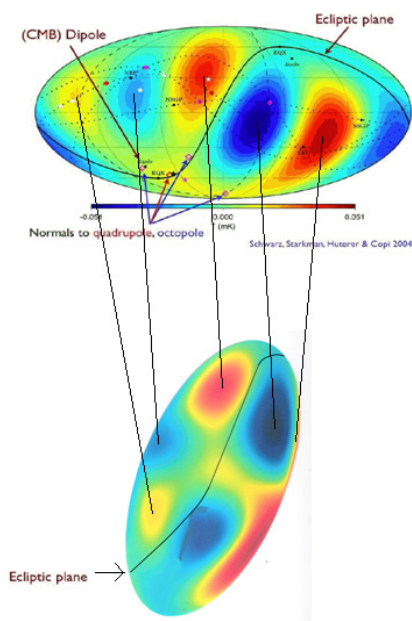
This leads us to conclude, of course, that the best representation of the relationship between Earth and the dipole/quadrupole/octupole is the original Tegmark graphic showing the hot and cold lobes on either side of the Earth's ecliptic plane. In fact, if we take the galactic coordinates used in the previous graphic (NSGP, SSGP, NEP, SEP) and put them in the Tegmark graphic, it results in the following:
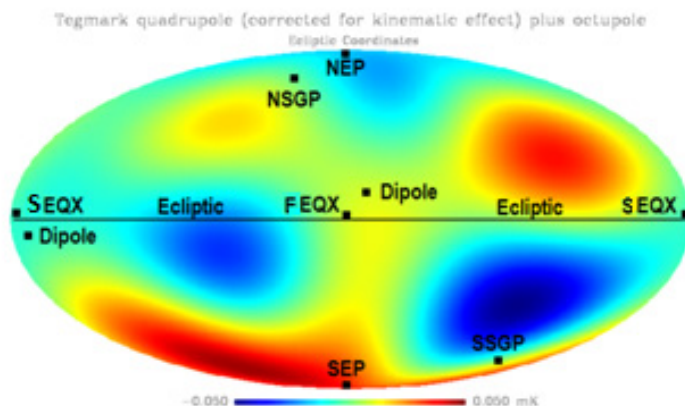
Original Tegmark 2003 Mollweide image marked with Schwarz' 2004 labels[542]
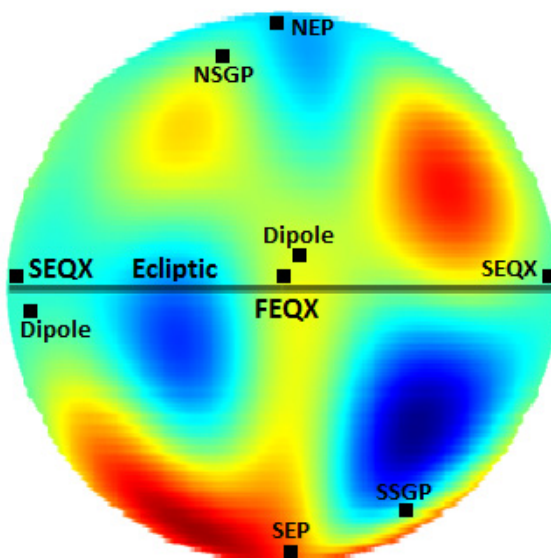
Same Tegmark image transposed to the sphere of the universe

Notice that the fall equinox (FEQX in yellow area) is in the center with the dipole, while the spring equinox (SEQX in light blue/green area) is with the other dipole. The fall and spring equinoxes rest on the ecliptic, and the quadrupoles/octopoles (red and blue lobes) are on either side of the ecliptic, showing once again that the dipole straddles the ecliptic during the equinoxes while the quadrupole and octopoles are orthogonal to the

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[542] My thanks to Gerry Bouw for his help in analyzing this data.

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ecliptic, which combination forms an X and Y axes with Earth directly in the center of it all.

All the studies show that the characteristics of the CMB: (a) lean heavily against the Big Bang theory and (b) suggest that our local system (*e.g.*, sun, Earth and planets) is either a central source or the central depository or "sink" for the CMB radiation. This means that the Earth and its neighbors are in the center of the phenomenon. The Copi team acknowledges that the positioning of the poles symmetrically above and beneath the ecliptic is to be interpreted as no accident. Even in the heliocentric model, the CMB poles could not position themselves in respect of the Earth's rotation or translation since the poles have no reaction to such movement. In either model there can be no other conclusion than the orientation of the CMB is purely geocentric.
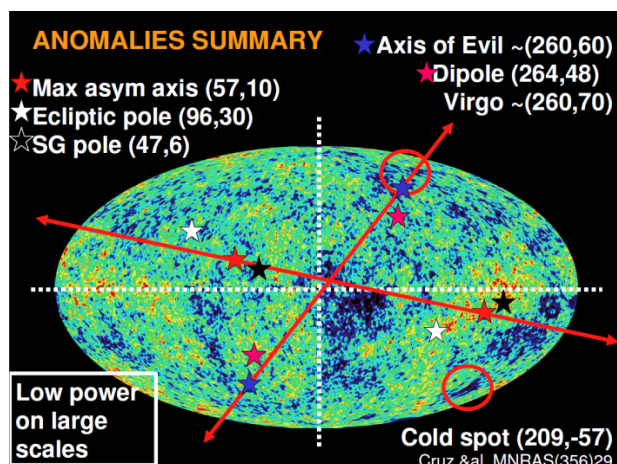
The Dipole axis intersects with the Quadrupole/Octupole axis, forming an X and Y graph, with Earth at or very near the intersection point

In a recent interview, speaking for the team, Glenn Starkman of Case Western University stated: "All this is mysterious. And the strange thing is, the more you delve into it, the more mysteries you find." This is a polite way of saying that he is shocked that the CMB is geocentrically orientated, since that is the last thing he expected to find by working from a Big Bang model. Nevertheless, in an attempt to put a damper on the geocentric possibilities, Starkman adds: "None of us believe that the universe knows about the solar system, or that the solar system knows about the universe."[543] "Far more plausible, he says, is that something within our

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[543] Dan Falk, *Astronomy Magazine*, Dec. 8, 2004, p. 1-2.

solar system is producing or absorbing microwaves,"[544] but, of course, neither Starkman nor any other cosmologist has detected such a source in the solar system. In the end one can see how the team's presuppositions determine how they will proceed to interpret the data. Their proposed solution sounds like the rationale for claiming that Dark Matter and Dark Energy exist even though they have found absolutely no evidence for them, even after searching for the last 40 years.[545] It is believed because it is needed to prop up the present paradigm. As always, the geocentric possibilities are summarily dismissed since such notions are, as we found earlier, "unthinkable" for the modern science community. The other possibility is that "the patterns seen by Dr. Starkman and his colleagues might simply be a fluke – an accidental alignment between the solar system and patterns in the CMB radiation."[546] Another physicist said: "The precise directional coincidences with solar system alignments are certainly thought-provoking. It may look like a smoking gun…but I'm going with the fluke hypothesis for now."[547] But the "fluke" hypothesis has been ruled out by a 99% confidence level in the collected data.

In a geocentric universe, the most likely reason for the CMB alignment with our equinoxes and ecliptic is the Coriolis force created by a rotating universe. Just as the Coriolis force will give direction to air and water currents on Earth (clockwise in the northern hemisphere and counterclockwise in the southern hemisphere), so it does with the heat distribution of the universe. In fact, comparing maps of the warm/cool deposits of the CMB with those of the maps of Earth's air and water currents, the resemblance between the two is quite remarkable. Since in the geocentric system the Coriolis force is a real force created by rotating universe (and not merely an effect as it is in the heliocentric system), we would expect that its influence extends from the edge of the universe to the very center. It will thus induce movements of the CMB, as well as the rotation of galaxies and the oscillation of the Foucault pendulum.

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[544] Dan Falk, "Cosmic oddity casts doubt on theory of universe," The Globe and Mail, Jan. 29, 2005, updated Mar. 17, 2009.

[545] A recent study Chilean astronomers confirms its absence. They write: "The amount of mass that we derive matches very well with what we see – stars, dust and gas – in the region around the sun, but this leaves no room for the extra material – dark matter – that we were expecting. Our calculations show that it should have shown up very clearly in our measurements. But it was just not there!" ("Serious Blow to Dark Matter Theories?," *ScienceDaily*, April 18, 2012).

[546] *Ibid*.

[547] Dan Falk quoting Craig Hogan of the University of Washington in Seattle, *Astronomy Magazine*, December 8, 2004, p. 1-2.

NASA's Interpretation of WMAP Data

In December 2012 NASA released its "Nine-Year Wilkinson Microwave Anisotropy Probe Observations: Final Maps and Results," which was headed up by C. L. Bennett of the Department of Physics and Astronomy at Johns Hopkins University.[548] As we would expect, Bennett tries his best to interpret the WMAP data in accord with the Big Bang. He writes: "The WMAP mission has resulted in a highly constrained ΛCDM cosmological model with precise and accurate parameters in agreement with a host of other cosmological measurements."[549] Perhaps the phrase "highly constrained" shows that it wasn't an easy task for Bennett. Certainly he would have preferred to use the phrase "highly refined" if the data had allowed him, but a "highly constrained" model means that only within certain parameters and assumptions will the ΛCDM (Big Bang) model be able to fit with the WMAP data. Included in those assumptions are Dark Energy and Dark Matter. Like most modern cosmologists, Bennett just assumes they exist due to the fact that his model needs them to exist, but he provides no empirical evidence to confirm their existence. As such, the Big Bang model is based on nothing more than a phantom.[550]

NASA, as we would expect, claims that the anisotropies of the CMB "support the case for the gravitational evolution of structure in the universe

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[548] December 20, 2012, at arXiv:1212.5225v1.

[549] "Nine-Year WMAP Observations," p. 2.

[550] NASA admits at the end of its paper that it is using Dark Matter and Dark Energy. "(14) The requirement for both cold dark matter, which gravitates but does not interact with photons, and a substantial mass-energy component consistent with a cosmological constant [Dark Energy], which causes an accelerated expansion of the universe as characterized by Type Ia supernovae measurements, is unavoidable because of the precision of the available data and the multiple methods of measurement. The CMB fluctuations require dark matter and dark energy. The inability to predict a value for vacuum energy was a pre-existing physics problem, but particle physics has no problem positing massive particles that do not interact with photons as candidates for the CDM. If the massive particles do not decay or annihilate, their identity makes little difference to cosmology. It may well turn out that the dominant mass-energy component of our universe is a cosmological constant arising from vacuum energy, and that the vacuum energy is fundamentally not a specifically predictable quantity. It will be exciting to see how current theories develop, and especially fascinating how well these theories can be tested with data. The CMB is a unique remnant of the early universe which has been our primary cosmological observable. It continues to be imperative to learn all that we can from it" (*ibid*., 134). As we have seen, however, the "vacuum energy" provides the Big Bang advocates with 10^{120} too much mass and energy for their preferred universe.

from primordial fluctuations."[551] As we have noted earlier, the anisotropies of the CMB put NASA between the proverbial rock and a hard place. On the one hand, original Big Bang theory did not predict the presence of anisotropies. It predicted an isotropic and homogeneous spreading out of the initial explosion. Moreover, without having to worry about anisotropies, there would be no worry of their peculiar alignment with the Earth and no threat to the Copernican principle. On the other hand, since anisotropies were discovered in 1978, which is about 50 years after the Big Bang predictions were made, NASA would eventually be forced to produce a cogent answer for these "anomalies." The answer came from NASA after it made sure the anisotropies were real, which certainty came after the 1989 COBE and 2001 WMAP missions, and is now confirmed by the 2009 PLANCK mission. Hence, forced to account for the anisotropies, NASA did the only thing it could do – invent an answer that sounded cogent. After a few possibilities were suggested, they settled on the idea that the CMB anisotropies were the seeds of galaxies. As we can see, this is a very convenient cosmology.

As we would also expect, NASA's paper contains not one word about the anisotropies showing evidence of what has become known among all cosmologists as the "Axis of Evil." Likewise, the names of Land and Magueijo who were the first to coin the "Axis of Evil" in 2004, are not mentioned in NASA's paper. NASA's paper doesn't contain one word about the axes of the CMB dipole, quadrupole and octupole aligning with the Sun-Earth ecliptic or with the Earth's equinoxes, respectively. It doesn't mention the names of Copi, Huterer, Starkman, and Schwarz from the University of Michigan, who have done the most work on the anisotropies of the WMAP data and have thus discovered the Earth's unique alignment with the CMB. Even Max Tegmark, although he is mentioned twice in NASA's paper, is cited only from 1997-1998, long before 2003 when he saw the vector poles of the CMB pointing from Earth to Virgo, and which discovery led to the work of Copi and his colleagues.

Instead NASA admits to various instances in which it unilaterally chose to ignore the CMB poles, such as "We start with a simple foreground model consisting of several simple power laws, and progressively add complexity to the model to improve the fit. The foreground model we use involves temperature only; we did not try to fit polarization."[552] But the whole reason for the consternation regarding WMAP's data is its more than obvious Earth-centered polarization results. NASA's intention is confirmed by an even more revealing statement:

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[551] *Ibid*., p. 3.
[552] *Ibid*., p. 70.

The CMB is modeled as a blackbody with constant thermodynamic temperature. To make the CMB fit look statistically isotropic, we add a prior that the CMB must be within 5 μK rms of the nine-year ILC. Without this prior, the data do not constrain the CMB very tightly in the galactic plane, and we find the CMB preferring values lower than -250 μK.[553]

In other words, NASA is telling us that they squeezed the data into their preferred (or "prior") molds in order to "make the CMB fit look statistically isotropic." We see that isotropy, not anisotropy, is the goal of NASA. Why? The following comment reveals that if they don't use "prior" molds then "the data do not constrain the CMB very tightly." This relates back to NASA's opening statement that "The WMAP mission has resulted in a highly *constrained* ΛCDM cosmological model." That is, NASA wants the CMB to be as isotropic as possible since this will be the best fit for the Big Bang universe it is promoting. In other words, NASA is admitting that it will seek to conform the data to the predicted isotropic Big Bang model as much as possible. This is what modern science has become. The model is put on a pedestal and the data is made to conform to it rather than the reverse. We see right from the get-go what NASA's intentions are when we see it juxtaposing "CMB anisotropies" with "CMB anomalies."[554] It is only an "anomaly" to one who wants isotropy so that he can make the evidence fit his pre-conceived model. This molding of the data to fit the preferred model is also noted in the following:

Adding a spinning dust component with peak frequency of 15.1 GHz (which is 0.85 times the CNM peak frequency of 17.8 GHz) does improve the fit, and allowing that peak frequency to vary between 12.5 GHz and 17.8 GHz helps even more. See Models 4 and 5.[555]

In other words, since adding another variable into the mix produces more isotropy and less anisotropy, NASA can produce what it deems as a viable model of the Big Bang universe. Perhaps the reason why a "spinning dust" model is preferred is stated here: "The spinning dust component is

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[553] *Ibid*., 72.

[554] Page 132: "This portion of the template-corrected sky is strongly dominated by *CMB anisotropy*….Having addressed the quadrupole value, the quadrupole-octupole alignment, and the general goodness-of-fit, we find no convincing evidence of *CMB anomalies* beyond the normal statistical ranges that should be anticipated to occur in a rich dataset."

[555] *Ibid*., p. 73.

assumed to have negligible polarization"[556] (since polarization would lead to the Axis of Evil), or here "If we do not allow the spectral index to vary, we again get bad fits in Models 6 and 7. However, a varying spectral index combined with a spinning dust component produces results that are fractionally better than a pure power law with the same spinning dust components,"[557] (since two variables to produce the Big Bang are better than one). But in the end, NASA admits: "Throughout this paper we use the term 'spinning dust' without regard to the accuracy of the implied underlying physical model…The actual physical emission mechanism(s) of this component may not yet be fully understood,"[558] yet NASA decided to use them in any case, since they make the Big Bang look credible.

Despite the obvious fudging of the data to fit its Big Bang model, NASA puts on an air of unbiased research as it prides itself on its "new procedures" in collecting data:

> As a result of this new procedure, the previously reported map power asymmetry, which we speculated was due to the asymmetric beams and not cosmology (Bennett *et al*. 2011) has indeed been mitigated in the new beam-symmetrized maps. In this paper we use the beam-symmetrized maps for foreground analyses, but not for cosmological analyses due to the more complex noise properties of these maps."[559]

This is all well and good, but power asymmetries are not the cause of the Axis of Evil. The Axis is caused by the Earth-centered anisotropies in the CMB data, the very anisotropies that NASA is obviously trying to eliminate from the data as much as it can. For example, in one graph the

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[556] *Ibid*., p. 67.

[557] *Ibid*., 73.

[558] *Ibid*., 131. Regarding dust models, Copi, Huterer, *et al*, state: "A number of authors have attempted to explain the observed quadrupole-octopole correlations in terms of a new foreground — for example the Rees-Sciama effect, interstellar dust, local voids, or the Sunyaev-Zeldovich effect. Most if not all of these proposals have a difficult time explaining the anomalies without severe fine tuning....Dikarev et al. studied the question of whether solar system dust could give rise to sizable levels of microwave emission or absorption….Such an extra contribution along the ecliptic could give rise to CMB structures aligned with the ecliptic, but those would look very different from the observed ones. On top of that, Solar system dust would be a new additive foreground and could not explain the lack of large angle correlations. Thus it seems unlikely that Solar system dust grains cause the reported large angle anomalies…" (*op. cit*., "Large Scale Anomalies in the CMB," 2010, p. 11)

[559] *Ibid*., p. 11.

caption reads: "Microwave emission near the Galactic plane is traced by a K-band minus W-band difference map, which eliminates CMB anisotropy," yet NASA gives no explanation why it subtracted the W-band, which is a completely different kind of measurement since it is much more insensitive to CMB anisotropies. See Figure below:
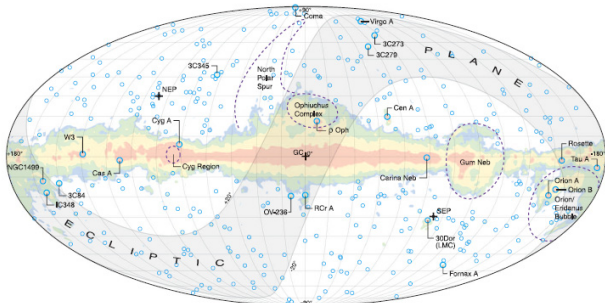
Fig. 12.— Microwave emission near the Galactic plane is traced by a K-band minus W-band difference map, which eliminates CMB anisotropy. A log scale is used for the color region and blue circles represent the positions of the brightest point sources, as seen by *WMAP*.

In another graph, NASA skips right over the important data. See graph below:
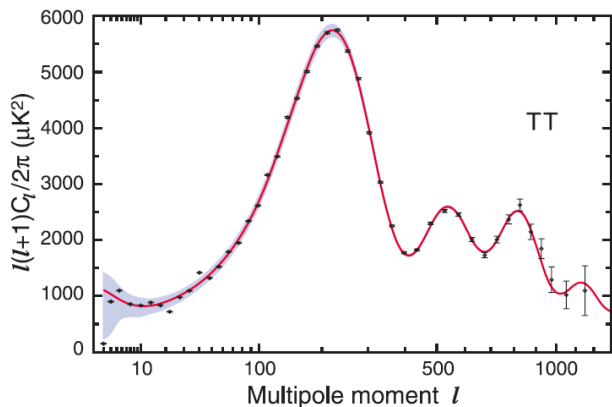
Fig. 32.— The nine-year *WMAP* TT angular power spectrum. The *WMAP* data are in black, with error bars, the best fit model is the red curve, and the smoothed binned cosmic variance curve is the shaded region. The first three acoustic peaks are well-determined.

This is one of the most important graphs concerning the CMB. It appears on page 100 of the 2012 NASA paper. It shows three major peaks of CMB multipoles (~ 200ℓ, 500ℓ and 800ℓ). In theory, these peaks should not be present in the homogeneous, isotropic, Gaussian and infinite universe of the Big Bang, or at the least they were not predicted by the Big Bang. As we noted earlier from Copi who analyzed these multipole moments:

…it is very difficult to explain within the context of the canonical Inflationary Lambda Cold Dark Matter of cosmology [*i.e*., the Big Bang]….Our first observation is that none of those data curves look like the [LCDM] theory curve….It is extremely difficult to arrange for the C_ℓ to have particular relative values in the context of the standard inflationary model…the observed sky, at least the part outside the Galaxy cut, seems not to respect the fundamental prediction of the standard cosmological model that the $a_{\ell m}$ are independent random variables…for the lowest multipoles and the largest angular skies, the observations disagree markedly with the predictions of the [Big Bang] theory.[560]

The above graph, in its essence, represents the dipole, quadrupole and octupole anisotropies of the CMB. It is, in a word, a graph of the "Axis of Evil." Some try to pass off these anomalous peaks as part-and-parcel of Big Bang cosmology. For example, an entry at Wikipedia has a similar graph and states: "The angular scale of the first peak determines the curvature of the universe….The next peak—ratio of the odd peaks to the even peaks—determines the reduced baryon density. The third peak can be used to get information about the dark matter density."[561] This is just another way of twisting the data to fit a preconceived model. These peaks are only indirectly related to Big Bang predictions; and they are fudged to fit the Big Bang. In reality, these peaks destroy the both the cosmological and Copernican principles upon which the Big Bang is based.

Other Big Bang cosmologists are at least honest with the data on the graph. For example, an astronomer who publishes on the Internet, Ethan Siegel, states:

There are people who look at the quadrupole and octopole moments of the Cosmic Microwave Background — or the first two points on the graph above — and question the entirety of modern cosmology. Why? Because they state that the "odds" of having a Universe that conspired to give those two data points just randomly is relatively low….When you hear the

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[560] "The Oddly Quiet Universe: How the CMB Challenges Cosmology's Standard Model," Glenn D. Starkman, Craig J. Copi, Dragan Huterer, Dominik Schwarz, January 12, 2012, acXiv:1201.2459v1.
[561] http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation under the subtitle, Primary anisotropy.

terminology "Axis of Evil" applied to cosmology, this is what they're talking about.[562]
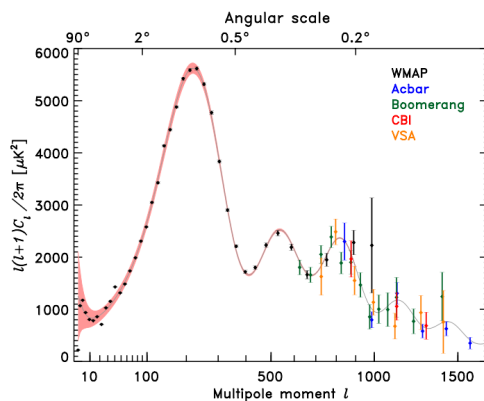
As we can see from the above graph[563] not only did WMAP chart the same peaks, four other studies (Acbar, Boomerang, CBI and VSA) found the same precise results. Consequently, the results cannot be dismissed. Siegel, rather than pretend these anomalous peaks are predicted by, or can be explained by, the Big Bang theory, understands that he must take a different route if he wants to escape being forced into admitting that the whole universe is oriented around little Earth. Thus he retorts:

> But there's nothing special at all about it: if we simulated our Universe millions of times, alignments like this in those two data points would occur hundreds of times. We just happen to live in a Universe where it did.

As we have seen earlier with others caught in this cosmological dilemma, Siegel opts for the Multiverse – a pure invention of his mind to solve his problems. Rather than face the fact that the odds of having three peaks show alignments that correlate with the Earth's ecliptic and equinoxes is about 1 to a hundred million (according to Copi), Siegel has no other option than to make his wager against such astronomical odds.

Glenn Starkman's analysis of specifies the low-ℓ anomaly of the WMAP data. In the following graph, Starkman notes in the regtangular

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area where the quadrupole of the CMB does not fit the LCDM Big Bang predictions.
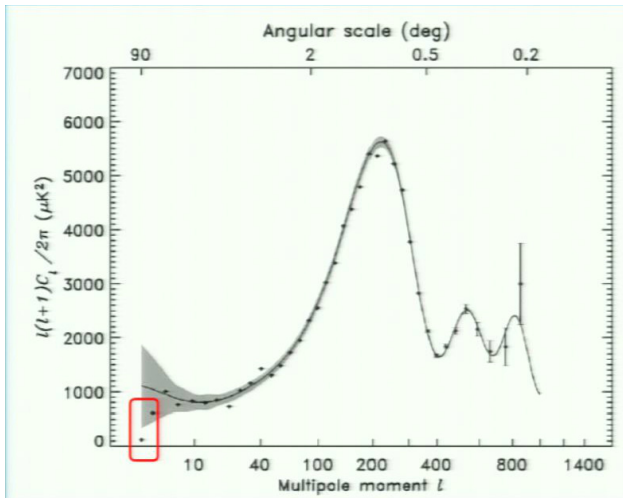
564

Low-ℓ multipole anomaly

In the same lecture, Starkman points out that the "two-point correlation" method of analysis shows an even greater discrepancy between Big Bang predictions and WMAP results.

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[564] Taken from Glenn Starkman's lecture titled: "If the CMB is right, it is inconsistent with standard inflationary Lambda CDM." The abstract says: "The Cosmic Microwave Background Radiation is our most important source of information about the early universe. Many of its features are in good agreement with the predictions of the so-called standard model of cosmology – the Lambda Cold Dark Matter Inflationary Big Bang. However, the large-angle correlations in the microwave background exhibit several statistically significant anomalies compared to the predictions of the standard model. On the one hand, the lowest multipoles seem to be correlated not just with each other but with the geometry of the solar system. On the other hand, when we look at the part of the sky that we most trust – the part outside the galactic plane, there is a dramatic lack of large angle correlations. So much so that no choice of angular powerspectrum can explain it if the alms are Gaussian random statistically isotropic variables of zero mean." Starkman's conclusion is that WMAP "contradicts predictions of generic inflationary models at >99.97% C.L. [confidence level], and of contrived models at ~97%". http://streamer.perimeterinstitute.ca/Flash/9cd6f9d2-a6bc-48c8-b94e-fbcb0f1c2c4a/viewer.html

565
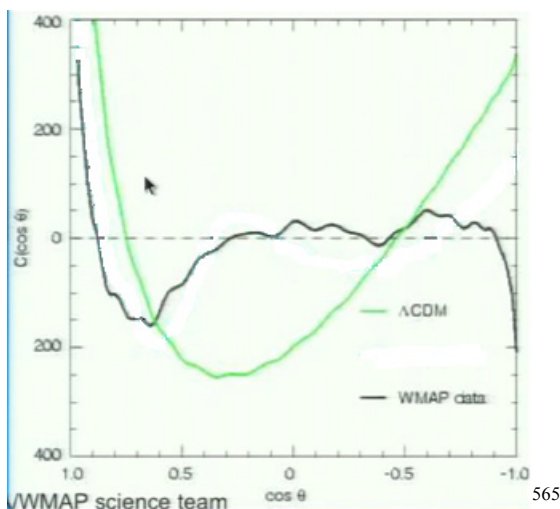
Two-point correlation method of analysis

In another place NASA says: "The primary difficulty with any method of extracting the CMB from the data is determining how much of the temperature in each pixel is foreground and how much is CMB. The data only constrain the sum of these two, and we must make other assumptions in order to separate them."[566] But other studies, namely, those of the Copi team, have done extensive studies on foreground contamination and concluded it is negligible. Additionally, NASA claims: "The ILC specifically assumes that the CMB has a blackbody spectrum while the foregrounds do not,"[567] but since the background contains galaxies that do not have a blackbody spectrum, NASA's assumption is invalid. Similar invalid remarks come when NASA says:

> We conclude that our ability to remove foregrounds is the limiting factor in our measurement of the cosmological quadrupole-octupole alignment. We cannot currently remove

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[565] *Ibid*. The "toy model" was deleted from the graph in order to make the contrast between the LCDM model that C. L. Bennett is supporting from the actual WMAP results.

[566] *Ibid*., p. 83.

[567] *Ibid*., pp. 83-84. A similar unproven assumption comes in the next sentence: "In addition, the ILC assumes that while the foregrounds may change amplitude across a region, an individual foreground does not change its spectral shape (proportional to antenna temperature as a function of frequency), so that a set of ILC weights can null a given foreground everywhere in a region."

foregrounds to the level needed to be sure the alignment is significant. The statistical significance of any alignment must be further degraded by the posterior selection made to examine this particular alignment.[568]

Of course, this kind of logic only comes back to bite NASA, for if one claims that one needs a certain removal of A in order to distinguish A from B, how does he know he is removing A if he can't distinguish it from B? The fact is, NASA already sees a quadrupole/octupole alignment, even with the amount of foreground contamination it has already accepted.

Perhaps the real reason NASA is reluctant to admit to a full scale Earth/CMB alignment is that it is much harder to produce an alternative explanation using the quadrupole/octupole than the dipole.[569] We are suspicious of such a motivation when we come across "analytical adjustments" such as this one:

> We first find that the quadrupole and octupole in the nine-year ILC are misaligned by about 3∘, instead of being exactly aligned (to < 0.5∘) in the seven-year ILC. We believe this is due in part to the deconvolution algorithm that we applied to the nine-year maps before constructing the ILC from them. After applying the perturbations, we find the median quadrupole-octupole misalignment to be 6∘.…This means there is less than a 3σ detection of alignment.[570]

In other words, the "deconvolution algorithm" reduced the accuracy of the analysis, which then reduced the improbability of the quadrupole/octupole alignment, and thus the certainty of the alignment itself to be reduced. How convenient. This is analogous to a man using a sharp axe to shave his face instead of a razor, which resulted in reducing the amount of facial hair he could cut off. What NASA doesn't say is that if it had tightened up the "deconvolution algorithm" instead of loosening it, the results would be much closer to the seven-year ILC. Still, after all the talk about a difference, NASA then says: "The quadrupole/octupole alignment remains approximately the same in the nine-year as seven-year

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[568] *Ibid.*, 113.
[569] NASA explains the dipole by claiming "dipole anisotropy [is] induced by the motion of the WMAP spacecraft with respect to the CMB rest frame" (*ibid.* p. 8). This explanation assumes, of course, that the CMB is a rest frame (but, curiously, also expanding faster than the speed of light). In any case, NASA proffers no such "rest frame" explanation for the quadrupole/octupole anisotropy.
[570] *Ibid.*, p. 113.

data…"[571] Consequently, after all the adjustments and uncertainties foisted on the data in this 2012 paper, NASA must admit that it cannot eliminate the alignments. Unfortunately for the reader, what NASA does not admit is that the alignments point directly to Earth as the center of the universe.

On the one hand, NASA has told us of their inability to measure accurately the anomalous CMB alignments; on the other hand, it claims the anomalies are merely expected statistical variations. In neither case, however, do they allow the reader to entertain any other possibilities as to why these "anomalies" exist. Propping up the Big Bang model is the only motivation for the analysis of NASA's present 2012 study of the CMB.

The 2009 Planck Probe

The Planck probe was sent up into space in 2009 by the European Space Agency with assistance from NASA. Its results were released on March 21, 2013. Since the scanning beam had a much shorter wavelength than the 2001 WMAP probe, Planck provided a much clearer and detailed image of the CMB sky. The big question on everyone's mind was whether Planck would confirm WMAP's findings or deny them as mere artifacts. To everyone's amazement, Planck not only confirmed WMAPs findings, it provided such a clear picture of the CMB sky that it left both ESA and NASA scientists with the very difficult task of trying to fit the Planck data in to the standard model of cosmology, the Big Bang. As Paolo Natoli of the University of Ferrara, Italy put it: "The fact that Planck has made such a significant detection of these anomalies erases any doubts about their reality; it can no longer be said that they are artifacts of the measurements. They are real and we have to look for a credible explanation."[572]

Although neither NASA nor ESA have made it clear they will not admit the COBE, WMAP or Planck results defy the Copernican Principle, still, we get hints of recognition that all is not well with the Big Bang universe. For example, the ESA article admits that "One of the most surprising findings is that the fluctuations in the CMB temperatures at large angular scales do not match those predicted by the standard model." This is quite an understatement. In plain terms it means Planck's results do not support Big Bang cosmology for most ("large angular scales") of the universe. ESA also admits: "Another is an asymmetry in the average temperatures on opposite hemispheres of the sky. This runs counter to the prediction made by the standard model that the Universe should be broadly

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[571] *Ibid*., p. 132.
[572] Michael Rundle, "ESA's Planck Satellite Reveals Most Precise Image Ever Made of the Primordial Universe," Huffington Post, March 21, 2013.

similar in any direction we look." This is another understatement. In layman's terms it means that the predictions of the Big Bang universe provided by Einstein's General Relativity equations that were adjusted by Friedmann, Lamaître, Robertson and Walker (FLRW) to produce an isotropic and homogeneous universe are falsified by the Planck data.
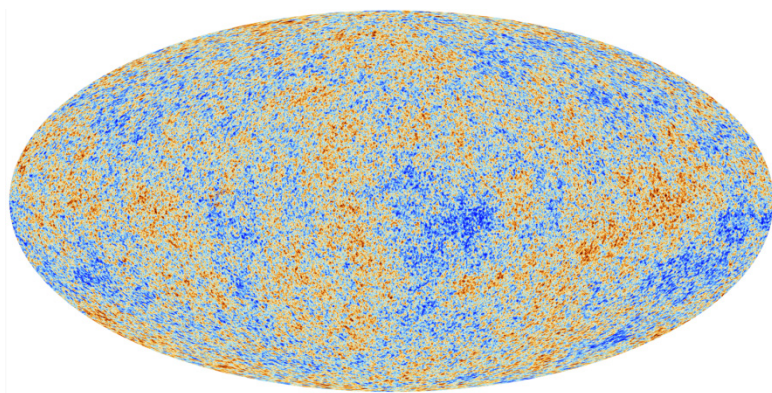
Original ESA image of Planck probe results, March 21, 2013
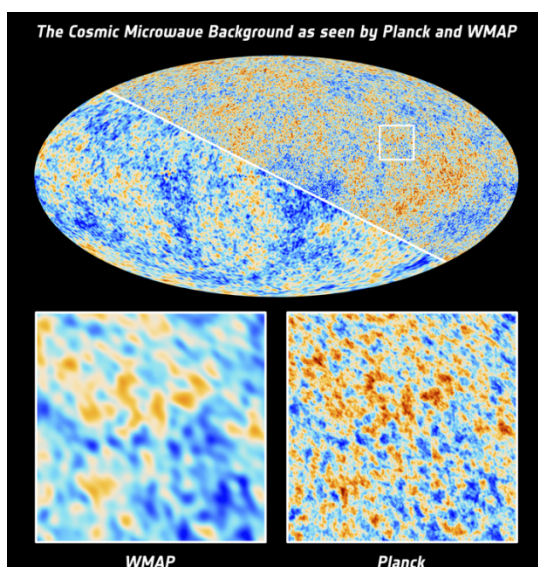
Comparison of Planck and WMAP showing same results of CMB

In the same article, Rundle says: "But the data could prove troubling for some scientists, as it includes 'large scale anomalies' which point to a preferred direction of energy fluctuations in the universe – the so called 'Axis of Evil.'"[573] *New Scientist* said much the same: "Planck's map greatly improves cosmologists' understanding of the universe, but it does not solve lingering mysteries over unusual patterns in the CMB. These include a 'preferred' direction in the way the temperature of the light varies, dubbed the cosmic 'axis of evil'….Cosmologists can't pack up and go home just yet though, as Planck's map has also confirmed the presence of a mysterious alignment of the universe. The 'axis of evil' was identified by Planck's predecessor, NASA's Wilkinson Microwave Anisotropy Probe (WMAP)…Planck's detectors are over 10 times more sensitive and have about 2.5 times the angular resolution of WMAP's, giving cosmologists a much better look at this alignment. 'We can be extremely confident that these anomalies are not caused by galactic emissions and not caused by instrumental effects, because our two instruments see very similar features,' said Efstathiou."[574]

The Planck analysis published in March 2013 by the California Institute of Technology (CIT) basically says the same thing. In the Overview the abstract states, "Several large scale anomalies in the CMB temperature distribution detected earlier by WMAP are confirmed with higher confidence."[575] Yet two sentences later it says, "Planck finds no evidence for non-Gaussian statistics of the CMB anisotropies." Both statements are then modified in Paper XXIII's abstract: "Deviations from isotropy have been found and demonstrated to be robust against component separation algorithm, mask and frequency dependence. Many of these anomalies were previously observed in the WMAP data, and are now confirmed at similar levels of significance (around 3σ). However, we find little evidence for non-Gaussianity with the exception of a few statistical signatures that seem to be associated with specific anomalies." The modification is also in XXIII's section 4.1: "However, it is clear that, except on the largest angular scales, there is no evidence for non-Gaussian behaviour in the data using these simple statistical measures."[576]

On the one hand, CIT holds on a *statistical basis* from Gaussian Distribution Function[577] that the Planck evidence more or less follows the standard Bell-curve plot, and thus matches up with the LCDM (Big Bang)

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[573] *Ibid*.

[574] Jacob Aron, "Planck shows almost perfect cosmos – plus axis of evil," March 21, 2013.

[575] http://planck.caltech.edu/pub/2013results/Planck_2013_results_01.pdf

[576] http://planck.caltech.edu/pub/2013results/Planck_2013_results_23.pdf

[577] http://en.wikipedia.org/wiki/Gaussian_function

predictions. On the other hand, Gaussian distribution includes incidences in which the data does not fit the Bell-curve, thus exposing anomalies that do not coincide with Big Bang predictions. The Planck team attempts to make the anomalies insignificant, but in reality they are akin to the proverbial pink elephant in the room. In the end, it matters little how much one can fit the Planck data into the Big Bang. The fact remains that the Big Bang did not predict, and could not predict, the Axis of Evil. The Axis is analogous to a mold of Jell-O (representing CMB isotropies and homogeneity) with two swords (representing CMB anisotropies and inhomogeneity) going right through the middle.
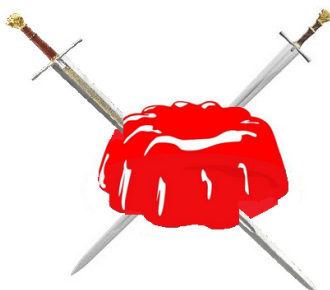
Similarly, it is comparable to drawing a big X on the whole universe, in which each of the four ends of the X touch the rim of the universe; and in which the middle of the X, where the two lines intersect, there we find the ecliptic and equinoxes of the Earth, at the very center of the universe.
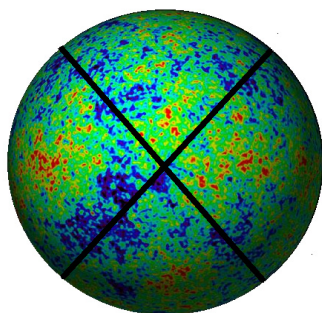
For NASA and ESA to claim that most of the Planck data matches the Big Bang predictions is like saying that two polka-dot dresses match each other in 95% of their style, except for the big polka dots that line themselves up in the front of the dress. In the end, it is not the similarities that determine whether they are comparable or contrasting, but the differences. Even with only a 1% difference between the two images, it amounts to a world of difference in their respective meanings.

The Planck team's casual references to mere "anomalies," or "deviations from isotropy" or "a few statistical signatures" shows that they are seeking to minimize the differences, but it is precisely these differences that constitute the Axis of Evil. Likewise, it matters little how much of the sky the Planck team determines the Axis occupies, or how much they determine it doesn't fit on the Bell curve. The mere fact that the Axis exists completely overturns the Copernican Principle and leaves the Big Bang theorists without any explanation whatsoever as to the Axis' origin.

In the end, the Planck probe data has confirmed that the whole universe is centered around Earth and that the Big Bang inflation theory has been falsified to its core. Few modern cosmologists can accept this death sentence, however. It is for this reason that they will now conjure up all kinds of fanciful explanations. For example, after admitting "the origins of what some cosmologists have called the 'Axis of Evil' remains mysterious" and that "the ESA concedes it is no longer possible to dismiss it as some kind of data glitch or trick of the cosmic light," the latest conjecture is that one of the "blue spots" that helps form the Axis "is the result of another universe colliding with our own," and concluding that "if our universe really is just one of a myriad filling the Multiverse, then collisions with our neighbors are inevitable. And the result of such collisions would be circular temperature anomalies – similar to the cold spot now seen by Planck."[578] This is what now passes for "science" in the halls of academia. The Multiverse will now become modern cosmology's response of choice in order to wiggle out of every piece of evidence that points to a non-Copernican universe.

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[578] "Ripples from another dimension," *TheNational*, Robert Matthews, April 7, 2013; www.thenational.ae/news/uae-news/ripples-from-another-dimension. See also "Inflationary paradigm in trouble after Planck 2013" by Anna Ijjas, Paul Steinhardt and Abraham Loeb (arXiv:1304.2785v1 April 9, 2013. They state: "In sum, we find that recent experiment data disfavors all the best-motivated [Big Bang] inflationary scenarios and introduces new, serious difficulties that cut to the core of the inflationary paradigm."

Correlation between the CMB Axis and Preferred Spin Direction of Spiral Galaxies

In 2009, **Michael Longo** of the University of Michigan did a study of more than 15,000 spiral galaxies in the northern hemisphere from the 2005 Sloan Digital Sky Survey data. Longo reiterates the astounding WMAP data we have already cited:

The Wilkinson Microwave Anisotropy Probe (WMAP) studied the cosmic microwave background (CMB) radiation (G. Hinshaw et al. 2006). Their results for the angular power spectra have been analyzed by Schwarz et al. (2004) and many others. Schwarz et al. show that: (1) the quadrupole plane and the three octopole planes are aligned, (2) three of these are orthogonal to the ecliptic, (3) the normals [perpendicular vectors] to these planes are aligned with the direction of the cosmological dipole and with the equinoxes. The respective probabilities that these alignments could happen by chance are 0.1%, 0.9%, and 0.4%. This alignment is considered to be so bizarre that it has been referred to as "the axis of evil" (AE) by K. Land and J. Magueijo (2005). Their nominal AE is at (l, b) ≈ (–100°, 60°), corresponding to (RA, δ) = (173°, 4°). The alignment with the ecliptic and equinoxes is especially problematic because this would suggest a serious bias in the WMAP data that is related to the direction of the Earth's spin axis, which is highly unlikely.[579]

In actuality, the findings are only "problematic" for those who have based their cosmological interpretations on the Copernican Principle. The WMAP data is obviously non-Copernican. Be that as it may, Longo's study is particularly important because he found the spin of spiral galaxies is aligned with the "axis of evil." He writes:

The approximate agreement of the spin alignment axis with the WMAP quadrupole/octopole axes reinforces the finding of an

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[579] "Evidence for Preferred Handedness in Spiral Galaxies," Michael J. Longo, University of Michigan, 2009 http://arxiv.org/ftp/arxiv/papers/0707/0707 .3793.pdf, p. 8.

asymmetry in spiral galaxy handedness and suggests that this special axis spans the universe. The fact that the spin asymmetry appears to be independent of redshift suggests that it is not connected to local structure. On the other hand, the spiral galaxy handedness represents a unique and completely independent confirmation that the AE is not an artifact in the WMAP data due to foreground contamination….It is interesting to note that the spiral galaxy alignment implies that the universe has a handedness as well as a unique axis.[580]

Longo concludes that not only is the spiral galaxy spin axis aligned with the "axis of evil," but the spin axis "spans the universe" and is "unique." For the geocentric system this discovery fits like a glove since Longo's axis is inclined 23.5° to the axis around which the universe itself rotates. The "asymmetry" he is finding is due to the fact that the universe spins around its center of mass in only one direction (clockwise), and does so with a slight precession.

News of this spin axis among galaxies hit the popular science magazines. *New Scientist* covered the story in October 2011 and again in August 2012. Interestingly enough, the former article begins: "So the universe is both expanding and accelerating. Fine. Now, though, hold on to your hats – it might be spinning, too." The second says:

A similar bias among structures of cosmic proportions would have deep implications. For example, if more galaxies are spinning one way than the other, this implies that the universe has a net spin, or angular momentum, in a particular direction. Since angular momentum can neither be created or destroyed,

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[580] http://arxiv.org/ftp/arxiv/papers/0707/0707.3793.pdf, p. 9. Longo says "The new study uses 15,158 with redshifts <0.085 and obtains very similar results to the first with a signal exceeding 5σ, corresponding to a probability ~2.5 × 10^{-7} for occurring by chance." In a slightly different version of the same article, Longo cites the study by Iye and Sugai of the southern hemisphere: "Iye and Sugai – Iye and Sugai (1991) have published a catalog of spin orientations of galaxies in the southern Galactic hemisphere that contains 8287 spiral galaxies. Of these, 3118 had R or L handedness about which both scanners agreed. I have analyzed their catalog using the sec- tor $-15°<\alpha<+45°$ and $-60°< \delta <+5°$, directly opposite that used above4. Redshifts of most of their galaxies were not measured, so only their (α, δ) were used. This gave an asymmetry $+0.047\pm 0.029$ with a preponderance of right-handed spirals in the southern Galactic hemisphere, in excellent agreement with the asymmetry $|A| = 0.0695\pm0.0127$ that I observe for the $°<\alpha<225°$ with a preponderance of left-handed spirals (http://arxiv.org /abs/0904.2529).

the universe must have come into existence in a spin. What set it spinning, though, and what is it spinning relative to?[581]

A spinning universe is obviously counter to both the Cosmological Principle (*i.e.*, everything looks and acts the same in the universe) and the Copernican Principle (*i.e.*, the Earth is neither special nor in a special place) but more in the realm of geocentric cosmology. As the author, Anil Ananthaswamy, sees the news, it is:

> "Fascinating – and heretical. The assumption of cosmic parity conservation is tied up with what is known as the cosmological principle: that wherever you are in the universe, and in whatever direction you look, things on average look the same. The universe does not tell left from right; in fact, it knows no special places or directions at all. As far as the philosophical bases of modern cosmology go, things don't come more fundamental than that."[582]

New Scientist's second article was prompted by the recent study of galaxy spin by by Lior Shamir of Lawrence Technological University in Michigan. He examined 250,000 spiral galaxies, more than ten times Longo's sampling.[583] Shamir notes: "The observation is so strange that it's difficult to interpret its meaning. A pattern in the structure of the universe at such a large scale is not something that we expect to see."

Knowing the implications of these astounding discoveries, Ananthaswamy is quick to stifle the geocentric implications, stating:

> Let's start with what that does not mean: Earth is not in a special place. Although it might look as if we are ideally positioned to look along the universe's unique spin axis, all of space expanded from just one infinitesimally small point at the big bang. The original spin axis has expanded with it, so wherever you are in the cosmos, it will be there too, pointing in the same direction.[584]

First, that Ananthaswamy feels he must make such a preemptive argument shows that he and his colleagues are very concerned about the

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[581] "Galactic 'axis of asymmetry' threatens cosmic order," *New Scientist*, August 22, 2012, p. 2.
[582] "Original Spin: Was the universe born whirling?" *New Scientist*, October 12, 2011, p. 2.
[583] *Physics Letters B*, doi.org/h6s.
[584] "Original Spin: Was the universe born whirling?" *op. cit.*, p. 3.

geocentric interpretation. He even includes a diagram to dissuade the reader from considering that our Earthly position of observation is special (see below). The argument is specious, however. The fact that "wherever you are in the cosmos, the spin axis will be there too" simply means that the spin axis is universal, not local.

There are other astounding facts in Longo's data that puts Earth right in the middle of the spin axis, but which Ananthaswamy's anti-geocentric interpretation totally misses. After Longo studied the northern hemisphere and saw there was a left-handed spin preferred by his sample of galaxies, he then studied the southern hemisphere and found that "stretching off as far as the telescope could see, along the same axis in the southern sky, there was a clear excess this time of right-handed spirals. It was the same effect, only in reverse." Unfortunately, both Longo and *New Scientist* miss the meaning of this "asymmetry." It is not only that "the universe has a net angular momentum" in its spin but that the preferred spin direction is not only centered on the Earth's equinoxes (just as the CMB dipole), but is differentiated by the plane of the equinoxes. The fact that the northern hemisphere of the whole universe has most of its galaxies spinning left, and the southern hemisphere of the whole universe has most of its galaxies spinning right, is the same phenomena we experience with hurricanes spinning left in the Earth's northern hemisphere while spinning right in the southern hemisphere. It is due to the Coriolis force, only this Coriolis force is not merely local. It is a universal Coriolis force caused by the rotation and oscillation of the universe around the Earth.

Universal axis ©NewScientist

Odd correlations in the rotations of galaxies could indicate that the universe was born spinning

The spinning universe originated as a point in the big bang

Left-handed galaxy   Right-handed galaxy
Alternative positions for Earth

The universe – and its spin axis – has since expanded, leaving the evidence for its spinning visible in the same direction wherever you are

ORIGINAL SPIN AXIS

Looking in this direction you see a preponderance of galaxies spinning to the left

In this and any other direction, you see approximately equal numbers of left and right galaxies

Some sources caught the implications of the reverse spin. *DiscoveryNews* notes:

> If the whole universe is rotating, then an excess number of galaxies on the opposite part of the sky, below the galactic plane, should be whirling in a clockwise direction. And indeed they are according to a separate 1991 survey of 8287 spiral galaxies in the southern galactic hemisphere.

> Galaxies spin, stars spin, and planets spin. So, why not the whole universe? The consequences of a spinning universe would be profound. The cornerstone of modern cosmology is that the universe is homogeneous and isotropic – it has no preferred orientation and looks the same in all directions. On the face of it, the claim of a spin axis would seem anti-Copernican. In other words, the universe has a preferred axis, which means there is indeed a special direction in space. A left-handed and right-handed imprint on the sky as reportedly revealed by galaxy rotation would imply the universe was rotating from the very beginning and retained an overwhelmingly strong angular momentum.

> This isn't the first time astronomers claimed to have observed a carousel universe. The cosmic microwave background from the big bang had suspected anomalies that were once suggested as evidence of rotation, but were later dismissed as instrumental effects. This result might just be a statistical fluke. Or is it somehow biased because we are only looking at the local universe? What is very curious to me is that the Milky Way's own spin axis roughly aligns to the universe's purported spin axis within just a few degrees, as deduced from the two galaxy surveys. That seems very anti-Copernican too. It has also been used to bolster biblical creationist arguments that we are at the "center" of the universe. [585]

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[585] "Is the Universe Spinning?" Analysis by Ray Villard, July 8, 2011, http://news.discovery.com/space/do-we-live-in-a-spinning-universe-110708.html. See also, "Was the Universe born spinning?" July 25, 2011, http://physicsworld.com/cws/article/news/2011/jul/25/was-the-universe-born-spinning. In 1996, before any of the information was available about the CMB's anisotropy or the preferred spin axis of galaxies, NASA answered a question concerning whether the universe rotated. Its response was: "As far as we know, the Universe is not rotating. The presence of rotation would induce a type of change in the Cosmic

Distant Radio Sources Confirm Non-Copernican Universe

A paper written in 2012 by J. C. Jackson of Northumbria University in England indicates that distant radio sources

> show significant anisotropy, the smallest value of Ωm being towards (l, b) = (253.9, 24.1)∘, the largest in the opposite direction. This is close to the CMB dipole axis, but in the obverse sense. This is interpreted as meaning that the Universe is not spatially homogeneous on the largest scales, and is better represented at late times by a spherically symmetric model with a density enhancement at its centre.

> I report here a test of isotropy based upon the angular-size/redshift relationship, using ultra-compact radio sources as standard measuring rods; these objects have angular diameters in the milliarcsecond (mas) range, and linear sizes of order several parsecs. In fact the test reveals significant anisotropy, a tentative interpretation of which is that the Universe is not spatially homogeneous on the largest scales, and is better represented at late times by a spherically symmetric model with a density enhancement at its centre. Antoniou & Perivolaropoulos (2010) have already looked at Union2 SnIa dataset in this context, which shows a similar anisotropy; my approach closely follows theirs.[586]

The CMB Displays a Small, Spherical Universe

The second astounding piece of information to come out of the WMAP data is that the universe is most likely small and in the shape of a sphere. In remarking on the giant sphere that WMAP produced, Max Tegmark noted: "Our entire observable universe is inside this sphere of radius 13.3 billion light-years, *with us at the center*."[587] Added to this was the interpretation of his colleague, Angélica de Oliveira-Costa, who stated

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Microwave Background temperature which has not been observed. In addition, the presence of rotation would imply that locations along the axis of the rotation were somehow 'special,' which violates our understanding of relativity that the Universe appears the same regardless of the location of the observer." (http://imagine.gsfc.nasa.gov/docs/ask_astro/ answers/961217a.html).

[586] "Ultra-compact radio sources and the isotropy and homogeneity of the Universe," J. C. Jackson, July 3, 2012, arXiv:1207

[587] http://news.bbc.co.uk/2/hi/science/nature/2814947.stm

that the cosmic quadrupole and octopole are both very planar and aligned, which according to the CERN correspondent reporting the interview means that the points "happen to fall on a great circle on the sky."[588] In their original paper, Tegmark and Oliveira-Costa noted that "the quadrupole…and the octopole have almost all their power perpendicular to a common axis in space, as if some process has suppressed large scale power in the direction of the axis."[589] From a geocentric perspective, this kind of evidence would naturally be understood as defining the axis upon which the universe rotates. Tegmark, *et al.*, allow such an interpretation, since they add:

> How significant is this quadrupole-octopole alignment? As a simple definition of preferred axis [it] denotes the spherical harmonic coefficients of the map in a rotated coordinate system.…if the CMB is an isotropic Gaussian random field, then a chance alignment this good requires a 1-in-62 fluke.[590]

Perhaps just as important is the following remark by the Tegmark team:

> What does this all mean?…it is difficult not to be intrigued by the similarities [of our findings] with what is expected in some non-standard [*i.e.*, non Big Bang] models, for instance, ones

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[588] A. de Oliveira-Costa, *et al.* 2004, *Physical Review* D 69 063516, as cited in Cern Courier, IOP Pub., Inc, 2005. The CERN team also discovered that the finding "does not agree with the expectation from inflation" [Big Bang] and "casts doubts on the cosmological interpretation of the lowest-ℓ multipoles…and…the claim that the first stars formed very early in the history of the universe." See also H. K. Eriksen, et al., *Astrophysical Journal* 605, 14, 2004. See also Oliveira-Costa's "Topology of the Universe" in which a rectangular, cubic and toroidal universe is ruled out (space.mit.edu/~angelica/topology. html).

[589] Max Tegmark, Angélica de Oliveira-Costa and Andrew J. S. Hamilton, "A high resolution foreground cleaned CMB map from WMAP," *Physical Rev.* D, July 26, 2003, p. 13.

[590] Max Tegmark, *et al.*, p. 14. In light of Tegmark's axis, it should also be noted that evidence for the rotation of the universe was discovered in the early 1980s (Paul Birch, "Is the Universe Rotating?" *Nature*, vol. 298, 29 July 1982, pp 451-454; Mitchell M. Waldrop, "The Currents of Space," *Science*, vol. 232, April 4, 1986, p. 26). After examining 132 radio sources, Birch determined that the polarization angle translated into the universe rotating at a rate of 10^{-13} radians per year. Although this rotation has nothing to do with the daily rotation advocated in the geocentric model, the rotation coincides with Tegmark's findings of Earth being the center point of the universe. See also Yu Obukhov, "Gauge Theories of Fundamental Interactions," 1990, Singapore, World Scientific.

involving a flat "small Universe" with a compact topology and one of the three dimensions being relatively small.[591]

This "non-standard…flat small Universe with compact topology," and, as noted above, the one with the "preferred axis" with odds of "1-in-62 of being a fluke," is precisely the one advocated by models of geocentric cosmology.
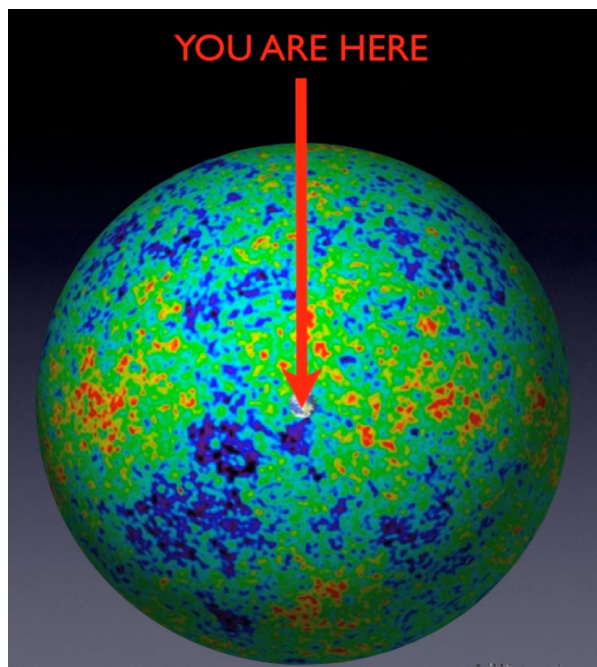
Max Tegmark: "A sphere of radius 13.3 billion light-years with us at the center"[592]

The "Hall of Mirrors" and the Possibility of a Small Universe

In light of this startling data, perhaps Tegmark's final comment is appropriate: "As so often in science when measurements are improved, WMAP has answered old questions and raised new ones."[593] Or, as David Spergel stated in the same interview: "If the universe were finite, then this

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[591] Tegmark, *et al*., p. 14.

[592] http://space.mit.edu/home/tegmark/wmap.html

[593] Tegmark, *et al*., p. 14.

would rule out inflation and require something new."[594] Although accurate, Spergel's comment is quite an understatement. "Something new" means that all that has been taught about cosmology since the early part of the twentieth century, and perhaps going back as far as Isaac Newton's infinite universe, is totally erroneous. In fact, Spergel and his colleagues have gone so far as to suggest that the small scale of the starry cosmos may be due to a "hall-of-mirrors" effect. Working alongside mathematician Jeffrey Weeks, *New Scientist* reports:

> …scientists announced tantalizing hints that the universe is actually relatively small, with a hall-of-mirrors illusion tricking us into thinking that space stretches on forever.…Weeks and his colleagues, a team of astrophysicists in France, say the WMAP results suggest that the universe is not only small, but that space wraps back on itself in a bizarre way (*Nature*, vol. 425, p. 593)….Effectively, the universe would be like a hall of mirrors, with the wraparound effect producing multiple images of everything inside. [Spergel adds]: "If we could prove that the universe was finite and small, that would be Earth-shattering. It would really change our view of the universe"[595]

George Ellis is much in favor of this type of universe since it would eliminate all the "infinities" that present theories produce. Moreover, he says that a small universe, "if it's true, the relation of humanity to the universe is in a sense completely different." He comments as follows:

> There's one possibility…that I would want to mention here is the small universe hypothesis, and this is the idea that, in fact, the universe is not very large, since it may be that the universe is spatially closed, not on a scale bigger than the horizon but smaller than the horizon. If that was true, we would be seeing around the universe one time, ten times, twenty times, since the time of Kepler. Now to me this is a very, very interesting possibility because Einstein's equations allow it. In fact, I did some simulations many years ago of this idea that maybe the

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[594] Dennis Overbye, "Universe as Doughnut: New Data, New Debate," *The New York Times*, March 11, 2003. Comments Overbye includes from other prominent scientists are: G. Hinshaw: "The fact that there appears to be an angular cutoff hints at a special distance scale in the universe"; George Smoot: "The basic idea is that God's on a budget."
[595] Hazel Muir, "Does the Universe Go On Forever," *New Scientist*, October 11, 2003, p. 6.

universe is closed on a space-scale smaller than the Hubble scale, and we're seeing the same galaxies many times over…and that would be an example of the universe which is comparable with observations but the philosophical relation of humanity to the universe is totally different because, if this was the case, we would be seeing our own galaxy at different places in the sky, and all of a sudden, the history of our own galaxy would become observational. We would be able to see our galaxy at different times….I'm saying it's a possibility and I'm saying it should be looked for. All the possibilities should be looked for because if it's true, <u>the relation of humanity to the universe is in a sense completely different</u>. One of the things it would do is it would knock out all those infinities because we would've seen everything there is. In fact, we would've seen everything there is multiple times.[596]

Regardless whether Ellis' version of a small universe under Einstein's equations is true or not, the fact remains that Ellis realizes how the smallness effects man's perception of himself. A small universe is, philosophically speaking, much more geo-centered than a large and/or infinite universe.

It is little wonder that Janna Levin, commenting on the WMAP data in the same interview, stated:

I suspect every last one of us would be flabbergasted if the universe was so small….I tried on the idea that we were really and truly seeing the finite extent of space and I was filled with dread. But I'm enjoying it too.[597]

Perhaps, as we noted earlier, Ms. Levin felt the same "dread" that Edwin Hubble and Stephen Hawking experienced when they realized their data were showing that the Earth was in the center of a small universe. Perhaps the equivocation between "dread" and "joy" is why Ms. Levin also wrote a paper seeking to downplay the inevitable geocentric interpretations of the WMAP data, but still finds herself having to admit the next best thing:

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[596] Interview of George F. R. Ellis for the movie, *The Principle*, October 2011, reel ref. 1:15:23.0.
[597] Dennis Overbye, "Universe as Doughnut: New Data, New Debate," *The New York Times*, March 11, 2003.

Copernicus realized that we are not at the center of the Universe. A universe made finite by topological identifications introduces a new Copernican consideration: while we may not be at the geometric centre of the Universe, some galaxy could be. A finite universe also picks out a preferred frame: the frame in which the universe is smallest. Although we are not likely to be at the centre of the Universe, we must live in the preferred frame (if we are at rest with respect to the cosmological expansion).[598]

Although many of the scientists who were asked to comment on the Tegmark analysis opined that a doughnut-shaped universe may be the best model to explain the new data, George Efstathiou of Cambridge University, who has worked very closely with Tegmark, recently submitted a paper on the WMAP and concluded that "a sphere" would be the most appropriate model to describe it,[599] which is, of course, the precise shape of a geocentric universe.

The Correlation between Stonehenge and the CMB

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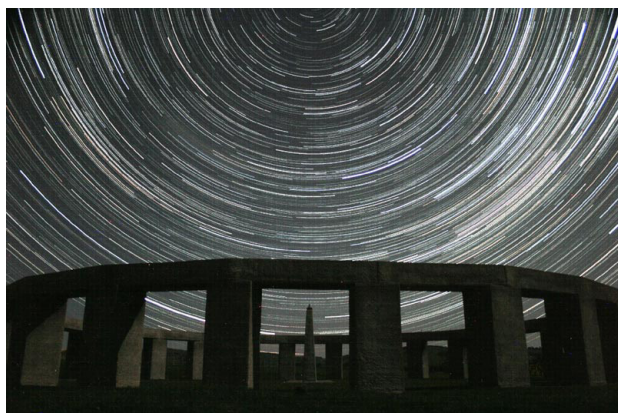
[598] J. D. Barrow and J. Levin, "The Copernican principle in compact space–times," *Monthly Notices of the Royal Astronomical Society*, December 2003, vol. 346, no. 2, pp. 615-618(4). Still working on the principle that the universe is both isotropic and homogeneous, Levin concludes her abstract with: "We show that the preferred topological frame must also be the comoving frame in a homogeneous and isotropic cosmological space–time." By the words "comoving frame" is meant that she will not consider a geostatic solution to the data, even though the data allows such an interpretation.

[599] M. Tegmark and G. Efstathiou, *Monthly Notices of the Royal Astronomical Society*, 281, 1297, 1996.

Since the 23.5 angle is foundational to the alignment of the stars, the CMB and the Earth, do any of the ancient cosmologies recognize this relationship? Surprisingly enough, along these lines of inquiry, the mystery behind Stonehenge may have been solved. Jonathan Morris has discovered that Stonehenge is actually an ancient model of a geocentric universe.[600] According to Morris,

> Diodorus Siculus tells us that a Geocentric model (world fixed with heavens revolving above) was discovered long before Roman records began. Stonehenge fits Diodorus's description. Its name fits Diodorus's description. We also know that Northern Europeans often travelled to Britain in Neolithic Times. Is it possible that the North of Europe knew the nature of the heavens thousands of years before Aristotle and Ptolemy?[601]
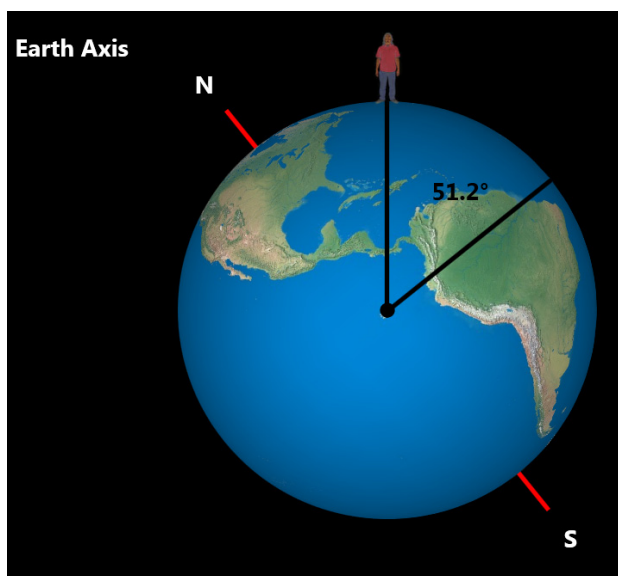
Man standing at Stonehenge, England on 51º latitude

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[600] http://heavenshenge.blogspot.com/2011/12/of-hyperion-we-are-told.html. See also http://www.megalithic.co.uk/article.php?sid=2146414126

[601] Diodorus Siculus was a Greek historian, who wrote between 60 and 30 BC, and in particular is his comprehensive history *Bibliotheca Historica*. Jerome writes of him as , "Diodorus of Sicily, a writer of Greek history, became illustrious." The *Bibliotheca Historica* consisted of forty books, of which books 1–5 and 11–20 survive, with fragments of the the lost books being preserved in Photius and the excerpts of Constantine Porphyrogenitus.
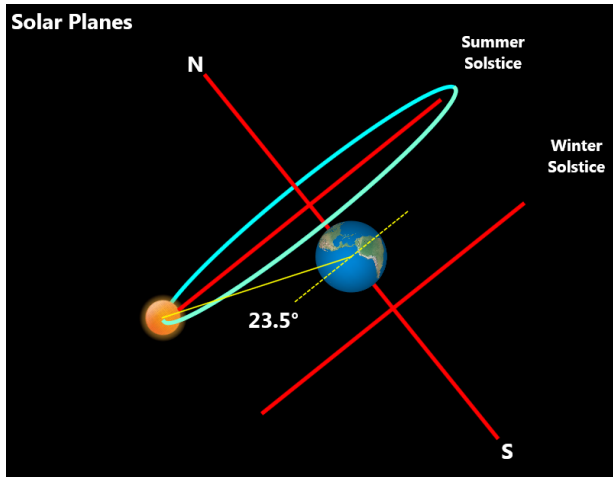
Stonehenge aligned with the 23.5º ecliptic
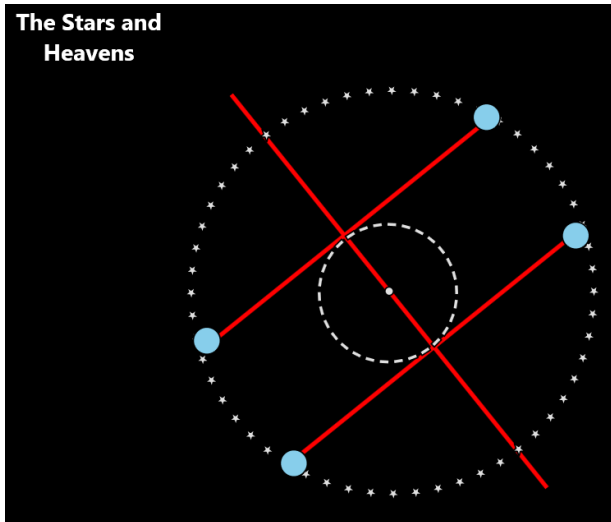
Stonehenge pillars representing the stars
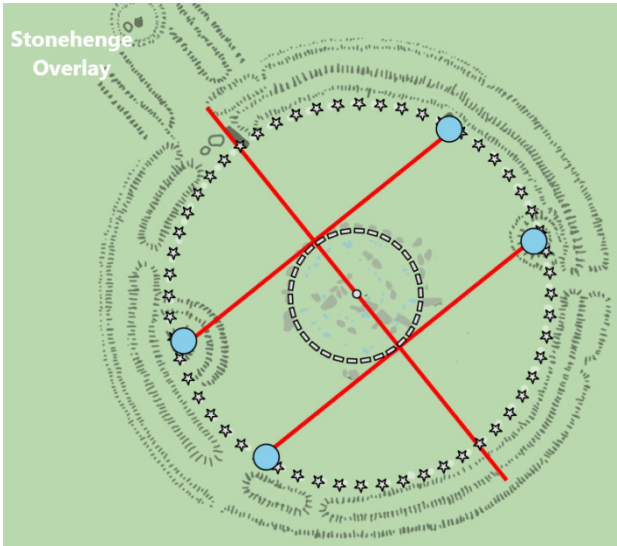
Stonehenge aligned with solar axes
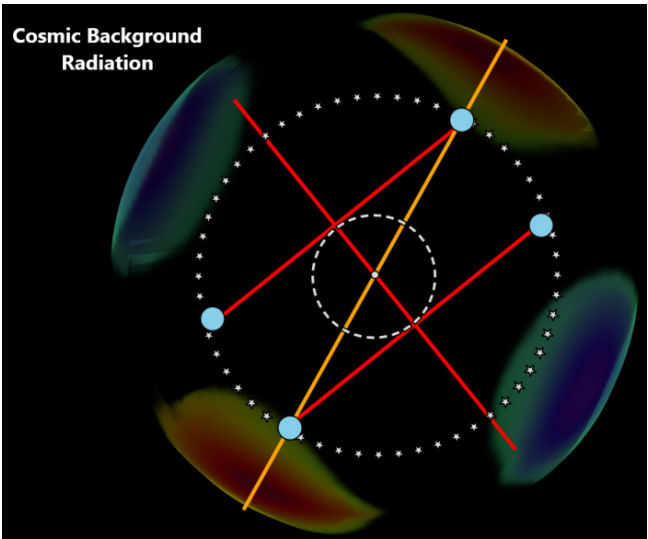
Stonehenge aligned with universe's CMB axis[602]

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[602] See CDROM for animation of Stonehenge and the CMB correlation.

Gamma-Ray Bursts and "The Copernican Dilemma"

Oxford seems to be the place to go to discover the current cosmological evidence supporting geocentrism. On this occasion it comes from Oxford University Press who recently published a book titled: *The Biggest Bangs: The Mystery of Gamma-Ray Bursts, the Most Violent Explosions in the Universe*, written by astrophysicist **Jonathan I. Katz** of Washington University, a scientist who admits of no partiality toward a geocentric universe yet includes a chapter titled *The Copernican Dilemma*. Obviously, the title indicates he has found disturbing evidence that puts the Copernican theory in question. Katz's studies have found that, when all the known gamma-ray bursts are calculated and catalogued, they show Earth to be in the center of it all. He writes:

The uniform distribution of burst arrival directions tells us that the distribution of gamma-ray-burst sources in space is a sphere or spherical shell, with us at the center (some other extremely contrived and implausible distributions are also possible). But Copernicus taught us that we are not in a special preferred position in the universe; Earth is not at the center of the solar system, the Sun is not at the center of the galaxy, and so forth. There is no reason to believe we are at the center of the distribution of gamma-ray bursts. If our instruments are sensitive enough to detect bursts at the edge of the spatial distribution, then they should not be isotropic on the sky, contrary to observation; if our instruments are less sensitive, then the $N \propto S^{-3/2}$ law should hold, also contrary to observation. That is the Copernican dilemma.[603]

Notice the clear geocentric language the author uses, that is, he sees in his telescope a sphere or spherical shell with us at the center.[604]

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[603] Jonathan I. Katz, *The Biggest Bangs: The Mystery of Gamma-Ray Bursts, The Most Violent Explosions in the Universe*, 2002, pp. 90-91. The photo and caption to the left is taken, word-for-word, from the *Encyclopedia of Astronomy*, 2004, p. 342.

[604] Although our book will often refer to Earth as the center of the universe, this geocentric view is distinct from other views which hold that the Milky Way

"Isotropic" means that the gamma-ray bursts are the same in all directions from Earth.[605] Katz knows the implications of his discovery since he immediately makes reference to the contradictions his findings have against the Copernican theory. Since Katz, being a modern astrophysicist, is a believer in the Big Bang theory and considers Earth as a speck of dust on one of the outer rims of the universe, we see him struggling to free himself from the implications of his evidence as he writes: "There is no reason to believe we are at the center of the distribution of gamma-ray

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galaxy, not Earth, is the center of the universe, a view espoused, for example, by astrophysicist D. Russell Humphreys in "Our galaxy is the center of the universe, quantized-redshifts show," *Technical Journal* 16 (2): 95-104; and *Starlight and Time*, Green Forest, AR: Master Books, 1994. Another such advocate is Robert V. Gentry in "Creation's Tiny Mystery," 3rd edition, *Earth Science Associates*, Knoxville, TN, pp. 287-290, 1992; and *Modern Physics Letters A* 12 (37): 2919-2925, 1997. Both Humphreys and Gentry posit that the Earth has diurnal and translational motion (*i.e.*, that the Earth both spins on an axis and revolves around the sun). Another geocentric view is that of Catholic Fernand Crombette (1880-1970). He held that the Earth, although centrally located in the universe, rotates on an axis each 24-hours. These views will be critiqued in volume II of this series. Suffice it to say for now that the geocentric view espoused in *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science* is actually a geostatic view, and follows the Papal and Sacred Congregation decrees of 1616, 1633 and 1664, which declare that Earth possess neither diurnal or translational motion, and is, in fact, motionless in the center of the universe.

[605] Here it is necessary to distinguish between *isotropic* and *homogeneous*. *Isotropic* refers to an environment that looks the same in all directions, excluding the observer's location. For example, if an observer is perched on top of a symmetrical sand hill in the middle of a flat desert, as he looks around the whole circumference of his view, he sees the same grade of hill approaching him, as well as a vast flat desert in all directions. *Homogeneous* refers to an environment that appears the same in all locations, but also includes the observer's location. In this case, the observer is not seated on a sand hill but on the flat desert itself, and as he looks out he sees a flat desert in all directions, including his seated position. Current cosmology, either Big Bang or Steady-State (non Earth-centered cosmologies) holds, with few exceptions, that the universe is both isotropic and homogeneous. As Edwin Hubble described it: "There must be no favoured location in the universe, no center, no boundary; all must see the universe alike. And, in order to ensure this situation, the cosmologist postulates spatial isotropy and spatial homogeneity, which is his way of stating that the universe must be pretty much alike everywhere and in all directions" (*The Observational Approach to Cosmology*, p. 54). If the universe is isotropic but inhomogeneous, it allows for an Earth-centered cosmology, since only from an isotropic center can the universe appear the same in all directions, but appear different when not observed from the center.

bursts," but he then admits twice that such a position would be contrary to observation. In other words, he can't believe his own eyes since obviously he has been so conditioned to see just the opposite. Katz continues:

> To this day, after the detection of several thousand bursts, and despite earnest efforts to show the contrary, no deviation from a uniform random distribution (isotropy) in the directions of gamma-ray bursts on the sky has ever been convincingly demonstrated.[606]

As Katz goes on to explain, the "Copernican dilemma" for astronomers is that they are required to explain why there are no faint gamma-ray bursts, since, according to the Big Bang theory, the universe is old and expansive. If so, then more distant bursts should register more faintly when compared to closer bursts. One theory proposes that the Milky Way is surrounded by a halo of Dark Matter that emits gamma-rays, but this is pure speculation.
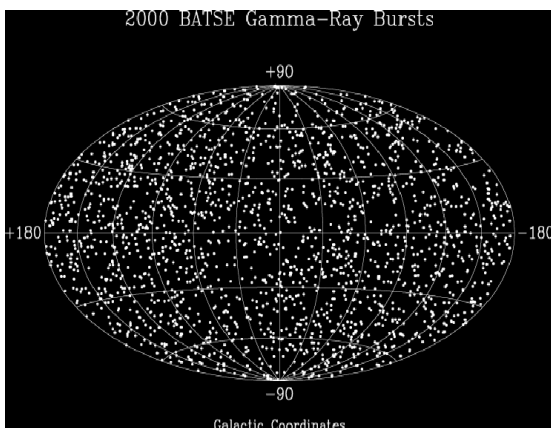
No one has proven that Dark Matter actually exists, much less produces gamma rays. A second theory holds that gamma-ray bursts

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[606]   Jonathan I. Katz, *The Biggest Bangs:* p. 84. A recent article in *Sky and Telescope* supported this interpretation: "'There's this myth that gamma-ray bursts are chaotic and unpredictable…but that's not true.' In fact GRB's might even be used as 'standard candles' with which to measure cosmic distances" (Joshua Roth, "Gamma-Ray Bursts Next Door," *Sky and Telescope*, January 9, 2002). Gamma-ray bursts are equivalent to 10^{45} watts of energy, which is over a million trillion times as powerful as the sun. The bursts occur at the rate of about one per day, but are fast-fading and random, never occurring in the same place twice.

originated from distances of ten billion light years, near the edge of the observable universe, and thus would be uniformly distributed as the rays approached Earth. But this would require the gamma-ray sources to have incredible energy in order to last long enough to reach Earth. Another problem was that a super burst appeared in the Large Magellanic Cloud in 1979, a satellite of the Milky Way and thus very close to Earth. Not surprisingly, the "large distance" theory was discarded as well.
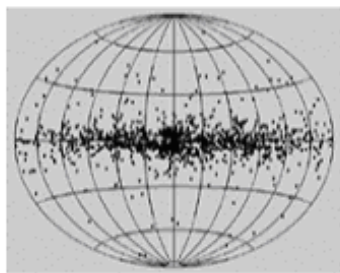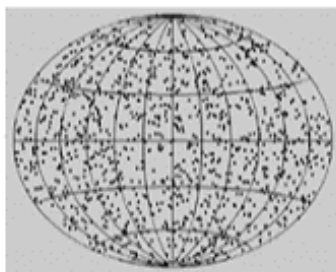
Expected   Observed

After citing some experiments designed to answer the Copernican dilemma,[607] the author admits:

> No longer could astronomers hope that the Copernican dilemma would disappear with improved data. The data were in hand, and their implication inescapable: we are at the center of a spherically symmetric distribution of gamma-ray-burst sources, and this distribution has an outer edge. Beyond this edge the density of burst sources decreases to insignificance.[608]

The implications of this admission are quite significant. Having no worthy explanation for the isotropic distribution of gamma-ray bursts, the astrophysicist is forced to admit one of the major planks of geocentric cosmology – that Earth is at the center of the forces we see in the universe.

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[607] In particular, the BATSE (Burst and Transient Source Experiment) launched in 1991, but again, "the deficiency of faith bursts, compared to the expected -3/2 power law, is unquestionable (p. 109)....Through its 9-year life BATSE detected nearly 3000 bursts, and only reconfirmed these conclusions with ever-increasing accuracy" (p. 111).

[608] *The Biggest Bangs*, p. 111.

Interestingly enough, Katz had opened the chapter reminding the reader that

> Mikolay Kopernik, the Polish astronomer also known by his Latin name Nicolaus Copernicus, established that Earth and the planets revolve around the Sun. The importance of Copernicus's ideas was both philosophical and scientific: Man is not at the center of the universe, but is only an insignificant spectator, viewing its fireworks from somewhere in the bleachers.…In modern times this has been elevated into the cosmological principle, which states that, if averaged over a sufficiently large region, the properties of the universe are the same everywhere; our neighborhood is completely ordinary and unremarkable. We are not special, and our home is not special, either. This is one of the foundations of nearly all modern cosmologies.[609]

Thus we see that Katz himself recognizes the implications of his own studies. He knows that gamma-ray bursts demolish the cosmological principle. Perhaps *man is* at the center of the universe; perhaps *he is* special and not merely an insignificant spectator but, in fact, is at the hub of all that goes on around him. If that is the case, we wonder if Katz, since he, too, is a man made in the image of God, wondered, even for a few fleeting minutes, whether these gamma-ray bursts meant that Earth was not a product of time and chance but, indeed, was placed in a very special place by its Creator.
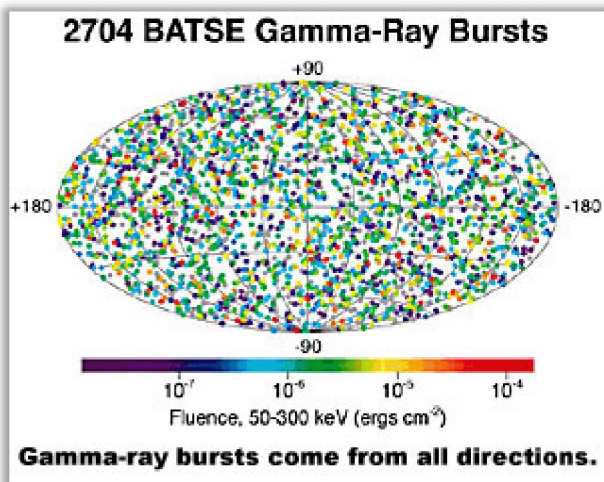
2704 BATSE Gamma-Ray Bursts

Fluence, 50-300 keV (ergs cm⁻²)

Gamma-ray bursts come from all directions.

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[609] *The Biggest Bangs*, p. 82.

We wonder if Katz would ever consider, since gamma-rays are high energy photons,[610] and photons are nothing but packages of light, that gamma-rays are one of the remnants of the first day of creation in which God, after having already created the heaven and the Earth (Genesis 1:1-2) said, 'Let there be light' (Genesis 1:3), thus distributing light uniformly around the already existing Earth? Would he ever consider that God, knowing that man would be intensely curious about where he is positioned in the universe in relation to everything else, left sign posts all throughout the starry skies saying: "Here, O man, is the clue to your origin and your destiny"! Since Katz does not mention God or Genesis in his book, we will never know where his private thoughts led him, but it is almost a certainty that the very foundation of his life was shaken when he discovered that the Earth was at the center point of photon disbursement.

Before he lowers the boom of gamma-ray evidence on unsuspecting Copernicans, Katz tries to offer some solace by appealing to the cosmological principle, which is, he says, supported by studies of the cosmic microwave background radiation (CMB), the popularized relic of the so-called "Big Bang."[611] But we wonder how Katz can be so confident of his interpretation of the CMB's isotropy when he reveals just a few paragraphs later that gamma-ray bursts have the same isotropy. For the isotropy of the former, Katz believes he has an ally in the cosmological principle and Copernican theory, but the isotropy of the latter, he admits, speaks against both. Why the contradiction? Because Katz is, without proof, taking for granted the main tenet of the cosmological principle, that is, a Big Bang occurred 13.5 billion years ago. In such a universe, Katz believes he can explain the CMB's isotropy as the result of its being evenly distributed throughout the whole universe, as opposed to gamma-ray bursts that, Katz realizes, have isotropic distribution only to a certain point, and then it suddenly disappears altogether. But how does Katz know that the isotropy of the CMB is situated any differently than the isotropy of the gamma-ray bursts? He doesn't, and neither does he know the origination of the 2.728º Kelvin CMB radiation. The only thing he knows is that the CMB is found in isotropic distribution around the Earth, the

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[610] According to Katz's glossary, a Gamma ray is "an electromagnetic radiation whose photons have energies greater than about 100,000 eV. Sometimes lower-energy photons (often as low as 10,000 eV) are also called gamma rays, overlapping the definition of X rays..."

[611] Katz says it is so called because "distances of billions of light-years are called cosmological, because they include the entire universe, and light from these remote regions takes so long to reach us that it was emitted when the universe was significantly younger than it is now and had different properties" (p. 24). What the different properties are Katz does not tell us.

same as gamma-ray bursts. If the Big Bang were not influencing him, the CMB isotropy should have led Katz to the same conclusion to which he arrived for gamma-ray bursts – that Earth is in the center of it all.

▶ **Quasars**
The density of quasars increases outwards from the Earth. In this plot (which has empty quadrants where quasars are hard to find among the stars of the Milky Way) the Earth is at the center, in a nearly blank area. The density of quasars decreases after about 11 billion l.y., into the 'dark ages' before they had formed.
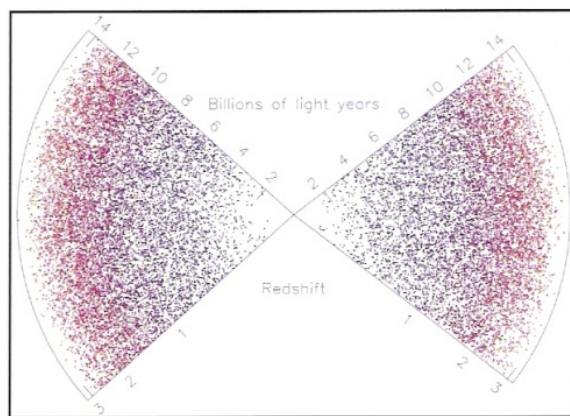
Quasars: Concentric Spheres around the Earth

About ten years prior to the discovery of gamma-ray bursts, astronomers stumbled upon another unique phenomenon in the universe. Radio telescopes employed in the 1960s found radio waves being transmitted by objects outside the solar system. Optical telescopes were then pointed in the same direction. They found faint points of light, which they named "quasi-stellar radio sources," soon shortened to "quasars."

Quasars presented a problem soon after their discovery since, according to the popular theory wherein redshift is understood as representing a recessional velocity, the quasars would have to be moving away from Earth at tremendous speeds, some between 15% and 95% of the speed of light. If so, they were then thought to be on the outer edges of the known universe, which then meant, if we are able to see their light, they must be putting out tremendous amounts of energy, starting at about a thousand times the luminosity of a galaxy. Not only that, but since any given quasar will vary in brightness, this means that the lower ebb of the luminosity translated into the quasar being an amazingly small object.

Astrophysicist **Yatendra P. Varshni** did extensive work on the spectra of quasars. In 1975 he catalogued 384 quasars between redshift of 0.2 and 3.53 and, amazingly, found that they were formed in 57 separate groupings of concentric spheres around the Earth. He made the following startling conclusion:

> ...the quasars in the 57 groups...are arranged on 57 spherical shells with the Earth as the center....The cosmological interpretation of the redshift in the spectra of quasars leads to yet another paradoxical result: namely, that the Earth is the center of the universe.[612]

Varshni first based his calculations on the spectra of the quasars and then did a second test on their actual redshifts. Both tests produced the same results. Varshni concludes that if his analysis is correct for quasars, then…

> The Earth is indeed the center of the Universe. The arrangement of quasars on certain spherical shells is only with respect to the Earth. These shells would disappear if viewed from another galaxy or quasar. This means that the cosmological principle will have to go. Also it implies that a coordinate system fixed to the Earth will be a preferred frame of reference in the Universe. Consequently, both the Special and General Theory of Relativity must be abandoned for cosmological purposes.[613]

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[612] Varshni's data, as cited in "The Red Shift Hypothesis for Quasars: Is the Earth the Center of the Universe?" *Astrophysics and Space Science*, 43: (1), (1976), p. 3. Although Varshni was firm on his discovery, he did leave room for an alternative explanation: "We are essentially left with only one possibility...the cosmological redshift interpretation. However, before we accept such an unaesthetic possibility, we must raise the question: Are the redshifts real? We wish to point out that we have proposed an alternative explanation of the spectra of quasars (Varshni, 1973, 1974, 1975; Menzel, 1970; Varshni and Lam, 1974) which is based on sound physical principles, does not require any redshifts, and has no basic difficulty." Varshni's alternative proposal was that the spectral lines were due to laser action in certain atomic species in the expanding envelope of a star (*Astrophysics and Space Science*, 37, L1, (1975)).

[613] *Astrophysics and Space Science*, 43: (1) (1976), p. 8. Varshni cites a counter-explanation and shows its weakness: "Quasars may be arranged like atoms in a crystal lattice, with the Earth being either at an empty lattice site or at a suitable interstitial site. Should that be the case, one would expect some pattern or regularity in the directions of quasars belonging to a certain group. No such evidence is found and this possibility must also be abandoned" (*ibid.*).
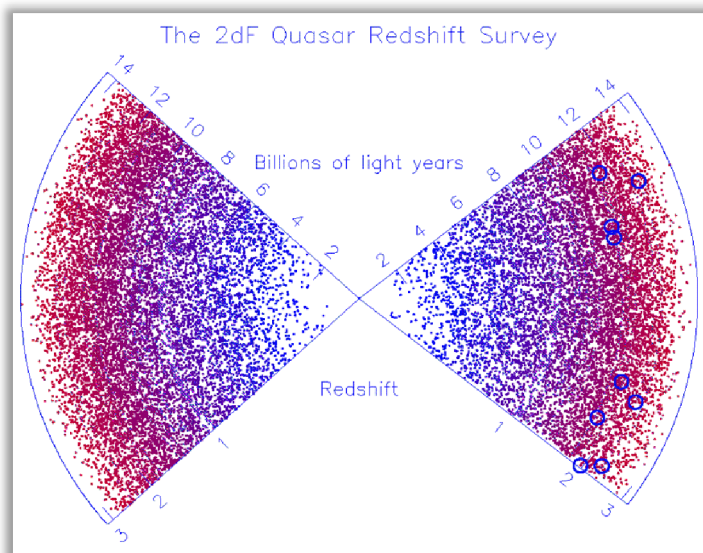
Concentric quasar distribution with void area at center

Varshni calculated the odds against such an arrangement and found:

> From the multiplicative law…the probability of these 57 sets of coincidences occurring in this system of 384 QSOs is $\approx 3 \times 10^{-85}$. We hope this number will be convincing evidence that the coincidences are real and cannot be attributed to chance.

Soon after Varshni's work, astronomers found over 20,000 quasars, and none of them altered Varshni's original results. In fact, they refer to it as the "quasar distribution problem." Of course, it's only a problem because, as Varshni was so bold to say, it puts a stake into the heart of the Copernican principle, as well as challenging the very tenets of the most prestigious work of science to date – Einstein's theory of Relativity. The other "problem," of course, is that since these quasars are distributed around Earth with such specific periodicity, this means that Earth is situated in a quasar-free hole, and that no other such "holes" exist anywhere else in the universe. Moreover, even if one were to dispute Varshni's findings by positing an alternative explanation for red-shift (*e.g.*, the belief that red-shift does not measure distance), the 57 concentric groupings of quasars will appear nonetheless when put in terms of "phase space," which, in astrophysics, is a multidimensional view of the sky utilizing Cartesian dimensions coupled with time and momentum to plot positions on a map.

A year after Varshni's 1976 paper, C. B. Stephenson attempted to explain the startling findings by suggesting that the Big Bang produced periodic bands of quasars that spread out over time.[614] Varshni wrote back to the same periodical a few months later critiquing Stephenson's proposal, saying:

> Instead of having Earth at the center, now we have to assume that the Universe evolved in fits and starts of quasar production. The concept of preferred epochs for quasar production is hardly any more aesthetic than that of a preferred position for the Earth."[615]
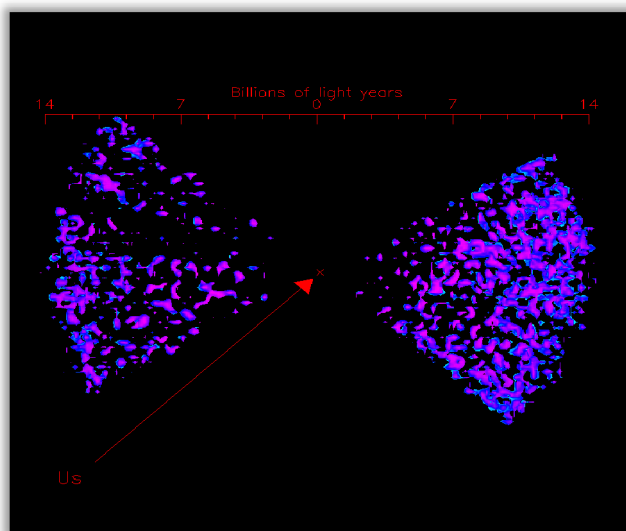
Earth at the center of quasar distribution

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[614] *Astrophysics and Space Science*, 51, 117-119 (1977).

[615] *Astrophysics and Space Science*, 51, 121, 1977. Varshni's only other published criticism came from R. Weymann, T. Boronson and J. Scargle, who claimed that Varshni overestimated the significance of the clustering of quasar redshifts by many magnitudes (*Astrophysics and Space Science*, 53, 265, 1978). Varshni responded in an article titled "Chance Coincidences and the So-Called Redshift Systems in the Absorption Spectrum of PKS 0237-23," stating: "It is shown that the number of redshift systems based on C IV doublets, proposed by Boronson, *et al* (1978) in the absorption spectrum of the quasar PKS 0237-23, is significantly different from that which would be expected from chance coincidences. Consequently, these systems and their *z*-values appear to be devoid of any physical significance" (*Astrophysics and Space Science*, 74, 3, 1981).

Not only does Varshni's evidence of symmetrical spheres challenge the prevailing cosmological principle, but as is the case with gamma-ray bursts, another problem with quasars for modern cosmology is that the distances they are assumed to be from Earth in the Einstein universe requires them to put out so much energy in order to match their luminosity (at least 10,000 times the combined energy of Milky Way galaxy), that such energy is impossible to account for under current physical laws. Not only that, but putting quasars at such large distances would require them, under the current hypothesis of an expanding universe, to be moving away from Earth at speeds faster than the speed of light – an obvious contradiction to Einstein's theory (although some attempt to avoid this problem by claiming that as the quasar moves it "creates space," or that Einstein's limitations only apply to the speed of "information" and not to the speed of light). As one author put it:

> When quasars were first discovered in the nineteen-sixties, they confronted astronomers and astrophysicists with an acute dilemma: If their enormous redshifts truly represented distance, nothing known in physics could explain their source of energy. Indeed, the very existence of such a compact but colossal source of energy seemed for a time to challenge the known body of physical principles, and a variety of fanciful notions like the "white hole" hypothesis were seriously considered in some quarters.[616]

Perhaps getting wind of Varshni's results, in the same year a team of astronomers from California Institute of Technology led by **Vera C. Rubin** set out to disprove the geo- or galacto-centric findings. That they may have been motivated to refute Varshni's findings is suggested by one conspicuous comment in their report reflecting the possible upsetting of their evidence: "Hopefully, it will not force a return to the pre-Copernican view of a hierarchy of motions whose sum is zero at the Sun."[617] The team

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[616] *Mosaic*, 9:18-27, May-June 1978. NB: A white hole is the theoretical porthole by which energy from another universe can be given to a quasar.

[617] Vera C. Rubin, Norbert Thonnard and W. Kent Ford, Jr., "Motion of the Galaxy and the Local Group determined from the velocity anisotropy of distant Sc I galaxies," *The Astronomical Journal*, vol. 81, No. 9, Sept. 1976, p. 735. In actuality, the "pre-Copernican" would have the "sum is zero" at the Earth, not the Sun. In any case, Rubin preferred a velocity for the Sun at 600 km/sec ± 125 km/sec and a velocity of the Milky Way of 425 km/sec ± 125 km/sec. The full paragraph reads: "If experiments underway or planned confirm the high degree of isotropy of the 2.7-K background radiation, and optical studies confirm a motion

set out to prove that the sum total of motions in the universe did not add up to zero in our local system, for a null sum would mean that the Earth-based observer was not in motion. Try as they may, the team was not able to rule out a null sum pointing to a geocentric universe. Within the allowable margin of error, they admitted that one possible solution to their findings was that all the motions in the galactic plane cancel out each other. Although they themselves advanced the view that the Sun and Galaxy were moving, the team was honest enough to conclude that they had no proof for this assertion.

Another study conducted in 1976 by Paul Schechter of the Steward Observatory analyzed the data of Rubin's team and sought to determine whether the results could be controverted, but found they could not. Schechter found the same canceling of galactic motion centered on the Earth-based observer as did the Rubin team.[618]

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of the Sun, $V > 300$ km/sec, then the resolution of this conflict should enhance our knowledge both of the early history of the Universe and of the motions of galaxies, r ~ 100 Mpc. Hopefully, it will not force a return to the pre-Copernican view of a hierarchy of motions whose sum is zero at the Sun." In their conclusion they admit: "This conflict remains unresolved" (*ibid*., p. 736). Other clues to their motivation appear in various places: "If our Galaxy is at rest, values of ΔV_{GM} will be distributed at random for galaxies across the sky. However, if our Galaxy is moving, galaxies in the direction of the apex will have negative values of $V_C - V_H$ in the mean" (*ibid*., p. 722). The team states that "The overriding conclusion…is that…the anisotropy persists, and in such a fashion that the most acceptable explanation is a motion of our Galaxy," yet admits that there are "A variety of solutions" (*ibid*., p. 722) and "this conclusion puts such great weight on the few nearer galaxies that we choose to discuss the other alternatives as well" (*ibid*., p. 728), and then they are forced to make a preference: "Employing Occam's razor, we reject this hypothesis [a stationary Milky Way] in favor of the simpler one of a motion of the observer" [a moving solar system]. In addition, they admit: "If our Galaxy is at rest, then diameters of apex and antapex galaxies will be equal when diameters are formed from the galactocentric velocities. Alternately, if the Galaxy and the Local Group have a motion, the galaxy diameters will be equal….As can be seen, the rms errors of the diameters are too large to distinguish between the two cases" (*ibid*., p. 730). Again, "While we prefer to interpret out results in terms of galactic motion, we admit the possibility that some fraction of the observed effect could arise from magnitude errors" (*ibid*., p. 733).

[618] Paul L. Schechter, "On the Solar Motion with Respect to External Galaxies," *Astronomical Journal*, vol. 82, August 1977, pp. 569-576. Schechter's abstract reads: "The ScI galaxy data by Rubin, Ford…have been examined to determine

Not only does the new scientific evidence show us that Earth is in the center of these heavenly bodies, it may also require us to accept that the universe is much smaller than Big Bang hypothesizers have led us to believe. Note this admission from the previous author:

> On the other hand, if the redshifts displayed by the object were false indicators of recession velocity, then the sources could be nearby and the problem of the energy source would go away. But the implications of this explanation were even more horrifying to astronomers. If some entirely unknown physical mechanism could mimic the Doppler displacement of the emission lines of a receding object, then the whole concept of an expanding universe would be thrown into question; the Hubble scale of cosmic distances an essential tool for both astronomers and cosmologists would have to be discarded.[619]

Not only does Varshni's evidence compel him to dismiss Einstein's Relativity, but Edwin Hubble's theory that the universe is expanding is

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whether the accuracy of the solar motion derived from anisotropy in the redshift-magnitude diagram can be substantially improved by the application of the 'diameter correction' employed by Rubin et al. It is found that it cannot. Analysis of a sample of nearby bright galaxies gives a solution for the solar motion with three times the formal accuracy obtained with the ScI sample, but with a possible systematic error arising from the motion of the sample galaxies toward the Virgo cluster." Rubin likewise admitted that evidence from James Peebles (Princeton, 1976) indicated "a component of motion toward Virgo" but that Rubin's showed "a component…away from the Virgo direction," while data from Sandage and Tammann (1975a, 1975b) "does not support the observed anisotropy" that the Rubin team saw (Rubin, *op. cit.*, p. 733). The practical ramifications of Rubin's inability to confirm her results is demonstrated in the opposing vectors touted by other astronomers in the same decade. Abell, for example, in *Exploration of the Universe*, asserts that we are moving toward the constellation Lyra at 20 km/sec, while Muller in *Scientific American* (May, 1978, p. 65) claims we are heading toward Leo at 400 km/sec, while Rubin has us moving "orthogonal to the Virgo cluster," which would be toward Gemini or Taurus. In a study by Smoot, Gorenstein and Muller, the 600 km/sec velocity [of Rubin] was "almost at right angles to the velocity with respect to the background" (Michael Rowan-Robinson, "Ether drift detected at last," *Nature*, Vol. 270, November 3, 1977, p. 9). Obviously, these contradicting results make the search for a movement of the Earth an exercise in futility. See also: Richard Warburton and John Goodkind, "The Search for Evidence of a Preferred Reference Frame," *Astrophysical Journal*, vol. 206, Sept. 1976, pp. 881-886.

[619] *Mosaic*, 9:18-27, May-June 1978.

also suspect. Varshni's astounding evidence has also been confirmed by other astrophysicists, with even more extensive studies. The Ukrainian team of N. A. Zhuck, V. V. Moroz, A. A. Varaksin, who examined 23,760 quasars, confirm the following:

> Regularity in quasar allocation…revealing that the quasars are grouped in thin walls of meshes [with] quasars spatial distribution in spherical and Cartesian coordinates… quasars have averages of distribution, root-mean-square diversion and correlation factors, typical for uniform distribution of random quantities; in smaller gauges the quasars are grouped in thin walls of meshes…. It is impossible to term these results, and the results of other similar investigations, as ordinary accidental coincidence. Obviously we have the facts confirming that the quasars are distributed uniformly in the universe…[620]

They conclude that the "quasars' allocation in meshes correlates with galaxy allocation," which means that the same spherical groupings noticed in quasars are also true for galaxies (which we will address in our next section).[621] Additionally, their evidence brings them to the same conclusion as Varshni's in the discovery of the distribution of his quasars. The Ukrainian team states that their result…

> …confirms the concept of the stationary inconvertible universe and to reject [the] concept [of a] dynamic dilating universe which [was] erroneously formed in the XXth century and taking

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[620] "Quasars and the Large Scale Structure of the Universe," N. A. Zhuck, V. V. Moroz, A. A. Varaksin, *Spacetime and Substance, International Physical Journal*, Ukraine, Vol. 2, No. 5 (10) 2001, p. 193, 196. The Zhuck team go on to say that "…meshes in which walls the quasars are concentrated not only change in size, but also that [which] is most important, [they] are deformed (are flattened) approaching the universe boundary that cardinally contradicts the theory of the explosion [*i.e.*, the Big Bang] which is typical of the homogeneous expansion of a substance and, accordingly, proportional expansion of the sizes of the indicated meshes" (NB: I have added words in brackets, since the translation from Russian is rather choppy in certain instances).

[621] They write: "It is necessary to note, that in 1971 Karlsson has found out for the first time a cyclic change of a spectral radiant density of quasars proportional argument ln (1 + z), where z is the red bias of their spectrums. Such allocation of quasars correlates with allocation of galaxies forming in the universe homogeneous thin-walled aggregations as meshes" (p. 206). Karlsson will also be mentioned in our next section on Galaxies. The reference is "Possible discretization of quasar redshift," *Astronomy and Astrophysics*, 13:333 (1971).

a beginning from a so-called Big Bang….Such a model is based on the non-steady solutions of the Einsteinian equations obtained by Soviet geophysicist and mathematician Friedmann at the beginning of the 1920s and the dynamics of the exploding commencement…advanced by American physicist Gamov at the end of the 1940s.[622]

We should pause to note, as much as we cite the works of Varshni, Zhuck and others in showing the centrality of Earth in relation to the quantized distribution of quasars, we are not by any means adopting anyone's opinion that the quasars are billions of light-years from Earth. The whole question of determining the distance of celestial objects is an inexact science, which we will address later in this book. Presently, the matter of whether quasar redshifts are intrinsic (that is, due to the nature of the object emitting the radiation, or even from the radiation's loss of energy) or cosmological (that is, due to the great distance quasars are said to be from Earth), is a hotly debated topic.[623] Regardless of the outcome,

[622] *Ibid*., p. 202. The Zhuck team adds that the redshift does not necessarily have to be interpreted as "the expansion of the universe," but as "the dissipation of the energy of light when it spreads at great distances." In another place: "The analysis of interaction of light with the universe has shown that gravitational potential ($-c^2$) acts on it, giving power loss and, as a corollary, change frequency v in relation to initial v_o under the law $v = v_o e^{-r/Ro}$ The given law completely permits [the] photometer paradox, explains the nature of red bias in spectrums of radiation of other galaxies without engaging a Doppler effect and gives a new formula of definition of distance up to galaxies $L = R_o \ln (1 + z)$, where z is the parameter of red bias in light frequency….The law completely explains the nature, numerical performances and character of allocation of background microwave radiation. Actually, it is not a relic of the Big Bang [but] aggregate radiation of all radiants of electromagnetic radiation (star, galaxies, etc.) of the universe...the light, when spreading in space, loses its energy since the light is permanently forced to break away from [the] gravitating masses behind" (pp. 205-207). Zhuck adds that this also answers Olber's paradox: "The law ($v = v_o e^{-r/Ro}$) has been completely proved by observations…by the missing of bright luminescence of the sky at night (contrary to a known photometer paradox of classical physics)," p. 209. (The reference to Friedmann appears in "Über die Krümmung des Raumes," *Ztschr. Phys*., 10:377-386, 1922 and 21:332-336, 1922; to Gamov in *Physical Review*, 70:572-573, 1946).

[623] There has been an ongoing debate whether the redshift of quasars is intrinsic (that is, due to the nature of the quasar or the nature of the emitted radiation - a view proposed by William Tifft) or cosmological (due to the great distance quasars might be from Earth). Fred Hoyle and Geoffrey Burbidge claim that the "Compton catastrophe" disallowed the cosmological origin of quasar redshift, but this was supposedly answered by Ludwig Woltjer (see Katz: *The Biggest Bangs*,

however, identical to gamma-ray bursts, quasars exhibit the same type of quantized and spherical distribution in space, having Earth as the center point. So for now, we can appeal to the findings of the above named astronomers simply because the spherical *proportions* of quasar distribution having Earth as the center remain the same whether the quasars are near or far away.

Along these lines, astronomer Halton Arp has ample evidence in his two books positing that the Big Bang interpretation of redshift (*i.e.*, redshift = distance) is fallacious.[624] Nevertheless, Arp's alternative still recognizes the obvious periodicity of cosmic redshifts and classifies them as "apparent" velocities for the sake of common nomenclature. Among his many proofs, Arp begins with the observational evidence from Burbidge and Karlsson:

> In 1967 Geoffrey and Margaret Burbidge pointed out the existence of some redshifts in quasars which seem to be preferred (particularly $z = 1.95$). In 1971 K. G. Karlsson showed that these, and later observed redshifts, obeyed the mathematical formula $(1 + z_2)/(1 + z_1) = 1.23$ (where z_2 is next higher redshift from z_1). This gives the observed quasar redshift periodicities of: $z = 0.061, 0.30, 0.60, 0.91, 1.41, 1.96$. In my opinion this is one

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pp. 44-45). D. Basu in "The Hubble Relation for a Comprehensive Sample of QSOs" in *Journal of Astrophysics and Astronomy* (2003), 24, 11-21, examines Burbidge's 1993 comprehensive data of 3000 QSOs and concludes redshifts of QSOs are of cosmological origin. Thomas Van Flandern proposes that redshift is caused by friction between the lightwave and the "classical graviton" medium through which it travels (*Pushing Gravity*, p. 118). Similarly, John Kierien offers that redshift is caused by the Compton effect, not the Doppler effect ("Implications of the Compton Effect Interpretation of the Redshift," *IEEE Trans. Plasma Science* 18, 61, 1990). D. R. Humphreys has suggested the redshift is caused by the expansion of space itself, which he coincides with his support of General Relativity. Halton Arp postulates that redshift is intrinsic to the object, and since each object is different because it is "created" at a different time, varying redshifts will be produced (*Seeing Red*, p. 195). We will have an in-depth analysis of this controversy later in our book. Suffice it to say for now, however, that the spherical patterns of quasar distribution observed in the universe are not dependent on one view of redshift or the other.

[624] *Quasars, Redshifts and Controversies*, 1987; *Seeing Red: Redshifts, Cosmology and Academic Science* 1998. Arp quotes those not disposed to accepting his observational data as saying "It's just noisy data" – Joseph Silk, University of Calif., Berkeley; "We have a lot of crank science in our field" – James Gunn, Princeton University; "I'm not being dogmatic and saying it cannot happen, but…" – James Peebles, Princeton University; (*Seeing Red*, pp. 199-200).

of the truly great discoveries in cosmic physics…. Many investigations confirmed the accuracy of this periodicity.[625]

From another publication, Arp adds: "This has most lately been confirmed for all quasars known through 1984 by Depaquit, Vigier and Pecker."[626] Added to this is the thorough investigation by the Chinese couple H. G. Bi and X. Zhu who, with power spectrum analysis, investigated the periodicity findings in all the data and found that the predicted periodicities (*i.e.*, z = 0.061, 0.30, 0.60, 0.91, 1.41, 1.96, etc.) fit the formula by 94-99.5%. With more refinements, Arp states: "…the confidence is 99.997% or only one chance in about 33,000 of being accidental."[627]

Lastly, a team studying the orientation of quasars has discovered that they have a preferred axis, the same as they found for radio wavelengths and micro wavelengths (*i.e.*, the CMB). The team of Federico Urban and Ariel Zhitnitsky state:

Observing very distant quasars, the authors[628] of have found evidence for a statistically significant correlation in the linear

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[625] *Seeing Red*, p. 203. Arp adds: "And of course, many claimed it was false. One postdoctoral student at the Institute of Theoretical Astronomy in Cambridge…claimed there was no periodicity. His analysis included the faintest, least accurate quasars which had been shown not to exhibit periodicity. They showed it anyway. In a new sample of x-ray quasars, he found the periodicity but issued the opinion that it would go away with further measures (fainter quasars). We will see the opposite happened" (*ibid*., p. 203). Arp records another attempt to dismiss his data: "Now one of the ongoing attempts to discredit the redshift periodicity was an argument that quasars were discovered by their ultraviolet excess and that excess was caused by prominent emission lines moving into the ultraviolet window at certain redshifts – in other words the periodicity was merely a selection effect. It had been shown that this was not the case, but nevertheless the argument was widely accepted as disproving this embarrassing observational result" (*ibid*., p. 204).

[626] "The Observational Impetus for Le Sage Gravity," Max Planck Institut fur Astrophysik, 1997. Burbidge wrote about the same phenomenon in *Mercury* in the article "Quasars in the Balance," 17:136 in 1988. Arp has provided the most information in his book *Quasars, Redshifts and Controversies* (1987) and *Seeing Red: Redshifts, Cosmology and Academic Science* (1998). He and Burbidge wrote of their work in *Physics Today*, 37:17, in 1984, in the article "Companion Galaxies Match Quasar Redshifts: The Debate Goes On."

[627] *Seeing Red*, p. 204.

[628] Urban is referring to D. Hutsemekers, et al., in Astronomy and Astrophysics, 332, 410 (1998); 367, 381 (2001); 441, 915 (2005).

polarisation angles of photons in the optical spectrum over huge distances of order of 1 Gpc. In particular, they have found that these vectors tend to identify *an axis in the sky which closely align with the direction of the cosmological dipole*. The use of slightly different statistics gives rise to consistent results, and in particular yields the same preferred axis. What is important for us is that this fact seems to not be related to the local environment we are immersed in (one may indeed think it arises from an incorrect galactic foreground subtraction), and this is corroborated by the result being redshift-dependent: were the observed polarisations contaminated by galactic dust they would all be so irrespective of their redshift. Moreover, the rotation fits linearly to redshift at the rate of 30° per Gpc.

Urban adds that the "identifiable preferred axis, the cosmological dipole…point all in the same direction, that of the [sun-earth] ecliptic or equinox."[629] In other words, quasar distribution is centered around the Earth, just as Varshni had discovered thirty-six years earlier. John P. Ralston recaps all these findings and summarizes them as follows:

> The "cosmological principle" was set up early without realizing its implications for the horizon problem, and almost entirely without support from observational data. Consistent signals of anisotropy have been found in data on electromagnetic propagation, polarizations of QSOs and CMB temperature maps. The axis of Virgo is found again and again in signals breaking isotropy, from independent observables in independent energy regimes. There are no satisfactory explanations of these effects in conventional astrophysics….To summarize, *our studies find there is nothing supporting isotropy of the CMB, and everything about the data contradicting it....*The PLANCK observations of polarization data from the CMB are eagerly awaited. We can predict with reasonable certainty that correlations contradicting isotropy will be seen; spontaneous alignment of polarizations will occur along the axis of Virgo.[630]

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[629] "The P-Odd Universe, Dark Energy and QCD," Federico R. Urban and Ariel R. Zhitnitsky, Univ. of British Columbia, Vancouver, BC, July 13, 2011, p. 2.

[630] "Question Isotropy," John P. Ralston, Department of Physics & Astronomy, The University of Kansas, Nov. 2010, abstract and assessment, arXiv:1011.2240v1, emphasis his.

Lastly, a paper written by Michael Longo in 2012 shows quasars acting in a similar way:

> Quasars provide our farthest-reaching view of the Universe. The Sloan Survey now contains over 100,000 quasar candidates. A careful look at the angular distribution of quasar magnitudes shows a surprising intensity enhancement with a "bulls eye" pattern toward $(\alpha, \delta) \sim (195°, 0°)$ for all wavelengths from UV through infrared. The angular pattern and size of the enhancement is very similar for all wave lengths, which is inconsistent with a Doppler shift due to a large peculiar velocity toward that direction. The enhancement is also too large to explain as a systematic error in the quasar magnitudes.[631]
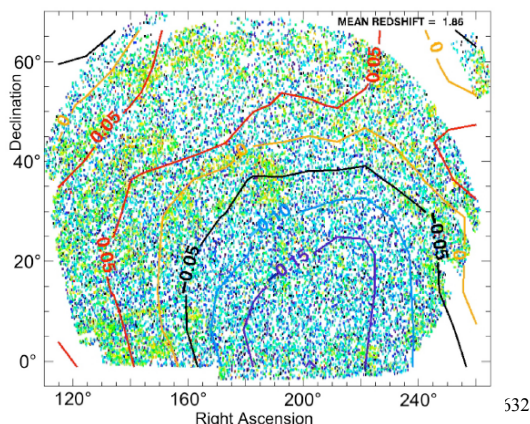
Not only are the quasars in "bulls-eye" patterns, Longo admits they are aligned with the Axis of Evil:

> The direction of the quasar intensity enhancement is also close to that of the so-called "Axis of Evil", a name coined by K. Land and J. Magueijo to describe the anomalies in the low multipoles of the CMB toward $(\alpha, \delta) \sim (173°, 4°)$. The extensive literature on the anomalies in the CMB was recently reviewed by Copi.[633]

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[631] "An Anomaly in the Angular Distribution of Quasar Magnitudes: Evidence for a Bubble Universe with a Mass $\sim 10^{21}$ M$_\odot$" April 25, 2012, Dept. of Physics, University of Michigan.

[632] Image taken from Longo's 2012 paper.

[633] *Ibid.*, p. 10. Although Longo seeks to explain away these anomalies by attributing them to a "bubble" universe or multiverse and gravitational lensing, it is merely an unproven hypothesis to support the Copernican Principle.

Violation of the Copernican Principle in Radio Sky

In a paper of May 2013 titled, "Is there a violation of the Copernican principle in radio sky," Ashok K. Singal noted even larger anisotropies of quasars and radio galaxies than what appeared in the CMB anisotropies. He first notes CMB anisotropies were confirmed by the Planck probe:

> Cosmic Microwave Background Radiation (CMBR) observations from the WMAP satellite have shown some unexpected anisotropies, which surprisingly seem to be aligned with the [Earth's] ecliptic. This alignment has been dubbed the "axis of evil" with very damaging implications for the standard model of cosmology. The latest data from the Planck satellite have confirmed the presence of these anisotropies.[634]

Singal then reports on the quasars and radio galaxies:

> Here we report even larger anisotropies in the sky distributions of powerful extended quasars and some other sub-classes of radio galaxies in the 3CRR catalogue, one of the oldest and most intensively studies sample of strong radio sources. The anisotropies lie about a plane passing through the two equinoxes and the north celestial pole (NCP). We can rule out at a 99.995% confidence level the hypothesis that these asymmetries are merely due to statistical fluctuations. Further, even the distribution of observed radio sizes of quasars and radio galaxies show large systematic differences between these two sky regions. The redshift distribution appear to be very similar in both regions of sky for all sources, which rules out any local effects to be the cause of these anomalies.

In other words, the anisotropic quasar and radio galaxy distribution is a second witness to the Earth being in the center of the universe. Singal more or less confirms this interpretation when he asks:

> What is intriguing even further is why such anisotropies should lie about a great circle decided purely by the orientation of earth's rotation axis and/or the axis of its revolution around the

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[634] Ashok K. Singal, "Is there a violation of the Copernican principle in radio sky," *Astronomy and Astrophysics*, Physical Research Laboratory, Naurangpura, Ahmedabad, India, May 17, 2013 at arXiv:1305.4134v1, p. 1.

sun? It looks as if these axes have a preferential placement in the larger scheme of things, <u>implying an apparent breakdown of the Copernican principle or its more generalization, cosmological principle</u>, <u>upon which all modern cosmological theories are based upon</u>. Copernican principle states that earth does not have any eminent or privileged position…

There is certainly a cause for worry. Is there a breakdown of the Copernican principle as things seen in two regions of sky divided purely by a coordinate system based on earth's orientation in space, shows a very large anisotropy in source distribution? Why should the equinox points and the NCP should have any bearing on the large scale distribution of matter in the universe?

The apparent alignment in the cosmic microwave background (CMB) in one particular direction through space is called "evil" because it undermines our ideas about the standard cosmological model….there is no denying that from the large anisotropies present in the radio sky, independently seen both in the discrete source distribution and in the diffuse CMBR, the Copernican principle seems to be in jeopardy.

Galaxies: Spheres of Stars Centered Around the Earth

The above astronomers are not the only ones to discover such quantized and spherical distribution of the heavenly bodies centered on the Earth. In 1970, William G. Tifft, astronomer at Steward Observatory at the University of Arizona examined the redshift of various galaxies and found that they were all distributed at specific spherical distances from Earth, namely, in multiples of 72 km/sec, and a smaller grouping of 36 km/sec.[635]

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[635] Tifft writes: "There is now very firm evidence that the redshifts of galaxies are quantized with a primary interval near 72 km s-1" (W. G. Tifft and W. J. Cocke, "Global redshift quantization," *Astrophysical Journal* 287:492-502, 1984). Also published in "Global Redshift Periodicities: Association with the Cosmic Background Radiation," *Astrophysics and Space Science*, 239, 35 (1996); "Evidence for Quantized and Variable Redshifts in the CBR Rest Frame," *Astrophysics and Space Science*, 1997. Also Tifft and Cocke in *Sky and Telescope*, 73:19, 1987: "Quantized Galaxy Redshifts," as well as in *New Scientist*, June 22, 1985: "Galaxy Redshifts Come in Clumps," and Tifft in *Star, Galaxies and Cosmos*, 1977.

To picture this in your mind's eye, it is like bands of galaxies, with each band separated from the other in evenly spaced and proportional rings. Tifft's findings were quite shocking to the field of astronomy, since not only were the more obscure sources such as gamma-rays and quasars showing Earth in the center of the universe, but now the common galaxy, which was far more numerous and readily observable, was showing precisely the same centrality of the Earth. Tifft's work went through the usual rigor of peer-review, but astronomers were still reluctant to accept his findings, since they were well aware of the dire implications it held against their cherished Big Bang theory.

Sky and Telescope, which is not by any means a geocentrist periodical, says of Tifft's results: "Quantized redshifts just don't fit into this view of the cosmos [the Big Bang view], for they imply concentric shells of galaxies expanding away from a central point, Earth."[636]

Ironically, Tifft couldn't quite come to embrace his own results. In one of his more recent and comprehensive papers he writes:

> The most obvious effect is the quantization of redshifts when viewed from an appropriate rest frame, especially the cosmic background rest frame. The redshift has imprinted on it a pattern that appears to have its origin in microscopic quantum physics, yet it carries this imprint across cosmological boundaries. A hierarchy of quantized domains is suggested.[637]

Typical of modern scientists who often lock themselves into paradigms, Tifft, rather than accept the face-value explanation that the galaxies are distributed in periodic distances from his telescope, opted for the *ad hoc* idea that something was "imprinted" on the light as it traveled from the galaxies to the Earth that merely made it appear as if it had come in quantized groupings. He also recognizes that even these "imprints" are quantized only when "viewed from an appropriate rest frame," but he deliberately ignores the rest frame upon which his telescope is seated,

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[636] "Quantized Redshifts: What's Going on Here?" *Sky and Telescope*, August 1992, p. 128 (84:128); see also January 1987, p. 19 and November 1973, p. 289. Halton Arp writes: "The fact that measured values of redshift do not vary continuously but come in steps…is so unexpected that conventional astronomy has never been able to accept it, in spite of the overwhelming observational evidence" (*Seeing Red: Redshifts, Cosmology and Academic Science*, p. 195).

[637] W. G. Tifft, "Global Redshift Periodicities and Variability," *The Astrophysical Journal*, 485: 465-483, August 20, 1997, p. 465. Tifft's purpose in giving this alternate explanation is to protect "a singular origin of the universe…and other early universe effects" (*ibid*).

namely, Earth, and arbitrarily chooses the ubiquitous "cosmic background" (the CMB) as his preferred absolute. Tifft often refers to the "CMB rest frame" in his paper, but if he believes any such entity is to be understood as a "rest frame" then he certainly can't hold to the theory of General Relativity that brought him the Big Bang, since the theory doesn't possess any rest frames.
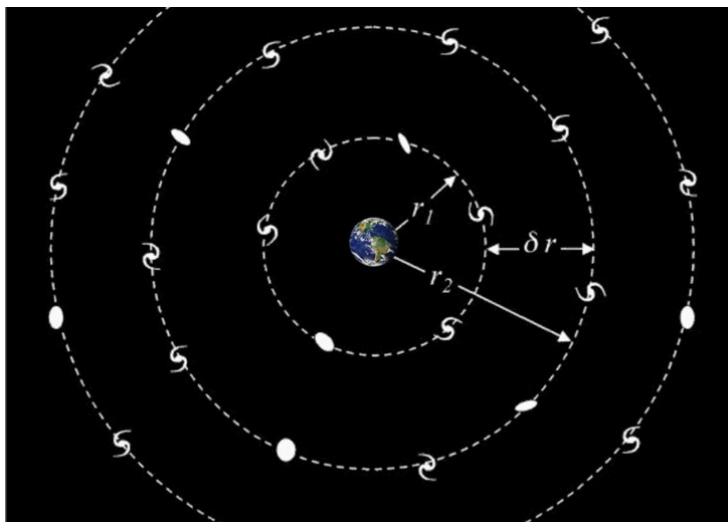
Geocentric View of Tifft's Data

In any case, recognizing the anti-Copernican implications of Tifft's work for what they really were, in 1991, with the express purpose of overturning Tifft's results, astronomers Bruce N. G. Guthrie and William M. Napier of the Royal University at Edinburgh compared the redshifts from 89 single spiral galaxies. To their astonishment they found a periodicity of 37.2 km/sec, which was very close to Tifft's recently revised quantum multiple of 36.2 km/sec for this class of galaxies. As Robert Matthews states:

> So unbelievable was this phenomenon that, when they first submitted their paper to *Astronomy and Astrophysics* a referee asked them to repeat their analysis with another set of galaxies. This, Napier and Guthrie did with 117 other galaxies. The same 37.5 km/sec figure thrust itself out of the data; and their paper was accepted.[638]

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[638] "Do Galaxies Fly through the Universe in Formation?" *Science*, 271:759 (1996). So surprising is this information that M. Disney, a galaxy specialist from

As a true scientist, Matthews understands quite well the implications of Napier's and Guthrie's exhaustive study. Like Varshni, he spares no words indicating how this evidence systematically overturns all prevailing theories of the cosmos:

> Unless Napier and Guthrie and, of course, W.G. Tifft, the discoverer of IT, can be proven wrong, all of modern astronomy and cosmology will be in jeopardy: the expanding universe, the big bang, the presumed age of the universe, not to mention the endless assertions that these are all facts not theories.[639]

D. Koo and R. Krone, two University of Chicago scientists, did the same kind of redshift analysis on galaxies. Their results were identical to Napier's and Guthrie's and even made it to the *New York Times*. They conclude: "…the clusters of galaxies, each containing hundreds of millions of stars, seemed to be concentrated in evenly spaced layers" [*i.e.*, concentric spheres around the Earth].[640] Incidentally, for those who see symbolic significance in numbers, the number of "evenly spaced layers" discovered by each team of astronomers is seven. There are seven evenly-spaced layers in the north direction, and seven evenly-spaced layers to the south. Koo admits that astronomers are very disturbed at this spacing, obviously because it gives evidence of intelligent design and geocentrism.

Added to this evidence is the astonishing fact that the most distant galaxies (*e.g.*, those said to be 10 billion light years away from Earth) look very much the same as the galaxies very close to us.[641] This creates an intractable problem for current cosmology. The most distant galaxies should logically appear 9-10 billion years younger in their formation, since their light took that long to arrive on Earth. One could possibly explain this discrepancy by asserting that galaxies mature very fast and level off after a

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the University of Wales, stated: "It would mean abandoning a great deal of present research." James Peebles, a cosmologist from Princeton University, stated: "…it's a real shocker" (*Science Frontiers*, No. 105: May-June 1996).

[639] "Do Galaxies Fly through the Universe in Formation?" *Science*, 271:759 (1996).

[640] Malcolm Browne, *In Chile, Galaxy-Watching Robot Seeks Measure of Universe*, *New York Times*, Dec. 17, 1991. D. Koo, and R. Krone, *Annual Review of Astronomy and Astrophysics*, 30, 613 (1992). In 1981 R. Kirshner discovered three immense and widely separated voids in space with no galaxies at 12,000 to 18,000 km/sec ("Deep Redshift Survey of Galaxies Suggest Million-MPC3 Void," *Physics Today*, 35:17-19, January 1982).

[641] "Most Distant Galaxies Surprisingly Mature," *Science News*, 119:148, 1981.

billion years, but that, of course, would not only be an *ad hoc* answer, it would conflict with other accepted understandings of current cosmology regarding galaxies.

Quantized Red Shifts of Galaxies
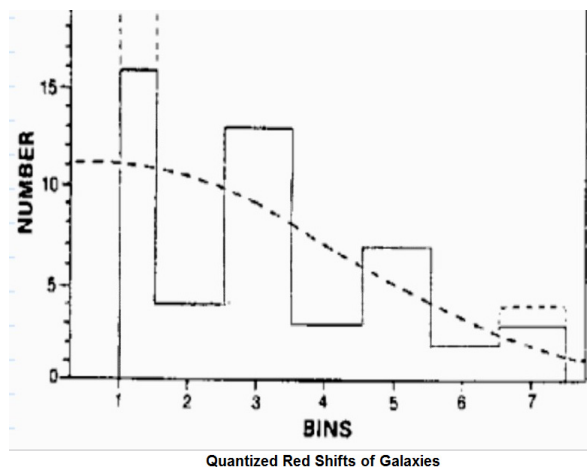
Not only do the galaxies look the same, but various groups of galaxies are so large that, given modern cosmology's estimate as to the rate galaxies and clusters form, it would be impossible for these massive structures to form with the little time afforded by the Big Bang theory (a common complaint raised by Steady State theorists). For example, a few years ago astronomers discovered the Great Galactic Wall, which is a mass of galaxies 500 million light-years by 300 million light-years by 15 million light-years in total area. In 1989, *Science* magazine admitted that such a structure could not have been formed in the 15 billion years then assigned to the age of the universe.[642] The only possible way would be for the Great Galactic Wall to have at least 100 times the mass it presently has, which prompted Stephen Hawking to comment: "Either we have failed to see 99% of the universe, or we are wrong about how the universe began."[643] Hawking's admission is magnified by the fact that, as noted above, thirteen additional "Great Walls" of galaxies have been discovered since his comment was made in 1989.[644]

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[642] From the work of Margaret J. Geller and John P. Huchra of the Harvard-Smithsonian Center for Astrophysics; *Science*, November 17, 1989, as cited in *The Biblical Astronomer*, Vol. 2, No. 61, p. 11.
[643] *Ibid.*, p. 11-12.
[644] See also *Astronomy*, "A Cross-Section of the Universe," November 1989; "Southern Super Cluster Traced Across the Sky," January, 1990; "Sky Survey

The 2005 Sloan Digital Sky Survey

As one thing leads to another, astronomers are very anxious to use their tools to map out the visible universe. Prompted by the above studies and figures, even more sophisticated equipment, backed by even more institutional money, the Sloan Digital Sky Survey is in operation to give what astronomers regard as the most accurate mapping of the galaxies, quasars, and other objects in the universe to date, and probably for some time to come. As noted in connection with the data from the CMB, Max Tegmark and a group of over 200 astronomers from 13 different institutions are involved in this project. As of this date, they have mapped over 200,000 galaxies. In the words of its own authors, the Sloan Digital Sky Survey or SDSS:

> …is the most ambitious astronomical survey project ever undertaken. The survey will map in detail one-quarter of the entire sky, determining the positions and absolute brightnesses of more than 100 million celestial objects. It will also measure the distances to more than a million galaxies and quasars. Apache Point Observatory, site of the SDSS telescopes, is operated by the Astrophysical Research Consortium (ARC). The SDSS addresses fascinating, fundamental questions about the universe. With the survey, astronomers will be able to see the large-scale patterns of galactic sheets and voids in the universe. Scientists have varying ideas about the evolution of the universe, and different patterns of large-scale structure point to different theories of how the universe evolved. The Sloan Digital Sky Survey will tell us which theories are right – or whether we have to come up with entirely new ideas. The Sloan Digital Sky Survey (SDSS) is a joint project of The University of Chicago, Fermilab, the Institute for Advanced Study, the Japan Participation Group, The Johns Hopkins University, the Los Alamos National Laboratory, the Max-Planck-Institute for Astronomy (MPIA), the Max-Planck-Institute for Astrophysics (MPA), New Mexico State University, University of Pittsburgh, Princeton University, the United States Naval Observatory, and the University of Washington. Funding for the project has been provided by the Alfred P. Sloan Foundation, the participating institutions, the National Aeronautics and Space Administration,

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Reveals Regularly Spaced Galaxies," June 1990; *Sky and Telescope*, "The Great Wall," January 1990; "A Universe of Bubbles and Voids," September 1990, *ibid*.

the National Science Foundation, the U.S. Department of Energy, the Japanese Monbukagakusho, and the Max Planck Society.[645]

So what has this ambitious project found? Precisely the same thing that the previous studies have found – that Earth is in the center of all the galaxies and quasars mapped in the known universe. The pictorial provided by SDSS shows Earth in the center of two wedge-shaped galaxy segments that also show galaxy density decreases as the distance from Earth increases. Only from the vantage point of Earth do these stunning proportions become significant. In other words, if one were to view them from another part of the universe the concentric proportions would not appear. The centrality of Earth provided by the Sloan Digital Survey is thus consistent with the quantization of redshift values that have been accumulated for four decades prior. Once again, the "Copernican Principle" is violated.

The importance of the foregoing evidence regarding the periodic distribution of galaxies is brought out when contrasted to its opposite. As Harold Slusher puts it:

> If the distribution of galaxies is homogeneous, then doubling the distance should increase the galaxy count eightfold; tripling it should produce a galaxy count 27 times as large. Actual counts of galaxies show a rate substantially less than this. If allowed to stand without correction, this feature of the galaxy counts implies a thinning out with distance in all directions, *and that we are at the very center of the highest concentration of matter in the universe....This would argue that we are at the center of the universe*. When galaxy counts are adjusted for dimming effects, it appears that the number of galaxies per unit volume of space increases with distance. *From this we still appear to be at the center of the universe*, but now it coincides with the point of least concentration of matter.[646]

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[645] Cited at the sdss.org website. A picture of the latest galaxy-mapping showing Earth in the center of over 65,000 galaxies appears at: www.sdss.org/news/ releases/galaxy_zoom.jpg

[646] Harold S. Slusher, *The Origin of the Universe: An Examination of the Big Bang and Steady State Cosmologies*, El Cajon, CA, Institute for Creation Research, 1980, pp. 12-13, emphasis added.

2005 Sloan Digital Sky Survey & 2dF Galaxy Redshift Survey
Periodicities at Delta z = 0.0246

.1784
.1538
.1292
.1046
.0800
.0554
.0308

647

SDSS Semi-circle rings based on
heaviest 2D clumping of galaxies

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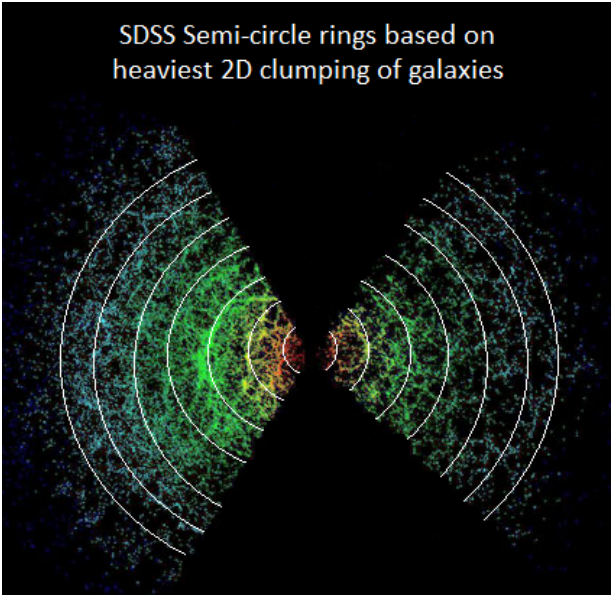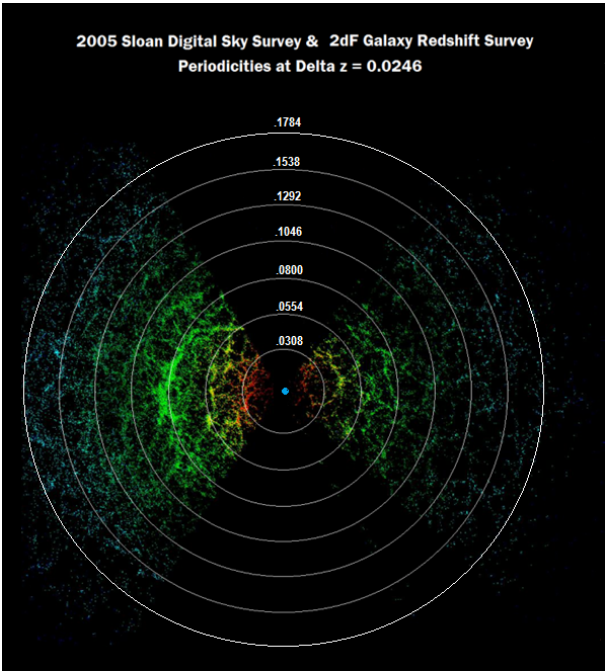
647 SDSS image courtesy of NASA. Ring alignments and spacing calculated by Robert Sungenis. Pictorial by BUF Compagnie for Stellar Motion Pictures, LLC.
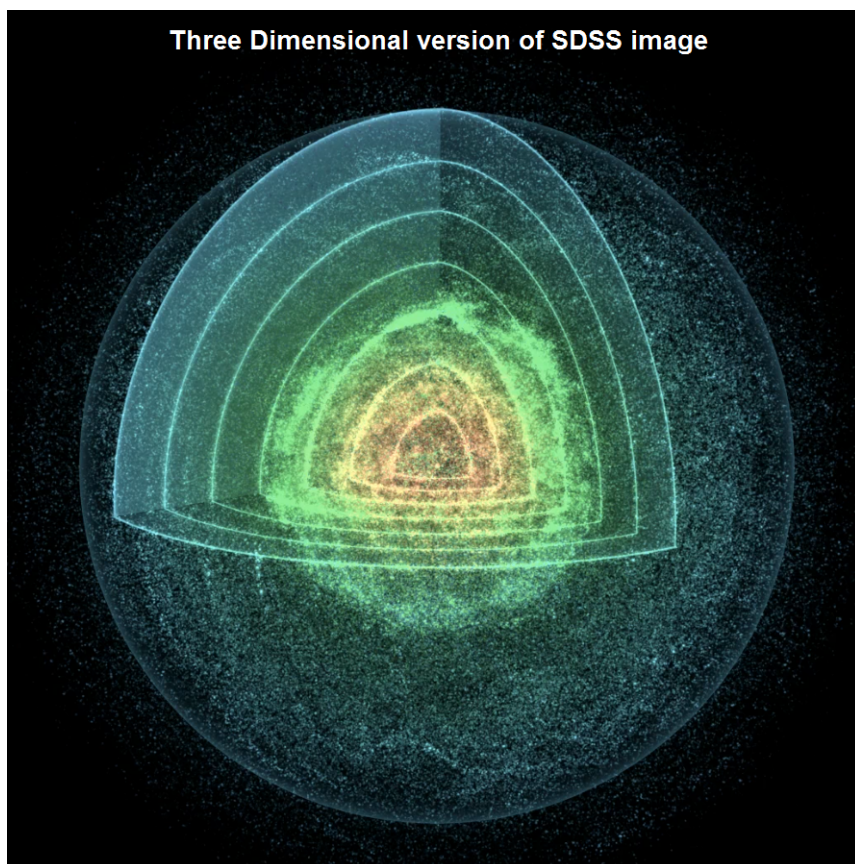
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The war between Big Bang theorists and their opponents wages even more fiercely as time goes on. As of this writing, in a recent article titled "No Quantized Redshifts," *Sky and Telescope* noted that a 2002 study conducted by Edward Hawkins and his colleagues at the University of Nottingham, England, revealed contrary evidence:

> …Hawkins…recently sifted through the massive new 2dF [Two Degree Field] redshift surveys of galaxies and quasars to test this idea. These surveys provided "by far the largest and most homogeneous sample for such a study," writes Hawkins in the October 11th *Monthly Notices* of the Royal Astronomical

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648 Pictorial by BUF Compagnie for Stellar Motion Pictures, LLC.

Society….Among 1,647 galaxy-quasar pairs, no sign of any quantized redshifts appears.[649]

This study was specifically designed to test Arp's theory that various galaxies and quasars occupy the same vicinity; the former producing the latter when material from the galaxy is ejected. If Arp is right, then obviously quasars are not at "cosmological" distances from Earth, that is, they are not at the farthest reaches of the universe. In addition, Arp holds that the redshifts of these galaxy-pairs are quantized, that is, they appear in regular intervals and thus are not representative of a homogeneous universe. Both of these (*i.e.*, pairing and quantization) would be impossible to explain from a Big Bang perspective.

Out of 250,000 galaxies and 30,000 quasars, the Hawkins team limited their study to 1647 quasars, the quasar pairs for the purpose of "quality control." Of these pairs they state:

No periodicity leaps off the page, but since the effect is likely to be quite subtle, one would not necessarily expect to be able to pick it out from the raw data, so it is important to carry out a rigorous statistical analysis.[650]

This, of course, opens the door for disagreements over the statistical data. At this point, opposing sides point the finger at each other. The Hawkins team determines that: "one can manipulate the data in order to specify ones own more optimal window – a procedure that statisticians whimsically refer to as 'carpentry," and they conclude that "…the previous detection of a periodic signal arose from the combination of noise and the effects of the window [statistical] function."[651]

Followers of the Arp team see it quite differently. Geoffrey Burbidge asserts that the entire work of the Hawkins team "is a real piece of dishonesty," since Burbidge's colleague, William Napier, had already pointed out a serious statistical flaw in Hawkins' analysis before he published his paper. Napier subsequently submitted a rebuttal to the Royal Astronomical Society alerting the society to Hawkins' flaw, as well as citing a recent Hubble photograph showing that one of the pairs studied by Hawkins had a luminous filament that physically connected the galaxy to

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[649] Alan M. MacRobert, *Sky and Telescope*, December 2002, p. 28.

[650] E. Hawkins, S. J. Maddox and M. R. Merrifield, "No periodicities in 2dF Redshift Survey data," *Monthly Notices of the Royal Astronomical Society*, Vol. 336, Is. 1, October 2002, p. L15.

[651] *Ibid*., p. L16, L17.

the quasar![652] Although Hawkins asserts that he and his team "attempted to carry out this analysis without prejudice," Burbidge concludes that the resistance of Hawkins and other Big Bang theorists is due to the "sociological problem associated with the need to believe" that redshifts are related to distances.[653]

Burbidge has a lot on his side. As of January 2005, his research led to the discovery of a quasar situated almost at the very center of a spiral galaxy, NCG 7319.[654] Obviously, this phenomenon cannot be dismissed by "statistical analysis," unless opponents attempt to argue that the galaxy's core is transparent and allows us to see the quasar as if one is looking through a peephole, an argument that no one seems willing to adopt.

Other studies continued the controversy. In 2005, the team of Su Min Tang and Shuang Nan Zhang state they "find there is no evidence for a periodicity at the predicted frequency in $log(1 + z)$, or at any other frequency."[655] In early 2006, the team of K. Bajan, P. Flin, W. Godlowski

[652] William Napier and Geoffrey Burbidge, *Monthly Notices of the Royal Astronomical Society*, 2003, 342, pp. 601-604.

[653] Govert Schilling, "New results reawaken quasar distance dispute," *Science*, October 11, 2002. Schilling adds that a recent Hubble photograph produced by Space Telescope Science Institute of the galaxy-quasar pair NGC 4319 (at $z =$ 0.006) and Markarian 205 (at $z = 0.070$), respectively, showed no luminous bridge connecting the two thus implying that the bridge didn't exist, contrary to Arp's assertion. Arp, accusing STSI of "deliberately misleading the public," obtained an enhanced photo of the Hubble photograph that clearly shows a bridge. Confirming Arp's contentions, a recent report showed that galaxy NGC 7603 and its companion quasar each had very different redshifts but were physically linked by a luminous bridge. The authors concluded it was "the most impressive case of a system of anomalous redshifts discovered so far" (M. Lopez-Corredoira and C. Gutierrez, *Astronomy and Astrophysics*, 2002, 390, pp. L15-18). The higher redshift for the quasar, Arp maintains, is due to it being newly formed from the much older galaxy. The same is true for galaxies NGC2775 and NGC2777, which, contrary to conventional wisdom proposing they were merging, is an example, according to Arp, that the former produced the latter, which was confirmed by the fact that the latter had no metal in its spectral lines as well as a much higher redshift than the former. In addition, the galaxies were connected by an "umbilical cord of neutral hydrogen" (Halton Arp, *Seeing Red*, Montreal, Apeiron, 1998, p. 103). Big Bang theorists have proposed the higher redshifts of the quasars are due to gravitational lensing, but Arp retorts that lensing cannot be the cause since the quasar aligns itself along the minor, not major, axis of the host galaxy. Arp had the support of Fred Hoyle in the 1981book *The Quasar Controversy Resolved* and in 2000 with *A Different Approach to Cosmology*.

[654] *Astrophysical Journal*, February 10, 2005.

[655] "Critical Examinations of QSO Redshift Periodicities and Associations with Galaxies in Sloan Digital Sky Survey Data," Submitted June 16, 2005, p. 1.

and V. N. Pervushin are not convinced. On the one hand the authors admit: "We conclude that galaxy redshift periodization is an effect which can really exist," on the other hand they reveal their link with E. Hawkins: "The subject of redshift periodization is not very popular, sometimes even regarded as scientifically suspicious. However, we share the opinion expressed by Hawkins *et al*. that all these effects should be carefully checked."[656] Bajan shows the various ways the data can be analyzed. Their chief complaint against Tifft, *et al*, is they didn't use a big enough sample. Yet even when Bajan examines a bigger sample, he admits that periodization, although not as prominent as Tifft believed, is still a legitimate interpretation of the data: "We applied the power spectrum analysis using the Hann function as a weighting together with the jackknife error estimation. We perform the detailed analysis of this approach. The distribution of galaxy redshift seems to be nonrandom."[657] "Nonrandom," of course, means that it has a definitive distribution pattern. Bajan then says: "For galactocentric reduction at the 2σ confidence level the peaks around 73 and 24 km/sec are observed." But this is similar to the peak levels Tifft observed as late as 1996, which Bajan admits is "72 and 36 km/sec." Bajan adds: "…the probability that they are coming from nonrandom distribution is 95%," which speaks very highly of Tifft's quantized distribution patterns. In the end, Bajan concludes:

> The previous result, based on the selected samples, showed the existence of the periodicity in the galaxy redshift distribution at a very high significance level. We found that at the 2σ significance level some effect was observed. We think that the solution of this curious phenomenon can be solved in the near future by using large database…[658]

Interestingly enough, another study performed in 2006 utilized the largest database ever gathered. In this particular study, M. B. Bell and D. McDiarmid state that even Tang and Zhang "found that there is a significant periodicity with period near 0.7 in redshift in the full sample containing over 46,000 redshifts."[659] Bell and McDiarmid show that their independent results confirm Arp's and Tifft's periodicity in six significant

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[656] "On the Investigations of Galaxy Redshift Periodicity," April 2006, pp. 16-17.
[657] *Ibid*., p. 22.
[658] *Ibid*., p. 23.
[659] "Six Peaks Visible in the Redshift Distribution of 46,400 SDSS Quasars Agree with the Preferred Redshifts Predicted by the Decreasing Intrinsic Redshift Model," Submitted , March 7, 2006, p. 4.

places. They also show that at higher levels, Tang and Zhang's data analysis was faulty. They write:

> There is no clear evidence for a power peak near a frequency of 1.6 in the lower half of the redshift data….Since Tang and Zhang (2005) made no effort to remove the overwhelming effects of the strong low-frequency components when they examined the lower half of the redshift data, they would not have been able to detect this feature. But this should not be surprising since these authors also failed to detect a significant power peak near $\Delta z = 0.62$ in the high redshift sample, even though one is clearly visible"[660]

They find fault with Tang and Zhang in another area:

> Also, Tang and Zhang (2005) report no evidence for a periodicity in the quasar redshift distribution obtained in the 2QZ survey….However, if the peaks are real, their absence in the 2QZ distribution must still be explained. Tang and Zhang (2005) explained this result by arguing that the 2QZ sample is more complete, and therefore free of selection effects. But this is a meaningless argument.[661]

In another place, Bell and McDiarmid say that Tang and Zhang's data could easily be interpreted to support the very theory of Arp and Burbidge they are trying to debunk. They write:

> The Tang and Zhang (2005) analysis could thus have missed, or misidentified, many of the parent galaxies, which could explain why the pairs they found differed little from what would be expected for a random distribution….Although Tang and Zhang (2005) concluded that QSOs are not ejected from active galaxies, it seems unlikely that the pair-finding technique they used could lead to a conclusion whose significance can approach that already obtained by others (Arp, the Burbidges, *etc*.) whose parent galaxy claims have been simultaneously backed up by other independent observations"[662] (p. 10).

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[660] *Ibid*. p. 6.
[661] *Ibid*., p. 9.
[662] *Ibid*., p. 10.

Here we have examined data sample containing (a) the entire SDSS redshift distribution with 46,400 sources….All three showed evidence for the period predicted by equation 1. It is also worth noting that a fourth source sample containing 574 quasar redshifts used by Karlsson (1971, 1977) was examined previously (Bell 2002c; Bell and Comeau 2003b) and it was found that the peaks in that distribution also correlated well with the preferred redshifts predicted by equation 1.[663]

In other words, this massive study of 46,400 quasars confirmed, not denied, the previous studies done by Arp, Napier, Tifft, Karlsson, *et al*. Not only do Bell and McDiarmid demote the Tang & Zhang study to a mass of anomalies, they further state that Tang & Zhang cannot claim, as they did in their 2005 paper, that the DIR pattern of redshifts is the result of "selection effects" rather than real effects. They write: "As a result it is very unlikely that a common selection effect could have been involved. This may rule out selection effects as the common origin of the peaks in the SDSS redshift distribution and the preferred values predicted by equation 1."[664]   In 2007 the team of Donald P. Schneider and 25 other scientists produced the "Fifth Data Release of the Sloan Digital Sky Survey Quasar Catalog IV," which examined 77,429 objects, an increase of 31,009 since the previous edition of the survey. In contrast to Bell and McDiarmid, Schneider states:

This structure in the catalog redshift histogram can be understood by careful modeling of the selection effects…the DR5 sample reveals no structure in the redshift distribution after selection effects have been included; this is in contrast to the reported redshift structure found in the SDSS quasar survey by Bell and McDiarmid.[665]

These results, however, were contested by J. G. Hartnett in 2008. Hartnett, "obtained 80,398 quasar data from the SDSS BestDR6 database" and notes that it was

…not filtered as was the DR5 quasar catalog described in Schneider, *et al*. 2007….The difference between the two data sets is essentially that there are many low redshift objects ($z <$

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[663] *Ibid*., p. 10.

[664] *Ibid*., p. 10.

[665] Donald P. Schneider, "The Sloan Digital Sky Survey Quasar Catalog. IV. Firth Data Release," *The Astronomical Journal*, 134:102-117, July 2007, p. 110.

0.4) not eliminated from the DR6 catalog data, which were removed in the DR5 catalog.[666]

Hartnett then concludes that his results

> …generally agree with the 6 peaks observed by Bell & McDiarmid 2006….Bell & McDiarmid 2006 analyzed the data from the third data release of the Sloan Digital Sky Survey and found a significant peak in the power spectrum near $\Delta z = 0.62$….In this paper I analyze the SDSS sixth quasar data release using a Fourier transform of their redshift abundances as a function of redshift. I show, regardless of any interpretation of the meaning of redshifts, and aside from any cosmological assumptions, that there is a significant periodicity in the SDSS quasar redshift abundance data.[667]
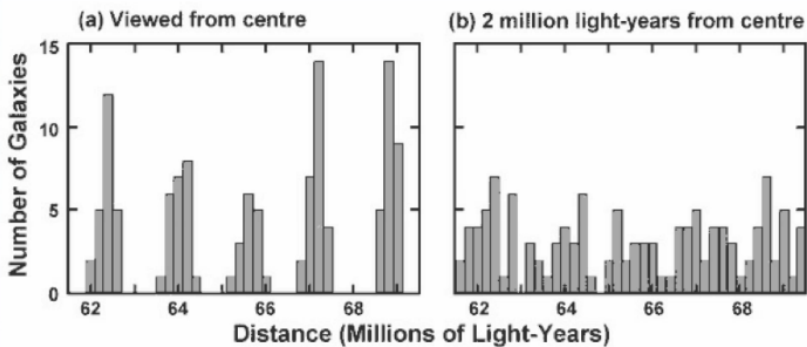
Concentric galaxies disappear unless observed from within 0.3% of the center of the universe[668]

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[666] J. G. Hartnett, "Redshift periodicity in quasar number counts from Sloan Digital Sky Survey," University of Western Australia, February 8, 2008, p. 2.

[667] *Ibid*., pp. 1-2. Harnett adds this amazing fact: "The analysis finds that there are preferred redshifts separated by intervals of $\Delta z = 0.258, 0.312, 0.44, 0.63$, and 1.1" and "The redshift periods Δz of Table I correspond to approximately $0.062n$ where $n = 4, 5, 7, 10$, and 20, within the standard errors from their Gaussian fits" (*ibid*. p. 3).

[668] Graph on left shows view of galaxies from a common center; graph on right show view of galaxies from two million light years from common center. This means that Earth's distance from the common center is minimal.

As one cosmologist put it:

> The probability P that we would be located in such a unique position in the cosmos by chance would be the ratio of the volumes involved,

$$P = \frac{4/3\pi a^3}{4/3\pi R^3} < \left(\frac{\delta r}{R}\right)^3$$

> where R is the minimum radius of the cosmos estimated by observation, say about 20 billion light years. Using δr = 1.6 million light years gives a value for P less than 5.12×10^{-13}. That is, the probability of our galaxy being so close to the centre of the cosmos by accident is less than one out of a trillion.[669]

In a 2010 paper by Hirano and Komiya, similar findings are clear:

> A widespread idea in cosmology is that the universe is homogeneous and isotropic above a certain scale. This hypothesis, usually called the cosmological principle…is thought to be a generalization of the Copernican principle that "the Earth is not in a central, specially favored position." The assumption is that any observer at any place at the same epoch would see essentially the same picture of the large scale distribution of galaxies in the universe.
>
> However, according to a Fourier analysis by Hartnett & Hirano, the galaxy number count N from redshift z data ($N - z$ relation) indicates that galaxies have preferred periodic redshift spacings of Δz = 0.0102, 0.0246, and 0.0448 in the Sloan Digital Sky Survey (SDSS), with very similar results from the 2dF Galaxy Redshift Survey (2dF GRS). These redshift spacings have been confirmed by mass density fluctuations, the power spectrum $P(z)$, and N_{pairs} calculations. The combined results from both surveys give characteristic periods of 31.7 ± 1.8 h^{-1} Mpc, 73.4 ± 5.8 h^{-1} Mpc, and 127 ± 21 h^{-1} Mpc. That is, the redshift space for relatively high galaxy number count and other that exhibits comparatively low number counts appear alternately.

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[669] "Our galaxy is the centre of the universe, 'quantized' redshifts show," D. Russell Humphreys, *Journal of Creation* 16(2):95–104, August 2002.

127 h^{-1} Mpc is the same scale as that found in a pencil-beam survey of field galaxies. Furthermore, the periodicity as a function of z in the distribution of QSO spectra has also been reported.

A natural interpretation is that concentric spherical shells of higher galaxy number densities surround us, with their individual centers situated at our location…it has been demonstrated, from many numerical simulations using the Einstein–de Sitter and ΛCDM models, that the probability of getting such a periodic spatial structure from clustering and cosmic web filaments is less than 10^{-3}.[670]

A 2011 study of the SDSS DR7 data by a Russian team confirms the prior findings of periodicity and inhomogeneity:

"The radial density method indicates inhomogeneities in the spatial distribution of galaxies with a scale length of 200 Mpc/h and a density contrast of two, confirming the recently established violation of statistical homogeneity in deep samples of SDSS galaxies."[671]

In the end, regardless of the interpretation of the galaxy and quasar data in favor of Big Bang cosmology or Steady State cosmology, there remains a non-Copernican periodicity that cannot be denied. In regard to the geocentric question, the battle between the Big Bang theorists and Halton Arp leaves geocentrism, at worst, in a neutral position and, at best, drawing support from both sides of the aisle. On the one hand, Big Bang theorists are more or less caught between the proverbial rock and a hard place since, as Arp points out, they have created the same "Copernican dilemma" that we saw earlier with the evidence from gamma-ray bursters: "For supposed recession velocities of quasars, to measure equal steps in all directions in the sky means *we are at the center of a series of explosions. This is an anti-Copernican embarrassment*."[672] In other words, regardless whether quasars are at cosmological distances, the concept that all the quasars are moving away from us (as measured by the redshift-distance

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[670] "Observational Tests for Oscillating Expansion Rate of the Universe," Koichi Hirano and Zen Komiya, October 28, 2010, p. 1, arXiv:1008.4456v2.
[671] "The Non-Uniform Distribution of Galaxies from Daa of the SDSS DR7 Survey," A. O. Verevkin, *et al.*, Sobolev Astronomical Institute, St. Petersburg University, Russia, Astronomy Reports (2011) Vol. 55, No. 4, p. 340.
[672] *Seeing Red: Redshifts, Cosmology and Academic Science*, p. 195.

relation) means that Earth is precisely in the center of the dispersion; or, the established periodicity of quasars (without radial velocity) also means that Earth is in the center of the distribution. On the other hand, Arp has created his own Copernican dilemma. First, as Varshni concluded 30 years ago, quantized redshifts show irrefutable evidence of Earth's centrality. Second, Arp's siding with redshift as an indication of age rather than distance evaporates the need for a huge universe. In fact, it is possible given Arp's calculations that we would have a universe only a little larger than Ptolemy's, and certainly nothing big enough to accommodate 13.7 billion years of evolution. As James Hogan says, "No wonder the Establishment puts Arp in the same league as the medieval Church did Giordano Bruno."[673] In the end, whether redshift is cosmological or intrinsic, today's scientists have little escape from geocentrism.

Concentric Circles in WMAP Anisotropies

In a 2010 paper by Roger Penrose and V. G. Gurzadyun, the authors point out there is strong evidence of concentric circles of WMAP anisotropies centered on the Earth. They are the first to see such a pattern. Their abstract speaks of…
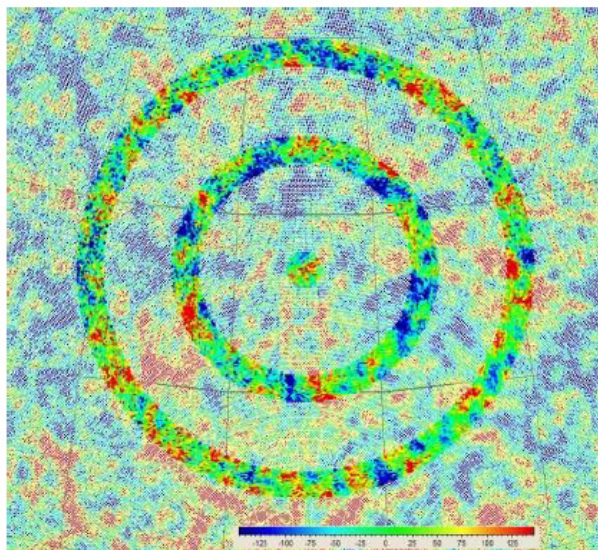
 …families of concentric circles over which the temperature variance is anomalously low, the center of each such family

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[673] James P. Hogan, *Kicking the Sacred Cow*, 2004, p.105.

representing the point…at which the cluster converges. These centers appear as fairly randomly distributed fixed points in our CMB sky. The analysis of Wilkinson Microwave Background Probe's (WMAP) cosmic microwave background 7-year maps does indeed reveal such concentric circles, of up to 6σ significance. This is confirmed when the same analysis is applied to BoomeranG98 data, eliminating the possibility of an instrumental cause for the effects.[674]

Our interest in this finding, of course, is not the same as Penrose and Gurzadyan's, for they seek to develop a new theory for the origin of the Big Bang, namely, Conformal Cyclic Cosmology (CCC), which is "an aeon preceding our Big Bang." Our interest, once again, is simply to point out that the cosmos is giving yet another indication that everything is structured around the Earth in concentric circles, putting the Earth in the most special place in the universe. Thanks to Penrose, this special place has now reached the 6σ confidence level.

Geocentric Spectroscopic Binaries and Globular Clusters

Spectral Lines of Binary Star Motion
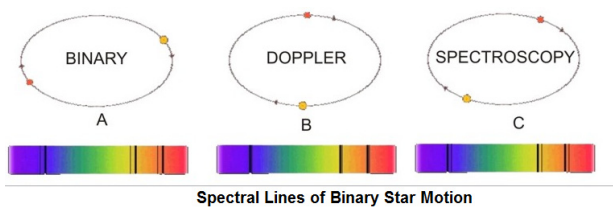
Recent data have shown that the periastron points of over one thousand spectroscopic binary stars are located farther away from Earth than their apastron points.[675] In astrophysical terms this means that the orbital axis of binaries are situated with respect to the Earth. Since binary stars are seen over the 360 degrees of visual space, this means that the axis of each binary system is pointing toward the Earth as if the Earth were the center of a giant merry-go-round and the axes were arrows. Without admitting to any possibility that the binaries show Earth is in the center of

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[674] "Concentric circles in WMAP data may provide evidence of violent pre-Big-Bang activity," V. G. Gurzadyan and Roger Penrose, 2010, p. 1, Nov. 10, 2010 (http://arxiv.org/abs/1011.3706).

[675] The periastron is the point at which the two stars are closest to each other. The apastron is the point that the stars are farthest away from each other.

the universe, astronomers instead prefer to attach innocuous names to such phenomena, this particular one being called the "Barr effect," after the astronomer J. M. Barr. Barr's original study found that of the 30 spectroscopic binaries he analyzed, 26 had longitudes of periastron between 0 and 180 degrees, which means that they were oriented toward Earth as their center.

In this light, it is interesting to see how even dissident physicists try to escape the implications of the "Barr effect" in dictating an Earth-centered universe. Dewey B. Larson, for example, is an anti-Big Bang advocate who has made quite a name for himself in science by denying the existence of black holes, as well as pointing out the anomalies of rotating galaxies and globular clusters, but he suddenly finds himself trying to downplay the observational evidence clearly demonstrated by the Barr effect. He writes:

> Until the time of Copernicus, virtually everyone believed that the Earth was the center of the physical universe. Although we often blame Aristotle and St. Thomas Aquinas for perpetuating this belief, it was a natural and apparently self-evident deduction from simple observations. This, more than any one person's authority, probably accounted for the belief in the central position of the Earth being elevated to dogma. Copernicus began to free us from the false notion, and now we have almost adopted an opposing dogma. Instead of being content to believe that the Earth is not in a central position, we often speak as if we believe that it cannot be. Confronted with a result like Barr's therefore, astronomers tend either to be skeptical about it, or to look for some systematic error in the observations that will account for it. In the present instance, these instincts are probably sound; it is more unlikely that some preferred direction exists for the orientation of the major axes of binary orbits with respect to our line of sight from Earth.[676]

As we saw earlier with Jonathan Katz and the evidence from gamma-ray bursts, we find it interesting that Dewey has absolutely no hesitation in

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[676] Dewey B. Larson, "Globular Clusters," *The Universe in Motion*, Oregon, 1984, pp. 33, 37. In 1979, the "Barr effect" was verified in measurements of over 1,000 spectroscopic binaries, as reported by astronomer M. G. Fracastoro (A. H. Batten, "The Barr Effect," *Journal of the Royal Astronomical Society of Canada*, 77:95, 1983). Some astronomers have attempted to dismiss the Barr effect by claiming that hot gases are distorting the spectroscope of the binaries, but others retort that no one has ever proved that the spectra of hot gas streams are combined with the spectra of stars to produce a Barr effect.

associating the phenomenon of Earth-oriented binary stars with the demise of Copernican cosmology. But, like Katz, he won't allow his mind to agree with what his eyes see. Rather, he allows himself the breathing room of looking for "some systematic error in the observations" so that he isn't required to make the evidence part of his scientific psyche. In any case, at least the evidence has made Dewey switch from the "cannot" position to the "is not" position. As for St. Thomas Aquinas, he indeed was a geocentrist, and it was based on his belief in divine revelation. Thomas writes:

> The Earth stands in relation to the heaven as the center of a circle to its circumference. But as one center may have many circumferences, so, though there is but one Earth, there may be many heavens.[677]

Lastly, we have evidence from globular clusters, which are conglomerations of thousands of loosely fitting stars. They form a spherical distribution around our nearest stars, and effectively, around the Earth. Dewey Larson writes:

> The distribution of [globular] clusters around the Galaxy is nearly spherical, and there is no evidence that the cluster system participates to any substantial degree in galactic rotation….We see the globular clusters as a roughly spherical halo….The cluster concentration gradually decreases until it reaches the cluster density of intergalactic space…[678]

Astronomers Victor Clube and William Napier found the same evidence, showing that globular clusters, while being independent of the galaxy in that they do not participate in the rotation of the same, show a radial dispersion from the center of the galaxy and conclude that "It is extremely difficult to explain these observations by any other kind of model."[679] In other words, all the evidence leads to a geocentric universe.

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[677] *Summa Theologica*, "Treatise on the Work of the Six Days," Question 68, Article 4. By "many heavens" Thomas is referring to the three ways in which Scripture uses the word "heaven" (the Earth's atmosphere; the starry cosmos; and the third heaven as God's domain above the firmament).
[678] Dewey Larson, "Globular Clusters," *The Universe of Motion*, pp. 33, 37.
[679] Victor Clube, "Do We Need a Revolution in Astronomy?" *New Scientist*, 80:284, 1978. Victor Clube and William Napier, "Universe to Galaxy: The Cosmic Framework," *The Cosmic Serpent*, New York, 1982, p. 41.

Quantized Planetary Orbits

That the precise and characteristic periodicity of gamma-rays, quasars, BL Lacs, X-ray clusters, and galaxies are not merely some fluke of nature is supported by the fact that the orbits of the planets in our own region of the sky use the same ratios. One of Arp's students, Jess Artem, initiated this discovery when he showed in 1990 that the Titius-Bode Law of planetary distances matches the preferred redshift of quasars, since both are based on the ratio 1:1.23.[680] Arp himself discovered that, after obtaining the most modern estimates of planetary masses, their ratios fell in the 1.23 factor.[681] The chance of this occurring by accident is less then 1 in 1300.[682]

This unique ratio also extends to the micro-world, since it has been shown that the electron orbits in the Bohr model of the atom are based on

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[680] That is, $(1 + z_n)/(1 + z_o) = (1.23)^n$. The Titius-Bode law, which is based on a sequence that varies as 2^n, works well until Neptune and Pluto are added. Titius-Bode was then modified by Blagg-Richarson with a value of 1.7275^n, and with corrections. In the geocentric version of the Titius-Bode law, the sun and Earth merely switch places. O. Neto in Brazil; Agnese and Festa in Italy; L. Nottale in France; and A. and J. Rubčić in Croatia found that the proportional distances of the planets from the sun matched the distances of shells in the Bohr atom, using the common value of 144 km/sec (found among quasar redshifts) divided by 3, 4, 5, 6, 11, 15, 21, 26, 30, respectively.

[681] Although Arp used 1.2282 and calculated from the smallest planet to the largest, we will use 1.23 and use Earth as the control mass from which to compare the eight planets. Masses are in 10^{24} kilograms. "Actual" masses are the best estimates of the planets based on Newton's laws, but are, nevertheless, only approximate values, due to the complexity of planetary orbits, the sun's minimal angular momentum, the presence of moons, rings, and other factors among the planets. From a geocentric perspective, with Earth as the control mass at 5.9742×10^{24} kg, then:

-Mass of Earth × 1.23 = mass of Venus (4.8570) (actual: 4.8690)
-Mass of Earth × 1.23 (11×) = mass of Mars (0.6128) (actual: 0.64191)
-Mass of Earth × 1.23 (14×) = mass of Mercury (0.3293) (actual: 0.33022)
-Mass of Earth × 1.23 (28×) = mass of Pluto (0.018) (actual: 0.015)
-Mass of Earth × 1.23 × 13 = mass of Uranus (88.11) (actual 86.625)
-Mass of Earth × 1.23 × 14 = mass of Neptune (108.38) (actual 102.78)
-Mass of Earth × 1.23 × 22 = mass of Saturn (567.79) (actual 568.50)
-Mass of Earth × 1.23 × 28 = mass of Jupiter (1966.17) (actual 1898.80)
-Mass of Earth × 1.23 × 61 = mass of Sun (1.82×10^{30}) (actual 1.989×10^{30})
-Mass of Earth/Planets (2.668×10^{27}) × 1.23 × 32 = mass of Sun (2.00×10^{30})

[682] *Apeiron*, April 1995, p. 42.

the factor of 1.23. Interestingly enough, in 1916 Arnold Sommerfeld modified Bohr's circular orbits to show that electrons were more stable in elliptical orbits, since they could move inwardly and outwardly without radiating or absorbing energy. Sommerfeld's work also led to the discovery that electrons spin while in orbit.[683] These discoveries, of course, have an uncanny resemblance to the orbits of the planets, as well as the spin some of them possess.

If Earth is in the center of the universe, then not only is our planetary system unique in the sense of position, but evidence shows it is also unique insofar as its contents. Astronomers reporting in the prestigious *Monthly Notices of the Royal Astronomical Society* state: "in the past 10 years, over 100 extrasolar systems have been discovered from the wobble in their host stars, caused by the motion of the planets themselves." The BBC reported: "none of them seem to resemble our Solar System very much. In fact, these exoplanets have several important attributes that are entirely at odds with the Solar System as we know it." The lead researcher, Dr. Martin Beer of the University of Leicester's theoretical astrophysics group stated: "But existing data suggests that the planets in the Solar System are truly different from other planets," concluding that the search for Earth-like planets around other stars may be in vain. Most exoplanets are gargantuan and gaseous masses like Jupiter; are very close to their stars; and follow highly eccentric or elliptical orbits. Planets similar to Earth are virtually absent. Beer's concludes: "The existing data leaves open the possibility that [our own planetary system] is quite unique compared to [others]…"[684]

The Last Copernican Frontier: The Multiverse

What is a multiverse? It is a theory positing that although our universe looks planned, fine-tuned and with an Earth that is special, it is only one of an infinite variety of universes where the exact opposite is true and the laws of physics are completely different. Essentially, this is modern science's way of restoring chance in a world that seems to be running by design. According to Stephen Hawking:

> Were it not for a series of startling coincidences in the precise details of physical law, it seems, humans and similar life-forms would never have come into being.…What can we make of these

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[683] J. Mehra and H. Rechenberg, *The Historical Development of Quantum Theory*, Vol. 1, Part 1: "The Quantum Theory of Planck, Einstein, Bohr, and Sommerfeld: Its Foundation and the Rise of Its Difficulties" (1900-1925), 1982.
[684] Jacqueline Ali, British Broadcasting Company News, 2004/08/06.

coincidences?...It cannot be so easily explained, and has far deeper physical and philosophical implications. Our universe and its laws appear to have a design that both is tailor-made to support us and, if we are to exist, leaves little room for alteration. That is not easily explained, and raises the natural question of why it is that way.

…for it means that our cosmic habitat – now the entire observable universe – is only one of many….That means that in the same way that the environmental coincidences of our solar system were rendered unremarkable by the realization that billions of such systems exist, the fine-tunings in the laws of nature can be explained by the existence of multiple universes….the multiverse concept can explain the fine-tuning of physical law without the need for a benevolent creator who made the universe for our benefit.[685]

An article in *Discover* said something similar: "Science's Alternative to an Intelligent Creator: the Multiverse Theory" with the subtitle: "Our universe is perfectly tailored for life. That may be the work of God or the result of our universe being one of many.[686]

How "tailored for life" is our universe? Tim Folger of *Discover* writes,

"Tweak the laws of physics in just about any way and—in our universe, anyway—life as we know it would not exist….Atoms consist of protons, neutrons, and electrons. If those protons were just 0.2 percent more massive than they actually are, they would be unstable and would decay into simpler particles. Atoms wouldn't exist; neither would we."[687]

Folger quotes Andre Linde as saying,

"We have a lot of really, really strange coincidences, and all of these coincidences are such that they make life possible….You might say 'Maybe this is some mysterious coincidence. Maybe

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[685] *The Grand Design*, 2010, pp. 161-164.
[686] "Sciene's Alternative to an Intelligent Creator: the Multiverse Theory," by Tim Folger, *Discover*, Nov. 10, 2008.
[687] *Ibid.*, with Folger adding: "A beef-up gravitational force would compress stars more tightly, making them smaller, hotter and denser…sputtering out long before life had a chance to evolve" with Linde adding: "And if we double the mass of the electron, life as we know it will disappear. If we change the strength of the interaction between protons and electrons, life will disappear."

God created the universe for our benefit.' Well, I don't know about God, but the universe itself might reproduce itself eternally in all its possible manifestations.

Michio Kaku: "The multiverse...an infinite number of universes each with a different law of physics."[688]

Folger concludes:

"Call it a fluke, a mystery, a miracle. Or call it the biggest problem in physics. Short of invoking a benevolent creator, many physicists see only one possible explanation: Our universe

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[688] Michio Kaku, interviewed on "Parallel Universes" on the BBC February 14, 2002. http://www.bbc.co.uk/ science/horizon/2001/parallelunitrans.shtml. Kaku continues: "Big Bangs probably take place all the time. Our Universe co-exists with other membranes, other universes which are also in the process of expansion. Our Universe could be just one bubble floating in an ocean of other bubbles." One of the best scientific analyses of the multiverse concept both pro and con is Paul Davies' "Multiverse Cosmological Models." Max Tegmark gives a thoroughly positive position in "Parallel Universes," A Scientific American Special Report, 2011, which is in turn critiqued by George F. R. Ellis in "Does the Multiverse Really Exist?," *Scientific American*, August 2011.

may be but one of perhaps infinitely many universes in an inconceivably vast multiverse…. Advocates argue that, like it or not, the multiverse may well be the only viable nonreligious explanation for what is often called the 'fine-tuning problem'— the baffling observation that the laws of the universe seem custom-tailored to favor the emergence of life….Critics see [it] as a step backward, a return to a human-centered way of looking at the universe that Copernicus discredited five centuries ago."

Folger then quotes physicist Bernard Carr saying, "If there is only one universe you might have to have a fine-tuner. If you don't want God, you'd better have a multiverse."[689] Francis Collins, director of NIH, put it thus:

To get our universe, with all of its potential for complexities or any kind of potential for any kind of life-form, everything has to be precisely defined on this knife edge of improbability….You have to see the hands of a creator who set the parameters to be just so because the creator was interested in something a little more complicated than random particles.

To which MIT physicist Alan Lightman replied:

Intelligent design, however, is an answer to fine-tuning that does not appeal to most scientists. The multiverse offers another explanation. If there are countless different universes with different properties – for example, some with nuclear forces much stronger than in our universe and some with nuclear forces much weaker – then some of those universes will allow the emergence of life and some will not….From the huge range of possible universes predicted by the theories, the fraction of universes with life is undoubtedly small, But that doesn't matter. We live in one of the universes that permits life because otherwise we wouldn't be here to ask the question….The multiverse offers an explanation to the fine-tuning conundrum that does not require the presence of a Designer. As Steven Weinberg says 'Over many centuries science has weakened the

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[689] In a conversation between Bernard Carr and George F. R. Ellis in the documentary *The Principle*, Carr asks Ellis: "Well, George, what do you do with all the fine-tuning. Is that tantamount to saying there is a Fine-Tuner?" to which Ellis replied, "Yes, I would say that is tantamount to saying there is a Fine-Tuner."

hold of religion, not by disproving the existence of God but by invalidating arguments for God based on what we observe in the natural world. The multiverse idea offers an explanation of why we find ourselves in a universe favorable to life that does not rely on the benevolence of a creator, and so if correct will leave still less support for religion.[690]

Carr's and Lightman's statements speak for all of modern man. As clear as it could possibly be, here we have an instance in which God, the Fine-Tuner, is staring man in the face but man is intent, as St. Paul says, to "suppress the truth…because that which may be known about God is evident within them; for God made it evident to them. For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse."[691] Despite the fact that there is no hard scientific evidence for the Multiverse, cosmologists such as Carr, Lightman and the rest keep promoting it because the alternative is a special Earth with a special place in one universe – the one that could not exist unless Someone cared for it like a mother bird cares for the chick in her nest.

How does the Multiverse seek to eliminate God? Because when one combines the leading cosmological and quantum theories, "the stock room of universes overflows" where a "diverse collection of possible universes become actual universes, brought to life by one big bang after another," says Brian Greene, a popular television cosmologist.[692] The "fine-tuned" existence we have is thus deduced as one that came into existence by time and chance, just as all the other universes did or will. As Greene puts it, "our universe is then virtually guaranteed to be among them. And because of the special features necessary for our form of life, that's the universe we inhabit." Or as George Ellis puts it: "A remarkable fact about our universe is that physical constants have just the right values needed to allow for complex structures, including living things. Steven Weinberg, Martin

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[690] Alan P. Lightman, "The accidental universe: Science's crisis of faith," *Harper's Magazine*, Dec. 2011, pp. 3-4. In the same article Alan Guth is quoted saying: "There will still be a lot for us to understand, but we will miss out on the fun of figuring everything out from first principles" (p. 7). In other words, modern science is willing to relinquish its own cherished laws and equations, stabbing its own empirical legacy in the heart and replacing it with an unprovable pipedream, just so that it doesn't have to admit to God's existence. Guth couldn't have admitted the plight of mankind better than the Bible itself.

[691] Romans 1:18-20.

[692] "The Mystery of the Multiverse," *Newsweek*, May 12, 2012, p. 25.

Rees, Leonard Susskind and others contend that "an exotic multiverse provides a tidy explanation for this apparent coincidence: if all possible values occur in a large enough collection of universes, then viable ones for life will surely be found somewhere."[693] In other words, other forms of life may be composed of protons that are bigger or smaller than ours. For carbon-based beings (such as the human race) protons can only be a certain size; gravity can only be a certain strength; and the Earth must be a certain size and distance from the sun in order to support biological life. It is analogous to rolling a number of dice, say, five hundred of them. Each big bang from a previous mother universe is another roll of the dice. To produce life in a universe, the roll of the 500 dice must turn up snake eyes on each die. The rolls that do not, will either produce no life or produce a different kind of life. This kind of speculation is attractive for modern cosmologists such as Carr and Greene because there has always been a mystique about what could happen by chance if one had a long enough time to roll the dice. If the rolls are infinite, then an infinite variety of universes could be created, and surely, our seemingly unique universe would inevitably be in the mix. Even if, as Roger Penrose has calculated, there is a 1 in 10^{10123} chance of producing biological life in one of these multiverses,[694] modern science still clings to it like a security blanket, since they have nothing else to save them from meeting their Creator face to face.
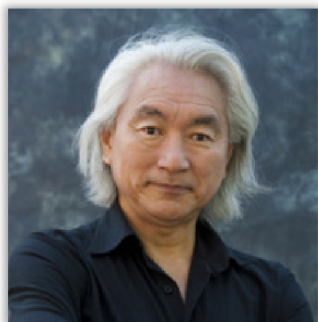
Michio Kaku, b. 1947

In the end, mere speculations about the existence of these alternate universes is all that its advocates really have. The only "science" employed is, as Greene says, "the justification that once a theory makes a slew of accurate predictions about things we can observe, as general relativity has, we justifiably gain confidence in the theory's predictions about things we can't observe."

The social, spiritual and philosophical implications of the Multiverse theory are proving to be quite provocative. Ironically, it seems that Carr's effort to eliminate God by means of the Multiverse is restored by what kind of universes it produces. One of the leading spokesman of the Multiverse is Michio Kaku, professor of theoretical physics at the City University of New York. In a recent clip on the Internet he says the following:

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[693] "Does the Multiverse Really Exist?" *Scientific American*, August 2001, p. 42.

[694] Roger Penrose, *The Emperor's New Mind*, Oxford University Press, 2002.

The old concept of a universe has been replaced by a multiverse and satellite data is leading the way. We could be on the cusp of a new Copernican revolution. Copernicus introduced the idea that the Earth is not the center of all there is….In this new Copernican revolution, our universe is not necessarily the only game in town….If you think about the multiverse idea, it is staggering in its philosophical and theological scope. For example, when I was a child…I used to learn about Genesis. My parents are Buddhists and in Buddhism there is no genesis; there is nirvana. Nirvana is timeless. There is no beginning, no end…two mutually exclusive ideas in my head. How could I reconcile them? Well now I'm a physicist…I realize that the multiverse idea gives us a wonderful blend, the melding of these two religious thinking, that genesis takes place continually in an ocean of nirvana…this nirvana is something we call 11-dimension hyper-space.…In the 1600s Giordano Bruno, a Catholic priest, was burned alive by the Catholic Church for saying precisely these things. He talked about parallel worlds in outer space, other suns, and what could be more innocent than alien civilizations out there in the heavens.[695]

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[695] Michio Kaku: *New Space 101*; http://www.youtube.com/watch?v=Pr2R2OK auNg&feature=results_main&playnext=1&list=PLDB1EF4826E25ED70.   There is no proof that Bruno was burned at the stake. Yates believed Bruno was executed, although she admits there is no official Vatican record of it (Frances A. Yates, *Giordano Bruno and the Hermetic Tradition*, University of Chicago Press, 1964, 1991, p. 349). Despite Yates' belief, there is substantial evidence leading to the conclusion that Bruno was never executed, least of all by Catholic authorities. According to one source: "The whole story is based on an alleged letter from Gaspard Schopp to his friend Conrad Rittenshausen, dated in Rome, Feb. 17, 1600….This letter was 'found' by a Lutheran pastor, Jean-Henri Ursin (1608-1667) in a book printed in Germany, a very rare book with a pseudonym for the author, as well as a false date and place of publication. No one has ever seen the original letter….No contemporary of Bruno's in Rome in 1600 ever mentioned an execution. Bruno was very famous throughout Europe, and his death, especially at the stake in Rome, would not go unnoticed, particularly by Protestant authors who would certainly have been all too happy to denounce Catholic intolerance. Moreover, there is absolutely no record of a trial or of any sentence against Bruno. All that is known is, after spending six years (1592-1598) in Venetian jails, Bruno came back to Rome. He might have been put under house arrest in some monastery, but no one knows how he died. Strangely enough, it is only from 1701 onwards that the story of Giordano Bruno made headlines, but without any new evidence about his fate….Pierre Bayle (1647-1706) the famous author of the *Dictionnaire historique et critique*…in his article on Bruno says he does not

So here we see that a new metaphysical science is going to be the ecumenical bridge to bring cosmic religion to mankind, joining the finite (genesis) and the infinite (nirvana) into an infinite series of big bangs that create an infinite number of universes. But it doesn't stop with the raw matter and energy of these multiverses. Kaku has bigger plans:

This means that when you apply the Quantum Principle to people, you have to understand that there are parallel people, that perhaps there are universes that we cannot even conceive of where the universe has split. Does this mean, therefore, that Elvis Presley is still alive? And the answer is yes. It means that in some parallel universe, Elvis Presley is probably still alive. The King did not necessarily have to die.[696]

But think about it. If you do believe in these parallel worlds in space, the Church would say to itself, 'Is there a pope?' 'Is there a Trinity?' 'Is there a parallel Christ?' 'Is there parallel saints?' 'How many saints are there in outer space?' 'How many popes?' 'Which pope has religious jurisdiction over any other pope?' The

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believe he was executed since the only source is Schopp's letter, which he considers a fake. In addition, Moreri (1643-1680), who wrote the *Grand Dictionnaire Historique*, does not believe Bruno was executed. Last but not least, the Venetian ambassadors in their diplomatic dispatches to the government never mentioned an execution of Bruno, yet he spent six years in their jails" (Source: Claude Eon, letter on file, November 2005, gleaned from the 1885 work of Théophile Desdouits).

[696] Excerpt from Kaku's interview for the documentary, *The Principle*, produced by Stellar Motion Pictures, 2013.

mind goes crazy thinking of the religious implications of parallel worlds, so the Church simply burned him alive.[697]

In other words, in Kaku's new multiverse religion, the Catholic Church is a rival religion. In his view, the Catholic Church not only persecuted Galileo for his local Copernican views, it also persecuted Bruno for his Multiverse views. In his book *Parallel Worlds* he quotes Bruno as saying, "Thus is the excellence of God magnified and the greatness of his kingdom made manifest; he is glorified not in one, but in countless suns; not in a single earth, a single world, but in a thousand thousand, I say in an infinity of worlds."[698] According to Kaku, the Church burned Bruno at the stake for creating competition for the Roman pope by envisioning Multiverse popes; and competition for Christ by creating Multiverse Christs, and thereby disrupting the whole Godhead and the Church; and he also created competition for Scripture and Tradition by taking the Earth out of the center of the actual universe we live in. This is the dream of the Multiverse metaphysicians – to continue the Copernican Principle *ad infinitum* so that the Church can never regain its authority over mankind, even if it means abandoning the very scientific rigor they once used to dethrone the Church in the first place.

To the question: where are these parallel universes, Kaku says:

…they are actually in our living rooms….We think that someone in a higher dimension than us could be visible to us via its gravity, gravity does seep across universes…Believe it or not, the Hubble Space telescope over the last several years has been giving us maps of something called dark matter. Dark Matter makes up most of the universe. It's not made out of atoms. Your chemistry teacher was wrong in saying that the universe is mainly made out of atoms….Whole generations of textbooks have now had to be thrown out….It's invisible. You cannot photograph dark matter. We know it's there because of its gravitational presence….Some of us believe that we are actually tracing out the outlines of…invisible galaxies, the invisible worlds hovering just above our universe, invisible because light

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[697] Michio Kaku: *New Space 101*; http://www.youtube.com/watch?v=Pr2R2OK auNg&feature=results_main&playnext=1&list=PLDB1EF4826E25ED70.

[698] *Parallel Worlds: A Journey Through Creation, Higher Dimensions, and the Future of the Cosmos*, Anchor Books, NY, 2005, p. 345. Kaku does not cite the reference, but the quote comes from his 1584 book, *On the Infinite Universe and Worlds*.

goes beneath it, but we feel the effects of its gravity which hops across universes…and can be measured.

Here we see that the abandoning of the scientific method is evident, even when the scientific method is claimed as the method. There is no empirical evidence for "Dark Matter." It is an invention of modern cosmology so that its theoretical Big Bang cosmogony can be maintained in the face of the most embarrassing anomalies. In the 1970s, Vera Rubin of Cal Tech discovered that galaxies do not rotate according to Newton's laws and neither do galaxies form clusters by the same laws.[699] To conform to Newton they need about 23% more matter than they contain. So instead of modifying their conception of galaxies or what makes them spin, or even Newton's laws and questioning the basis of the Big Bang, modern cosmology invented the matter it needed without the slightest empirical evidence for its existence. As such, when Kaku says that he knows Dark Matter exists by its "gravitational presence" he doesn't mean that he has actually seen Dark Matter; rather, he is only referring to the fact that the gravity of galaxies doesn't work unless science arbitrarily adds Dark Matter in by hand. To cover up the fact that the matter is neither empirically verified nor falsifiable, Kaku claims that it is a wholly different substance than ordinary baryonic matter and thus it is undetectable (*i.e.*, "invisible because light goes beneath it") yet Newton's $F = ma$ acts the same as if it was baryonic matter. In all this conjecture, Kaku shows not the slightest shame in calling it "science." As George Ellis notes: "Similar claims have been made since antiquity by many cultures [*e.g.*, Giordano Bruno]. What is new is the assertion that the multiverse is a scientific theory, with all that implies about being mathematically

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[699] "See How to See the Invisible: 3 Approaches to Finding Dark Matter," *Discover*, Feb. 22, 2012: "Rubin found that stars far from the luminous central matter rotated with the same velocity as stars one-tenth the distance from the galaxy's center. This implied that the mass density did not fall off with distance, at least to the distances Rubin observed. Astronomers concluded that galaxies consisted primarily of unseen dark matter." One explanation from a geocentric system for the non-flat rotation curves of galaxies is that the diurnally spinning universe creates slight but noticeable vortices around galaxies that push them beyond their normal $F = ma$ limits. A related issue notes that galaxies have a preferred left-handed spin to an excess of 7%, which then translates into a preferred axis and a residual angular momentum for the whole universe. In Longo's words, "the universe was born spinning." Longo also found that the spin axis is directly related to the "axis of evil" in the CMB which is aligned with our ecliptic and equinoxes. ("Evidence for a Preferred Handedness of Spiral Galaxies," Michael Longo, *Physics Letters B* 10.1016, 2009; http://arxiv.org/ftp/arxiv/papers/ 0904/0904.2529. pdf).

rigorous and experimentally testable….Proponents of the multiverse…are implicitly redefining what is meant by 'science.'"[700]

Interestingly enough, as we noted earlier, this same Vera Rubin discovered that if we calculate all the known motions in the galactic plane, they all add up to zero in the Earth's vicinity. This finding amounts to the Earth being in the center of everything and was the very reason Rubin said before her research project, "Hopefully, it will not force a return to the pre-Copernican view of a hierarchy of motions whose sum is zero at the Sun."[701] Of course, this particular discovery of Rubin's was ignored while her discovery of irregular rotation curves for galaxies and the subsequent need for Dark Matter was made the pinnacle of modern cosmology.

Proceeding with Michio Kaku's lecture:

> We can detect a parallel universe in several ways. First of all, how does a parallel universe form? Everybody knows when matter falls into a black hole it disappears….Where does it go? Some of us believe that it's blown out the other end…it's blown out into a white hole. Now a white hole emits matter rather than swallowing it up. A white hole expands very rapidly to accommodate all this new matter flowing into it. And hey, doesn't that sound like the Big Bang. Doesn't it sound like Genesis itself. Our universe could be a white hole…with matter expanding rapidly into it, connected by an umbilical cord to, perhaps, a parent universe.

Whereas black holes and white holes were once considered cosmological dead ends produced by the mathematics of General Relativity,[702] they are now considered the birth canal for baby universes

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[700] "Does the Multiverse Really Exist?" George F. R. Ellis, *Scientific American*, August 2011, p. 40. He adds: "The various 'proofs,' in effect, propose that we should accept a theoretical explanation instead of insisting on observational testing….The challenge I pose to multiverse proponents is: Can you prove that unseeable parallel universes are vital to explain the world we do see? And is the link essential and inescapable" (p. 43).

[701] Vera C. Rubin, Norbert Thonnard and W. Kent Ford, Jr., "Motion of the Galaxy and the Local Group determined from the velocity anisotropy of distant Sc I galaxies," *The Astronomical Journal*, vol. 81, No. 9, Sept. 1976, p. 735.

[702] George Musser, "After all, relativity is riddled with holes – black holes….Clearly the theory is incomplete" ("Was Einstein Right?" *Scientific American*, Sept. 2004, p. 89); Stephen Hawking: "Thus, general relativity brings about its own downfall by predicting singularities" (*Black Holes and Baby Universes*, p. 92); *Time* magazine: "these inkblots of space are mere mathematical figments. So far, they can be shown to exist only as solutions to the complex

from the mother Multiverse. The interviewer, sensing Kaku is making it up as he goes, posits the next logical question: "To many people listening to this it is almost as if theoretical physics has become a new priesthood…we have to take it on trust that you've got it right." Kaku responded:

> We are accountable to the laws of nature. We have the WMAP satellite forcing us to rewrite a whole generation of textbooks, that said there is only one universe and there are only atoms that make up the universe. That's the old thing that's been replaced by the WMAP satellite….If we confirm it, it will be the greatest revolution in philosophy since the Copernican revolution.

As we have seen, the only "forcing" the WMAP satellite has put on modern cosmology is its total disagreement with the Copernican Principle. WMAP has shown that the entire cosmic microwave background radiation (CMB) is aligned with the Earth's equinoxes and ecliptic – a fact that Kaku doesn't even mention in his lectures or books, much less consider as a viable alternative to his Multiverse fantasy. WMAP has seen no Dark Matter. It has only seen atoms, but Kaku insists that it has detected Dark Matter because it is indispensable for his Big Bang universe that isn't obeying the Copernican revolution's dogma previously laid down for it. In brief, Kaku is little different than the patient in the mental ward who sees things that aren't there and hears voices that aren't speaking. We are reminded of the words of Piglet in the book, *Winnie the Pooh*: "What did it look like? Like—like—It had the biggest head you ever saw….A huge great enormous thing, like—like nothing. A huge big—well, like a—I don't know—like an enormous big nothing."[703] We are perhaps also reminded of the old saying, "what goes around, comes around." The ancient cosmologies of the Far East believed that the world sat on the back of a turtle. When asked what the turtle rested on, the reply was "another turtle." And asked what that turtle was resting on, the reply was, "another turtle." This didn't mean that the ancients actually believed it was a turtle. It was symbolic of an infinite series of creative or supportive forces the ended up at our world. As such, their concept of beginnings and essences is little different than what is being proposed with today's Multiverse.

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equations of general relativity—Einstein's theory of gravity—and very troubling solutions at that" ("Those Baffling Black Holes," September 4, 1978, pp. 56-62); John Moffat: 'Einstein didn't like black holes. The real motivation for "generalizing" his gravity theory was to see if he could find, as he called them, "everywhere regular solutions" that fit the equations.' Tim Folger, "Einstein's Grand Quest for a Unified Theory," *Discover*, September 2004, p. 64.
[703] *Winnie the Pooh*, by A.A. Milne, 1926.

Instead of successive turtles we now have successive universes, and both are created out of pure imagination without the slightest scientific proof.
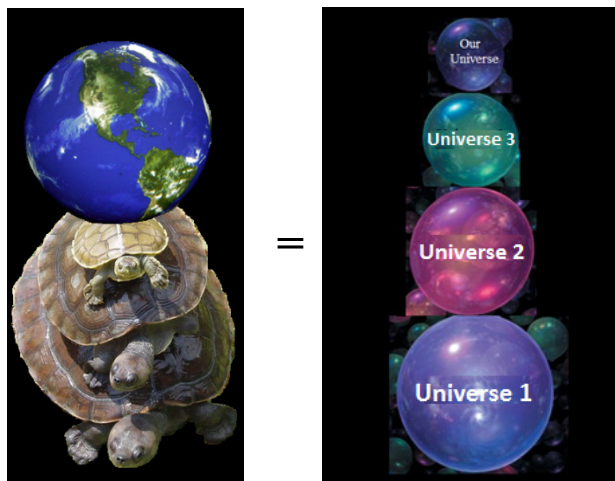
Interestingly enough, a 2011 paper by Noorbala and Vanchurin shows that the Multiverse "violates some of the basic properties of probability theory," and that the best system based on the available data leads away from a Multiverse and solidly toward a geocentric universe. They write:

> We have shown that most of the global time cutoff measures of the multiverse suffer from severe inconsistencies and developed a new framework which allows us to study the measure problem from a completely different perspective. In the emerging picture an infinite multiverse is replaced with a finite geocentric region, and the search for the correct measure is replaced by a search for a 3D Lagrangian yet to be discovered. There are two ways to look for the correct Lagrangian. One could either try to perform direct phenomenological searches or one could try to derive it from first principles. For the phenomenological approach one has to reinterpret the existing cosmological data from the geocentric view point.[704]

Science has certainly come full circle. Searching to escape a geocentric universe by embracing the Multiverse has forced them back to a

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[704] "Geocentric cosmology: a new look at the measure problem," Mahdiyar Noorbala and Vitaly Vanchurin, Department of Physics, Stanford University, January 20, 2011; arXiv:1006.4148v2, p. 5.

geocentric universe. The most interesting dimension of this circle is that it comes from science's own testimony.

"The View from the Center of the Universe"

Another way in which modern cosmology has come full circle to a geocentric universe is through the back door, as the saying goes. In 2006 the husband and wife team of Joel Primack, professor of physics at the University of California, Santa Cruz, and Nancy Abrams, published the book, *The View from the Center of the Universe*.[705] Apparently bothered by the developing implications of Big Bang cosmology that increasing places mankind in the uneasy position of being highly insignificant in this vast universe, Primack set out to redeem man's worth by restoring him to the center of the universe. Like Pascal and his cry of horror, Primack is typical of modern man who, after developing elaborate systems of abstract thought and infinite universes, finds that he can't live in the very world he built for himself. Primack has no center, but he needs a center to survive, to give himself significance, and, perhaps, to stop from going insane. The task was somewhat difficult, of course, since as Primack admits,

> There is no geographic center to an expanding universe, but we are central in several unexpected ways that derive directly from physics and cosmology—for example, we are in the center of all possible sizes in the universe, we are made of the rarest material, and we are living at the midpoint of time for both the universe and the earth….Prescientific people always saw themselves at the center of the world, whatever their world was. They were wrong on the details, but they were right on a deep level: the human instinct to experience ourselves as central reflects something real about the universe, something independent of our viewpoint. Working from the assumption of their own centrality, the ancients took the cosmos—as they understood it—as the

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[705] Per Richard K. Delano, producer for the movie, *The Principle* (released in 2013) arrangements were made to interview many of the world's cosmologists, theologians and philosophers at Yale University for the "Why is there Anything" conference in October 2010. All of the participants asked to be interviewed graciously accepted, including George F. R. Ellis, Bernard Carr, James Van Pelt and many others. Joel Primack, who was briefed by the producer that we were soliticing interviews regarding recent cosmological challenges to the Copernican Principle, refused to be interviewed, and also convinced fellow cosmologist, Martin Rees, to decline the interview.

model for their lives and their religions. This book argues that we should too.[706]

Neither the flat earth nor the geocentric cosmos is remotely suggestive of the modern picture, yet both will be valuable for helping us to approach the new picture, because they put humanity at the center of the story. Modern scientific cosmology doesn't even discuss us, and it is a simple fact that if science has nothing to say *about* human beings, it will have little to say *to* most human beings. This book is committed to figuring out how we humans might fit into the story.[707]

Primack says that the problem of setting man adrift started with Newton:

But "universal gravitation," despite the name, was never applicable to the whole universe. Paradoxes arose when Newton tried to apply his theory beyond the solar system. For example, if the universe were finite in size, it would have a center, and gravity would make everything collapse to the center; therefore the universe can't be finite. But if the universe were infinite, then the night sky would be white because there would be a star along the lind of sight in every direction; therefore the universe can't be infinite….The Newtonian picture left humans drifting in a kind of cosmic homelessness that persists to this day….There may have been no way to avoid the four-century period of disconnection from the universe implicit in the Newtonian picture.[708]

Of course, the easy solution to this quandary is the geocentric universe which counters the pull of gravity by a rotating universe around a fixed Earth in the center. But being a Copernican at heart, Primack is totally against a geographic solution. He prefers "eternal inflation," in which the universe counters the pull of gravity by forever expanding. It is ironic, but one man's rotation is another man's expansion. Both systems have space moving, although one is radial and the other is linear.

Although Primack admits that eternal inflation is more "metaphysics" than astrophysics,[709] and also admits that he needs 96% more matter and

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[706] *The View from the Center of the Universe*, p. 7.
[707] *Ibid.*, p. 41.
[708] *Ibid.*, pp. 81-83.
[709] Primack says: "If you put the emphasis on its current untestability, then the theory of eternal inflation is 'metaphysics.' If you put the emphasis on the fact

energy in his universe than he can presently find in order to give it any semblance of feasibility, this tenuous path is more inviting to him than believing in a God who made the universe at once with all its working parts, intact and unchangeable. Primack wants his cake and eat it, too. He has an extreme aversion to the *physically* central Earth of past cosmology, but he will allow himself to borrow the concept so that he can have a "psychologically" central Earth and pretend that he is significant just the same. Thus he says, "They were wrong astronomically that Earth is the center of the universe, but they were right psychologically: the universe must be viewed from the inside, from our center, where we really are, and not from some perspective on the periphery or even outside."[710] It is rather amazing to see how the mind of man twists the evidence to make it palatable to his emotional comfort level.

The means by which Primack accomplishes this cosmic sleight-of-hand is to change the parameters of the debate. Repudiating the "hard crystal objects or orbits of celestial bodies," he changes them to "what we call 'Cosmic Spheres of Time,' and we truly are at the center in a sense never imagined in the Middle Ages,"[711]

> ….and this symbol ties together all these ideas and immerses us in them: that the universe is expanding; that the speed of light is the limiting speed for everything but space; that looking out into space is looking back in time; that the universe evolves and is very different from what it was in the beginning and will be in the future; and that human (or intelligent alien) consciousness is an essential element of what makes a visible universe.[712]

In essence, Primack believes he can have Aristotle's universe without having Aristotle's universe. He can make himself feel comfortable believing there is a center and that he occupies it without him actually having a center and occupying it. He can draw diagrams of circles and show himself in the center when in fact his eternally inflated universe has made a market of saying there are no circles because there is no center. The only thing Primack has is abstract thought of the flow of time, and these straws are enough for him to grasp so that he can make himself feel that he has restored his significance and that he has departed from Pascal's

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that mathematical intuition has in the past led to theories that were later tested and confirmed, then eternal inflation, like string theory, is an 'untested physical theory'" (*ibid.*, p. 179)

[710] *Ibid.*, p. 133.

[711] *Ibid.*, p. 134.

[712] *Ibid.*, pp. 137-138.

universe. Thus, in a subtitle in one of his chapters, "Are We Insignificant?" Primack concludes:

Primack's "Cosmic Spheres of Time" Universe
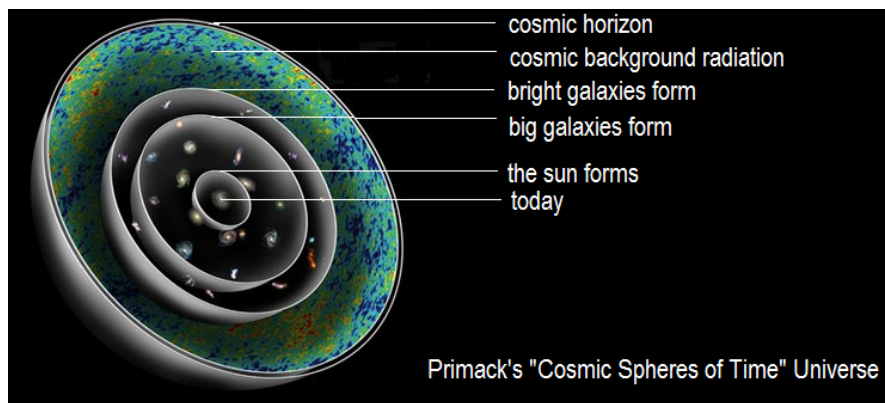
[713]

> Many people today contemplate the stars and the vast distances in between and conclude how insignificantly small we are compared to the universe. This view has contributed to a sense of alienation and sometimes even despair that have for more than three centuries been a reaction to humanity's demotion from the pinnacle of God's creation to a tiny speck floating in endless space. But now we understand something we didn't know before. There is no thing and no force in the universe that is significant on all size scales."[714]

Has Primack really solved his problem? Hardly. He has merely exchanged one infinite vastness (space) for another (time). How much solace can Primack really derive from "all size scales" that are "eternally inflating"? The more they inflate the more he loses touch with them, until one day he is all by himself since he can no longer see them. All Primack has is an illusion, an illusion he was desperate to create to give himself some temporary relief. Like all such artificial fixes, the effects will one day wear off and Pascal's horror will be even more horrifying.

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[713] Modled from Primack's *The View from the Center of the Universe*, p. 135.
[714] *Ibid*., p. 173.

"…the famous experiment of Michelson and Morley undertaken to measure the so-called absolute velocity of the Earth…"

Max Planck[715]

"…Albert Michelson from Chicago whose celebrated experiments are the main foundation of relativity."

Max Born[716]

"Yet now we can see that a positive result [to the Michelson-Morley experiment] would have been a very tame conclusion; and the negative result has started a new stream of knowledge revolutionizing the fundamental concepts of physics."

Daniel Kennefick[717]

"This conclusion directly contradicts the explanation…which presupposes that the Earth moves…"

Albert Michelson[718]

"There was just one alternative [to the Michelson-Morley experiment]; the earth's true velocity through space might happen to have been nil…"

Arthur Eddington[719]

"The realization that time behaves like space presents a new alternative. It removes the age-old objection to the universe having a beginning, but also means that the beginning of the universe was governed by the laws of science and doesn't need to be set in motion by some god….It is not necessary to invoke God to light the blue touch paper and set the universe going."

Stephen Hawking[720]

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[715] Max Planck, *Scientific Autobiography and Other Papers*, 1949, p. 139.

[716] Letter dated March 28, 1961 from Born to Michelson's daughter, Dorothy Michelson Livingston, as cited in *The Master of Light: A Biography of Albert A. Michelson*, p. 256.

[717] "Not Only Because of Theory: Dyson, Eddington, and the Compelling Myths of the 1919 Eclipse Expedition," University of Arkansas, p. 204.

[718] Albert A. Michelson, "The Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Vol. 22, August 1881, p. 125, said after his interferometer experiment did not detect the movement of ether against the Earth.

[719] Arthur Eddington, *The Nature of the Physical World*, 1929, pp. 11, 8.

[720] Stephen Hawking, *The Grand Design*, 2010, pp. 135, 180.

Chapter 4

Experimental Evidence Indicating Earth is Motionless in Space

Einstein's "Unthinkable" Alternative

It is one thing to deal with scientific evidence that indicates Earth is at the center of the universe, but what does one do with evidence that narrows down the field a bit more than expected? What if the evidence shows that Earth is not only the center of the universe but that it doesn't move at all? This brings us to a few decades before gamma-rays, quasars and galaxies were discovered to a time when science was at a major crossroads and whose outcome would determine the course of history for centuries to come.
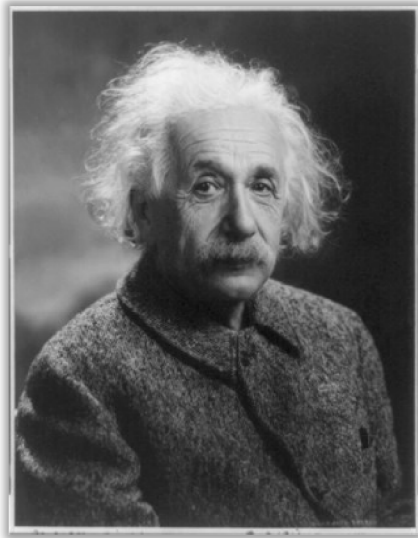
Without question, no one has influenced physics and cosmology more than **Albert Einstein** (1879-1955). His name has become a household word, one associated with superior intelligence and foresight. His work has inspired many a young man to take up the mantle and advance the cause of science, and even philosophy and politics. As with many popular figures, however, they are often bigger than life, and soon the myths surrounding

the person become more popular and accepted than the actual person himself. This is especially true with Einstein. Most people know very little behind the image of the wire-haired, absent-minded professor or the floating formula $E=mc^2$ they see in scenic backgrounds of movies and television. They know very little concerning how Einstein's famous theory of Relativity originated or what it means. Often the extent of their knowledge is the oft used cliché "everything's relative."

In reality, Einstein was the forerunner to Hubble, Hawking, Sagan and the rest of modern science's icons who have done their best to preserve the Copernican Principle in the face of evidence that strongly indicated it was seriously flawed. Similar to Hubble who stated that an Earth-centered cosmos would be "intolerable" and "must be avoided at all costs," so Einstein gave birth to Relativity for precisely the same reason, only his biographer chose the word "unthinkable." After the famous Michelson-Morley experiment of 1887, Ronald W. Clark describes what came next:

> In the United States Albert Michelson and Edward Morley had performed an experiment which confronted scientists with an appalling choice. Designed to show the existence of the ether…it had yielded a null result, leaving science with the alternatives of tossing aside the key which had helped to explain the phenomena of electricity, magnetism, and light or of deciding that the earth was not in fact moving at all.[721]

> The problem which now faced science was considerable. For there seemed to be only three alternatives. The first was that the Earth was standing still, which meant scuttling the whole Copernican theory and was *unthinkable*.[722]

We must give credit to Clark for even mentioning a motionless Earth as a possible explanation to this famous experiment, for many other biographers and historians do not even allow their readers the privilege of knowing that such an option exists. Some allude to the possibility, and some even admit it anachronistically, as in G. J. Whitrow's comment that a very simple explanation to the Michelson-Morley experiment is that the Earth doesn't move:

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[721] *Einstein: The Life and Times*, 1984, p. 57.

[722] *Ibid.,* pp. 109-110, emphasis added. In the opposite vein, senator James W. Fulbright once remarked: "We must care to think about the unthinkable things, because when things become unthinkable, thinking stops and action becomes mindless."

It is both amusing and instructive to speculate on what might have happened if such an experiment could have been performed in the sixteenth or seventeenth centuries when men were debating the rival merits of the Copernican and Ptolemaic systems. The result would surely have been interpreted as conclusive evidence for the immobility of the Earth, and therefore as a triumphant vindication of the Ptolemaic system and irrefutable falsification of the Copernican hypothesis. The moral of this historical fantasy is that it is often dangerous to believe in the absolute verification or falsification of a scientific hypothesis. All judgments of this type are necessarily made in some historical context which may be drastically modified by the changing perspective of human knowledge.[723]

The scientific community would much rather the public not entertain such ideas, let alone seriously study them. Nevertheless, as Clark forthrightly reveals, a motionless Earth was among the scientific alternatives to explain one of the most important and puzzling experiments of human history. Sadly, he also shows that scientists were so ingrained with the Copernican Principle that no one would even dare question whether heliocentrism was really true, even when evidence against it was staring them in the face. It was as preposterous as saying that the sky is green or grass is pink. As the historical record will show, so "unthinkable" was this alternative that scientists were in a virtual frenzy to find some way to dispel it, to relieve themselves of having to dethrone their heroes: Copernicus, Galileo, Kepler and Newton, or be required to give a posthumous apology to St. Robert Bellarmine and Popes Paul V, Urban VIII and Alexander VII.[724]

Later, when Einstein was inventing his second leg of the theory, General Relativity, the decision had already been made. Clark writes:

As Einstein wrestled with the cosmological implications of the General Theory, the first of these alternatives, the Earth-centered universe of the Middle Ages, was effectively ruled out…[725]

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[723] G. J. Whitrow, *The Structure and Evolution of the Universe*, 1949, 1959, p. 79.

[724] St. Robert Bellarmine was head of the Sacred Congregation for the Faith in the trial of Galileo in 1616 under Paul V; in 1633 Urban VIII upheld the decision of Paul V and put Galileo under house arrest for continuing to teach the Copernican theory, while in 1664 Alexander VII issued a papal bull containing condemnations of Copernicus, Galileo and Kepler.

[725] *Einstein: The Life and Times*, p. 267.

Interestingly enough, in Clark's entire biography of Einstein, which amounts to 878 pages, not one reason, or even a suggestion of a reason, is ever cited as to why, scientifically speaking, the Earth-centered universe was "ruled out." In fact, no other biography, or even autobiography, of Einstein gives a reason to the "ruling out" of geocentrism. Heliocentrism is just assumed as fact; and a fact upon which every other decision in physics would be made for the next one hundred years. As Einstein himself said about heliocentrism: "Even this simple idea, so clear to everyone, was not left untouched by the advance of science. But let us leave this question for the time being and accept Copernicus' point of view."[726]

We can sympathize with Einstein's plight. One can imagine the sheer embarrassment science would face if it had to apologize for 500 years of propagating one of the biggest blunders since the dawn of time. This was not the medieval period, a time in which mistakes could be excused because of primitive scientific tools and superstitious notions. This was the era of Newton, Lavoisier, Maxwell, Faraday, Pasteur, Dalton, Darwin, Lyell and scores of other heroes of science. If heliocentrism was wrong, how could modern science ever face the world again? How could it ever hold to the legacy left by these giants if it had to admit that it was wrong about one of its most sacrosanct and fundamental beliefs? Admitting such a possibility would put question marks around every discovery, every theory, every scientific career, every university curriculum, especially the theory of evolution, which was just coming into its own in the late 1800s and early 1900s. The very foundations of modern life would crumble before their eyes. Not only would Earth literally become immobile, it would figuratively come to a halt as well, for men would be required to revamp their whole view of the universe and consider the most frightening reality of all – that a supreme Creator actually *did* put our tiny globe in the most prestigious place in the universe. Only fools would conclude that Earth could occupy the center of the universe by chance. Compared to the rediscovery of an immobile Earth the Renaissance and the Enlightenment would be a mere parenthesis built on pretentious energy. Most of all, science would have to hand the reins of power and influence back to the Church and to Scripture, since it is from those sources alone that the teaching of a motionless Earth never wavered. In short, after the Michelson-Morley experiment the entire future of mankind's existence hung in the balance. Could science produce a savior to lead the world away from the clutches of this spoiler?

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[726] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154-155.

Enter Albert Einstein. To save the world from having to reconnect with the Middle Ages, Einstein set his mind to finding an explanation to the Michelson-Morley experiment whose *prima facie* results showed the Earth wasn't moving. Most people don't realize, and even fewer would admit it, but Relativity was created for one reason: so that mankind would not be forced to admit that the Earth was standing still in space. As his contemporary, **Max von Laue** stated:
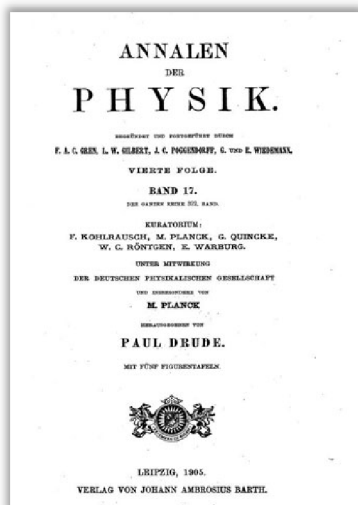
Thus, a new epoch in physics created a new mechanics…it began, we might say, with the question as to what effect the motion of the Earth has on physical processes which take place on the Earth…we can assign to the dividing line between epochs a precise date: It was on September 26, 1905, that Albert Einstein's investigation entitled 'On the Electrodynamics of Bodies in Motion' appeared in the ***Annalen der Physik***.[727]

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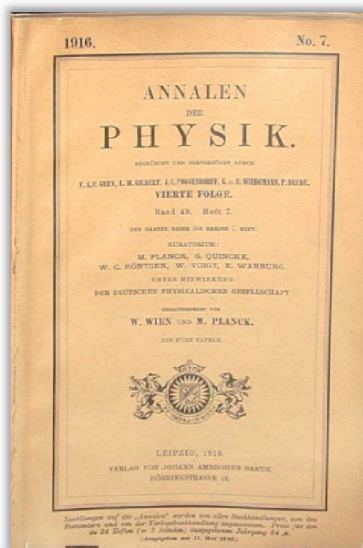
[727] *Albert Einstein: Philosopher-Scientist*, p. 523. Einstein does not specifically mention either Michelson-Morley's experiment or any other preceding experiment in "On the Electrodynamics of Moving Bodies," rather, he makes allusion to all of

In fact, Einstein would be called "a new Copernicus."[728] Unbeknownst to the world, however, Einstein's explanation would not only require a total revamping of science, it would necessitate the acceptance of what *The Times* of London called "an affront to common sense,"[729] forcing his fellow man to accept principles and postulates that heretofore would have been considered completely absurd. Einstein would require men to believe that matter shrunk in length and increased in mass when it moved, that clocks slowed down, that two people could age at different rates, that space was curved, that time and space would meld into one, and many other strange concepts. But in the end, as we will see unfold before us in a most ironic drama, what Einstein's Special Relativity took away with the left hand, his General Relativity restored ten years later with the right hand. As van der Kamp puts it:

> No question about it: if STR [Special Theory of Relativity] is true then the logically understandable hierarchical and Earth-centered universe of antiquity and the Middle Ages was a pipe dream. The problem remains the "if" in the last sentence….In the present context I am satisfied with the undeniable actuality that though STR presumably allowed the astronomers to escape from a geocentric bugbear – and a daunting argument from design behind it – the GTR [General Theory of Relativity] has been compelled to declare the Earth-centered model "as good as anybody else's, but no better"... after Einstein…burst for the second time upon the scene the tables were turned…the geocentric model of the universe, be it absolutely unacceptable, science cannot show it to be wrong…the theoretical status of the Earth-centered concept is today under Einstein's regimen higher than it has ever been since the 1687 publication of Newton's *Principia*, the ruling model now "giving increased respectability to the geocentric picture."[730]

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the preceding experiments with light in the statement: "…the unsuccessful attempts to discover any motion of the Earth relatively to the 'light medium."

[728] *Einstein: The Life and Times*, p. 192.

[729] *Ibid.,* p. 101.

[730] Walter van der Kamp, *De Labore Solis*, pp. 46-48, 55, 61, the first quote from the popular astronomer Fred Hoyle in *Frontiers of Astronomy*, 1963, p. 304; the second also from Hoyle in *Nicolaus Copernicus: An Essay on His Life and Work*, 1973, p. 87. Others are convinced that Relativity is just a simple modification of nature. Stephen Hawking writes: "The theory of relativity does, however, force us to change fundamentally our ideas of space and time. We must accept that time is not completely separate from and independent of space, but is combined with it to

Nevertheless, Einstein's relativistic contortions were a small price to pay to save the world from the embarrassment of having to admit that it had been wrong for five centuries about one of the most fundamental issues of life. Accordingly, Van der Kamp remarks on how students are pressured to accept Relativity theory:

As science teachers know: when students for the first time are introduced to the special theory of relativity it is not the dullards in the class who initially are often unwilling to reconcile themselves to it. Until, of course, they begin to realize that a refusal logically constrains them to part with Copernicus' system. Which system, thanks to Galileo and his apostles, they have been brainwashed to deem 'obvious.' And therefore seeing no other way out of the dilemma, no other acceptable possibility in sight, they close their eyes and swallow what in their hearts they know to be impossible [STR] but gradually and under persistent peer pressure are converted into believing as scientific and self-evidently true truth….If we accept Copernicus there is no way around it. The wearying trouble is that "if."[731]

Dean Turner provides the same insight:

Many writers pretend to understand [relativity], but simply do not. Many otherwise alert students studying relativity become logically bewildered and lose confidence in their own ability to think clearly as they slip into mysticism and become the next generation of scientific priests….The public has trusted the physicists, trusted them perhaps more, in this generation, than any other group. But in time, people will learn that physicists are no more immune to the perverse motivational currents of the times than any other professional people. Scientists have enormous vested interests in protecting their theories – vested energy, time, money and indeed reputation. Like most other human beings, many are less than saintly in possessing the attributes of honesty, unselfishness and respect for truth….For seventy-two years [1905-1977] humanity has been browbeaten by an incomparably brazen bit of pseudo-science because its

form an object called space-time" (*A Brief History of Time*, p. 23). Gerald Holton, who is otherwise reliable, softens quite noticeably in the aura of Einstein, even suggesting that Relativity theory is "an effort to return to classical purity" (*Thematic Origins*, p. 195).
[731] *De Labore Solis*, pp. 50-51.

perpetrators have defended it by using mathematics which, though valid in itself, is not applied in relation to objective facts that are analyzed logically in the real world. Recondite kinds of higher mathematics have been falsely used to create an awesome, esoteric language whereby the initiated elite have set themselves apart from the world and have labeled all dissenters as quacks.[732]

The Significance of the Michelson-Morley Experiment

The Michelson-Morley interferometer experiment was a simple one. The hypothesis of Albert Michelson and Edward Morley was this: if the Earth is presently moving through space at a clip of 66,000 mph around the sun, and this movement is through a medium that fills all of space (at that time it was called "ether," a view opposed to Relativity's belief that space is a vacuum), then a light beam discharged from Earth in the direction of the Earth's supposed motion should logically find its speed impeded to a degree proportional to the speed of the Earth. Light, even though it seems to be without substance, can be impeded by the medium through which it travels. We see these effects quite readily when, for example, we put a pencil in a glass of water and observe how the light rays are bent, or slowed down, by the water, and thus make the pencil appear broken. The decrease in light's speed can be measured quite accurately. By the same token, the Michelson-Morley experiment would show that a light beam discharged from the north pole to the south pole, or vice versa, would experience no change in speed, since it would not be moving in the direction of Earth's path around the sun and thus not against the ether.

Albert Michelson and Edward Morley were anticipating being able to measure the difference in speed because of their previous success in repeating Armand Fizeau's experiment with light in moving water. With their new *interferential refractometer*, as it was originally called, they would be able to determine effects of the second order with an accuracy that was previously unobtainable. Thus Morley wrote to his father that the purpose of the experiment was "to see if light travels with the same velocity in all directions."[733]

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[732] Richard Hazelett and Dean Turner, *The Einstein Myth and the Ives Papers: A Counter-Revolution in Physics*, 1979, pp. 88-91.
[733] Letter dated April 17, 1887, in the Edward W. Morley Papers, Library of Congress, as cited in Dorothy Michelson Livingston's *Master of Light: A Biography of Albert Michelson*, 1973, p. 126.
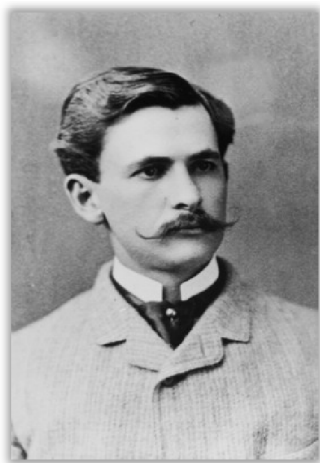
Albert Michelson (1852–1931)   **Edward Morley (1838–1923)**

To everyone's utter surprise, Michelson and Morley found that a light beam discharged in the direction of the Earth's assumed motion showed virtually no difference in speed from a light beam discharged north to south or south to north. In other words, the experiment failed to detect the Earth moving in or against space, of whatever space was understood to consist. As one can imagine, this result was of great concern to Einstein.

Einstein's Concern for the Fizeau and Airy Experiments

The Michelson-Morley experiment was not the only one that was of concern to Einstein, however. In fact, since Einstein was well aware of previous experiments with the same results, he probably would have expected a negative result from Michelson-Morley. We suspect this to be the case since interviews with Einstein show he was just as concerned with the results of experiments performed about 10-50 years earlier. Robert Shankland's interview with Einstein reveals the details:

> Prof. Einstein volunteered a rather strong statement that he had been more influenced by the Fizeau experiment on the effect of moving water on the speed of light, and by astronomical aberration, especially Airy's observations with a water-filled telescope, than by the Michelson-Morley experiment.[734]

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[734] Robert S. Shankland, "Conversations with Albert Einstein," *American Journal of Physics*, 31:47-57, 1963, and specifically the follow up report in 41:895-901,

Why would the "Fizeau experiment" and "especially Airy's observations with a water-filled telescope," cause such consternation in the mind of Einstein? Very simply, Armand Fizeau and George Biddell Airy's experiments are two of the foremost evidences of a motionless Earth ever produced. Einstein's contemporary, Hendrik Lorentz, stated quite succinctly that these experiments put unbridled fear into the science establishment. In remarking on those same experiments Lorentz wrote this astounding admission: "Briefly, everything occurs as if the Earth were at rest…"[735] Eventually, it would take the full force of Relativity theory and its attendant Lorentzian-derived "transformation equations" to make even an attempt at explaining the amazing results of Fizeau, Airy and various stellar aberration experiments.[736] The Michelson-Morley experiment was merely a desperate attempt, using more sophisticated equipment, to

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1973, p. 896. Einstein repeated this same concern on a number of occasions, each time minimizing the impact of Michelson-Morley against Airy and the stellar aberration experiments. For a running commentary on these occasions, see Holton's *Thematic Origins of Scientific Thought*, pp. 191-370.

[735] From Lorentz's 1886 paper, "On the Influence of the Earth's Motion of Luminiferous Phenomena," as quoted in Arthur Miller's *Albert Einstein's Special Theory of Relativity*, p. 20. Although Miller, an avowed heliocentrist, does not admit to a concern that the Copernican system might be overturned by the Fizeau/Airy evidence, his consistent references to being required to view things from the "geocentric system" shows that he is at least aware of the differences (*e.g.*, "The stellar aberration of light from a fixed star is observed in the *geocentric system*….If, in the *geocentric system*, *c* was the light velocity from a star – *v* was the star's velocity relative to the Earth (*i.e.*, *v* = 30km/sec which is the Earth's velocity relative to the sun)….At the time *t* in the *geocentric system* there is a point *P* on a spherical wave front, and the wave is traversing a medium of refracted index *N* that is at rest on the Earth….Consider, in the *geocentric system*, a water-filled telescope…Lorentz continued (1886), by noting that from the viewpoint of the *geocentric system*…(pp. 15, 19, emphases added). Also revealing are the times Arthur Miller makes such statements as: "optical phenomena were unaffected by the Earth's motion" or "interferometer experiments could not detect the Earth's motion…" (p. 20) yet, because he has accepted heliocentrism as an absolute, he cannot find it within himself to entertain the possibility that the Earth is actually not in motion.

[736] Arthur Miller claims "Einstein did not have to discuss the experiments of Airy and Arago because special relativity theory reduced their observations to a foregone conclusion." As we can see from Shankland's interview (above), Miller is quite wrong about Einstein's motivations. Not only did Einstein "discuss…Airy," but he considered it a formidable puzzle that had to be answered.

overturn Fizeau and Airy's findings, but as noted above, it failed to do so.[737]

Einstein's biographer probably didn't even know this history when he wrote that men were faced with the possibility of "scuttling the whole Copernican theory" after the Michelson-Morley experiment. Unlike Einstein, most such biographers have fixated on the cart but were rather oblivious to the horse. All in all, we can say this much for Einstein: although his theories were certainly fantastic to the point of absurdity, at least he was smart enough to know from whence his opposition came. In the battle for the cosmos, the unexpected results of the Fizeau and Airy experiments had already put modern science on trial, but since they both produced anti-Copernican results, the clarion call of concern was not being trumpeted to the rest of the world. For the rest of his career Einstein would do everything in his power to stop it from sounding. As van der Kamp has stated: "Yes, I think I understand the sentiment motivating him. If we cannot prove what we *a priori* 'know' to be true [a moving Earth], then we have to find a reason why such a proof eludes us."[738] And thus was born the theory of Relativity.

When one reads Einstein's works, there appears to be no ostensible concern that these experiments could "scuttle the whole Copernican

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[737] As physicist Herbert Ives reminds us: "It must not be forgotten in the discussion of this subject that the Michelson-Morley experiment…only demands invariance of light signals with the velocity of the moving platform of measurement *on the premise that the Earth is moving* – there is no other motion involved in the experiment. If this is not agreed to then the null result proves nothing with regard to invariance, and the whole discussion is futile" ("Light Signals on Moving Bodies," *Journal of the Optical Society of America*, July 1937, Vol. 27, p. 271, emphasis added). The corollary, of course, is that the Earth may not be moving.

[738] *De Labore Solis*, p. 43. As we will see shortly, all claims that the Earth is moving based on stellar aberration are presumptuous, since from Airy's experiment it has been proven that the necessity of tilting a telescope to catch all of a star's light is due to a fixed Earth in a moving star system, not a moving Earth in a fixed star system. Interestingly enough, the type of experiment Airy performed was suggested more than a century earlier in 1766 by Ruggiero Giuseppe Boscovich (1711-1787), a Jesuit astronomer, and again by Augustin Fresnel in 1818, which may have been the source of Airy's idea. In 1746 Boscovich published a study on the elliptical orbits of the planets based on the Copernican system (*De Determinanda Orbita Planeta ope catoptrica*, Rome 1749). He published a second edition in 1785 (*Opera Pertinentia ad Opticam et Astronomiam*, Bassan, 1785). Perhaps if Boscovich had had the good fortune to perform an Airy-type experiment, he might have thought twice about adopting the Copernican system.

theory," nevertheless, there is an undercurrent in his writings that he is indeed cognizant of such implications yet does his best not to alarm the world. Even in private his concerns are subtle. For example, in an exchange with Willem de Sitter in 1917 over whether the universe was a "3-dimensional hypersphere embedded in a 4-dimentional Euclidean space" or a "4-dimensional hypersphere embedded in a 5-dimensional Euclidean space," Einstein objected to de Sitter's 4-5 model based mainly on the fact that it had "*a preferred center.*"[739]

Relativity theory, by its very nature, is especially susceptible to anti-Copernican interpretations since for everything that Relativity claims for itself by a moving Earth in a fixed universe can easily be "relativized" for a fixed Earth in a rotating universe. In fact, stellar aberration was indeed a major concern of Einstein's for that very reason, since Relativity theory, in principle, demands equal viability for both of the aforementioned perspectives.[740] Einstein's concern was justified. As we will see, Airy's experiment threw a wrench into the reciprocity of Relativity, for it demonstrated that it really does make a difference whether the Earth is moving or at rest in regards to how light from a star travels through a telescope mounted on the Earth. Consequently, Einstein could not "relativize" the results of Airy's experiment since stellar aberration provided a distinction he could not readily overcome. Consequently, Einstein would be forced to resort to the *ad hoc* "field transformation" equations of Henrick Lorentz to answer Airy's results; and although others didn't voice their opinions too loudly for fear of being ostracized, everyone knew that Einstein's efforts were just mathematical fudge factors. There was one inescapable fact that Airy's telescope was revealing: barring any mathematical fudging, Earth was standing still and

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[739] "The Einstein-De Sitter Debate and Its Aftermath," Michael Janssen, University of Minnesota, p. 3.

[740] Einstein demonstrated this in his 1911 paper "Über den Einfluß der Schwerkraft auf die Ausbreitung des Lichtes," *Annalen der Physik*, 35, 903f. According to Einstein, the argument of whether the Earth rotates or the heavens revolve around Earth is understood as nothing more than a choice between reference frames. The Earth's poles would flatten from either reference frame, says Einstein. In the frame of a rotating Earth in a fixed star system, the centrifugal force is a consequence of the Earth's uniform acceleration relative to the fixed stars. In a fixed Earth frame, Einstein says the centrifugal force is attributed to the effect of "the rotating masses" [stars] that are generating a gravitational field that causes the Earth's poles to flatten. The two frames are said to be equivalent, since there is equivalence between inertial mass and gravitational mass. As we will see later, the flattening of the Earth's poles occurs, according to Einstein, because the gravity of the stars creates a curvature of the space-time fabric surrounding the Earth.

the stars were revolving around it, not vice-versa. Hence, the importance of the Michelson-Morley experiment was that it confirmed, by a significantly different kind of experiment, the same results that Airy found in his water-filled telescope sixteen years earlier. But before we get to Airy's actual experiment we need to cover the history that led up to it.

The Experiments of Dominique Arago

The "Fizeau experiment" and "Airy's observations" that Einstein mentions in the Shankland interview have their impetus for concern a few years prior in the work of **Dominique François Arago** (1786-1853). Arago is one of France's most celebrated scientists. He had his hands in many fields of interest, but his unique work with light set the pace for many years to come. For our purposes, there are two things of note in his discoveries between the years 1810 to 1818. First, Arago observed one star through a telescope for the whole course of a year. In the heliocentric system the Earth will move toward the star and then move away. Arago reasoned that the focal length of his telescope would need to change when viewing the star since the limited speed of light must be compensated to accommodate both a receding Earth and an advancing Earth at six month intervals.
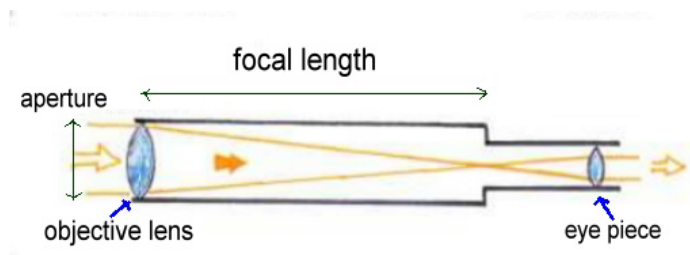
To his utter astonishment, Arago did not need to adjust the focus to see the star clearly. If one were predisposed to heliocentrism one might interpret this phenomenon as an indication that the stars were far enough away that, regardless of whether the Earth moving toward or away from the star, the star light is unaffected. If one were a geocentrist, one would be inclined to conclude that there is no need to adjust the focus simply because the star actually is where it appears to be and there is very little relative movement between the Earth and the star on an annual basis.

Second, Arago had previously experimented with light beams traveling through glass. He showed that light traveled slower in denser mediums, such as glass or water, and this, in turn, helped support the wave theory of light (as opposed to the particle theory). Arago assumed the light waves had a uniform speed through the ether. If Earth was moving against
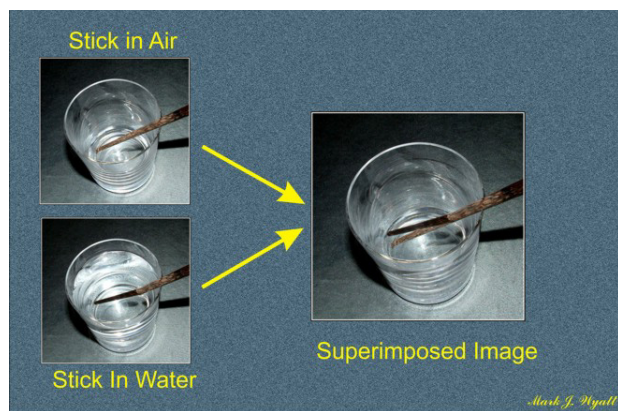
the ether (as would be the case if it were revolving around the sun) then the ether should impede the speed of light, just as it did in glass or water. Arago's experiment showed, however, that whether the light beam going through the glass was pointed in the direction of the Earth's supposed movement or opposite that movement, there was no effect on its speed going through the glass. Moreover, he showed that a light beam pointed toward or away from the Earth's supposed orbit had the same **refraction in glass** as the refraction of starlight in glass.[741] Hence, in whatever way he

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[741] François Arago, "Mémoire sur la vitesse de la lumière, lu à la prémière classe de l'Institut, le 10 décembre 1810. *Académie des sciences* (Paris). *Comptes Rendus* 36 (1853):38-49. As Arthur Miller describes it: "…Arago covered half of his telescope with an achromatic prism. He found that the aberration angle was independent of whether light passed through the prism…" (*Albert Einstein's Special Theory of Relativity*, p. 15).

tested the incidence of light, it always showed Earth at rest in the ether. As E. T. Whittaker puts it:

> Arago submitted the matter to the test of experiment, and concluded that the light coming from any star behaves in all cases of reflexion and refraction precisely as it would if *the star were situated in the place which it appears to occupy* in consequence of aberration, *and the earth were at rest*; so that the apparent refraction in a moving prism is equal to the absolute refraction in a fixed prism.[742]

Here was the first confirmed evidence since the Copernican hypothesis arose three centuries prior that science had been far too presumptuous in opting for a heliocentric solar system. In order to stop the hemorrhaging, science had to find the proper tourniquet to save the appearances for a moving Earth.

The Experiments of Augustin Fresnel

Enter **Augustin Jean Fresnel** (1788-1827). Fresnel worked with Arago on various occasions, and it was left to Fresnel, the more famous of the two, to explain Arago's results by retaining the moving Earth model. Both Arago and Fresnel were advocates of the wave theory of light, and Arago asked Fresnel if it would be possible to explain the results of his starlight experiment by the wave theory. Fresnel came up with an ingenious answer and explained it to Arago in a letter dated 1818.[743] He postulated that there was no effect on the incidence of starlight because the ether through which the light traveled was being "dragged," at least partially, by the magnifying glass of the telescope.

Because ether was understood to permeate all substances, Fresnel hypothesized that there was a certain amount of ether trapped within the glass and it would be denser than and independent from the ether in the surrounding air. The key to understanding this theory is that Fresnel held that the ether outside the glass was immobile. As the glass moved with the

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[742] E. T. Whittaker, *A History of the Theories of Aether and Electricity*, Dublin University Press, Longmans, Green and Co., 1910, p. 116, emphasis added.

[743] "Lettre d'Augustin Fresnel à François Arago sur l'influence du mouvement terrestre dans quelques phénomènes d'optique," *Annales de chimie et de physique* 9 (1818): 57-66, 286. Reprinted in *Oeuvres Complètes*. Paris: Imprimerie impériale, 1866-1870, vol. 2, pp. 627-636.

Earth's assumed movement and against the immobile ether outside, the glass would "drag" its trapped ether with it.

Thus Fresnel conveniently concluded that Arago couldn't detect any difference in the speed of light because the glass in his experiment was dragging the ether just enough in the opposite direction to the Earth's movement so as to mask the Earth's speed of 30 km/sec through the immobile ether.[744]

To understand the rationalization of Fresnel's "drag" to explain Arago's results, let's use an example. We have two telescopes, one hollow and one filled with glass. Both telescopes are viewing the same star. Will

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[744] As van der Kamp states: "…an omnipresent Fresnel drag caused by an at least 30 km/sec ether wind in all transparent materials, whether water, glass, perspex, champagne, or castor oil. However, no observer at rest on the Earth's surface can measure this drag as such. Only a supposed 'change' in that drag becomes visible by setting these substances in motion relative to such an observer" (*De Labore Solis*, p. 45). Note that scientists in Fresnel's day were using the term "immobile ether" due to the fact that they believed the Earth was moving through an immobile ether rather than the ether moving against an immobile Earth. The two environments will, in fact, produce the same results, but to avoid any implications of admitting to a fixed Earth, the scientists of this period invariably describe it as an "immobile ether." Some current scientists do the same. For example, Stephen Marinov, whose experiments show an ether-drift of 279-327 km/sec, declares that the Earth is moving through it toward the midpoint of the constellations Virgo, Hydra and Libra. Marinov's calculations are very close to those of Dayton Miller's 1925 interferometer experiments, which registered the Earth's movement at 208 km/sec, but toward Draco. See footnotes later in this volume concerning Dayton Miller's experiments for explanation of this ether-drift in respect of Geocentrism.

each telescope measure the same aberration (bending) of the starlight? One would think that, since light bends appreciably more in glass, that the glass telescope should show considerably more bending of the starlight compared to the hollow telescope, just as when we put a pencil in a glass of water and notice the pencil appear to bend in the water. (We would notice the same bending if we put half of the pencil in a glass cube).[745] But as we will see shortly, all such telescopic views of stars will show no more bending of starlight in the glass telescope than in the hollow telescope. There is something about the incidence of starlight received on the Earth that causes this strange phenomenon. As we will see, the natural and least complicated answer for this phenomenon is that Earth is not moving, and since the stars, although moving, are so very far away, the angle of incidence will be virtually the same on one side of the Earth as on the other, that is, it will always be straight overhead and thus produce no refraction or diffraction through air telescopes as opposed to glass telescopes.

Once again, Fresnel explained this phenomenon using the model of an Earth moving at least 30km/sec around the sun and against the incidence of starlight. As noted above, he claimed that the glass telescope had a certain amount of ether contained within it that was denser than the ether outside.[746] When the starlight enters the glass telescope, the extra ether, by using the Earth's movement, had the ability to "drag" the starlight sufficiently enough away from the immobile ether in the air to make the light within the glass appear to equal the speed of the starlight in the hollow telescope. Incidentally, glass could perform this feat, according to Fresnel, because the light entering it was understood as a wave, whereas if light were composed of particles, Fresnel's theory would not work.

By this clever manipulation of something he couldn't even detect (*i.e.*, the ether) and a nature of light he hadn't even proven (*i.e.*, exclusively waves), Fresnel helped science avoid having to entertain a non-moving Earth as the most likely answer to Arago's puzzling findings. Obviously, to fair-minded observers, Fresnel's explanation appears to be a little too convenient, especially since he arrived at his solution without any

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[745] This bending is described by Snell's law of refraction, which is the relationship between the angles of incidence and refraction, and the indices of refraction of two mediums. The formula is $n_i \times \sine(\theta_i) = n_r \times \sine(\theta_r)$, where θ_i = the angle of incidence; θ_r = the angle of refraction; n_i = the index of refraction of the incident medium; n_r = the index of refraction of the refractive medium.

[746] Fresnel held that the ether density in the transparent medium (*i.e.*, glass) was proportional to the square of the medium's index of refraction. As such, the ether inside the glass moving through the ether in the air, will move with a fraction [$f = 1 - 1/\eta^2$] of that ether in the air's velocity.

physical experimentation; rather, he merely postulated various assumptions just so he and Arago could escape the geocentric implications that were haunting them and the rest of the science community. As one heliocentrist seeking to soften the blow states:

> It is possible generally to prove how Fresnel's theory entails that not a single optical observation will enable us to decide whether the direction in which one sees a star has been changed by aberration. By means of aberration we can hence not decide whether the Earth is moving or rather the star: only that one of the two must be moving with respect to the other can be established. Fresnel's theory is hence a step in the direction of the theory of relativity.[747]

Although "Relativity" theory would eventually be called to make an unprecedented rescue for Copernicanism, as this saga progresses we will see that it, too, offers no satisfactory escape from Arago or the other stellar aberration experiments that would be performed in the coming years. One problem led to another, and, in light of these intricate experiments, there would be no peace for those resting on the laurels of Copernicus and Kepler. Obviously, in order to add some legitimacy to Fresnel's hypothesis, another experiment had to be devised.[748]

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[747] J. D. ver der Walls, *Ober den wereldether*, p. 78. Cited in *De Labore Solis*, p. 34.

[748] Mathematically, Fresnel claimed that ether "drags" the light in the glass telescope in accord with the equation: $c = (1 - 1/\eta^2)v$, where c is the speed of light, η is the refractive index of the medium, and v is the velocity of 30 km/sec of Earth's supposed orbit; or more simply $f = 1 - 1/\eta^2$ where f is the "Fresnel drag" and η is the refractive index of the medium. This is described in Fresnel's paper, *Ann. De Chimie*, 17:180 that he wrote in 1821. Please note that our criticism of Fresnel's "drag" theory does not necessarily mean we deny that ether has the ability to drag light. We are critiquing the rather convenient formula Fresnel derived to mask a motionless Earth. In any case, in 1828, and with a more refined view in 1839, Augustine Cauchy, following the work of Claude Navier, postulated that the ether has the same inertia in each medium, but different elastic properties. The ratio of the elastic constant (p) to the measure of a substance's density (Δ) is equal to the speed of light squared (c^2). Fresnel used this ratio and proposed that when the glass plate moves through the ether, it sweeps up ether and obtains a new density. The velocity of the glass plate with respect to its internal ether will be different with respect to the external ether. Although the velocity and density of the internal ether changes, the total mass of the ether must remain the same. Because of the refractive index of light (η), the velocity of light in the moving glass plate is to be subtracted from the velocity of the ether impeded through the

The Experiments of Armand Fizeau

Enter Armand Fizeau (1821-1896), the very person whose experiments Einstein mentions as a major cause for concern and the impetus for his

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plate. The velocity of light, as measured by an observer at rest in the frame of the moving plate is added to the velocity of the plate through the same frame. In 1845 George Stokes (1819-1903), objecting to the notion that a massive body such as the Earth could move through the ether without disturbing it, advocated that stellar aberration was caused by the Earth dragging along all of the ether near its surface as it rotates, which he coined "the etherosphere," and which theory Michelson "revered above all others" (Loyd Swenson, *The Ethereal Ether*, p. 24). Stokes' view was diametrically opposed to Fresnel's concept that ether was immobile and only partially dragged by such things as glass. Fresnel held to an immobile ether to accommodate his "transverse" wave theory of light (as opposed to longitudinal waves), a theory he was forced to adopt to explain light polarization. As such, Fresnel required a solid ether (as opposed to a fluid ether) to produce the forces needed to oppose the distortions caused by transverse waves. In further developments, in 1849 Stokes suggested that the ether was not dragged by the moving glass plate, but that the ether within the plate was compacted. In his work with light diffraction around opaque bodies and light diffraction in the sky, he showed that the vibration of ether particles is at right angles to the plane of polarization. The same did not hold for crystals, so Stokes reversed Cauchy's hypothesis, making the elastic properties of ether the same in all materials, but allowing the inertia to be anisotropic. In the end, Stokes' ether behaves as a rigid solid for high-frequency oscillations of light but as a fluid for the slow moving celestial bodies. In 1867, further experiments forced Stokes to withdraw his theory. (*cf.*, G. G. Stokes, "On the Aberration of Light," *Philosophical Magazine* 27, pp. 9-15, 1845; "On Fresnel's Theory of the Aberration of Light," *Philosophical Magazine* 28, pp. 76-81, 1846; "On the Constitution of the Luminiferous Ether Viewed with Reference to the Phenomenon of the Aberration of Light," *Philosophical Magazine* 29, pp. 6-10, 1846; "On the Constitution of the Luminiferous Ether," *Philosophical Magazine* 32, pp. 343-349, 1848). In the same year, Joseph Boussinesq proposed that, rather than ether having differing inertia in various media, it is the same in all locations but interacts in various ways depending on the type of materials. By 1888 R. T. Glazebrook revived Cauchy's wave theory and combined it with Stokes' anisotropic ether to agree with Stokes' 1867 experiment. In the early 1870s, Wilhelm Veltmann objected to Fresnel's theory due to the differences in refractive indexes for the various colors of light, which would require Fresnel's drag to be different for each color ("Über die Fortpflanzung des Lichtes in bewegten Medien," *Annalen der Physik* 150, pp. 497-535, 1873). In 1912, Larmor held that the ether itself could not be detected, only its consequent effects. In 1951 Paul Dirac suggested that physics needed a revised ether theory, as did Louis de Broglie in 1971.

invention of Relativity theory.[749] Fizeau needed to prove Fresnel's "drag" theory so as to have a physical, not merely theoretical or mathematical, answer for Arago's results. So horrible were the implications of Arago's experiments that counter-experiments such as the one Fizeau would soon undertake were described as an attempt to "find the ether" or "discover the nature of the ether" rather than what was truly at stake – finding out whether the Earth was really moving or not.
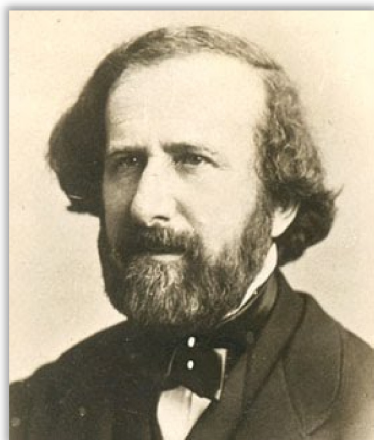
By and large, scientists strictly avoided language suggesting that the Earth could be motionless, for the Copernican Principle, although possessing not a shred of proof, was the holy grail of the science establishment and no one dare trespass its domain. Whereas the nineteenth century experimenters often camouflaged worries that Earth could be standing still in space by referring instead to a "motionless ether," twentieth century commentators after Einstein consistently avoided the geocentric implications of the nineteenth century experiments by turning the issue into one of "searching in vain for" or "abandoning" the elusive ether once they found out that the experiments invariably led to the possibility of a motionless Earth. To get a feeling of this sentiment, the reader need only recall the words of Edwin Hubble we cited earlier: to

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[749] That Fizeau probably knew the stakes for failure would require a rejection of Copernican cosmology is supported by the fact that he worked very closely with Jean Foucault (1819-1868), famous for the Foucault Pendulum which hangs in many of today's scientific museums as the so-called "proof" of the Earth's rotation. Fizeau and Foucault had worked together a few years before 1851 in demonstrating that the speed of light could be determined in the laboratory, not just astronomically. Fizeau became famous for his "toothed-wheel" experiment to measure light's speed.

Hubble, finding the Earth in the center of the universe would be "intolerable" and a "horror" that "must be rejected."

As for Armand Fizeau, his initial experiments found that the speed of light through glass varied with the color of the light, something for which neither Arago nor Fresnel tested. This meant, of course, that the ether would have to be reacting differently with various colors of light; or, there was a different amount of ether trapped in the glass for each particular color, options which seemed far-fetched. Fizeau proposed the hypothesis that the ether possessed elasticity, and varying degrees of elasticity would cause various reactions with light.

Thus, Fizeau set out to test the constitution of the ether in 1851. He sent two parallel light beams in opposite directions through tubes of water in which the water was flowing rapidly. In this way, one beam would be traveling with the flow of water, the other against the flow. When the light beams meet back at the receiving plate, the one traveling against the flow of water should arrive later, just as a person swimming against a water current will need more time to complete a journey than one swimming with the current. As the light beams arrive at the final destination at different times, the peaks and troughs of their wavelengths will not be in synch, which will then cause light and dark fringe markings to appear on the receiving plate. Water was the perfect medium to make such a test. Since light's speed in water is two-thirds of the upper limit at which it is said to travel in a vacuum, the water-medium would provide enough margin from the upper limit so that one could easily notice whether its speed was changed. As it turned out, the interference fringes showed a difference in the arrival times of the two beams and this result was said to support the Fresnel "drag" formula.[750]

Although Fizeau helped to give credibility to Fresnel's "drag" theory, he did little to establish that the Earth was moving through the ether. If we on Earth are moving through ether, then the speed of the light in the water tube will be increased with the speed of the Earth's motion (30 km/sec).

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[750] Armand Hippolyte Louis Fizeau, "Sur les hypotheses relatives à l'éther lumineux, et sur une experience qui paraît démontrer que le mouvement des corps change la vitesse à laquelle la lumière se propage dans leur intérieur" *Académie des sciences* (Paris), *Comptes Rendus* 33 (1851):349-355. In mathematical terms, Fizeau's formula to determine the interference fringes is $\delta = 4\eta^2 f v L/\lambda c$ where λ is the wavelength of light; v is the speed of the water; L is the length of the tubing; f is the drag factor; η the refractive index; and c the speed of light. In the experiment Fizeau calculated a difference of $\delta = 0.23$ interference lines, which implies an empirical drag factor $f = 0.48$. Since the theoretical drag is calculated from $f = 1 - 1/\eta^2$, which is 0.435, there is a margin of error of approximately 10% between Fresnel and Fizeau.

But the outcome was quite different than what Fizeau expected. The speed of light was not a sum of the velocity of the light added to the velocity of the Earth. Rather, the only effect Fizeau found on the speed of light was that which was induced by the water's refractive index. This was quite a dilemma. On the one hand, it showed that light was affected by a medium (*i.e.*, water), but on the other hand, the light was not being affected by the medium of ether, that is, its speed was not increased or decreased as the Earth went through the ether. The logical conclusion of this experiment is that it was presumptuous of Fizeau to assume the Earth was moving through the ether, since a fixed-Earth can easily account for why the light was not affected by the ether but only by the water (*i.e.*, by refraction).[751]
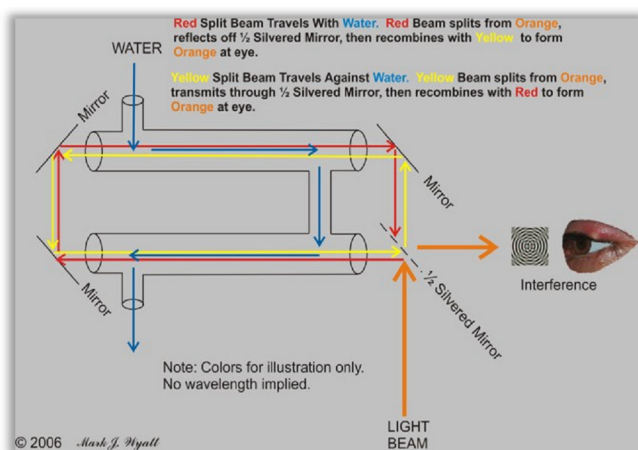
In order to escape this problem, Fizeau postulated that, as the water flowed, it would drag *only some* of the ether with it, and thus make the light move against *only some* of the ether, which would then appear as an alteration in the speed of the light in the water, and which, coincidentally, would equal the refractive index of the water, and which would also equal the Fresnel "drag" coefficient. Thus it seemed that Fizeau's experiment supported Fresnel's, at least the way they wanted to interpret it. In reality, both Fresnel and Fizeau, without any proof whatsoever, were already discounting a fixed-Earth as a viable solution to the unexpected results of their experiments.[752]

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[751] In Fizeau's experiment no distinction is made between the ether in the water and the ether in the air, since both light beams are traveling through water, and it is only those light beams which are subsequently measured.

[752] In a repeat of Fizeau's experiment in 1884, Michelson and Morley agreed with Fizeau's results, which they published in 1886. They wrote: "…the result of this

Despite this apparent "solution," there was still an open question: would Fizeau's use of water to drag ether and impede the speed of light prove to be true for starlight? Of course, the reason the question of starlight would surface is not because starlight is intrinsically different than laboratory light, but only because underneath it all the parties involved were quite cognizant of the cosmic implications of testing starlight, that is, because of the star's immense distance from Earth it had the ability to determine whether the Earth was really moving or not. Arago had already demonstrated this fact to the science community back in 1810 when he observed no change in the incidence of starlight over the course of a year's observations, but the Copernicans were determined to put these results in the category of "interesting, but unconvincing."

The Experiments of James Bradley and George Airy

Twenty years after Fizeau's experiment, George Biddell Airy would perform his own water-tube experiment, which, to his utter surprise, would confirm Arago's results – that Earth was standing still in space. Although Fresnel temporarily saved the world from having to scuttle the Copernican theory, we will see that the nature of Airy's experiment left Einstein with no choice but the fantastic postulations of Relativity theory to answer Airy's results.

George Airy belonged to the exclusive Astronomer Royal of England. He was a well-respected scientist and had quite a reputation and audience for his endeavors. But Airy was an avowed heliocentrist just as Einstein, so it is not Airy's position as an esteemed scientist for which we make reference to his work, but precisely because of his failure to prove his cherished view of cosmology. Airy was quite certain, at least before he did his experiment, that his water-filled telescope would prove the Earth revolved around the sun. Hence, he was quite surprised at his "failure."

Here's how "Airy's failure" transpired. Airy knew from Arago that: (1) light's speed was slower in a solid transparent medium than in air; (2) that any movement ascribed to the Earth did not affect the speed of light, and (3) that Fresnel's explanation of Arago's experiment was that the glass plate "dragged" the ether and acted independently of ether in the air. Airy, by merely enhancing the procedures of those before him, decided to use a

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work is therefore that the result announced by Fizeau is essentially correct: and that the luminiferous ether is entirely unaffected by the motion of the matter which it permeates" ("Influence of Motion of the Medium on the Velocity of Light," *American Journal of Science*, 31, p. 386, 1886). But they would later withdraw their support after their 1887 interferometer experiment.

source of light outside Earth, namely starlight, and direct it through different mediums to see if the light was affected.

Before we see what Airy's experiment did in the battle for whether the Earth was fixed in space, it would be beneficial to know a little of the history about the nature of starlight. As early as 1640 the astronomer Giovanni Pieroni observed that various stars shifted their position in the sky during the year. As we noted earlier, Francesco Rinuccini brought this evidence to Galileo's attention in 1641, but Galileo was unimpressed. Robert Hooke, three decades later, in 1669, noticed the same kind of shifting for one star in particular, *Gamma Draconis*. Since everyone from the time of Copernicus had been looking for physical evidence of a moving Earth, Hooke actually thought he had discovered the first parallax as its proof. Almost another thirty years later (1694), John Flamsteed observed the same kind of shifting in the star Polaris.

James Bradley and *Gamma Draconis*
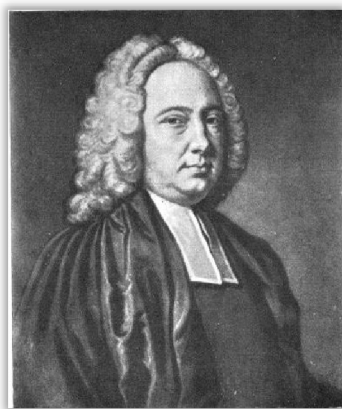
Another thirty years later, James Bradley (d. 1762) set out to determine whether Hooke's observations were, indeed, a parallax of *Gamma Draconis*. During the years of 1725-1728 he noticed that during the course of a year the star inscribed a small ellipse in its path, almost the same as a parallax would make. In the heliocentric system, parallax is understood as a one-to-one correspondence between Earth's annual revolution and the star's annual ellipse, but Bradley noticed that the star's ellipse was not following this particular pattern.[753]

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[753] Parallax, as measured from Earth, is understood as the measure of the apparent movement of a star against more distant stars that do not move. There are about 700 stars in our sky that are close enough to Earth and far enough from
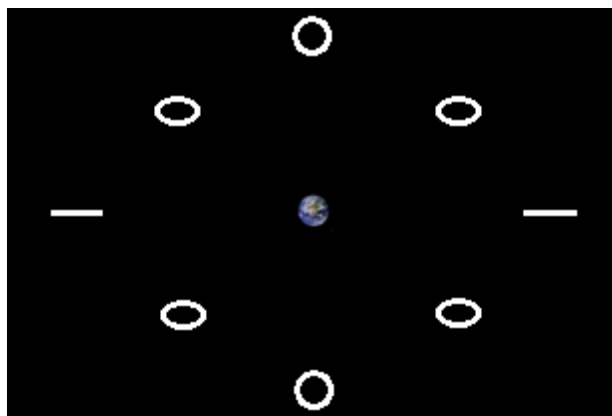
Stellar aberration as seen from Earth

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background stars in order to form a parallax. In the heliocentric system, which Bradley was using, a star's parallax is measured by using the Earth's orbit. At each point on the Earth's path, a star with parallax will appear on the opposite side of the Earth's orbit in the star's ellipsis. For example, in the heliocentric system, if the Earth is at twelve o'clock in its orbit the star will be at six o'clock in its ellipsis; if Earth is at three o'clock, the star will be at nine o'clock. In stellar aberration, the Earth and the star will not be on opposite sides of their respective ellipses. So, if the Earth is at twelve o'clock in its orbit, the star will also be at twelve o'clock in its ellipsis. Bradley noticed that *Gamma Draconis* was following the stellar aberration pattern, not the parallax pattern, since it was behind the parallax pattern by at least three months. Bradley found a 20.47° angle of aberration. As we will see later, stellar aberration can also be explained by the geocentric model, since in that model the stars are centered on the sun and partake of the sun's annual movement around Earth, and thus stellar aberration will occur in exactly the same proportions as in the heliocentric system. Incidentally, Bradley also discovered that *Gamma Draconis* traced out an additional smaller ellipse in the course of 18.6 years. The heliocentric explanation for this ellipse is that the moon, since its orbital precession rotates around Earth once every 18.6 years, is altering the Earth's axial spin (otherwise known as nutation). This explanation fails, however, since it would require each star to have the same 18.6 year ellipse as *Gamma Draconis*. The geocentric explanation for the 18.6 year ellipse is that, as the universe rotates around Earth, a slight uneven mass distribution causes a small precession of the universe of 18.6 years, which is part of a larger precession of 25,800 years (the heliocentric system has a 25,800-year precession of the Earth's axial rotation). These dual precessions, in conjunction with the stars that move within those precessions in a specified elliptical path depending on their distance from Earth, distance from the North Star (Polaris), and their mass, will create a specified ellipse for each star, as seen from Earth.

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At this point, astronomical science was still waiting for a confirmed parallax of any star, since no one had ever measured one. A confirmed measurement of parallax would not be made until more than a century later by Friedrich Bessel in 1838. So Bradley, reasoning that *Gamma Draconis* was too far away to register a parallax, found another explanation, and it was a rather ingenious one. He theorized that the star's annual ellipse was being formed because the speed of light was finite.[754] That is, the star wasn't actually moving in the sky; rather, its light, moving at a finite speed, was hitting a moving Earth, an Earth that for six months was moving toward the star, and in the next six months was moving away from the star. While the Earth moved toward the star, the star's light would hit the Earth sooner, but while the Earth moved away, the light would hit it later. Bradley reasoned that, if light's speed was infinite, there would be no such effect, but since it is finite, these back-and-forth movements of the Earth would translate into seeing the star move in an ellipse over the course of a year. This explanation was a welcome relief for the heliocentric view, since until Bradley no one, including Galileo who died in 1642, had supplied any real evidence that the Earth could be revolving around the sun.[755]

The only "evidence" Galileo's contemporaries provided was that of analogy, that is, because he saw moons revolving around Jupiter through his telescope he conjectured that smaller bodies (such as the Earth) had to revolve around larger bodies (such as the sun). As one author put it, in Galileo's day, "the telescope did not prove the validity of Copernicus' conceptual scheme. But it did provide an immensely effective weapon for the battle. It was not proof, but it was propaganda."[756] Thus, the

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[754] Up until this time, the only one who had suggested that light had a finite speed was Ole Römer in 1670 as he was observing the variations between two successive eclipses of Io, one of Jupiter's moons. The eclipse is the shortest in duration when, in the heliocentric system, Earth is moving toward Jupiter, and longest in duration when Earth is moving away. As we will see later, this same phenomena can be explained by the geocentric model since in that model, Jupiter, revolving around the sun, is moving toward and away from a fixed Earth in the same proportions as in the heliocentric system.

[755] As one modern astronomer presumptuously concluded: "The discovery of this aberration was the first experimental proof that the earth has a yearly motion and that Copernicus was right" (A. Pannekoek, *A History of Astronomy*, 1961; originally published in 1951 under the Dutch title: *De Groei van ons Wereld*, cited in *The Biblical Astronomer*, Vol. 3, No. 64, 1993).

[756] Thomas Kuhn, *The Copernican Revolution*, 1959, p. 224. Kuhn adds: "The opposition took varied forms. A few of Galileo's more fanatical opponents refused even to look through the new instrument… Others…claimed…they were apparitions caused by the telescope itself. Most of Galileo's opponents behaved

Arago/Fresnel/Fizeau affair was more or less an interlude until someone would come along and either prove or disprove Bradley's hypothesis.

Enter **George Airy** (1801 – 1892). As ingenious as Bradley's answer was to the ellipse formed by *Gamma Draconis* so was Airy's experiment to prove it right or wrong. Accepting that light's speed was finite, Airy had to figure out some way of determining whether the light from a star was affected by Earth's presumed motion. Whereas Bradley used only one kind of telescope, Airy had the ingenious idea of using a second telescope standing right next to the first telescope, but filled with water instead of air. Since Arago/Fresnel/Fizeau had already shown that light's speed was slowed by glass or water, Airy assumed that if a telescope was filled with water then the starlight coming through the water should be slower than it would be in air and thus bend the starlight outward toward the side of the telescope and away from the eyepiece (just as we see light bent when we put a pencil in water). In order to compensate for the outward bending of the starlight, Airy assumed he would need to tilt his water-filled telescope just a little more toward the lower end of the star so that its light would hit his eyepiece directly rather than hitting the side of the telescope.

One would do the same, for example, if he were carrying a drinking glass while he were running through a rainstorm. In order to catch the raindrops so that they hit the bottom and not the side of the drinking glass, one must tilt the drinking glass forward a bit in order to compensate for one's running speed. Another example that illustrates this principle rather well is the task of dropping a drop of water into a test tube from an eye-dropper. If the test tube is mounted so that it stands straight up on a rotating disc and one tries to drop a drop of water into the test tube as it comes around, the drop will invariably hit the inside of the test tube. One must tilt the test tube slightly in the direction of the rotation in order to allow the drop to hit the bottom of the test tube. Light, because it reacts as

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more rationally. Like Bellarmine, they agreed that the phenomena were in the sky but denied that they proved Galileo's contentions. In this, of course, they were quite right. Though the telescope argued much, it proved nothing" (*ibid*., p. 226).

if it were a substance, moves in a similar fashion to the drop of water (only it moves much faster than rain and eye drops and thus the effects are much more subtle).
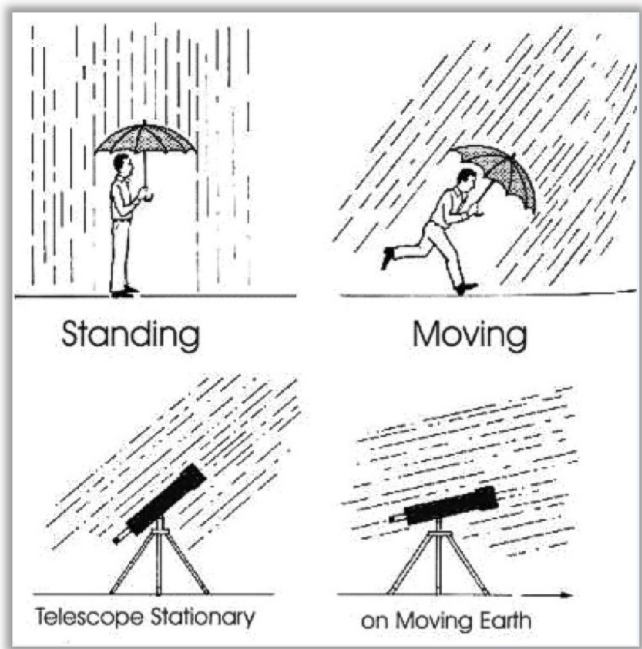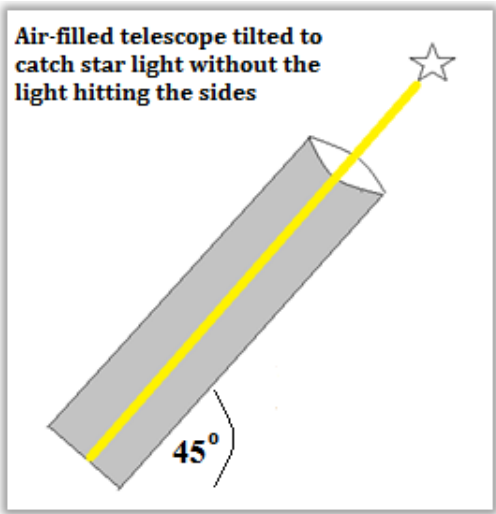
Air-filled telescope tilted to catch star light without the light hitting the sides

45°

Standing

Moving

Telescope Stationary

on Moving Earth

Although Airy had suspected the outcome prior to the actual experiment, indeed, he soon discovered that he was not required to tilt his water-filled telescope toward the star to any greater degree than his air-filled telescope.
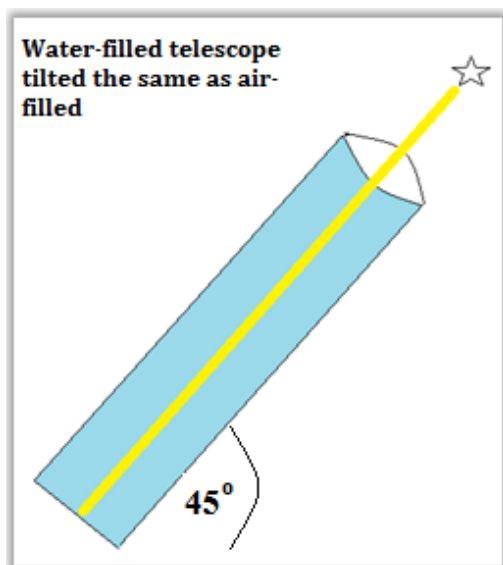
These results indicated that Earth wasn't moving, since if there is no additional adjustment necessary for a water-filled telescope toward the direction of the starlight it means the starlight is coming into both telescopes at the same angle and speed. If Earth were moving, then a water-filled telescope would have to be tilted toward the starlight a little more acutely than an air-filled telescope. This is so for two related reasons: (1) in the heliocentric model, the Earth is moving sufficiently against the incidence of starlight upon it, and thus the water-filled telescope would not be able to catch all of the starlight in the slower medium of water. It would have to be tilted slightly ahead of the air-filled telescope to make up for light's slower speed in water; and (2) since the starlight is coming from outside Earth's ether environment, then one cannot readily explain Airy's failure by saying that the denser medium (*i.e.*, water as opposed to air) carried a higher or lower amount of ether, as Fresnel had claimed. Starlight seemed to be unaffected by the ether, or any medium, since Airy proved that its light was coming to Earth at one specified angle and speed.[757]

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[757] George B. Airy, "On a supposed alteration in the amount of astronomical aberration of light produced by the passage of light through a considerable thickness of refracting medium" (Proceedings of the Royal Society, London,

Proceedings: Royal Society of London, 1871
Volume 20, pages 35-39

IV. "On a supposed alteration in the amount of Astronomical Aberration of Light, produced by the passage of the Light through a considerable thickness of Refracting Medium." By GEORGE BIDDELL AIRY, C.B., Astronomer Royal. Received November 17, 1871.

A discussion has taken place on the Continent, conducted partly in the 'Astronomische Nachrichten,' partly in independent pamphlets, on the change of direction which a ray of light will receive (as inferred from the Undulatory Theory of Light) when it traverses a refracting medium which has a motion of translation. The subject to which attention is particularly called is the effect that will be produced on the apparent amount of that

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38 *On a supposed Alteration of Aberration of Light &c.* [Nov. 23,

Day of observation.	Star's Observed Zenith-distance North.	Star's Declination from 'Nautical Almanac.'	Difference for Geographical Latitude of Instrument.	Correction for Aberration adopted in 'Nautical Almanac.'
1871.				
Feb. 28	85·30	51 29 55·3	51 28 34·0	−18·71
March 1	85·71	59·1	33·6	18·82
3	84·19	58·9	34·7	19·02
4	82·18	58·8	35·6	19·11
16	83·63	58·0	34·4	19·73
17	84·58	58·0	35·4	19·74
21	83·67	57·9	34·0	19·73
23	82·73	57·9	35·2	19·63
24	84·18	58·0	33·8	19·66
26	84·04	58·1	34·1	19·59
27	83·48	51 29 58·2	51 28 34·7	−19·54
Mean Latitude of Instrument from Spring Observations			51 28 34·4	→ 51° 28' 34.4"
Aug. 29	122·10	51 30 34·4	51 28 32·3	+18·25
Sept. 5	121·84	35·0	33·2	19·01
7	121·62	35·1	33·5	19·18
9	120·27	35·2	34·9	19·35
11	122·98	35·3	32·3	19·45
15	122·20	35·4	33·2	19·64
17	121·33	35·5	34·0	19·70
22	121·38	35·5	34·1	19·74
24	120·01	35·4	35·4	19·72
Oct. 1	120·62	35·1	34·5	19·46
2	120·29	35·1	34·8	19·40
3	121·31	35·0	33·7	19·35
4	124·41	34·9	30·5	19·25
6	120·60	51 30 34·8	51 28 34·2	+19·10
Mean Latitude of Instrument from Autumn Observations			51 28 33·6	→ 51° 28' 33,6"

Only 0.8 " Difference

Excerpts from Airy's report to the Royal Astronomical Society

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1871, pp. 35-39). As Arthur Miller describes it by means of a diagram: "Consider, in the geocentric system, a water-filled telescope whose line of sight to a star is normal to the direction of the star's velocity relative to the Earth which is $-v/N^2$ (according to Fresnel's hypothesis). The law of sines yields $\sin \delta' = v/cN$). Since the starlight is refracted on entering the water then δ' is not the aberration angle. Using Snel's law to relate v and δ', *i.e.*, $\sin \delta = N \sin \delta'$, we obtain $\sin \delta = v/c$. This derivation is based on the ones of Veltmann (1873), Lorentz (1886) and Drude (1900). The notion of seeking deviations from stellar aberration in air by using a water-filled telescope had been suggested by Boscovich in 1766, and was mentioned by Fresnel (1818), who predicted no change because this experiment was equivalent to Arago's. Airy (1871) carried out the experiment and found no change in the aberration angle" (*Albert Einstein's Special Theory of Relativity*, p. 19).

> thesis of Professor Klinkerfues is untenable. Had it been retained, the
> Aberrations to be employed in the corrections would have been increased
> by $+15''$ and $-15''$ respectively, and the two mean results would have dis-
> agreed by $30''$.

> and laws of Aberration were first established. The position of this star is
> at present somewhat more favourable than it was in the time of Bradley,
> its mean zenith-distance north at the Royal Observatory being about $100''$
> and still slowly diminishing. With the sanction of the Government, there-
> fore, I planned an instrument, of which the essential part is that the whole

At this point we should mention the fact that Bradley's appeal to a 20.5" arc in the star's movement as being due to a 30 km/sec revolution of the Earth around the sun assumes that the sun is a fixed object. Without taking the sun as fixed, Bradley would not be able to detect any aberration in *Gamma Draconis*. But according to modern cosmology, no object in the sky is fixed, and thus Bradley's theory is nullified on that count alone. Otherwise, the sun is at rest or Relativity is wrong.

As we noted earlier, Arago had already postulated in theory what Airy found by experiment. Arago wrote a paper on the subject in 1839 and thus the science establishment should have anticipated Airy's results.[758] In 1766 Giuseppe Boscovich, and afterward Augustin Fresnel in 1818, had also recommended testing Arago's hypothesis by a water-filled telescope. In Airy's experiment, the water-filled telescope would be analogous to Arago's glass plate (or the glass-filled telescope example we offered earlier), since both would make light travel at a slower speed than in air. Fresnel, being a firm believer that the Earth revolved around the sun in an ether medium, explained Arago's results by claiming the glass plate trapped the ether and thus dragged it and the light, giving the appearance of the bending of light in the glass plate. In fact, Fresnel would be quite satisfied in assuming that the plate dragged the ether just enough to be equal to the Earth's presumed movement around the sun.[759] But it was not easy for Fresnel to explain Airy's failure, because Airy found, with respect to two different telescopic mediums, there is no additional drag of starlight by the ether surrounding Earth. In other words, if Earth were moving, it would be moving against the ether, and thus the ether wind would be

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[758] *Comptes Rendus de l' Académie des Sciences*, 8, 326, 1839.
[759] In other words, the angle of refraction in the glass plate will equal the arc seconds Earth moves in its angular journey around the sun, since both are formed by Earth's movement through the ether. Incidentally, although we emphasize that Fresnel was a "heliocentrist," Arago and Airy were also heliocentrists, and thus "Airy's failure" is a failure for heliocentrism.

expected to push the starlight past the telescope. Airy showed that the ether was not pushing the starlight faster through one medium than the other since both telescopes viewed the star from the same angle. Fresnel would also not be able to explain Airy's failure if he claimed that the ether is moving with the Earth instead of against the Earth, otherwise he would have no more explanation why, in Arago's case, light is diffracted more in a glass plate than in air. Science was in a bind once again. Unless Airy's experiment could be answered, the world was about to stand still in space, both literally and figuratively.[760]

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[760] Aware of the acute dilemma for heliocentrism that Airy's experiment presents, an example of how modern science seeks to rationalize its results is noted in the explanation of S. Tolansky on the art of telescope viewing: "If the Fresnel drag coefficient be introduced into the calculation of the aberration, there emerges the fact that the aberration is the same with or without water in the telescope. Thus, conversely, Airy's negative result confirms the validity of the Fresnel coefficient" (*An Introduction to Interferometry*, 1973, p. 98, cited in *De Labore Solis*, p. 35). What Tolansky didn't tell his students is that if the Fresnel coefficient is NOT used for both telescopes, they would both still produce the same aberration, and thus the Fresnel drag becomes superfluous, except for those trying to save the appearances for heliocentrism. As van der Kamp notes, "…the drag coefficient cannot be dragged into court to vindicate Copernicus" (*op. cit.,* p. 36). Another objection comes from Wolfgang Pauli. With his typical pungency, Pauli wrote in 1958: "The Airy experiment, as seen from the rest system of the observer (Earth), therefore only demonstrates the (relativistically) trivial fact that for a zero angle of incidence (normal incidence) the angle of refraction is zero, too" (Wolfgang Pauli, *Theory of Relativity*, translated by G. Field, 1958, p. 114). Apparently, Einstein did not share the same casualness about Airy that Pauli did. Pauli seems to have both forgotten that neither the "observer" nor the "Earth" are "at rest" in the Copernican system, and that a "zero" value to both incidence and refraction is precisely the reason Airy's experiment is so important, since, given the same incidence of starlight in both telescopes, only the Earth's velocity would have made the starlight hit the side of the telescope. Moreover, it would be rather difficult for Relativity to explain stellar aberration on the basis of the limited speed of light, since without ether, Relativity must understand light as a scalar phenomenon (*i.e.*, it has a speed but no definite direction, and thus the speed is everywhere the same), not a vector (*i.e.*, a definite speed in a definite direction). As such, Relativity will see the star rotate rather than exhibit an aberration. Other attempts to explain Airy's failure use the Fitzgerald contraction hypothesis, that is, the telescope shrank in the direction it was moving, or that the telescope expanded in the direction perpendicular to its movement. It may be no coincidence that the Fitzgerald contraction predicts the same result for Airy's experiment as the Fresnel drag. Thus, as Bouw notes: "Physically speaking, it they are real, both effects must be contributing so that in actuality we must either conclude that Fresnel drag and the Fitzgerald contraction are one and the same thing or else that

The Experiment of Martinus Hoek

Just three years before Airy's entrance, Martinus Hoek, an astronomer at Utrecht, performed another type of experiment, but one that had demonstrated the same results as Airy, namely, that the Earth was not moving.[761] In 1868 he created a variation of Fizeau's experiment in order to test the nature of light. Up until this time, the use of laboratory light by Fresnel and Fizeau had yet to be answered, and thus the Copernicans retained hope that they could protect their cherished cosmology. In his apparatus, Hoek split a light beam so that it would travel in opposite directions, and he had the beams travel through both water and air. Again, since light travels slower in water, then, as the light beams meet back at the starting point, one beam will come in slower than the other and cause "fringes" on the receiving plate, that is, alternating light and dark patterns. Working on the idea that as the Earth moved through space it was doing so against the ether (which creates friction against the light and which Fresnel described as a "drag"), if the apparatus of Hoek's experiment were turned in the direction of the Earth's movement, and then subsequently perpendicular to it, there should not only be fringes but a noticeable *shifting* of the fringes. Hook's apparatus:

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one effect or the other, but not both, is in operation. If the Fitzgerald contraction is removed then the only conclusion left is that the earth is standing still; otherwise, if Fresnel drag is removed, the question remains as to why Fresnel drag is observed in the laboratory but not in this analogous case. The simplest solution is that the earth is at rest, immobile, in absolute space" (*Geocentricity*, p. 244).

[761] Martinus Hoek, "Determination de la vitesse avec laquelle est entrainée une onde lumineuse traversant un milieu en mouvement," *Arch. Neerl.*, 1868, 3, pp. 180-185; and 1869, 4, pp. 443-450. Prior to Hoek, M. Babinet performed another form of the experiment, and a few years later Ernst Klinkerfues had also performed similar experiments to Hoek's with the same results (*Die Aberration der Fixsterne nach der Wellentheorie*. Leipzig: Von Quandt and Händel, 1867), cited in *The Proceedings of the Royal Society*, vol. xx, 1871, pp. 35-39. Mascart makes reference to Babinet in M. Mascart, "Sur les modifications qu'éprouve la lumière par suite du mouvement de la source lumineuse et du mouvement de l'observateur," *Annales Scientifiques de l'École Normale Supérieure* Sér. 2, 1, 1872, pp. 157-214.
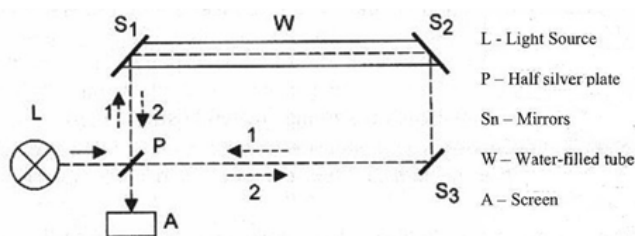
As **C. Møller** describes it:

> A measurement of the velocity of light in transparent substances seems to offer a new possibility for a determination of the absolute motion of the earth. An experiment of this kind was performed in 1868 by Hoek who used an interferometer arrangement of…a monochromatic light ray from a source of light…divided by a (weakly silver-coated) glass plate….
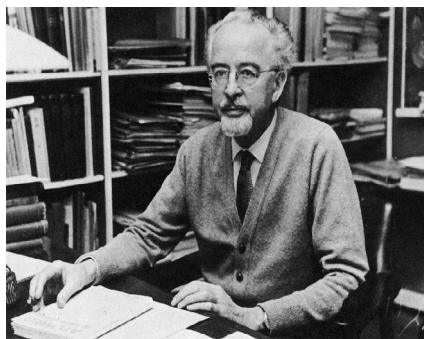
> Even if the whole apparatus were at rest in the ether, such an arrangement would give rise to interference fringes in the telescope, since the slope of the mirrors cannot possibly be adjusted so accurately that two rays 1 and 2 which focus on the same point in the telescope have traversed a path exactly the same optical length. However, if the whole apparatus has a velocity v with respect to the ether, this will cause an extra phase difference ΔF between the rays 1 and 2…[762]

To his surprise, Hoek noticed no significant difference in the fringes, at least not in accord with an Earth moving 30 km/sec. The obvious

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[762] C. Møller, *The Theory of Relativity*, p. 17.

interpretation of this experiment is that Earth is not moving through the ether. Similar to Airy's eventual experience, we could call this experiment: "Hoek's failure."[763]

The Experiment of Eleuthère Mascart

Still another experiment was performed just one year after Airy's findings to test for the motion of the Earth. In 1872 Eleuthère Elie Nicolas Mascart devised an experiment in which he could detect the motion of the Earth through ether by measuring the rotation of the plane of polarization of light propagated along the axis of a quartz crystal. Polarization is a phenomenon of white light, which propagates along the axis of forward movement at many different angles but is reduced to just one angle. Polarizers are filters containing long-chain polymer molecules that are oriented in one specific position. As such, the incident light vibrating in the same plane as the polymer molecules is the only light absorbed, while light vibrating at right angles to the plane is passed through the polarizer. Mascart set up the experiment so that if the Earth were passing through the ether at the expected clip of 30 km/sec, then the light's plane of polarization would be affected. Mascart found no such results. His experiment was just another indication that Earth was not moving.

Prior to these events, in 1809 Carl Gauss had published his *Theoria Motus Carporum Cælestium*, which predicted the orbit of the asteroid Ceres, thus suggesting (as Galileo once did with Jupiter's moons), that smaller bodies rotated around larger ones. Further claims to have proof of

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[763] Heliocentric explanations to Hoek's result are quite presumptuous. As Walter van der Kamp states: "It is not difficult to see the conclusion that Hoek thought he could draw from this null result. Whatever speed v of the ether relative to the Earth we have decided to believe in, be it a few centimeters or many kilometers – we cannot demonstrate that speed" (*De Labore Solis*, p. 32). That is, Hoek and his colleagues just assumed the Earth was moving at 30 km/sec without ever demonstrating such movement. Van der Kamp also chides heliocentrist J. D. van der Waals' comments on Hoek's experiment. Van der Walls writes: "To perform the test he did not have to take great pains to give the whole apparatus a sufficient speed…The Earth by means of her rotation and annual orbit around the sun, provided a speed that was vastly greater than could have been obtained in any other manner…If the ether carrying the light moves with a velocity w…then we find $w = v(\eta^2 - 1/\eta^2)$, which is exactly the ether velocity according to Fresnel" (*Ober den wereldether*, Haarlem, Erven Bohn, 1929, pp. 81). Of course, as van der Kamp points out, this only begs the question, for if the Earth is not moving, then $v = 0$, and if that is the case then $w = 0$, and we have mathematical formulas that don't amount to anything.

the Copernican system were advanced by Frederich Bessel in 1838 as he finally discovered the long-awaited stellar parallax. In 1843, John C. Adams, and later Urbain Leverrier in 1846, used Newtonian mechanics to predict the orbit of Neptune. In 1851 Jean Foucault published his experiments on the pendulum. All of these events were leaning toward the adoption of the Copernican system, yet none of them provided any real proof. Since no one, including Copernicus and Galileo, had ever proved that the Earth was moving, then as long as there was the possibility of explaining these experiments by assuming a non-moving Earth, then modern science was at a crossroads. But the pressure was mounting against the Copernicans, for Hoek countered Fresnel, and Airy countered Bradley and Fizeau, and Mascart put the icing on the cake. So now, even though the science community was silent, geocentrism was the unconquerable foe of the Copernicans. As van der Kamp observes:

> Hence it can be argued that Fresnel's theory holds for transparent substances moving through an ether at rest in that ether. Which is tantamount to saying that Hoek and Airy (observer and substance both at rest), Fizeau (observer at rest, substance in motion) and Michelson and Morley, all five of them have with one accord been vainly striving to show that the Earth is not at rest.

The 1881 Michelson Experiment

So now we have a better picture of the circumstances that led to the Michelson-Morley experiments. To save the world from having to "scuttle the Copernican theory," just a few years after George Airy's experiment Albert Michelson invented a somewhat sophisticated piece of equipment to test Airy's results.[764] The interferometer he assembled was similar to

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[764] Another impetus for Michelson was James Clerk Maxwell. After establishing his electromagnetic theory of light, Maxwell designed and performed an experiment for the purpose of detecting the Earth's motion through the ether. Not surprisingly, Maxwell found a null result. He reported the results to Stokes in 1864 and readied a paper for publication in the *Proceeding of the Royal Society*. Stokes informed Maxwell that Arago had already performed such an experiment and that Fresnel accounted for Arago's null results by means of the "drag" formula. Maxwell then withdrew his paper. Shortly before his death, Maxwell posted an article for the ninth edition of the *Encyclopedia Britannica* under the title "Ether," in which he argued that the only way to measure the Earth's velocity in the ether is to observe variations in the velocity of light traveling between two mirrors. A letter Maxwell wrote to astronomer D. P. Todd (1855-1939) inquiring

Hoek's but it was built a little better and was more accurate, yet it was very sensitive to vibration and heat and therefore its results could be thrown off a bit. Nevertheless, if the Earth were moving through ether this machine was designed to detect it.

Heliocentric View of Ether Flow
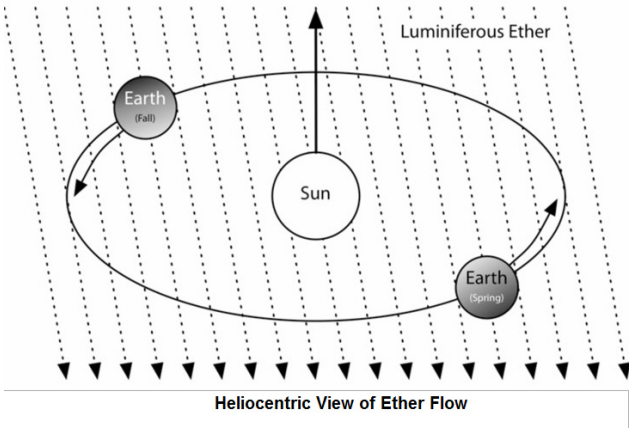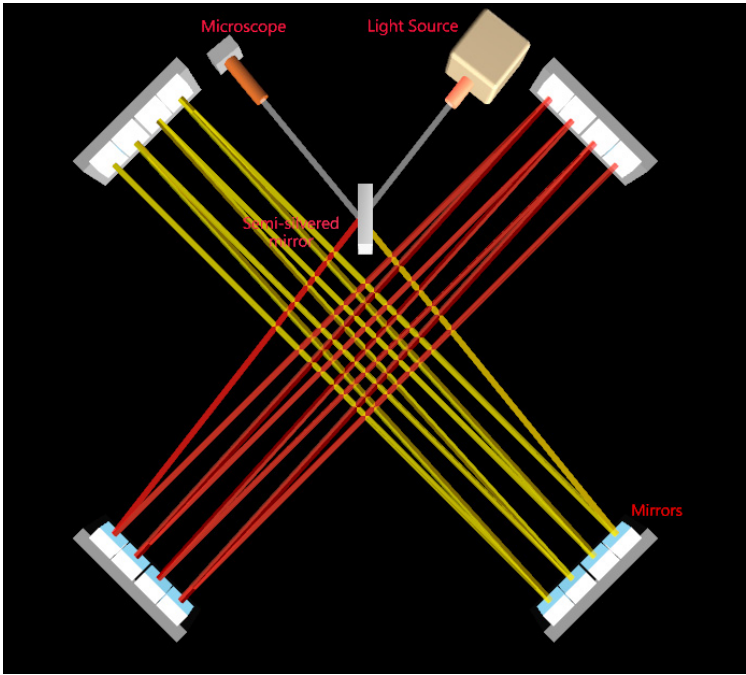
about these issues was published in *Nature*, which was the very letter that inspired Michelson to take up Maxwell's challenge.
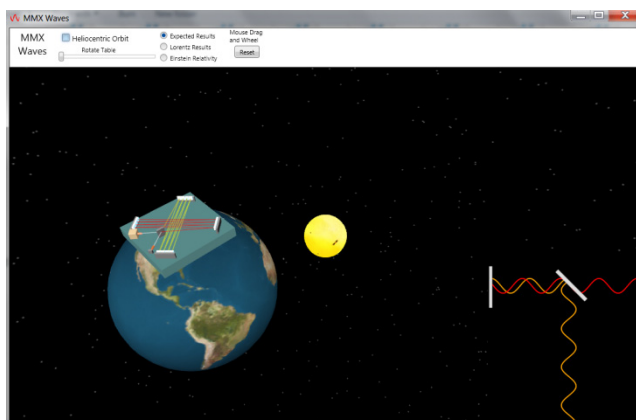
Presumed rationale for Michelson-Morley experiment: apparatus revolves with Earth around the Sun[765]
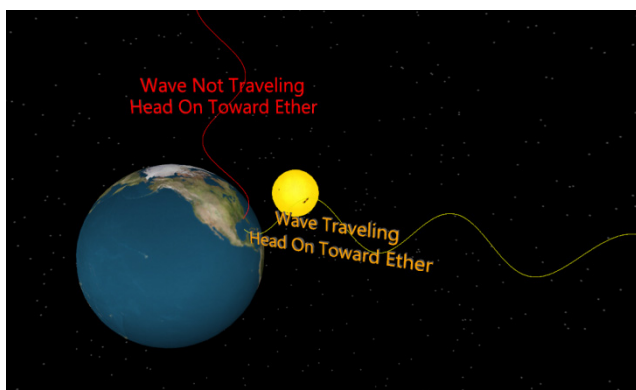
Presumed results of Michelson-Morley experiment: waves heading into the ether contract with waves not heading into the ether, and form fringes[766]

The idea was to split a light beam into two beams and send them in perpendicular directions, which beams are then reflected back and recombined on a photographic plate. The distances traveled by the beams are not the same, thus the waves from the two beams will not be in synch, producing a pattern of **light and dark fringes** after they recombine. These fringes prove that the principle behind the interferometer works since non-synchronous light waves will produce fringes. Identical to Hoek's experiment, Michelson's procedure was to turn the table slightly and

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[765] See CDROM Animation.
[766] See CDROM Animation.

periodically on which the interferometer rested. The speeds of the two beams with respect to the ether will thus change and so will the times taken for the beams to recombine. Because troughs and crests of the light waves would not match up the same as in a non-rotating table, the original fringes would shift in their pattern of bright and dark lines.
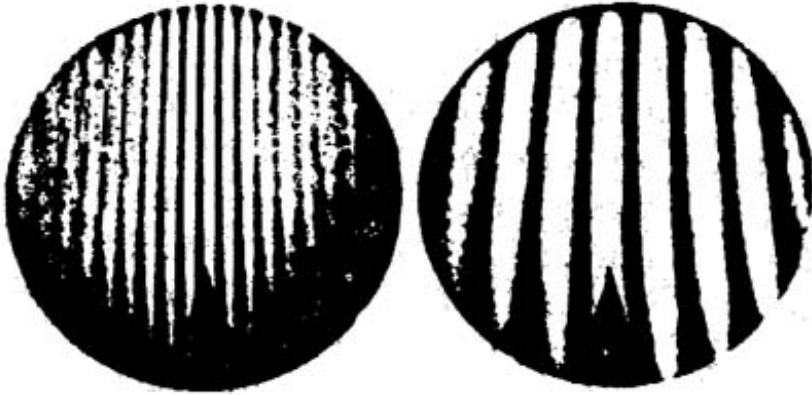
Light and dark fringe shifts caused by non-uniform light waves

As Charles Lane Poor puts it:

> Light waves vibrate, or follow one another, at a rate of about six hundred thousand billion a second; and it was this interval of time that Michelson used to measure the relative retardations of the waves traveling in the two directions….In any one fixed position of the apparatus…an observed retardation of one ray over the other might be the indication merely of instrumental errors of adjustment, errors in the length of arms, in the alignment of the mirrors, or in the direction of the instrument as a whole. But if the apparatus be rotated so that the arms take up various positions with respect to the [ether] drift, then the retardations due to instrumental errors will be eliminated, and that due to the drift will show up.[767]

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[767] Charles Lane Poor, *Gravitation versus Relativity*, 1922, pp. 14, 16.

The first interferometer trial was in 1881. After Michelson drew up plans for the device and submitted them to a company in Berlin for construction, Alexander Graham Bell, famous for the invention of the telephone, provided the needed funds. Michelson had not met Edward Morley as yet and thus he worked alone. Lo and behold, when Michelson performed the experiment he did not see a significant shifting of fringes, at least not those he was expecting. Using a 600 nanometer wavelength of light, Michelson expected to see fringe shifts (or, as he called them, "displacement of the interference bands") of at least 0.04 of a fringe width. The 0.04 figure corresponds to an Earth moving at 30 km/sec around the sun. If this was combined with what Michelson believed was the solar system's apparent movement toward the constellation Hercules, the fringes should have shifted on the order of 0.10 of a fringe width. But Michelson didn't see any fringe shifting close to either value. He writes:

> The interpretation of these results is that there is no displacement of the interference bands. The result of the hypothesis of a stationary ether is thus shown to be incorrect, and the necessary conclusion follows that the hypothesis is erroneous. This conclusion directly contradicts the explanation of aberration which has been hitherto generally accepted, and which presupposes that the Earth moves through the ether, the latter remaining at rest.[768]

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[768] Albert A. Michelson, "The relative motion of the Earth and the Luminiferous ether," *The American Journal of Science*, Vol. 3, No. 22, 1881, p. 128. As regards the Earth's supposed movement around the sun, in 1881 Michelson expected a fringe shift of 0.04 but got 0.02. In 1882, Hendrik Lorentz examined Michelson's results and determined them "to be in error," and Michelson conceded to this judgment in 1887. As Arthur Miller writes: "…Lorentz pointed out a calculation error committed by Michelson in his data analysis: Michelson had calculated the time required for the light ray to traverse the interferometer arm normal to the direction of the Earth's motion to be $2l/c$, instead of $2l/c + lv^2/c^3$ [the exact result was $(2l/c \ (1/\sqrt{1-v^2/c^2})]$. The extra term, Lorentz continued, reduced the calculated fringe shift by a factor of two, thereby placing any effect beyond Michelson's experimental accuracy; so Michelson's data ruled out neither Fresnel's theory nor the hybrid theory composed of elements of Fresnel's and Stokes' theories" (Arthur Miller, *Albert Einstein's Special Theory of Relativity*, p. 23). Despite the discrepancy pointed out by Lorentz, the fact is that the 1881 results, although a little exaggerated, show the same principle results as the 1887 experiment – there is an ether drift, regardless how small.
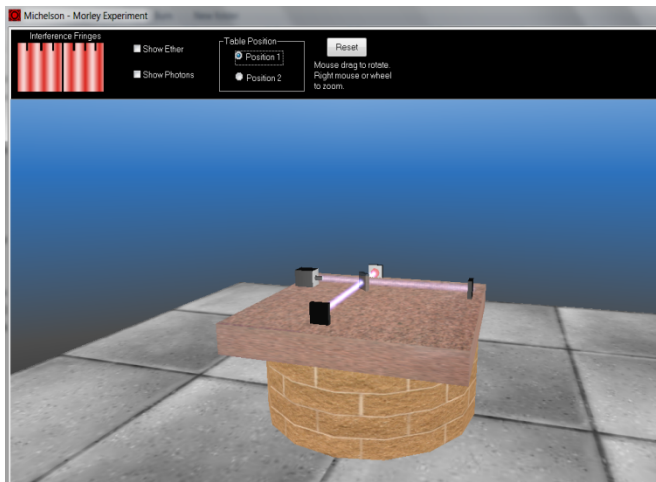
Simplified Michelson-Morley experiment with fringe-shifting meter[769]

Notice, for future reference, that Michelson did not say there was *no* displacement of the interference bands, but that the "*interpretation* of these results is that there is no displacement of the interference bands." Obviously, if you are looking for fringe shifting on the order of 0.10 but you get results that are 0.040 of a fringe width, you would be inclined to say there was "no displacement of the interference bands."
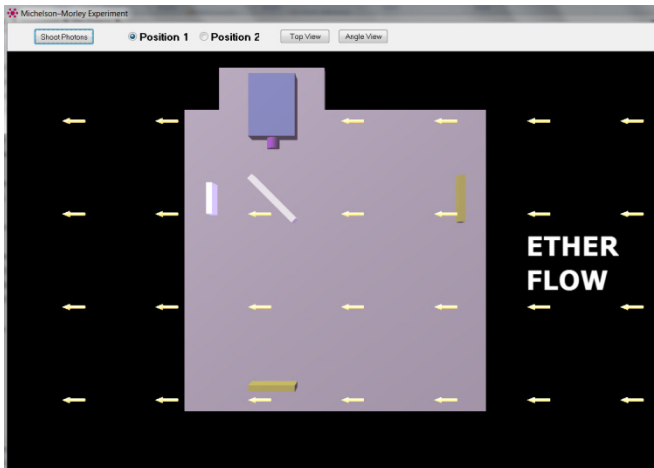
Simplified Michelson-Morley experiment with ether flow[770]

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[769] See CDROM for Animation.
[770] See CDROM for Animation.

Notably, in the above quote from his 1881 experiment Michelson makes reference to the same "stellar aberration" phenomenon over which Einstein would later be concerned. This shows that Michelson had his heart set on confirming or denying the experimental results of George Airy and Armand Fizeau. Unfortunately for the heliocentrists, Michelson only confirmed Airy's results and, in the process, overturned the hypothesis of Fresnel and Fizeau, who claimed that the Earth moved through space at 30 km/sec and was doing so against the ether, which creates friction against a light beam pointed in the same direction, and which would thus decrease the speed of the light beam.

Michelson's experiment, as he says himself, also overturned the idea that "the Earth moves through the ether." On the surface, this is a rather amazing admission by Michelson. Perhaps he did not realize what he had said; nevertheless, there it is. He did not say that the ether did not exist; rather, he said Earth does not move through the ether. Fresnel had "presupposed" that the Earth moved at 30 km/sec through ether, but Michelson's results said no. At this point Michelson was being very honest with his own results. Let us remember Michelson's original interpretation as we move on in this saga.

The 1887 Michelson-Morley Experiment

Perhaps Michelson was so astounded at his 1881 results and the interpretation he was forced to admit ("This conclusion directly contradicts…[the idea] which presupposes that the Earth moves through the ether") that he had to do the test again just to make sure he could convince himself to believe what his own eyes were showing him, and to reassure every other concerned physicist that this experiment was not a fluke. After attending a series of lectures by William Thomson (aka Lord Kelvin) in 1884, Michelson's interest in redoing the 1881 interferometer experiment was sparked. Michelson secured financial aid from the Bache Fund of the National Academy of Sciences. This involvement reveals that many influential people were intently anticipating the results. Michelson, and his newfound partner Edward Morley, created a new instrument for the occasion, which was much more accurate and not so easily upset by environmental factors. (People walking at a distance of 100 yards from the interferometer disturbed Michelson's 1881 apparatus). Michelson and Morley increased by eightfold the length the light had to travel in contrast to the 1881 machinery. They even put their new interferometer in a pool of mercury so that it could be rotated without causing any vibration. They secured an adequate basement facility at Case Western University. With these improved conditions, Michelson and Morley now expected to see an

interference pattern equal to 0.40 of a fringe width as opposed to the 0.1 he expected in 1881.
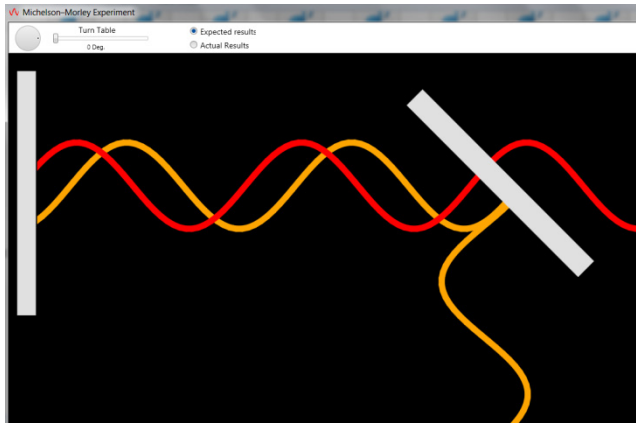
**Expected results: significant separation of waves
if Earth is revolving around the sun**

As they rotated the apparatus in the mercury pool in increments of $1/16^{th}$ of a turn, their assistant would write down the fringe shift values Michelson calibrated from graduated markings in the eyepiece. To his surprise, Michelson did not find what he expected.
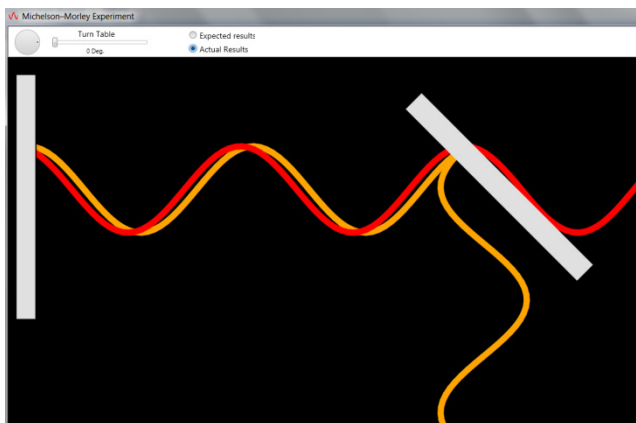
**Actual results: small separation of waves.
Viable interpretation: Earth is not moving**

The experiment was repeated a number of times, but regardless of location, season, elevation, or orientation of instruments Michelson found the results were the same as the 1881 experiment, within a reasonable margin of error. As Michelson records it:

> Considering the motion of the Earth in its orbit only, this displacement should be 2D v^2/V^2 = 2D × 10^{-8}. The distance D was about eleven meters, or 2 × 10^7 wavelengths of yellow light; hence, the displacement to be expected was 0.4 fringe. The actual displacement was certainly less than the twentieth part of this, and probably less than the fortieth part. But since the displacement is proportional to the square of the velocity, the relative velocity of the Earth and the ether is probably less than one-sixth the Earth's orbital velocity, and certainly less than one-fourth.[771]

Rest Frame

$t = \dfrac{2L}{c}$ (both arms)
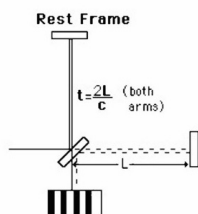
Michelson-Morley 1887 Experiment At Rest

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[771] A. A. Michelson and E. W. Morley, "On the Relative Motion of the Earth and the Luminiferous Ether," Art. xxxvi, *The American Journal of Science*, eds. James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341. As one textbook calculates it: "$\Delta t - \Delta t' = (l_1 + l_2) \, v^2/c^3$. Now we take v = 3.0 × 10^4 m/s, the speed of the Earth in its orbit around the Sun. In Michelson and Morley's experiment, the arms l_1 and l_2 were about 11 m long. The time difference would then be about $(22m)(3.0 \times 10^4 \text{ m/s})^2/(3.0 \times 10^8 \text{ m/s})^3 \approx 7.0 \times 10^{-16}$ s. For visible light of wavelength λ = 5.5 × 10^{-7} m, say, the frequency would be $f = c/\lambda$ = (3.0 × 10^8 m/s)/(5.5 × 10^{-7} m) = 5.5 × 10^{14} Hz, which means that wave crests pass by a point every 1/(5.5 × 10^{14} Hz) = 1.8 × 10^{-15} s. Thus, with a time difference of 7.0 × 10^{-16} s, Michelson and Morley should have noted a movement in the interference pattern of (7.0 × 10^{-16} s)/(1.8 × 10^{-15} s) = 0.4 fringe. They could easily have detected this, since their apparatus was capable of observing a fringe shift as small as 0.01 fringe. But they found no significant fringe shift whatever….Never did they observe a significant fringe shift. This 'null' result was one of the great puzzles of physics at the end of the nineteenth century" (*Physics: Principles with Applications*, Fourth Edition, Douglas C. Giancoli, 1995, p. 749). Notice that the author does not say there was no fringe shift, but that there was no "significant fringe shift."

Michelson-Morley 1887 Experiment With Relative Motion
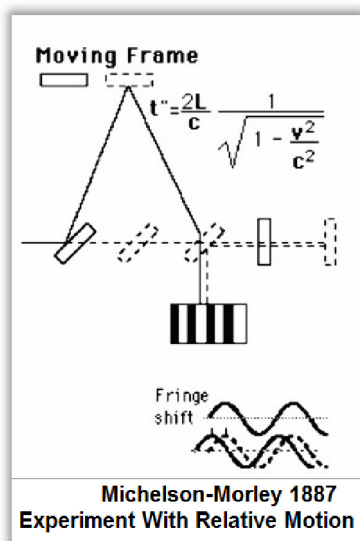
In a letter to **Lord Rayleigh** (aka John William Strutt), he states it more simply:
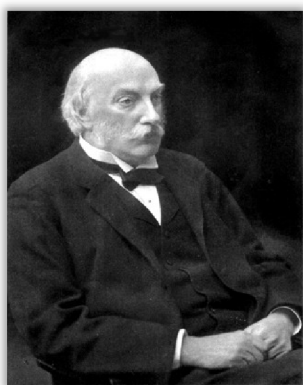
The experiments on relative motion of earth and ether have been completed and the result is decidedly negative. The expected deviation of the interference fringes from the zero should have been 0.40 of a fringe – the maximum displacement was 0.02 and the average much less than 0.01 – and then not in the right place. As displacement is proportional to squares of the relative velocities it follows that if the ether does slip past [the Earth] the relative velocity is less than one sixth of the Earth's velocity.[772]

So here we see that, although his 1881 results would not allow anyone to "presuppose that the Earth was moving through the ether," it is just this

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[772] Letter dated August 17, 1887, from the Rayleigh Archives, cited in Dorothy M. Livingston, *The Master of Light: A Biography of Albert A. Michelson*, 1973, p. 130.

that Michelson is presupposing to interpret his 1887 experiment. This shows how ingrained the idea of an orbiting Earth was in the minds of scientists only two centuries from the Galileo affair in the 1600s. It was the foundation from which they interpreted everything in the cosmos. Finding interference patterns of only hundredths of a fringe rather than half a fringe meant that someone had to come up with a convincing explanation, or Michelson and company might have to stop making such grandiose "presuppositions."[773]

Again, as we noted earlier, here was additional evidence, from an even more sophisticated machine specifically designed to vindicate Copernicus, Galileo, Kepler and Newton, yet it failed, miserably failed. Unfortunately, the scientists interpreting Airy, Hoek and Michelson-Morley simply did not want to consider a motionless Earth as even a possible solution to these astounding experiments. They "knew" the Earth revolved around the sun and thus they set their heart toward finding other solutions to the problem. As noted earlier, Einstein's biographer describes it thus:

> In the United States Albert Michelson and Edward Morley had performed an experiment which confronted scientists with an appalling choice. Designed to show the existence of the ether, at that time considered essential, it had yielded a null result, leaving science with the alternatives of tossing aside the key which had helped to explain the phenomena of electricity, magnetism, and light *or of deciding that the Earth was not in fact moving at all*.[774]

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[773] In *The Ethereal Ether*, Loyd Swenson summarizes Michelson's options as: "1. The Earth passes through the ether without appreciable influence; 2. The length of all bodies is altered (equally?) by their motion through ether; 3. The Earth in its motion drags with it the ether even at distances of many thousands of kilometers from its surface" (Austin, University of Texas, 1972, p. 118, cited in *De Labore Solis*, p. 36, parenthetical "equally" included by Michelson). Van der Kamp remarks: "…this lifelong agnostic…Michelson…appears on one issue not in the least agnostic, but as firmly a fundamentalist Copernican believer…There is no place in Michelson's only partially agnostic tunnel-vision for possibility Number Four [*i.e.*, that Earth is motionless in space]…Yet…a geocentric explanation of the enigmas encountered…stares…any open-minded down-to-Earth scientist in the face when he surveys all those abortive efforts to disqualify it…In Michelson's heliocentrically preconditioned mind the obvious corollary, a simple straightforward geocentric hypothesis, did not get a chance to rear its unwanted head…Michelson searched for and found those three helpful *ad hocs*, three pretexts able to ward off a disturbing and unwanted perspective" (*ibid*. pp. 36-42).
[774] *Einstein: The Life and Times*, p. 57, emphasis added.

If they were set on refusing to consider that the Earth was standing still in space, this left them with two more options to explain its results. As Clark records it:

> The second was that the ether was carried along by the Earth in its passage through space, a possibility which had already been ruled out to the satisfaction of the scientific community by a number of experiments, notably those of the English astronomer James Bradley. The third solution was that the ether simply did not exist, which to many nineteenth century scientists was equivalent to scrapping current views of light, electricity, and magnetism, and starting again.[775]

Henri Poincaré, one of the world's most respected physicists, compared it to a "crisis."

> Are we about to enter now upon the eve of a second crisis? These principles on which we have built all, are they about to crumble away in their turn? ….Alas…such are the indubitable results of the experiments of Michelson.[776]

Henri Poincaré (1854 – 1912)

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[775] *Einstein: The Life and Times*, p. 110.
[776] Henri Poincaré, "The Principles of Mathematical Physics," *The Monist*, vol. XV, January 1905, pp. 6, 20.

It is ironic that Poincaré would describe the problem as a "second crisis," since the context of his paragraph shows that the "first crisis" he has in view is the Copernican revolution. The irony is that the "second crisis" was now bringing science back to consider that it made a wrong decision during the "first crisis." In essence, the Michelson-Morley experiment trapped science like the proverbial rat in the corner. Nothing less than the total revamping of physical science could satisfy the demands of these experiments if, indeed, a motionless Earth was not considered an option. As Van der Kamp puts it: "That is to say: nothing less than a premise capable of turning all evidence favoring a geocentric universe into evidence for an a-centric homogenous one will suffice."[777] Eventually this revamping of science would lead to Einstein's Special Relativity theory, but there were stops along the way to set the stage for his arrival.

Fitzgerald/Lorentz's Incredible Shrinking Machine, Phase I

In 1892 Hendrik Lorentz wrote to Lord Rayleigh and expressed his consternation at the results of the Michelson-Morley experiment:

> I am totally at a loss how to solve the contradiction and yet I believe that if Fresnel's wave theory is abandoned, we should have no adequate aberration theory at all….Can there be some point in the theory of Mr. Michelson's experiment which has as yet been overseen? [sic].[778]
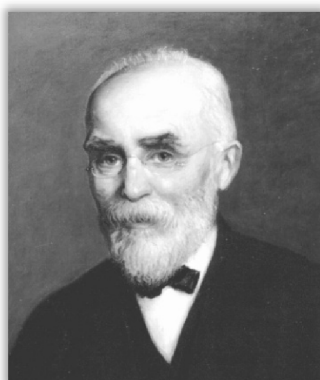
Hendrik Lorentz (1853-1928)

We see what is at stake. As Einstein himself would recognize, the Michelson-Morley experiment is not only showing that there is no movement of the Earth against ether, it is denying to the heliocentrists the only explanation available (Fresnel's wave theory) to deal with the results of Airy's failure. If they cannot use Fresnel to answer Airy and the other

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[777] *De Labore Solis*, p. 44. Later he writes: "…astronomy books, misleading as – courtesy of Albert Einstein – their heliocentric illustrations and explanations are, seldom or ever spell out the a-centric concept to which the Copernican revolution has inevitably led" (*ibid.*, p. 112).

[778] Letter dated August 18, 1892, from the Lorentz microfilm at the Niels Bohr Library, New York, as cited in Dorothy Michelson Livingston's *The Master of Light: A Biography of Albert A. Michelson*, p. 131.

aberration experiments, then they would have to resign themselves to admitting that the Earth is motionless in space. A solution had to be found. Clark explains what it was:

> The only other explanation must surely lie in some perverse feature of the physical world which scientists had not yet suspected, and during the next few years this was sought by three men in particular George Fitzgerald... Hendrik Lorentz ...and Henri Poincare. The Fitzgerald explanation came first. To many it must have seemed that he had strained at a gnat and swallowed an elephant. For while Fitzgerald was unwilling to believe that the velocity of light could remain unaffected by the velocity of its source, he suggested instead that all moving objects were shortened along the axis of their movement. A foot rule moving end forwards would be slightly shorter than a stationary foot rule, and the faster it moved the shorter it would be.[779]
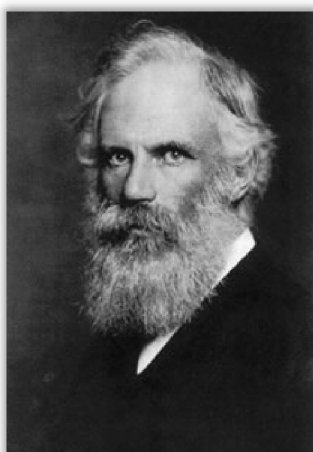
George F. Fitzgerald (1851 – 1901)

A November 10, 1894 letter from Lorentz to Fitzgerald shows that the Michelson-Morley experiment was driving them to these positions:

> My dear Sir, in his "Aberration Problems" Prof. Oliver Lodge mentioned a hypothesis *which you have imagined in order to account* for the negative result of Mr. Michelson's experiment.[780]

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[779] *Einstein: The Life and Times*, p. 110.
[780] Draft copy in Algemeen Rijksarchief, The Hague, published by Stephen G. Brush, in *Note on the History of the Fitzgerald-Lorentz Contraction*, Isis, 58:231,

"Imagination," indeed. Fitzgerald revealed this imaginative "hypothesis" to Oliver Lodge in early 1892 on a visit to Liverpool. He told him the following:

> Well, the only way out of it that I can see is that the equality of paths must be inaccurate; the block of stone must be distorted, put out of shape by its motion…the stone would have to shorten in the direction of motion and swell out in the other two directions.[781]

On May 27, 1892, Lodge made it known to the public that "Professor Fitzgerald has suggested *a way out of the difficulty* by supposing the size of bodies to be a function of their velocity through the ether."[782] Lodge proceeded to give an example of Fitzgerald's hypothesis. According to Lodge, a length of 8,000 miles (approximately the diameter of the Earth), would have to be shortened only 3 inches in order to account for the null result of the Michelson-Morley experiment.[783] On the one hand, since 3 inches seemed to be such a trivial length, it wouldn't take much to adjust the mathematics to make it fit into the physical measurements. On the other hand, since 3 inches is minute compared to 8,000 miles, it shows how precise the Michelson-Morley experiment really was, and it was a
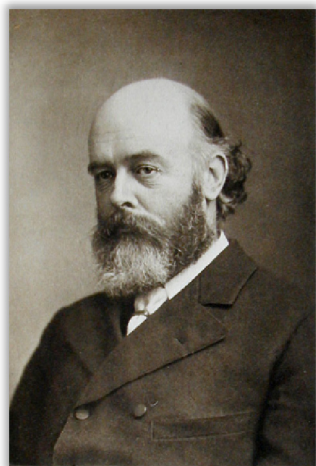
Oliver Lodge (1851-1940) preciseness that simply would not go away, since the same ratios showed up in virtually every interferometer experiment performed for the next several decades.

In any case, we see clear evidence that, in refusing to accept the possibility of a motionless Earth, yet having to come up with a plausible

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1967; emphasis added; cited in Holton's *The Thematic Origin of Scientific Thought*, pp. 328, 364.

[781] Archived in "Report of Activities of the Physical Society," *Nature*, vol. XLVI (1891), p. 165, as cited in Dorothy Michelson Livingston, *The Master of Light*, p. 132.

[782] Oliver Lodge, "On the Present State of Knowledge of the Connection between Ether and Matter: A Historical Summary," *Nature*, 46:164-165, 1892; emphasis added, cited in Holton's *Thematic Origins of Scientific Thought*, pp. 328, 364.

[783] As reported to the *Royal Society of London, Philosophical Transactions* under the title "Aberration Problems," vol. 184-A (1893), pp. 749-750.

answer to the "null" results of the Michelson-Morley experiment, physics was resigned to opt for the absurd hypothesis that matter was mysteriously squeezed as it moved. Fitzgerald was forced to this position since he had to answer why, if Earth was moving 18.5 miles per second, that a light beam discharged in the same direction as Earth's movement arrived at its destination at the same time that a beam discharged perpendicular to the Earth's movement arrived at the same destination. Michelson's equipment was sensitive enough to calibrate an ether wind speed of 1 mile per second, which was obviously 18.5 times more sensitive than the Earth supposedly moving through the ether.[784]

To be consistent with his newfound hypothesis, Fitzgerald was required to posit that the test instruments must adjust in the same way, truncating their length as they were turned into the direction of the Earth's movement around the sun. Incidentally, this "contraction" solution would also be employed to explain stellar aberration, since Fitzgerald could claim that as the Earth traveled at 66,000 mph the telescope would alter in length and thus receive starlight in altered forms: one form for when the Earth was receding from the star and another when it was moving toward the star.

The reader is reminded that, despite Airy's discovery that there is no difference in the incidence of starlight on two respective telescopes (thereby discounting stellar aberration as a proof for heliocentrism), stellar aberration is still a natural phenomenon that always occurs when one views a star over the course of several months. As such, it must be explained. For those who accepted an ether-filled space between Earth and the stars, appealing to Fresnel "drag" was one attempt to explain stellar aberration, and the Fitzgerald "contraction" was another. In both cases the Earth is understood to be moving through motionless ether. But as we have seen earlier, Fresnel's theory is discounted by Airy's "failure," which leaves only Fitzgerald's theory. But as Clark shows, initially it was not well received:

> For some years this explanation appeared to be little more than a plausible trick. 'I have been rather laughed at for my view over here,' Fitzgerald wrote to Lorentz from Dublin in 1894.[785]

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[784] In fact, based on light's wavelength of 5×10^{-7} meters, the Michelson-Morley experiment was supposed to be sensitive enough to detect not only the revolution of the Earth around the sun (18.5 mps; 66,600 mph; or 30 km/s) but also the rotation of the Earth (300 m/s at the longitude of the experiment). As history shows, it detected neither.

[785] *Einstein: The Life and Times*, p. 111.

But when Fitzgerald learned of Lorentz's support for the hypothesis, he suddenly changed his tune and wrote these words:

> My dear Sir, I have been preaching and lecturing on the doctrine that Michelson's experiment proves, and is one of the only ways of proving, that the length of a body depends on how it is moving through the ether…Now that I hear you as an advocate and authority I shall begin to jeer at others for holding any other view.[786]

Obviously, Fitzgerald was "laughed at" because his solution seemed all too convenient. As physicist Dennis Sciama notes about similar acts of desperation in science:

> No one would take this theory seriously, of course. One reason for this, no doubt, would be the obviously *ad hoc* and, indeed, ludicrous appearance of the theory. But the fundamental reason for objecting to the theory is that the demons cannot be observed *except through the very phenomenon they were invented to explain*. The introduction of the demon thus adds nothing to what we know already.[787]

Although Fitzgerald was "laughed at" for proposing his contraction theory, he probably would have been scorned or put in a straight jacket if he had proposed that the Earth was standing still in space. By now, Copernicanism was so much a part of the fabric of life that any *ad hoc* explanation of the Michelson-Morley experiment would probably have been accepted if people knew the alternative was believing in a motionless Earth. But the alternative was never told to them, for Fitzgerald, *et al*., did not want the common man even thinking about that possibility. In fact, once he received Lorentz's agreement, Fitzgerald considered the contraction hypothesis as scientific dogma, and he decided to do the "laughing" at others who disagreed with him. All that was needed now was to package Fitzgerald's idea in scientific garb and mathematical equations and it would instantly attain an air of prestige and intelligence. This task was left to Henrick Lorentz. As he puts it:

> The first example of this kind is Michelson's well-known interference experiment, the negative result of which has led

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[786] Holton, *Thematic Origins*, p. 331.
[787] Dennis Sciama, *The Unity of the Universe*, 1961, p. 103, emphasis his.

Fitzgerald and myself to the conclusion that the dimensions of solid bodies are slightly altered by their motion through the ether.[788]

As Ronald Clark describes it:

Lorentz had been among the first to postulate the electron, the negatively charged particle whose existence had finally been proved by J. J. Thomson at Cambridge. It now seemed to him that such a contraction could well be a direct result of electromagnetic forces produced when a body with its electrical charges was moved through the ether. These would disturb the equilibrium of the body, and its particles would assume new relative distances from one another. The result would be a change in the shape of the body, which would become flattened in the direction of its movement.…Lorentz's invocation of electro-magnetism thus brought a whiff of sanity into the game. Here at least was a credible explanation of how a foot rule in motion could be of a different length from the foot rule at rest.[789]

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[788] H. A. Lorentz, "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*, translated by W. Perrett and G. B. Jeffery from the 1923 first edition, 1952, p. 11. In another paper Lorentz adds: "For if we now understand by S_1 and S_2 not, as formerly, two systems of charged particles, but two systems of molecules – the second at rest and the first moving with a velocity v in the direction of the axis x – between the dimensions of which the relationship subsists as previously stated; and if we assume that in both systems the x components of the forces are the same, while the y and z components differ from one another by the factor $\sqrt{(1 - v^2/c^2)}$, then it is clear that the forces in S_1 will be in equilibrium whenever they are so in S_2. If therefore S_2 is the state of equilibrium of a solid body at rest, then the molecules in S_1 have precisely those positions in which they can persist under the influence of translation. The displacement would naturally bring about this disposition of the molecules of its own accord, and thus effect a shortening in the direction of motion in the proportion of 1 to $\sqrt{(1 - v^2/c^2)}$" (H. A. Lorentz, "Michelson's Interference Experiment," in *The Principle of Relativity*, trans. by W. Perrett and G. B. Jeffery from the 1923 first edition, 1952, p. 7).
[789] *Ibid*., p. 111. Lorentz happened upon these equations in a paper by Woldemar Voigt written in 1887 on the Doppler effect (Über das Dopplersche Prinzip, Nachr. Ges. Wiss. Göttingen). Voigt came to his view by analyzing differential equations for oscillations in an incompressible elastic medium, which led to a set of transformation equations to support his theory of the converging or diverging of spherical forces. It wasn't until many years later that Lorentz acknowledged Voigt's primary work.

Being a firm believer in Relativity, Clark describes Lorentz's solution as a "whiff of sanity," but for those of us who are not as inclined toward such *ad hoc* speculations the "whiff" is more of a stench. Lorentz, by an explanation heretofore unimagined in common-sense science, is saying that matter shrinks when it moves, which is due to some internal structural change its atoms undergo by some unexplained electrical forces, caused by an ether which previously understood to be frictionless. Of course, Lorentz would have to exclude light from this natural contraction, and thus the full title of his 1904 paper became "Electromagnetic Phenomena in a System Moving *with Any Velocity Less than that of Light*."[790] As Louis Essen describes Lorentz's hypothesis:

> …moving particles gave rise to a magnetic field, thus disturbing the equilibrium of the forces binding the particles together and causing the length of any moving object to be reduced. The requirements of the electro-magnetic theory made it necessary for time to change in a similar way, and these assumptions led to the Lorentz transformations.[791]

Lorentz had no proof of this explanation but it certainly was a relief to a science community that up to this point was totally stymied by the results of optical experiments showing a motionless Earth. At least Lorentz's explanation was a much easier pill to swallow than bringing the human race back to pre-Copernican days. In essence, Lorentz created an equation that allowed the Earth's rest to appear as motion and no one was the wiser.

The completely *ad hoc* nature of the contraction hypothesis is made obvious by the diametrically opposed views of Fitzgerald and Lorentz. Herbert Dingle astutely pointed out that, although Fitzgerald's proposal has been commonly reported as a *contraction* of the longitudinal arm of the interferometer (the arm pointing toward the direction of the Earth's movement), Fitzgerald originally proposed that the width, not the length, of the longitudinal arm increased, and that the length of the transverse arm also increased (the arm at a right angle to the movement of the Earth). The only account of Fitzgerald's proposal is included in Lodge's book 1909 *The Ether of Space*, an account that he obtained by a personal interview with Fitzgerald.[792] Lorentz changed the phenomenon to one having the

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[790] From the English version in the Proceedings of the Academy of Sciences of Amsterdam, 6, 1904, cited in *The Principle of Relativity*, p. 9, emphasis added.
[791] Louis Essen, *The Special Theory of Relativity – A Critical Analysis*, p. 4.
[792] Dingle's charge is confirmed as Lodge quotes Fitzgerald speaking of "when a block of matter is moving through the ether of space its cohesive forces across the line of motion are diminished, and consequently in that direction it expands."

longitudinal arm decrease in length and the transverse arm decrease in width, and it was this version of the "contraction" that became the pair's best answer to the Michelson-Morley experiment.[793] Lorentz writes:

> We are therefore led to suppose that the influence of a translation on the dimensions (of the separate electrons and of a ponderable body as a whole) *is confined to those that have the direction of the motion*, these becoming β times smaller than they are in the state of rest.[794]

Lodge records it as follows: "Hence, although there may be some way of getting round Mr. Michelson's experiment, there is no obvious way; and if the true conclusion be not that the ether near the earth is stagnant, it must lead to some other important and unknown fact. ¶ That fact has now come clearly to light. It was first suggested by the late Prof. G. F. FitzGerald, of Trinity College, Dublin, while sitting in my study at Liverpool and discussing the matter with me. The suggestion bore the impress of truth from the first. It independently occurred also to Prof. H. A. Lorentz, of Leiden, into whose theory it completely fits, and who has brilliantly worked it into his system. It may be explained briefly thus….¶ 'Atoms of matter are charged; and cohesion is a residual electric attraction. So when a block of matter is moving through the ether of space its cohesive forces across the line of motion are diminished, and consequently in that direction it expands, by an amount proportioned to the square of aberration magnitude. ¶ A light journey, to and fro, across the path of a relatively moving medium is slightly quicker than the same journey, to and fro, along. But if the journeys are planned or set out on a block of matter, they do not remain quite the same when it is conveyed through space; the journey across the direction of motion becomes longer than the other journey, as we have just seen. And the extra distance compensates or neutralizes the extra speed; so that light takes the same time for both" (Lodge, *The Ether of Space*, p. 69. Dingle says it appears on pp. 65-66).

[793] Herbert Dingle, *Science at the Crossroads*, p. 163. Dingle adds: "Lodge's account, it is true, does not make it perfectly clear whether this is his explanation of the effect or FitzGerald's, but since he leaves no doubt that the fundamental idea was FitzGerald's, it is unlikely that he would change it without saying so, and in that case there is no such thing as the 'FitzGerald contraction'; it is the FitzGerald expansion, for, according to this explanation, it is not the longitudinal arm that is contracted but the transverse arm that is lengthened – the effect on the fringes, of course, being the same" (*ibid*., 163-164).

[794] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 28.

There would result a contraction of the body in the direction of motion which is proportional to the square of the ratio of the velocities of translation and of light and which would have a magnitude such as to annul the effect of ether-drift in the Michelson-Morley interferometer.[795]
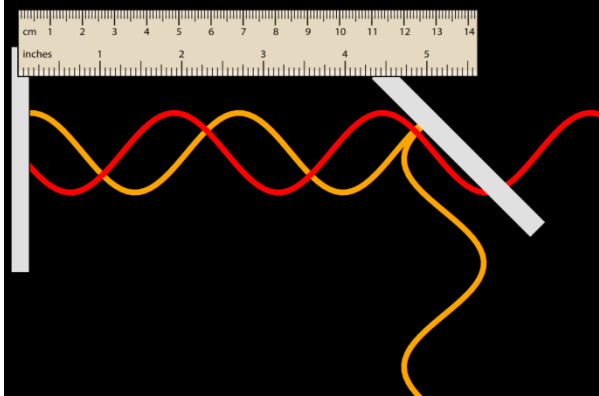
**Expected results: waves are separated due to presumed
motion of Earth; ruler at normal length**
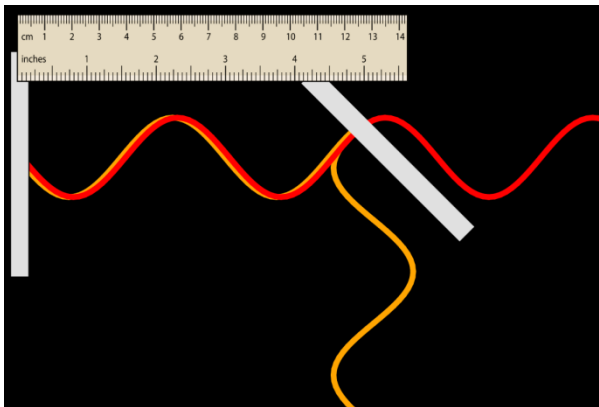
**Contrived results: Lorentz Contraction claims waves coalesce because
apparatus shrinks as Earth moves around the sun; ruler contracted**

[795] H. A. Lorentz, *Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern*, Leyden, 1895, cited in Miller's "The Ether Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, Vol. 5, July, 1933.

Lorentz was still in a bind, however. His 1886 paper "On the Influence of the Earth's Motion on Luminiferous Phenomena" dealing with the optical effects of bodies in motion, stated that it was possible for ether to be partially dragged. But Lorentz's theory of how electrons moved, which he introduced in the early 1890s, was based on the idea of an immobile ether. In this view, ether was understood to be totally separate from matter, and consequently, the only way ether and matter could interact was through infinitesimal charged particles, such as electrons, which generate electrical and magnetic fields in the ether, and which fields, in turn, exert forces on the electrons. Lorentz faced the very difficult task of explaining, based on his electron/immobile-ether theory, why optical experiments, such as those performed by Michelson-Morley, Hoek, Fresnel, Fizeau, Airy, *et al.*, failed to detect the Earth moving through an immobile ether. Fresnel had worked on the basis of "dragged" ether, and thus Lorentz had to derive Fresnel's formula from his new theory of electrons and electromagnetic propagation without admitting to an ether drag. His solution? In 1892, Lorentz claimed that the electromagnetic waves, not the ether, are partially dragged. Thus, the ether can remain immobile and the Earth can remain in motion, but while the Earth moves it brings some of the electromagnetic waves with it.[796] As one can see, the shell game of modern science continued and Lorentz became

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[796] As Arthur Miller explains it, hoping to give it some respectability: "Lorentz (1886) used Huygens' principle and Fresnel's hypothesis to deduce the velocity of light that traversed a medium of refractive index N that was at rest where the source could have been either on the Earth or in the ether [which] explained Arago's experiment and an equivalent one by George Biddell Airy. Lorentz continued (1886), by noting that from the viewpoint of the geocentric system we could say that 'the waves are entrained by the ether' according to the amount – v/N^2. For consistency with the nomenclature of the time Lorentz defined v_r as the velocity of the 'relative ray' and c/N as the velocity of the 'absolute ray.' For example, in order to view the light from a fixed star, a telescope, or a system of aligned slits, at rest on the Earth had to be oriented in the direction of the relative ray because the relative ray was the direction in which energy was transported….On the other hand, an observer at rest in the ether measured the velocity of the light that was propagating through the medium at rest on the moving Earth to be $c' = u_r + v$…Lorentz noted that the ether-fixed observer could interpret $[c' = u_r + v]$ as the 'entrainment of the light waves by the ponderable matter" (*Albert Einstein's Special Theory of Relativity*, pp. 19-20). Of course, even Einstein could see through this hodgepodge of *ad hoc* explanations, politely calling them "asymmetries which do not appear to be inherent in the phenomena," in his 1905 *Annalen der Physik* article. In the end, Lorentz was forced to admit: "Briefly, everything occurs as if the Earth were at rest, and the relative rays were the absolute rays" (*ibid.*, p. 20).

its premier magician, all in an effort to avoid having to admit to the audience the possibility that the Earth was standing still in space.

The issue was further obfuscated when physicists began creating different responses to explain the "contraction" solution. At one point Lorentz held: "Yes, it is as real as anything we can observe," to which Arthur Eddington retorted:

> When the rod in the Michelson-Morley experiment is turned through a right angle it contracts; that naturally gives the impression that something has happened to the rod itself. Nothing whatever has happened to the rod – the object in the external world. It's length has altered, but length is not an intrinsic property of the rod, since it is quite indeterminate until some observer is specified. Turning the rod through a right angle has altered the relation to the observer…but the rod itself, or the relation of a molecule at one end to a molecule at the other, is unchanged.[797]

But in another place he claims that the contraction is real, at least to one's eye: "…your retina has contracted in the vertical direction without your knowing it, so that your visual estimates of vertical length are double what they should be."[798] At another time Eddington said: "The shortening of the moving rod is *true*, but it is not *really true*."[799] In one of his more sober moments, however, he added: "...it was like the adventures of Gulliver in Lilliputland and Alice's adventures in Wonderland."[800] Albert

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[797] Arthur Eddington, *Space, Time and Gravitation*, p. 34.

[798] *Ibid*., p. 22.

[799] Arthur S. Eddington, *The Nature of the Physical World*, 1929, pp. 33-34, emphasis his. Other confusing statements include Wolfgang Pauli's: "It therefore follows that the Lorentz contraction is not a property of a single rod taken by itself, but a reciprocal relation between two such rods moving relatively to each other, and this relation is in principle observable" (Wolfgang Pauli, *Theory of Relativity*, 1958, pp. 12-13); and Herman Minkowski's: "This hypothesis sounds extremely fantastical, for the contraction is not to be looked upon as a consequence of resistances in the ether, or anything of that kind, but simply as a gift from above, – as an accompanying circumstance of the circumstance of motion" ("Space and Time," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 81).

[800] *Relativity, Time and Reality*, Harold Nordenson, 1969, p. 153. Jaffe adds: "To anyone accustomed to thinking in terms of the then recognizable truths of physics, Fitzgerald's theory was a sort of Mad Hatter's deduction" (Bernard Jaffe,

Michelson didn't buy it either. To him the Lorentz solution was artificial, mainly because the so-called contraction was independent of the elastic property inherent in the interferometer itself, as in, for example, the resilience of a tennis ball returning to its original shape after it is struck. He writes of Lorentz's proposal: "Such a conclusion seems so improbable that one is inclined to return to the hypothesis of Fresnel and try to reconcile in some other way the 'negative result' [of the Michelson-Morley experiment]."[801] At other points Lorentz admitted he was uncertain. In 1904 he stated:

> It need hardly be said that the present theory is put forward with all due reserve. Though it seems to me that it can account for all well-established facts, it leads to some consequences that cannot as yet be put to the test of experiment. One of these is that the result of Michelson's experiment must remain negative…[802]

> The experiments of which I have spoken are not the only reason for which a new examination of the problems connected with the motion of the Earth is desirable…in order to explain Michelson's negative result, the introduction of a new hypothesis has been required…Surely this course of inventing special hypotheses for each new experimental result is somewhat artificial. It would be more satisfactory if it were possible to show by means of certain fundamental assumptions...[803]

Michelson and the Speed of Light, p. 92). Recognizing the inherent duplicity of Relativity theory, Eddington admitted: "Gulliver regarded the Lilliputians as a race of dwarfs; and the Lilliputians regarded Gulliver as a giant. That is natural. If the Lilliputians had appeared dwarfs to Gulliver, and Gulliver had appeared a dwarf to the Lilliputians – but no! that is too absurd for fiction, and is an idea only to be found in the sober pages of science" (*Space, Time and Gravitation*, pp. 23-24).

[801] A. Michelson, "Relative Motion of the Earth and the Ether," *Amer. Jour. of Science*, vol. III, June 1897, p. 478.

[802] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 29).

[803] As cited in *Thematic Origins of Scientific Thought*, Gerald Holton, 1988, p. 323. Christian Møller adds this criticism: "The contraction hypothesis looks rather startling at first sight, but, as stressed by Lorentz, it is impossible to escape from it as long as the conception of an absolute unmovable ether is maintained…. The difficulty was only that the presupposition that the particles are held together

Notice that Lorentz is concerned with "problems connected with the motion of the Earth," which tells us that the fear of being forced to accept the "unthinkable" immobile Earth was the basis upon which his *ad hoc* solution was determined. Reading between the lines we know that Lorentz was concerned with the fact that, if he could not come up with a convincing explanation to Michelson-Morley, he and the rest of the world would be in for a great embarrassment. Undaunted, Lorentz put the contraction theory of Fitzgerald into a mathematical equation which eventually became world famous. Known as the "Lorentz Transformation," it is still employed by scientists today for almost any problem having to do with dismissing the possibility that Earth is motionless in space.[804]

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exclusively by electric forces could scarcely be assumed to be satisfied in the real substances. In particular it was difficult to imagine how the charge of a single electron could be held together, unless strong attractive forces of non-electrical nature were active inside the electron. If one therefore assumes that the contraction formula [$l = l_0(1-v^2/c^2)^{1/2}$] is valid also for a single electron, as was actually assumed by Lorentz, this must be regarded as a pure hypothesis which cannot be based on the principles of the electron theory alone" (C. Møller, *The Theory of Relativity*, p. 29).

[804] As noted, Fitzgerald was the first to hypothesize length contraction in 1889, but Lorentz improved the concept and applied the mathematics. After Michelson had published the results of his first experiment in the *American Journal of Science* in 1881, Lorentz published its interpretation in 1886 ("Over den invloed, dien de beweging der aarde op de lichtverschijnselen uitoefent," Koninklijke Akademie van Wetenschappen (Amsterdam); Afdeeling Natuurkunde, Verslagen en Mededeelingen 2 (1885-86): 297-372. Reprinted: "De l'influence du mouvement de la terre sur les phénomènes lumineux," Archives néerlandaises des sciences exactes et naturelles 21 (1887): 103-176). Of note, Michelson and Morley stated in their 1887 paper that Lorentz's idea of a partially dragged ether "also fails." Six years later (1892) Lorentz published his papers on Maxwell's work ("La theorie electromagnétique de Maxwell et son application aux corps mouvants," Archives néerlandaises des sciences exactes et naturelles 25 (1892): 363-552; and "De relatieve beweging van de aarde en den ether" reprinted as "The Relative Motion of the Earth and the Ether"). Both the 1886 and 1892 papers postulated the "contraction" concept. In 1895 Lorentz wrote a more definitive paper titled: "Versuch einer Theorie der elektrischen und optischen Erscheinungen in bewegten Koerpern," in which he elaborated on the ether-based contraction hypothesis. As noted above, Lorentz invented his equation based on Woldemar Voigt's equation explaining the Doppler-effect for converging spherical forces (Über das Dopplersche Prinzip, Nachr. Ges. Wiss. Göttingen, 1887). Voigt's equations are based on division by $1 – (v/c)^{1/2}$ where v is the velocity of convergence. As Wolfgang Pauli describes it: "As long ago as 1887, in a paper still written from the point of view of the elastic-solid theory of light, Voigt

mentioned that it was mathematically convenient to introduce a local time *t'* into a moving reference system…These remarks, however, remained completely unnoticed, and a similar transformation was not again suggested until 1892 and 1895, when H. A. Lorentz published his fundamental papers on the subject" (*Theory of Relativity*, W. Pauli, translated by G. Field, 1958, p. 1). Pauli also notes that "Larmor who, as early as 1900, set up the formulae now generally known as the Lorentz transformation, and who thus considered a change also in the time scale (*ibid.*, p. 2, citing J. J. Larmor, *Ether and Matter*, 1900, pp. 167-177). Poincaré made revisions to Lorentz's work, and Lorentz gave a final proposal in 1905, but both agreed that the method of arriving at the formula was by "groping" for it. As Ives reports: "Lorentz arrived at his formulae by a process of invention and accretion; Poincaré arrived at his by giving Lorentz's equations a mathematical going-over to make them fit his principle of relativity" ("Revisions of the Lorentz Transformations," *Proceedings of the American Philosophical Society*, vol. 95, no. 2, April, 1951, p. 131). The formula said that length (L) had to be multiplied by the square root of 1 minus the square of: the velocity of the object divided by the speed of light, $L = L \times 1 - (v/c)^2$. In this formula, v = the speed of the Earth at 30 kilometers per second around the sun, while "*c*" is the speed of light in a vacuum, presently held at 299,792,459 meters per second. The resulting value in the Lorentz transformation is then 0.999999995 = L. In the original equations, $[(1 - v^2/c^2)^{\frac{1}{2}}]n + 1$ was used for rods shortened when in uniform motion; $[(1 - v^2/c^2)^{\frac{1}{2}}]n$ was used for rods shortened in the direction of motion, and later, $[(1 - v^2/c^2)^{\frac{1}{2}}]1 - n$ was used for clocks slowing in uniform motion. Lorentz admitted that the value of "n" was "the origin of all our difficulties," since there was no experimental data to verify its assumed value (See Ives, "Light Signals on Moving Bodies as Measured by Transported Rods and Clocks" *Journal of the Optical Society of America*, July 1937, vol. 27, p. 263). Interestingly enough, the Lorentz-Fitzgerald contraction matched the Fresnel-Fizeau drag coefficient, but this, of course, is only to be expected, since both solutions are merely mathematical gap-fillers for an effect that neither group of scientists understood. Not surprisingly, Max Born cites the notorious controversy leaving open whether the contraction is "real" or only "apparent." A more recent advocate of Lorentz admits:

> Since the first steps of relativity, Lorentz-Fitzgerald contraction has been the subject of a debate which is not closed today, and divides physicists in opposite clans. Some of them consider length contraction as a naive opinion, for example Wesley, Phipps, Cornille, Galeczki. Some others consider it as a fundamental process which explains a lot of experimental facts. Among them Bell, Selleri, Builder, et al. Length contraction had been proposed by Lorentz and Fitzgerald in order to explain the null result of Michelson's experiment. (In fact, the result was not completely null, but much weaker than expected). Length contraction was never observed. Of course, it cannot be observed directly by an observer in a moving frame, since the standard used to

That Lorentz knew the implications of the problem is noted in a personal letter he wrote to Einstein in 1915. As we noted previously (but is well worth repeating), as he began to feel the effects of the centerless universe into which Einstein's Relativity put the human race, in a moment of seeming desperation Lorentz appeals to the same entity upon which Isaac Newton and his "action-at-a-distance" concept found himself depending – a divine being that could hold it all together. Lorentz writes:

> A "world spirit," who would permeate the whole system under consideration without being tied to a particular place or "in whom" the system would consist, and for whom it would be possible to "feel" all events directly would obviously immediately single out one of the frames of reference over all others.[805]

Obviously, Lorentz is finding it difficult to live in the universe he created for himself. Here he is searching for a ubiquitous entity that can not only sense and coordinate all events instantaneously, but one that can also provide him with an absolute frame of reference. Why? Because Lorentz knows deep within himself that it can work no other way. A world of relativity ends up in chaos. Without admitting it, Lorentz is asking for precisely what we are providing – God and a fixed Earth.

For the time being, however, his "transformation" equation would spare him any tinge of guilt. This will not be the first time that mere

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measure it, also contracts. But it could be observed indirectly. This was the objective of different renowned physicists who tried to observe the physical modifications entailed by motion: [*e.g.,*] variation of the refractive index of a refringent solid (Rayleigh and Brace); influence of the ether wind on a charged condenser (Trouton and Noble); the experiments of Trouton and Rankine and of Chase and Tomashek on the electrical resistance of moving objects; and finally of Wood, Tomlison and Essen on the frequency of the longitudinal vibration of a rod. But the experiments proved all negative" ("How the Apparent Speed of Light Invariance Follows from Lorentz Contraction," Joseph Lévy, France, unpublished, pp. 1-2. Lévy has also written: "Hidden Variables in Lorentz Transformation" (P. I. R. T., 1998) and "Some Important Questions Regarding Lorentz-Poincare's Theory and Einstein's Relativity" (P. I. R. T., 1996)).

[805] Henrick Lorentz to Albert Einstein, January 1915, Robert Schulmann, A. J. Kox, Michael Janssen and József Illy, editors, *The Collected Papers of Albert Einstein, Correspondence 1914-1918*, Princeton University Press, 1998, Document 43.

imagination and mathematics come to the rescue to solve scientific enigmas. As Alfred O'Rahilly opined: "The mathematicians got their chance and the semi-educated developed their natural gullibility."[806] In the same vein, Engelbert Schücking boasted: "We have been able to scare most of the ministers out of cosmology by a straightforward application of tensor analysis." As planned, Einstein's obtuse tensors were quite the show-stopper. In November 1919, Ludwik Silberstein approached Arthur Eddington at a joint meeting of the Royal Society and the Royal Astronomical Society. "Professor Eddington," Silberstein declared, "you must be one of three persons in the world who understands general relativity." In response to Eddington's silence, Silberstein continued: "Don't be modest, Eddington." Eddington then replied, "On the contrary, I am trying to think who the third person is!"[807] This reply, of course, was the perfect ploy to form a mystique around Relativity. If one judged Relativity as bogus, then it could be said that he was "not one of three who understood it." If one showed favor to Relativity, he would be deemed as "smart" as the original three. Others, G. Burniston Brown says,

> …were not impressed: they tended to agree with Rutherford. After Wilhelm Wien had tried to impress him with the splendours of relativity, without success, and exclaimed in despair "No Anglo-Saxon can understand relativity!," Rutherford guffawed and replied "No! they've got too much sense!"[808]

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[806] Alfred O'Rahilly, *Electromagnetics: A Discussion of Fundamentals*, 1938; Dover Reprint edition, 1965. p. 851.

[807] Schücking reference to scaring ministers comes from E. L. Schücking, "Cosmology," *Relativity Theory and Astrophysics 1. Relativity and Cosmology*, ed. Jurgen Ehlers, Providence, RI: American Mathematical Society, 1967, p. 218, cited in *The Fingerprint of God*, p. 35. Tensor analysis, originally known as "absolute differential calculus," was invented by Gregorio Ricci Curbastro and Tullio Levi-Civita. It was so abstruse that Alfred North Whitehead said of it: "It is not going too far to say that the announcement that physicists would have in the future to study the theory of tensors created a veritable panic among them when the verification of Einstein's predictions was first announced" (Whitehead, *The Concept of Nature*, p. 182). This would not be the last time a scientific fraud was perpetrated by basing it merely on a mathematical "proof" too difficult for anyone to understand. The conversation between Eddington and Silberstein appeared in *Time*, February 19, 1979, p. 76.

[808] Quoted from the Rutherford Memorial Lecture to the Physical Society 1954 by P.M.S. Blackett (Yearbook of the Physical Society, 1955), as cited in G. Burniston Brown's "What is wrong with relativity"? 1967, p. 71.

Because Relativity was more or less a mathematical theory rather than a physical explanation of nature, the mathematical permutations began to make many scientists skeptical that a true model of the universe had been found. J. J. Thomson, for example, showed what science had morphed into:

We have Einstein's space, de Sitter's space, expanding universes, contracting universes, vibrating universes, mysterious universes. In fact the pure mathematician may create universes just by writing down an equation, and indeed if he is an individualist he can have a universe of his own.[809]

J. J. Thomson (1856 – 1940)

Thomson's contemporary, Joseph Needham, said of the state of physics at the turn of the century:

The mathematisation of physics...is continually growing and physics is becoming more and more dependent upon the fate of mathematics....This special mathematics has for the greater part been created by the physicists themselves, for ordinary mathematics is unable to satisfy the requirements of present day physics.[810]

Stanislaw Ulam in *Adventures of a Mathematician*, adds:

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[809] *Einstein: Life and Times*, p. 301.
[810] *Science at the Crossroads*, "Marx's Theory on the Historical Process," 1971, p. 189.

I should add here for the benefit of the reader who is not a professional physicist that the last thirty years or so have been a period of kaleidoscopically changing explanations of the increasingly strange world of elementary particles and of fields of force. A number of extremely talented theorists vie with each other in learned and clever attempts to explain and order the constant flow of experimental results which, or so it seems to me, almost perversely cast doubts about the just completed theoretical formulations.[811]

Philosopher Bertrand Russell is a bit more sardonic:
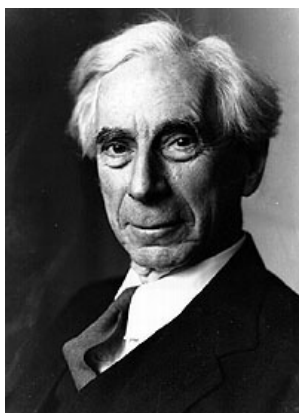
Bertrand Russell (1872 – 1970)

Pure mathematics consists entirely of assertions to the effect that if such and such a proposition is true of *anything* then such and such another proposition is true of that thing. It is essential not to discuss whether the first proposition is really true, and not to mention what the anything is, of which it is supposed to be true. Both of these points would belong to applied mathematics…. Thus mathematics may be defined as the subject in which we never know what we are talking about, nor what we are saying is true.[812]

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[811] Stanislaw Ulam, *Adventures of a Mathematician*, 1976, p. 261.
[812] Bertrand Russell, *Mysticism and Logic*, 1957, pp. 70-71, emphasis in the original. Russell was famous for causing the retraction of G. Frege's two-volume mathematical treatise by pointing out that the then current set theory, formulated by Georg Cantor, led to the absurd conclusion that: "N is a member of N set if, and only if, it is not a member of N set."

Mario Livio, head of the science division of the Hubble Space Telescope, writes:

> The success of pure mathematics turned into applied mathematics, in this picture, merely reflects an overproduction of concepts, from which physics has selected the most adequate for its needs – a true survival of the fittest. After all, "inventionists" would point out, Godfrey H. Hardy was always proud of having "never done anything 'useful.'" This opinion of mathematics is apparently espoused also by Marilyn vos Savant, the "world record holder" in IQ – an incredible 228. She is quoted as having said "I'm beginning to think simply that mathematics can be invented to describe anything, and matter is no exception."[813]

Even more critical of mathematics and its applications to science is Morris Kline, professor of mathematics at the Courant Institute and New York University. He writes:

> The current predicament of mathematics is that there is not one but many mathematics and that for numerous reasons each fails to satisfy the members of the opposing schools. It is now apparent that the concept of a universally accepted, infallible body of reasoning – the majestic mathematics of 1800 and the pride of man – is a grand illusion. Uncertainty and doubt concerning the future of mathematics have replaced the certainties and complacency of the past. The disagreements about the foundations of the "most certain" science are both surprising and, to put it mildly, disconcerting. The present state of mathematics is a mockery of the hitherto deep-rooted and widely reputed truth and logical perfection of mathematics.
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> The disagreements concerning what correct mathematics is and the variety of differing foundations affect seriously not only mathematics proper but most vitally physical science… The loss of truth, the constantly increasing complexity of mathematics and science, and the uncertainty about which approach to mathematics is secure have caused most mathematicians to

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[813] Mario Livio, *The Golden Ratio*, 2002, p. 245. The reference to "inventionists" refers to the debate whether mathematics has been invented or discovered.

abandon science… The hope of finding objective, infallible laws and standards has faded. The Age of Reason is gone.[814]

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[814] Morris Kline, *Mathematics: The Loss of Certainty*, 1980, p. 6. Quoting Einstein he adds: "The relationship of mathematics to the physical world was well expressed by Einstein in 1921: 'Insofar as the propositions of mathematics give an account of reality they are not certain; and insofar as they are certain they do not describe reality…'. Mathematicians had given up God and so it behooved them to accept man. And this is what they did. They continued to develop mathematics and to search for laws of nature, knowing that what they produced was not the design of God but the work of man" (*ibid.*, p. 97). The problems of mathematics are quite numerous, yet most people are still under the illusion that mathematics is the perfect and unassailable science. Problems with infinite sets, the square roots of negative numbers, quaternions, Zeno's Paradox, Euclid's parallel postulate, and many more are well known. Just a couple of examples may suffice: (a) Karl Popper gives the example of:

"…the square root of 2…consists in showing that the assumption (1) $\sqrt{2}$ = n/m, that is that $\sqrt{2}$ is equal to a ratio of any two natural numbers, n and m, leads to an absurdity. We first note that we can assume that (2) not more than one of the two numbers, n and m, is even. For if both were even, then we could always cancel out the factor 2 so as to obtain two other natural numbers, n' and m' such that n/m = n'/m' and such that at most one of the two numbers, n' and m' would be even. Now by squaring (1) we get (3) $2 = n^2/m^2$, and from this (4) $2m^2 = n^2$, and thus (5) n is even. Thus there must exist a natural number a so that (6) n = 2a, and we get from (3) and (6) [the next step] (7) $2m^2 = n^2 = 4a^2$, and thus (8) $m^2 = 2a^2$. But this means (9) m is even. It is clear that (5) and (9) contradict (2). Thus the assumption that there are two natural numbers, n and m, whose ratio equals $\sqrt{2}$, leads to an absurd conclusion. Therefore $\sqrt{2}$ is not a ratio, it is 'irrational'" (*Conjectures and Refutations: The Growth of Scientific Knowledge*, p. 86; Mario Livio, *The Golden Ratio: The Story of Phi, The World's Most Astonishing Number*, New York, Random House, 2002, pp. 36-39).

See also: Morris Kline, *Mathematics and the Search for Knowledge*, Oxford University Press, 1986; *Mathematics and the Physical World*, Dover Publications, 1981; Eugene P. Northrop, *Riddles in Mathematics*, Krieger Publishing, 1975; *Mathematics and Western Culture*, Oxford University Press, 1953; Evert Beth, *The Foundations of Mathematics*, New York, Harper and Row, 1966; W. Rudin, *Mathematical Analysis*, New York, McGraw-Hill, 1964; J. M. Dubbey, *Development of Mathematics*, Crane, Russak and Co., 1970; W. S. Hatcher, *Foundation of Mathematics*, W. B. Saunders, 1968; A. Robinson, "The Metaphysics of the Calculus" in *The Philosophy of Mathematics*, ed. J. Hintikka, Oxford University Press; E. Gilson, *The Philosophy of St. Bonaventure*, New Jersey, St. Anthony Guild Press, 1965; Eugene Wigner, "The Unreasonable

Commenting on the *Incompleteness Theorem* of Kurt Gödel, another author offered a sobering assessment of what we can expect in the future:

> …human beings can never formulate a correct and complete description of the set of natural numbers. But if mathematicians cannot even fully understand something as simple as number theory, then it is certainly too much to expect that science will ever expose any ultimate secret of the universe. Any system of knowledge about the world is, and must remain fundamentally incomplete, eternally subject to revision.[815]

Despite the mathematical magic, for now the world would be satisfied that science had sufficiently answered the Earth-shattering dilemma brought to them by Michelson and Morley. Lost in the shuffle, however, was the simplest solution – the one that didn't involve inventing mathematical fudge factors. That solution, of course, was "unthinkable." Science just "knew" the Earth was moving.

Now that science fooled itself into thinking the null result had been solved, there were other issues that needed to be addressed. If everything is in motion and there is no center point in space, then how can we be sure of things we measure? What standard ruler, what immovable object, could be used to measure one thing against another? While Lorentz and Fitzgerald were tackling the mechanics of light beams and moving objects, Henri Poincaré was postulating about the new "relative" universe. In 1896 Poincaré gave a speech at the International Congress of Mathematicians in Zurich describing his own non-Euclidean relativity theory. Einstein was a student there at the time. Poincaré's penchant toward making everything relative is precisely what we would expect once it is postulated that measuring rods contract when they are moving at speeds as slow as 30 km/sec. The whole universe is now outside of the realm of certainty, since no one can ever say for certain what is big or small or fast or slow. In 1904, Poincaré gave another speech on the same subject, this time to the Congress of Arts and Sciences, but a speech that, in his own words, was "an indication of the scientific unrest and philosophical distrust created not

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Effectiveness of Mathematics in the Natural Sciences," *Communications on Pure and Applied Mathematics* XIII (1960); Leonard M. Wapner, *The Pea and the Sun*, A. K. Peters Co., 2005, detailing the 1924 Tarski paradox and the 1014 Hausdorff paradox.

[815] Rudy Rucker, *Infinity and the Mind*, 1982, p. 165.

only by the Michelson-Morley experiment, but by others made during the preceding two decades...”[816]

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[816] *Einstein: The Life and Times*, p. 113. After hearing the news that Walter Kaufmann’s 1905-1906 experiment disproved both Lorentz and Einstein, Lorentz, not being able to add any more modifications to his view, wrote to Poincaré: “Unfortunately my hypothesis of the flattening of electrons is in contradiction with Kaufmann’s results, and I must abandon it. I am, therefore, at the end of my Latin.” Poincaré stated: “The principle of relativity thus does not appear to have the rigorous validity which one was tempted to attribute to it” (*Thematic Origins of Scientific Thought*, Gerald Holton, Harvard University Press, 1988, p. 206). In a 1907 article, Einstein acknowledged that his theory conflicted with Kaufmann’s results, and admitted, at least at that time, he could find no errors in Kaufmann’s experiment or interpretation. But Einstein would not give up, since his theory, based on a macro-evaluation of the whole universe, did not consider micro-results to undermine the basic postulates of his theory. Someway would be found to vindicate Einstein, as has always been the case with physics since 1905. Kaufmann’s experiment involved the deflection of electrons in an electromagnetic field. Kaufmann writes in a Nov. 30, 1905 note: “In addition there is to be mentioned a recent publication of Mr. A. Einstein on the theory of electrodynamics which leads to results which are formally identical with those of Lorentz’s theory. I anticipate right away the general result of the [Kaufmann] measurements to be described in the following: the results are not compatible with the Lorentz-Einstein fundamental assumptions.” The reason is that Kaufmann’s attenuation factor of the electric field strength that deflected the electrons (his “k” value) implied a velocity greater than the speed of light. Max Planck then readjusted Kaufmann’s “k” value to give a slight favoring toward the Lorentz-Einstein theory. In 1908, Bucherer performed a variation of Kaufmann’s experiment using Planck’s recalculated “k” values, which allowed it to agree more with the Lorentz-Einstein model. Planck’s partiality toward Einstein’s Special Relativity theory was no secret, however. As Brush reports: “Planck presented the theory at the physics colloquium in Berlin during the winter semester 1905-6 and published a paper on it in 1906 (the first publication on relativity other than Einstein’s)…As editor of the prestigious journal *Annalen der Physik*, Planck saw to it that any paper on relativity meeting the normal standards would get published. According to Goldberg, Planck was attracted to relativity theory because of ‘his philosophical and ethical convictions about the ultimate laws of reality’” (Stephen Brush, “Why Was Relativity Accepted?” p. 193). In any case, Brush recognizes that Planck’s readjustment of the “k” value only showed that “Kaufmann’s data did not rule out relativity,” not that it vindicated Relativity. Gerald Holton takes a more negative view of Bucherer’s results, stating: “theories of electron motion given earlier by Abraham and by Bucherer do give predictions considerably closer to the experimental results of Kaufmann. But Einstein refuses to let the ‘facts’ decide the matter.” Holton says that “the work of Guye and Lavanchy in 1916” found errors in Kaufmann’s equipment, which was “an

Perhaps Poincaré was referring to the results of Arago and Airy, which up to this time had not been answered by the scientific establishment. A motionless Earth, of course, would have solved all the problems confronting scientists and philosophers, for it would have provided a firm and unmovable standard by which to measure anything in the known universe. The scientific unrest was just beginning, however. The implications of the Lorentz-Fitzgerald contraction would press very deep into the heart of physics and question its very foundations. It was one thing to say that rods shrank as they moved through the ether with the Earth, but to be consistent Lorentz realized that clocks running through the ether must also be affected and thus tick more slowly by the same factor that made the rods shrink. They had no choice but to alter time, for if someone with a normal-running clock is keeping the time of how long it takes the light beam to travel through the ether in Michelson-Morley's experiment, he will record that the beam reached its destination later then it should have, that is, it would have reached its destination much later than the beam traveling perpendicular to the Earth's motion, which would cause significant fringe shifts to appear. So in order to have the clock accommodate an experiment in which <u>no</u> fringe shifts appear, not only must lengths shorten, but the clock calculating how long it took the light beam to travel the shortened distance must run slower than normal. The Relativist is forced to this position. If not, then the light beam will arrive sooner than it should. So now we have what modern science calls "time dilation." The pace of time itself can change, and therefore it is as relative as everything else.

The problems are not over yet. Not only would time be forced to slow down, but Poincaré showed through the laws of momentum that the mass of an object moving against the ether had to increase. Thus, length, time and mass must change to accommodate the null results of Michelson-Morley. Since they were all interconnected they had to stay in balance, otherwise the mathematics would not work. Confounded by all these requirements, Lorentz and Poincaré complained: "nature was conspiring against us." Needless to say nature wasn't conspiring against them; rather, they were conspiring against themselves. Nature was shouting loud and clear that these absurd contortions of length, time and mass could all be avoided if one would simply start from the fact that the Earth was standing still in space. Absolute time, length, and mass would be a natural result of a stationary Earth. But scientists were simply not listening to nature. The stakes were too high for them to hear her sweet, soft voice. This was a

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inadequate vacuum system" discovered by Lorentz (*Thematic Origins of Scientific Thought*, pp. 206, 231, 253).

battle for who was going to control the world and the minds of its people: would it be the Church and the Bible or atheistic science? With Lorentz creating his mathematical fudge factor to explain the Michelson-Morley experiment, and Poincaré developing the first phases of the theory of Relativity, the stage was now set for Albert Einstein to put what science hoped would be the final nail into the coffin of the motionless Earth.

Albert Einstein (1879 – 1955)

Einstein Enters the Fray

How much did the Michelson-Morley experiment influence the thinking of Albert Einstein? Most biographers, historians and academics say that it affected him tremendously, although there are a few who say it was only indirectly.[817] The issue is somewhat difficult because Einstein himself gave different testimonies.

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[817] Among the more notables are, Stephen Hawking in the best-selling *A Brief History of Time*, p. 20, and Richard Feynman in "The Feynman Lectures on Physics," Vol. 1, Reading, Massachusetts: Addison-Wesley, 1963, p. 15, cited in Holton, p. 350. I would estimate that over 95% of the literature holds that Einstein based his theory of Relativity directly upon the Michelson-Morley experiment. Holton sees this as "folklore," and claims that Michelson-Morley had only an "indirect" effect on Einstein's thinking. He cites one or two others in support of his thesis. In the end, Holton's special pleading makes little difference since, as noted above, Einstein made explicit reference to all the "unsuccessful attempts to discover any motion of the Earth," which, after the fact, would include Michelson-Morley. Even Abraham Pais, who is unabashedly favorable to Einstein writes: "Why, on the whole, was Einstein so reticent to acknowledge the influence of the Michelson-Morley experiment on his thinking" (*Subtle is the Lord*, Oxford, 1982, p. 164). The truth is that Einstein was reluctant to base his Relativity theory on Michelson-Morley because it would reveal that his foremost quest was the preservation of Copernicanism and the vindication of Galileo over the Catholic Church.

We have already noted that Einstein was troubled by, as he put it, "the Fizeau experiment on the effect of moving water on the speed of light, and by astronomical aberration, especially Airy's observations with a water-filled telescope," but since Michelson-Morley was principally connected to these previous experiments then it should have had an affect on Einstein. Moreover, if it was not precisely the Michelson-Morley experiment that was the primary motivating factor for Einstein in the formulation of his Relativity theory, it was certainly the whole cadre of similar experiments performed after 1887 and prior to 1905, namely, those of Roentgen, Lodge, Rayleigh, Brace, Trouton-Noble and Morley-Miller, all of which produced the same results as Michelson-Morley. Einstein admitted as much in his famous 1905 paper as he makes explicit reference to "the unsuccessful attempts to discover any motion of the Earth relative to the light medium."[818] We can be sure of one fact: all of the aforementioned experiments from Roentgen to Miller concerned one thing, and only one thing – "motion of the Earth relative to the light medium."

More specific information that Einstein based Relativity primarily on the Michelson-Morley experiment comes from various sources. **Robert S. Shankland**, who worked with Einstein in the 1950s, reveals some persuasive information. When he visited Einstein in 1950, he asked him how he learned of the Michelson-Morley experiment. In this instance Einstein replied that he had "become aware of it through the writings of H. A. Lorentz, but *only after 1905*." Two years later (1952), Shankland again asked Einstein the same question, wherein Einstein stated: "This is not so easy. I am not sure when I first heard of the Michelson experiment." Shankland goes on to comment:

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[818] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905. The full paragraph is: "Examples of this sort, together with the unsuccessful attempts to discover any motion of the Earth relative to the 'light medium,' suggests that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest. They suggest rather that, as has already been shown to the first order of small quantities, the same laws of electrodynamics and optics will be valid for all frames of reference for which the equations of mechanics hold good."

However, Einstein said that in the years 1905-1909, he thought a great deal about Michelson's result in his discussions with Lorentz and others in his thinking about general relativity. He then realized (so he told me) that he had also been conscious of Michelson's result *before 1905* partly through his reading of the papers of Lorentz and more because he had assumed this result of Michelson to be true.[819]

This is confirmed by a letter that Einstein wrote to Marcel Grossmann in 1901, in which he stated:

A new and considerably simpler method for the investigation of the motion of matter with respect to the luminiferous ether has come into my mind. It is based on the usual interference

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[819] *Einstein: The Life and Times*, pp. 128-129. Emphasis added. A longer quote appears in *Thematic Origins of Scientific Thought*, pp. 300-301. Holton admits: "We have positive evidence of Einstein having read only one paper and one book by Lorentz – the paper of 1892 and the book of 1895." Of the 1895 book, Holton attempts to downplay the facts, stating: "…the Michelson ether-drift experiments are only briefly mentioned (on p. 2)…The matter is not brought up again until page 120." Also, Holton admits to "a newly found letter of 1899 (Document 57 of "The Collected Papers of Albert Einstein," vol. 1 [Princeton: Princeton University Press, 1987]) in which Einstein indicated that he had read Wilhelm Wien's paper, "Ueber die Fragen, welche die translatorische Bewegung des Lichtäthers betreffen," *Annalen der Physik und Chemie*, 65:I-xvii, 1898. In it Einstein would have seen a discussion of ten 'experiments with negative result' on the supposed existence of a fixed ether; the Michelson-Morley experiment was the last on Wien's list, with Wien's acknowledgement that it was necessary to adopt a 'hypothesis' of the compensatory shrinking of the length dimensions of rigid bodies to rescue the interpretation of the experiment" (*The Thematic Origins of Scientific Thought*, p. 478). Also G. H. Keswani was able to show that Einstein had, previous to his "Electrodynamik" paper of 1905, read *Science et Hypothèse*, written by Henri Poincaré. The index of Poincaré's book mentions Michelson four times in connection with the Michelson-Morley experiment (G. H. Keswani in "The Origin and Concept of Relativity," *British Journal for the Philosophy of Science* 15: 286-306, 1965. This evidence shows that Einstein not only knew of the Michelson-Morley experiment before his 1905 paper, but also its implications. Thus, statements of Einstein's, such as the one in the letter to a "Mr. Davenport" that Holton cites Einstein writing, which says, "In my own development Michelson's result has not had a considerable influence. I do not even remember if I knew of it at all when I wrote my first paper on the subject (1905)…One can therefore understand why in my personal struggle Michelson's experiment played no role or at least no decisive role," seem to be both a convenient a lapse of memory and an equivocation.

experiments. If only once inexorable destiny will allow me to finish with the necessary time and calm! When we meet again, I will tell you all about that.[820]

The "usual interference experiments" not only point to the Michelson-Morley experiment but to the many repeats of that experiment performed by various scientists (Lodge, Brace, *et al*) up until 1901. Einstein's knowledge of them is supported by an account that Michelson's biographer, Bernard Jaffe, records from Einstein's speech in honor of Michelson:

> I have come among men who for many years have been true comrades with me in my labors. You, my honored Dr. Michelson, began with this work when I was only a little youngster, hardly three feet high. It was you who led the physicists into new paths, and through your marvelous experimental work paved the way for the development of the Theory of Relativity. You uncovered an insidious defect in the ether theory of light, as it then existed, and stimulated the ideas of H. A. Lorentz and Fitzgerald, out of which the Special Theory of Relativity developed. Without your work this theory would today be scarcely more than an interesting speculation; it was your verifications which first set the theory on a real basis.[821]

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[820] Albert Einstein, "Letter to Grossman, 6?/9/1901," EA, 11-485, cited in Ludwik Kostro, *Einstein and the Ether*, 2000, p. 16.

[821] Bernard Jaffe, *Michelson and the Speed of Light*, 1960, pp. 167-168. Holton points out that there is a sentence in the original German after the clause "out of which the special theory of relativity developed," which is "These in turn led the way to the general theory of relativity, and to the theory of gravitation." From this addition Holton claims that this "switches the discussion away from Michelson and special relativity toward the assembled astronomers and general relativity" (*Thematic Origins of Scientific Thought*, p. 338). But our interest is not so much General Relativity, but what Einstein knew about Michelson's experiment and its implications before he wrote his 1905 paper on Special Relativity. In any case, Holton is forced to admit Einstein's statement on July 17, 1931 to the Physikalische Gesellschaft of Berlin in memory of Michelson (who died two months earlier) that Michelson's greatest idea, as Einstein put it "was the invention of his famous interference apparatus, which came to be of greater significance both for relativity theory as well as for the observation of spectral lines…this negative result [of the Michelson experiment] greatly advanced the belief in the validity of the general relativity theory" (*ibid*., p. 339). Holton also wrote "On the Origins of the Special Theory of Relativity," in *American Journal of Physics*, Vol. 28 (1960), of which the relevant detail is on pages 627-636. On

There is also the evidence from Yoshimasa Ono who cites an Einstein speech titled: "How I Created the Theory of Relativity," which was delivered at Kyoto University, Japan, on Dec. 14 1922. Einstein delivered the speech in his native German and J. Isiwara (professor of physics at Tohoku University) gave a running translation of the speech to the Japanese students. Isiwara later published his translation in 1923 in the Japanese periodical, *Kaizo*. Ono quotes one part of Isiwara's translation of Einstein's speech as follows:

> Soon I came to the conclusion that our idea about the motion of the Earth with respect to the ether is incorrect, if we admit Michelson's null result as a fact. This was the first path which led me to the special theory of relativity. Since then I have come to believe that the motion of the Earth cannot be detected by any optical experiment, though the Earth is revolving around the sun.[822]

There are also Einstein's lectures at Princeton in 1921, in which Einstein stated:

> But all experiments have shown that electro-magnetic and optical phenomena, relative to the earth as the body of reference, are not influenced by the translational velocity of the earth. The most important of these experiments are those of Michelson and Morley, which I shall assume are known. The validity of the principle of special relativity can therefore hardly be doubted.[823]

Here, once again, we see that Einstein and the rest of modern science got themselves into this conundrum by assuming, as an absolute fact of science and the foundation upon which all other experiments are to be interpreted, that the Earth is revolving around the sun. At the very same time, they admit there is no optical experiment devised that can prove the assumption. What is Einstein's solution? If we can't prove it by an optical experiment, we can still assume the Earth is moving and convince people

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his side is Stephen Brush, who states that Michelson-Morley "was not the primary motivation for his research, and had only a small and indirect effect on his early work" ("Why Was Relativity Accepted?" *Physics in Perspective* 1 (1999), p. 187). This is, indeed, a dubious conclusion when everyone else (Fitzgerald, Lorentz, Poincaré, *et al*) saw Michelson-Morley as quite a dilemma for physics.

[822] Yoshimasa A. Ono, *Physics Today*, 35 (8), 45 (1982).

[823] *The Meaning of Relativity*, four lectures delivered at Princeton University, May 1921, Princeton University Press, 1923, p. 29.

it is so by simply inventing a whole new physics – Special Relativity. As he says himself:

> …to the question whether or not the motion of the Earth in space can be made perceptible in terrestrial experiments. We have already remarked…that all attempts of this nature led to a negative result. Before the theory of relativity was put forward, it was difficult to become reconciled to this negative result.[824]

Hence, with this evidence in the background, it is safe to say that Einstein's theory of Relativity was based and formulated, at least in large part, upon the results of the Michelson-Morley experiment. In fact, it could be said that Einstein was at the mercy of the Michelson-Morley experiment. Even though Albert Michelson and Edward Morley promised in their original 1887 paper that "the experiment would be repeated at intervals of three months, and thus all uncertainty will be avoided,"[825] they never produced another set of readings. The whole world was dependent on only 36 readings taken over six hours in four days, a pittance by scientific standards.[826]

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[824] "Relativity – The Special and General Theory," cited in Stephen Hawking's, *A Stubbornly Persistent Illusion*, 2007, p. 169.

[825] "On the Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Third Series, Vol. xxxiv (203), Nov. 1887.

[826] Michelson and Morley took 17 readings twice each day (noon and evening) on July 8 and 9, and one reading each on July 11 and 12:

- Trial 1: July 8 (noon): -0.001; +0.024; +0.053; +0.015; -0.036; -0.007; +0.024; +0.026; -0.021; -0.022; -0.031; -0.005; -0.024; -0.017; -0.002; +0.022; -0.001.
- Trial 2: July 8 (evening): -0.016; +0.008; -0.010; +0.070; +0.041; +0.055; +0.057; +0.029; -0.005; +0.023; +0.005; -0.030; -0.034; -0.052; -0.084; -0.062; -0.016.
- Trial 3: July 9 (noon): +0.018; -0.004; -0.004; -0.003; -0.031; -0.020; -0.025; -0.021; -0.049; -0.032; +0.001; +0.012; +0.041; +0.042; +0.070; -0.005; +0.018.
- Trial 4: July 9 (evening): +0.007; -0.015; +0.006; +0.004; +0.027; +0.015; -0.022; -0.036; -0.033; +0.001; -0.008; -0.014; -0.007; +0.015; +0.026; +0.024; +0.007.
- Trial 5: July 11 (noon): +0.015; -0.035; -0.039; -0.067; -0.043; -0.015; -0.001; +0.027; +0.001; -0.011; -0.005; +0.011; +0.047; +0.053; +0.037; +0.005; +0.015.

In the meantime, **Wilhelm C. Roentgen**, famous for the discovery of X-rays, performed an experiment in 1888 (which was the forerunner of the Trouton-Noble experiment of 1903) and reported his "unsuccessful" attempt in detecting the "velocity of the Earth through the ether."[827] Sir Oliver Lodge, who received fame for his work in electricity, performed "ether wave" experiments in 1892, which were designed to detect the Earth's motion through space. He sent light beams between rapidly moving steel disks to test the hypothesis that, as matter moved, it would drag ether with it. He observed no such effect.[828] If there was no ether drag, an obvious conclusion would be that the Earth was not moving through the ether, and thus standing still in space, but neither Lodge nor his colleagues were of the frame of mind to consider such an option.[829] Still, Lodge showed, contrary to Michelson's 1887

- Trial 6: July 12 (evening): +0.034; +0.042; +0.045; +0.025; -0.004; -0.014; +0.005; -0.013; -0.030; -0.066; -0.093; -0.059; -0.040; +0.038; +0.057; +0.041; +0.034;

[827] W. C. Roentgen (or Röntgen), *Annalen der Physik* 35:264, 1888. After Roentgen, A. Eichenwalt, *Annalen der Physik* 11:1, 241, 1903, and H. A. Wilson, *Philosophical Transcripts of the Royal Society*, London 204:121, 1904, used the "Roentgen convection" with electric and magnetic fields, respectively, but with no significant results.

[828] *Philosophical Transcripts of the Royal Society*, London 184: 727-804, 1893; 189:149-166, 1897. In his book *The Ether of Space* he writes: "At first I saw plenty of shift…On stopping the disks the bands returned to their old position. On starting them again in the opposite direction the bands ought to have shifted the other way too, if the effect were genuine; but they did not; they went the same way as before. The shift was therefore wholly spurious….We have no means of getting hold of the ether mechanically; we cannot grip it or move it in the ordinary way: we can only get it electrically. We are straining the ether when we charge a body with electricity; it tries to recover, it has the power of recoil." In another work he writes: "…space empty of matter is endowed with finite and measurable physical properties. It is absolutely transparent and undispersive. In other words it quenches no light but transmits it undiminished in total intensity, though diluted by spreading…" (Oliver Lodge, *The Ether of Space*, 1909. p. 70).

[829] In Lodge's book, *The Ether of Space*, he consistently refers to "Earth's moving through space at nineteen miles a second" as the basis for all his interpretations of the interferometer experiments (pp. 48, 55, 58, 61, 63, 66, 68), never once allowing for an immobile Earth to answer the perplexing questions.

experiment, that light was not affected by the motion of adjacent matter. This led Michelson to plan a repeat of his 1887 experiment in 1897, since he proposed to himself that perhaps in his first attempt in the basement laboratory in Cleveland the ether was "trapped" and therefore became motionless. But in 1897 Michelson found that there was no difference when the interferometer was placed above the ground. The displacement was less than one-twentieth of a fringe.[830] As Robert Laughlin sees it, instead of opting for a non-moving Earth, science chose to make the speed of light invariable and allow objects to magically gain mass:

> By 1897 this had improved to a factor of forty, a disparity too great to be dismissed as irrelevant or an experimental artifact. The expected modification of the speed of light due to the earth's motion did not exist. This finding led Albert Einstein to conclude that the speed of light is fundamental and that moving bodies must gain mass as their speed increases.[831]
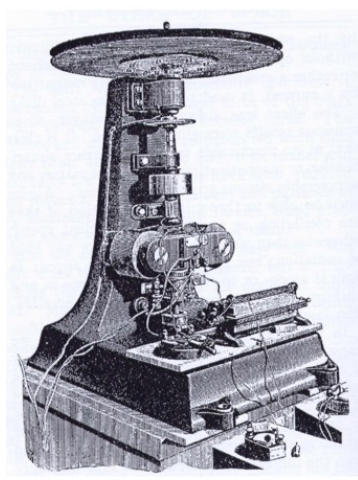
The Lodge Ether Machine

In 1902, Lord Rayleigh performed another ether-drift experiment, this one depending on a refractometer that would produce a double refraction of light. His concept was to discharge polarized light in a direction parallel to the motion of ether-drift (or the motion of the Earth) over against polarized light perpendicular to that direction, thus causing a different

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[830] Dorothy Michelson Livingston, *The Master of Light: A Biography of Albert A. Michelson*, p. 200.
[831] Robert B. Laughlin, *A Different Universe*, p. 13.

velocity in the two beams, which would be detected by a double refraction. Rayleigh was unable to detect any effect, although some claim that his equipment may not have been sensitive enough to give a positive result.[832]

To rectify this apparent problem, in 1904 **DeWitt Bristol Brace** built an apparatus that had 150 times more sensitivity than Rayleigh's. Brace reflected the light back and forth several times and thus was able to increase the light path to 30 meters. In order to detect the rotation of the direction of polarization, he invented a very sensitive polarimeter for the occasion. With this equipment he could detect a difference of up to 7.8×10^{-13} between the two velocities, which was 300 times greater than the Michelson-Morley experiment.[833] Brace reported that he did not find any ether drift. Lorentz, assuming again that the Earth was in motion, described their efforts as follows:

> Rayleigh and Brace have examined the question whether the Earth's motion may cause a body to become doubly refracting. At first sight this might be expected, if the just mentioned chance of dimensions is admitted. Both physicists, however, have obtained a negative result.[834]

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[832] *Philosophical Magazine*, 4, 678, 1902 and 1904. Also, "On the Theory of Optical Images," *Philosophical Magazine*, 42:167, 1896.

[833] "Double Refraction in Matter Moving Through the Ether." *Philosophical Magazine*, new series, 7: 317-328, 1904. Interestingly enough, Brace also tested the Lorentz-Fitzgerald contraction hypothesis, using optical methods, and found it unsupported by his results.

[834] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," H. A. Lorentz, in *The Principle of Relativity*, 1952, p. 11.

Trouton-Noble Experiment
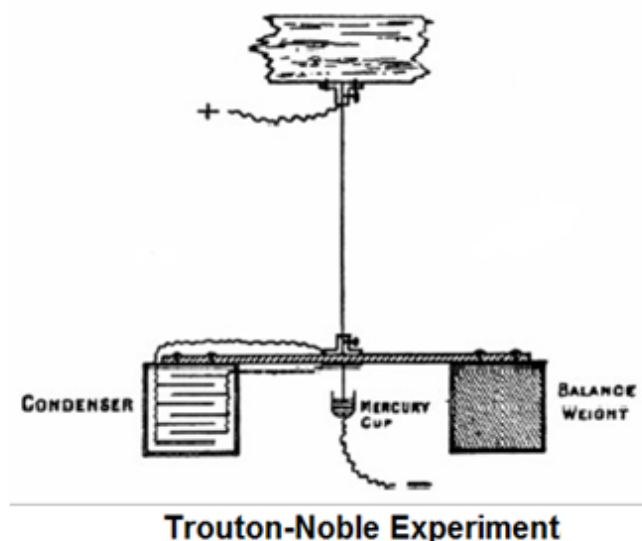
Just a year prior (1903) F. T. Trouton and H. R. Noble did another experiment to detect ether drift. Their results seemed to confirm the thesis that there was no significant drift, although the interpretation of that experiment is still in dispute.[835] Using even more sophisticated

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[835] At the suggestion of Fitzgerald, Trouton and Noble suspended a highly-charged parallel-plate capacitor. If the Earth is moving around the sun through the ether, an electromagnetic torque is to be expected due to magnetic forces, since the capacitor is moving through the ether. The plate will minimize its total energy and seek a stable position parallel to the direction of the motion of the Earth (*e.g.*, a zero-point field). Trouton and Noble reported a null result, that is, the plate did not orient itself in a position which eliminates the angular momentum against the velocity of the Earth (F. T. Trouton and H. R. Noble, "The forces acting on a charged condenser moving through space," *Proceedings of the Royal Society*, Vol. 72, p. 132, 1903; *Phil. Trans. Royal Soc*. A 202, 165–181, 1903. In 1927, Carl T. Chase confirmed Trouton-Noble's results (C. T. Chase, "A repetition of the Trouton-Noble ether drift experiment," *Physical Review*, Vol. 28, p. 378, 1926; 30, 516-519, 1927). As recently as 1994, H. C. Hayden reconfirmed the null result with an apparatus 105 times more sensitive than Trouton-Noble's (H. C. Hayden, "High sensitivity Trouton-Noble experiment," *Review Scientific Instruments*, Vol. 65, No. 4, p. 788, 1994), but Hayden stated that one could not argue for the existence of ether (H. C. Hayden, "Analysis of Trouton-Noble experiment, Galilean Electrodynamics," Vol. 5, No. 4, p. 83, 1994). His claim has been contested in 1998 by Patrick Cornille and Jean-Louis Naudin (P. Cornille,

interferometers, most scientists found "null" results similar to those of Michelson-Morley. Experiments by Trouton and Rankine[836] and of Chase and Tomashek[837] on the electrical resistance of moving objects, and also of Wood, Tomlinson and Essen[838] on the frequency of the longitudinal vibration of a rod likewise proved "negative." In 1903-1905 Edward Morley and Dayton Miller tested for ether drag in a series of interferometer experiments and found the same results as Morley's 1887 experiment, at least no results above 8 km/second for the respective speed of ether against Earth.[839] As we will see later, when Miller worked by himself in 1925, he again found an ether drift of 8-10 km/sec.

"Correspondence: Making a Trouton-Noble experiment succeed," *Galilean Electrodynamics* 9 (2), 33, 1998. P. Cornille, "A linear Trouton-Noble experiment which shows the violation of Newton's third law," *Hadronic J. Supplement* 13 (2), 191–202, 1998, and in 2000 by Alexandre D. Szames, Patrick Cornille, Jean-Louis Naudin and Christian Bizouard). The latter's abstract states: "When correctly performed, this very simple electrostatic ether drift experiment gives unambiguous positive results: a suspended, parallel-plate capacitor charged at high voltage by means of lateral feeding wires exhibits a stimulated torque and tends to line up its plates in the East-West direction" (AIP Conference Proceedings Vol. 504 (1) pp. 1004-1017, January 19, 2000). See also Saul A. Teukolsky, "The explanation of the Trouton-Noble experiment revisited," *American Journal of Physics* 64 (9), 1104–1109, 1996; Oleg D. Jefimenko, "The Trouton-Noble paradox," *Journal of Physics* A. 32, 3755–3762, 1999; L. Nieves, M. Rodriguez, G. Spavieri, and E. Tonni, "An experiment of the Trouton-Noble type as a test of the differential form of Faraday's law," *Il Nuovo Cimento* 116 B (5), 585–592 (2001). Michel Janssen, "A comparison between Lorentz's ether theory and special relativity in the light of the experiments of Trouton and Noble," Ph.D. thesis, 1995.

[836] F. T. Trouton and A. D. Rankine, "On the Electrical Resistance of Moving Matter," *Proceedings of the Royal Society* 80, 420, 1908.

[837] C. T. Chase, *Physical Review*, 30, 516 (1927); R. Tomashek, *Annalen der Physik*, 73, 105, 1924; 78, 743, 1925; 80, 509, 1926; 84, 161, 1927.

[838] A. B. Wood, G. A. Tomlinson, L. Essen, "The Effect of the Fitzgerald-Lorentz Contraction on the Frequency of Longitudinal Vibration of a Rod," *Proceedings of the Royal Society*, 158, 6061, 1937.

[839] Morley and Miller had extended the paths of the light beams considerably in contrast to the 1887 experiment, and also replaced the foundation of their apparatus with stone, wood and steel, respectively. In the third trial of 1905, they moved the apparatus to a hill in Cleveland Heights, Ohio, which was 285 meters high, but this did not change the results, which was an ether wind of about 3.5 kilometers per second. Morley and Miller also tested for Fitzgerald's contraction hypothesis and found their results did not support it. Because of other pressing issues, Miller would not return to these experiments until 1921.

Dayton Miller (1866 – 1941)

With all these "negative" experimental results, in addition to those of Michelson-Morley in 1881 and 1887, the evidence was mounting like flood water at the dam. If someone did not find an answer soon, the dam was going to break. On the macro-level, there were only two possible answers: (a) the Earth was motionless in space, or (b) the Earth was carrying the ether with it as it revolved around the sun. But since having the Earth carry the ether led to difficulties with the observed aberration of starlight (as we saw with the Arago, Airy and Fresnel affair), this left only a motionless Earth to solve the problem. Of course, that solution was "unthinkable" to modern man.

Because the attempts of Lorentz and Poincaré at answering Michelson-Morley, Lodge, Brace, Rayleigh and Trouton-Noble were unsatisfactory to Einstein, he set out to create his own theory, and one that would put a significant demarcation between all past science and future science. As noted earlier, Einstein was well aware of the implications of these experiments, since he makes explicit mention in his 1905 paper of "the unsuccessful attempts to discover any motion of the Earth." This certainly coincides with Einstein's statement in 1921 that his theory of Relativity "is not speculative in origin; it owes its invention entirely to the

desire to make physical theory fit observed fact as well as possible."[840] In fact, so pressured was Einstein to explain these experiments that, in his effort to save Copernicus, he would end up destroying the idea of a heliocentric system in exchange for an a-centric system, as well as obliterating Isaac Newton's concept of "absolute space." Up until Einstein, men had believed in some type of absolute space and absolute time. They didn't know the precise constitution of space, but intuitively they reasoned that something real and substantive had to occupy the space between Earth and the stars. As Oliver Lodge had described it: "space empty of matter is endowed with finite and measurable physical properties. It is absolutely transparent and undispersive….a perfect continuum, an absolute plenum."[841] This 'substance' would serve as the background against which to make all cosmic measurements, even if only theoretical.[842] Because Galileo and Newton rejected a centrally located and motionless Earth, they were in desperate need of a motionless medium outside of Earth to serve as the standard upon which all other objects of the universe moved and could be measured.

Although Newton did not believe that absolute motion could be detected by mechanical means (since all objects were in motion), this left room for absolute motion to be detected by non-mechanical devices, namely light. But because Hoek's, Airy's, and Michelson-Morley's experiments with light did not detect absolute motion through a medium (the medium commonly known as "ether"), then Einstein understood that he had two choices: either Earth was not in motion, or the ether did not exist and absolute motion could never be detected, even when using light. The difference between Newtonian Relativity and Einsteinian Relativity is that the former says absolute motion cannot be detected by mechanical means, while the latter says it cannot be detected either by mechanical or non-mechanical means.

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[840] *Einstein: The Life and Times*, p. 128.

[841] *The Ether of Space*, 1909, p. 95.

[842] We emphasize "theoretical" to accommodate the fact that since Newton's heliocentrism did not leave him with any heavenly body at rest, he thus depended on his own "relativity" to understand motion. As Newton put it in his *Principia*: "It may be that there is no body really at rest, to which the places and motions of others may be referred." As a result, Newton's relativity then leads to his three laws of motion. As Rom Harré describes it: "We must notice a peculiarity of his [Newton's] famous laws. They have an important mathematical property, called Galilean Invariance. This property means that Newton's Laws of Motion are the same for all bodies, no matter how fast they are moving relative to each other….It follows that there is no mechanical way of detecting one's absolute motion" (*Great Scientific Experiments*, 1981, p. 126).

Name	Location	Year	Arm length (meters)	Fringe shift expected	Fringe shift measured	Ratio	Upper Limit on V_{aether}	Experimental Resolution	Null result
Michelson[4]	Potsdam	1881	1.2	0.04	≤ 0.02	2	~ 20 km/s	0.02	≈ yes
Michelson and Morley[1]	Cleveland	1887	11.0	0.4	< 0.02 or ≤ 0.01	40	~ 4–8 km/s	0.01	≈ yes
Morley and Miller [10][11]	Cleveland	1902 −1904	32.2	1.13	≤ 0.015	80	~ 3.5 km/s	0.015	yes
Miller[15]	Mt. Wilson	1921	32.0	1.12	≤ 0.08	15	~ 8–10 km/s	unclear	unclear
Miller[15]	Cleveland	1923 −1924	32.0	1.12	≤ 0.03	40	~ 5 km/s	0.03	yes
Miller (sunlight)[15]	Cleveland	1924	32.0	1.12	≤ 0.014	80	~ 3 km/s	0.014	yes
Tomaschek (star light)[16]	Heidelberg	1924	8.6	0.3	≤ 0.02	15	~ 7 km/s	0.02	yes
Miller[15][A 12]	Mt. Wilson	1925 −1926	32.0	1.12	≤ 0.088	13	~ 8–10 km/s	unclear	unclear
Kennedy[12]	Pasadena/Mt. Wilson	1926	2.0	0.07	≤ 0.002	35	~ 5 km/s	0.002	yes
Illingworth[13]	Pasadena	1927	2.0	0.07	≤ 0.0004	175	~ 2 km/s	0.0004	yes
Piccard & Stahel[17]	with a Balloon	1926	2.8	0.13	≤ 0.006	20	~ 7 km/s	0.006	yes
Piccard & Stahel[18]	Brussels	1927	2.8	0.13	≤ 0.0002	185	~ 2.5 km/s	0.0007	yes
Piccard & Stahel[19]	Rigi	1927	2.8	0.13	≤ 0.0003	185	~ 2.5 km/s	0.0007	yes
Michelson et al.[20]	Mt. Wilson	1929	25.9	0.9	≤ 0.01	90	~ 3 km/s	0.01	yes
Joos[14]	Jena	1930	21.0	0.75	≤ 0.002	375	~ 1.5 km/s	0.002	yes

The above chart is taken from Wikipedia.[843] In each case it can be seen that, similar to Michelson-Morley, the "Fring shift measured" is a fraction of the "Fringe shift expected." Yet for some odd reason, each experiment (except for two unexplained instances of Miller's) says "yes" to the column of "Null result." Hence, all the contributors to Wikipedia for this topic assume the Earth is revolving around the sun as the foundational basis for interpreting whether the results are "null."

Ether Entrainment: The Third Option
to Interpret Michelson/Morley

As noted above, a third choice not favorable to Einstein, and the one that would favor Newtonian Relativity, was that the ether moved with the Earth and at the same speed, commonly known as "ether entrainment." Various modern ether theories opt for this choice since they reject Relativity theory but still believe a moving Earth is a sacrosanct fact of science. Modern thinkers who espouse this view are few, but one of the more prominent is Tom Bethell, who bases his view on those of Petr Beckmann. His view is that "The Earth's field 'translates' with the Earth, but it does not rotate with its rotation."[844] The major problem with the

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[843] http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment
[844] *Questioning Einstein: Is Relativity Necessary?*, 2009, p. 181. See also pp. 91, 103. Bethell adds: "But Lorentz went astray, surely, when he suggested that, if we can detect a small rotational effect, we can't 'a priori deny the possibility' of

ether entrainment theory, however, is that it would only be viable if the Michelson/Morley experiment showed no positive result. If the ether were entrained by a moving Earth then the Michelson/Morley apparatus would show no fringe shifting. But since the results were positive to at least one-sixth of what they expected, then the ether had to be moving against the Earth to that degree and thus could not be entrained. The only other possibility is that the ether was only partially entrained around the Earth as the latter moved around the sun. This would require the Earth to have only a small fraction of the power needed to hold ether close to its surface, but the full power to hold all of the atmosphere close to its surface as it whipped around the sun at 66,000mph. Moreover, a fractional ether entrainment would require a mechanism to demarcate the entrained ether from the non-entrained ether, or at least gradient levels of entrained ether, but these are distinctions which have no experimental evidence to support them. As Martin Selbrede notes:

> The problem with these ether entrainment models is a serious one. It is that we appear to have ether entrainment for the velocity around the sun, which is a very fast velocity, and no apparent ether entrainment for the rotational velocity at the equator of a thousand miles per hour. So why is it that the faster speed has no entrainment and this lower speed does? Entrainment models can't explain that.[845]

What we know is that the ether is there and it is consistent. As **Herbert Ives** acknowledged:

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seeing the larger effect of the Earth's translation (orbital motion). Attempts had already been made by Michelson and Co. to detect the large translation effect, without success. Decades later, the smaller rotational effect indeed was detected, thanks to much more refined clocks. But even with more and more accurate instruments investigators still have not been able to detect – and it is safe to say they never will detect – the translational effect. For it isn't there to be seen" (p. 181). A letter was sent by this author in 2009 to Mr. Bethell on this point, suggesting to him that no "detection of a translation effect" was forthcoming simply because the Earth is not orbiting the sun, but he declined to answer the challenge. It is precisely for Bethell's unproven presumption that causes him to conclude that all the interferometer experiments by Miller, Piccard, Townes, *et al*, "found no fringe shift" (p. 194). Bethell even says that Michelson-Morley found no fringe shift (p. 185), but this is obviously a misrepresentation of these experiments since they all reported at least some fringe shifting.
[845] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012.

The frequent assertion that 'the Michelson-Morley experiment abolished the ether' is a piece of faulty logic. When Maxwell predicted a positive result from the experiment he did so on the basis of *two* assumptions; the first, that the light waves were transmitted through a medium, the second, which was not realized until pointed out by Fitzgerald, that the measuring instruments would not be affected by motion. The null result of the experiment proved *some* assumption made in predicting a positive result to be wrong. The experimental demonstration of the variation of measuring instruments with motion, in exactly the way to produce a null result, shows that it was the second assumption alone that was wrong; leaving evidence for a transmitting medium, as derived from aberrational and rotational phenomena [*cf.*, Arago, Airy, *et al.*], as strong, if not stronger, than ever.[846]

Einstein and the Incredible Shrinking Machine, Phase II

Einstein opted to eliminate the ether and resign the world to having no absolutes. As he developed his theory to support that choice, he was hailed as the greatest scientist the world has ever known. Modern humanity was on the brink of utter humiliation before the Greeks, Romans, Egyptians and Babylonians, but Einstein, at least so the world thought, saved them from having to bow the knee. As we will see, Einstein created two theories to replace Newton. The Special Relativity theory held that there is no absolute time or absolute space; while the General Relativity theory held that space moved (or "curved"), and this movement is the principle cause of gravity, among other things. In regards to motion (as opposed to time and space) the word "Special" in Special Relativity referred to the "special" cases of uniform (non-accelerated) motion, and the word "General" in General Relativity referred to cases of non-uniform (accelerated or decelerated) motion.

After Poincaré's initial work, Einstein further developed the mathematics behind the theory of Relativity. He realized that in order to maintain the mathematical validity of his theory (that is, that the light beams of the interferometer were equal in speed), contractions of time and

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[846] "The Measurement of the Velocity of Light by Signals Sent in One Direction," *Journal of the Optical Society of America*, Oct. 1948, vol. 38, no. 10, p. 879.

length could not be ignored. But whereas Lorentz had invented the length contractions to compensate for the ether's effect on the light beam, Einstein dispensed with the ether altogether, and thus he was left with having to explain the length and time contraction by another means.[847] As G. Burniston Brown notes:

> Einstein's attempt to derive the Lorentz transformation equations from the principle of relativity and the postulate that the velocity of light is independent of that of the source would (if it had not involved a contradiction) have made Lorentz transformations

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[847] Interestingly enough, in Einstein's theory one might say there is no real length contraction (only apparent contraction) because, without ether, there is no measurable motion between the apparatus and the observer. Ives, quoting Lorentz about his own contraction formula, states: "[it] enables us to predict that no experiment made with a terrestrial source of light will ever show us the influence of the Earth's motion." Here Lorentz admits that, the very basis for his experiment (*i.e.*, a moving Earth), cannot be proven by experiment. As for Einstein's mathematics, Ives goes on to say: "Einstein, starting with this conclusion [that no experiment will show the influence of the Earth's motion]…and elevating it to a new principle of physics, was able, by working backward, to deduce the contraction formula $(1 - v^2/c^2)^{\frac{1}{2}}$" ("Historical Note on the Rate of a Moving Clock," *Journal of the Optical Society of America*, Oct. 1947, vol. 37, no. 10, p. 810). Assis adds this interesting note: "Einstein…stated that 'the introduction of the luminiferous ether will prove to be superfluous.' If this is the case, then he should have discarded length contraction of rods and rigid bodies. After all, this idea of length contraction was only introduced to reconcile the null result of the Michelson-Morley experiment with the ether concept. If there is no ether, we should not expect any change in the interference fringes…But in this case it makes no sense to introduce or to suppose a length contraction of bodies. Making the ether superfluous would require making length contraction superfluous as well. This was clearly pointed out by O'Rahilly in his book, *Electromagnetic Theory – A Critical Examination of Fundamentals*, Vol. 1, Chap. VIII, Sect. 1, p. 259 [108]. As we know, this logical course was not followed by Einstein. He retained the length contraction although he had discarded the ether! With this, another source of confusions and paradoxes was brought into physics" (*Relational Mechanics*, pp. 145-146). It is also interesting to note, as G. Burniston Brown does, "There were other disturbing features: the fact that Einstein never wrote a definitive account of his theory; that his first derivation of the Lorentz transformation equations contained velocities of light of c - v, c + v and $(c^2 - v^2)^{\frac{1}{2}}$, quite contrary to his second postulate that the velocity of light was independent of the motion of the source; and that his first attempt to prove the formula $E = m_0c^2$, suggested by Poincaré, was fallacious because he assumed what he wanted to prove, as was shown by Ives (Ives 1952)" ("What is wrong with relativity?" Vol. 18, March, 1967, p. 71)

independent of any particular assumption about the construction of matter (as it had not been in Lorentz's derivation). This feature, of course, was pleasing to the mathematically minded, and Pauli considered it an advance. Einstein said that the Lorentz transformations were "the real basis of the special relativity theory" (Einstein 1935), and this makes it clear that he had converted a theory which, in Lorentz's hands at any rate, was a physical theory (involving, for instance, contraction of matter when moving with respect to the aether) into something that is not a physical theory in the ordinary sense, but the physical interpretation of a set of algebraic transformations derived from a principle which turns out to be a rule about laws, together with a postulate which is, or could be, just the algebraic expression of a fact—the independence of the velocity of light of that of the source (experiments already done appear to confirm it but more direct evidence is needed). We see, then, that 'relativity' is not an ordinary physical theory: it is what Synge calls a "cuckoo process"; that is to say. Nature's laws must be found first, and then they can, perhaps, be adapted to comply with the overall 'principle.'

"The eggs are laid, not on the bare ground to be hatched in the clear light of Greek logic, but in the nest of another bird, where they are warmed by the body of a foster mother, which, in the case of relativity, is Newton's physics of the 19th century" (Synge 1956).

The special theory of relativity is therefore founded on two postulates

(a) a law about laws (Poincaré's principle of relativity).

(b) an algebraic representation of what is, or could be, a fact (velocity of light constant, independent of the velocity of the source) and its application to the physical universe is

(c) a cuckoo process.

This basis of the theory explains a great deal that has mystified many physicists and engineers. They could not understand how Einstein could sometimes speak as though the aether was superfluous (Einstein 1905) and at other times say "space

without aether is unthinkable" (Einstein 1922). This was due, of course, to not starting with physical terms—matter its motion, and its interactions (force). A physical theory which included radiation would have to start by stating whether an aether, action-at-a-distance, or ballistic transmission of force was being postulated….

The fact that Einstein asserted that the Lorentz transformation equations were the basis of the special theory, and these are, of course, purely mathematical, means that, in so far as the theory is considered to have any physical implications, these implications must be the result of the interpretation of mathematical expressions in physical terms. But in this process there can be no guarantee that contradictions will not arise, and, in fact, serious contradictions have have arisen which have marred the special theory. Half a century of argumentation has not removed them, and the device of calling them only apparent contradictions (paradoxes) has not succeeded in preventing the special theory of relativity from becoming untenable as a physical theory.[848]

For Einstein and his generation the syllogism was simple:

Major Premise:	We can't detect the Earth moving.
Minor Premise:	We know the Earth moves.
The Conclusion:	We must accept Relativity.[849]

The alternative syllogism that was "unthinkable" for Einstein and his colleagues was:

Major Premise:	We can't detect Earth moving.
Minor Premise:	The Earth isn't moving.
The Conclusion:	We must accept Absolutes.

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[848] "What is wrong with relativity?" G. Burniston Brown, *Bulletin of the Institute of Physics and Physical Society*, Vol. 18, March 1967, pp. 73-74.

[849] Galileo came to the same conclusion and developed what we know today as Galilean Relativity. Like Einstein, Galileo presumed the Earth was moving around the sun but we had no way of sensing or detecting the movement, which then led to the idea that the motion of a uniformly moving object (*i.e.*, one that induces no inertial forces such as centrifugal or Coriolis forces) is relative. Galileo used the example of a man in a ship who is moving uniformly across the ocean and not being able to tell whether he was moving or the water is moving past him (if he had no landmarks against which to judge his motion).

As Martin Selbrede notes:

> We say that the result is truthful and you should believe the detector, and they say, 'No, we have to explain away the result of the detector because we know that the Earth is in motion regardless of the speedometer telling us it is at zero. So if Einstein's explanation of the non- zero result is put aside, then we have only one alternative left, which is that the measurement is correct and the Earth isn't in motion at all. So when people say, 'Well, the geocentrists are not scientific because they don't follow the experiments,' no, we are the ones who actually point to the experiments and say, 'hello, wake up, zero mile per hour motion according to this instrument.' And that's where modern science has fallen apart ever since. Ever since that happened, modern science has been in a conundrum, and it actually has split into two giant sides: the Relativity side for the large and the Quantum side for the small, and we haven't been able to unify all things back together again. At least under the geocentric paradigm we see the potential for a unification.[850]

Because Einstein believed Earth's motion through space was an accepted fact, he eliminated the ether because, as he understood it, no experiment had demonstrated its existence. Like his predecessors, Einstein just "knew" the Earth moved, so it was virtually inevitable that he, or someone else, would conclude that ether did not exist. We know, of course, that the evidence demonstrated only that Earth was not moving at 30+ km/sec, not that ether was non-existent. Eliminating the ether certainly solved a lot of problems for Einstein, but like any *ad hoc* solution, it created additional ones.[851] William Magie, president of the

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[850] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012.

[851] The differences between the Lorentz's theory and Einstein's theory, as Herbert Dingle points out,

> Lorentz ascribes the contraction of rods and slowing down of clocks to an *ad hoc* physical effect of the ether on moving bodies; Einstein ascribes them to an *ad hoc* modification of kinematics at high velocities. Lorentz's theory is impossible without an ether; Einstein's (because of its relativity postulate) is impossible with one. Einstein's theory makes a velocity greater than *c* logically impossible; Lorentz specifically restricted his theory to 'a system moving with any velocity less than that of light,' and, from the nature of its effects, it must break

American Physical Society, pointed out one of the obvious ones in 1911. To his scientific constituents he complained:

> The principle of relativity accounts for the negative result of the experiment of Michelson and Morley but without an ether how do we account for the interference phenomena, which made that experiment possible?[852]

In order to answer Michelson-Morley without using ether as the cause for length and time contraction, Einstein resorted to saying that mere motion causes them to contract. There was something about motion itself that produced all kinds of instability in a world we had normally thought was stable. For Einstein, ether was now "superfluous" because space itself, whatever he imagined it to be, performed the same task. He writes:

> The introduction of a 'light ether' will prove to be superfluous, because the view here to be developed will introduce neither a 'space at absolute rest' provided with special properties, nor assign a velocity vector to a point of empty space in which electro-magnetic processes take place.[853]

His biographer, Ronald Clark, gives more detail:

> down well short of that velocity…it makes the 'light barrier' no more necessarily impassable than the 'sound barrier.' Einstein's theory merges space and time into an unimaginable 'space-time'; Lorentz leaves them independent, as in ordinary understanding. The physical consequences of these differences when very high macroscopic velocities are attained are enormous and ominously incalculable" (*Science at the Crossroads*, p. 232).

Still, since Einstein's theory was based on alterations of the basic fabrics of life, it could be said, as J. L. Synge observed in 1956, that the Special Theory of Relativity might be called the theory of the Lorentz transformations. Similarly, Bertrand Russell stated that the "whole of the special theory is contained in the transformations." Essen adds: "Einstein's theory differs from that of Lorentz only in the method of derivation of the transformations…the subsequent mathematical development could be the same in both theories" (*The Special Theory of Relativity: A Critical Analysis*, p. 8).

[852] William F. Magie, "The Primary Concepts of Physics," *Science*, vol. XXXV, Feb. 23, 1912, cited in Loyd S. Swenson, Jr., *The Ethereal Ether*, 1972, p. 177.
[853] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905.

It is at this point that the difference between the ideas of Fitzgerald, Lorentz, and even Poincaré, and the ideas of Einstein, begins to appear. For his predecessors, the Lorentz transformation was merely a useful tool for linking objects in relative motion; for Einstein it was not a mathematical tool so much as a revelation about nature herself. As he wrote years later, he had seen "that the bearing of the Lorentz transformation transcends its connection with Maxwell's equations and was concerned with the nature of space and time in general….For with his Special Theory Einstein was not so much propounding an idea as revealing a truth of nature that had previously been overlooked….it was a property of the way in which God had made the world.[854]

We see an acute irony in Clark's description. Whereas God had stated in the revelation of Scripture that the Earth was motionless, Clark regards the opposing view, Special Relativity, as an alternate "revelation" from "God," and Einstein is his prophet. Another biographer, Abraham Pais, put Einstein on a similar pedestal:

A new man appears abruptly, the 'suddenly famous Doctor Einstein.' He carries the message of a new order in the universe. He is a new Moses come down from the mountain to bring the law and a new Joshua controlling the motion of heavenly bodies….The new man who appears at that time represents order and power. He becomes the θεῖος ἀνήρ, the divine man, of the twentieth century.[855]

According to these biographers, everyone except Einstein had "overlooked" that the contraction of time and space was a "fact of nature." Of course, many previous to Einstein were convinced God had already "revealed" the Earth does not move, and therefore time and physical dimensions always stay the same. In their view, anyone coming in the name of God with a different "revelation" would be considered a false prophet, much like Pharaoh's magicians who used their formulas to mimic Moses.[856] The irony, (which is, perhaps, the same that confounded Pharaoh's magicians when they discovered they could only mimic 30% of

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[854] *Einstein: The Life and Times*, pp. 120-121.

[855] Abraham Pais, *Subtle is the Lord*, 1982, 2005, p. 311. The phrase θεῖος ἀνήρ is the Greek for "divine man."

[856] *Cf*, Exodus 7:10-12; Deuteronomy 13:1-5.

Moses' miracles), is Clark proceeds to point out that Einstein's disciples could not figure out whether this God-revealed "fact of nature" was prophetically fulfilled:

> The difference between the earlier view and that of Einstein was exemplified by what Max Born, one of the first expositors of relativity, called "the notorious controversy as to whether the contraction is 'real' or only 'apparent.'" Lorentz had one view. "Asked if I consider this contraction as a real one, I should answer 'Yes,'" he said. "It is as real as anything I can observe." Sir Arthur Eddington, the later great exponent of Einstein, held a rather different view. "When a rod is started from rest into uniform motion, nothing whatever happens to the rod," he has written. "We say that it contracts; but length is not a property of the rod; it is a relation between the rod and the observer. Until the observer is specified the length of the rod is quite indeterminate.[857]

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[857] *Einstein: The Life and Times*, p. 120. Opposed to Eddington, some believe:
(1) "The contraction is real." Lorentz stated in 1922 that the "contraction could be photographed" (*Lectures on Theoretical Physics*, Vol. 3, Macmillan, p. 203); C. Møller writes: "Contraction is a real effect observable in principle by experiment…This means the concept of length has lost its absolute meaning" (Møller, *The Theory of Relativity*, 1972, p. 44); Wolfgang Pauli: "It therefore follows that the Lorentz contraction is not a property of a single rod taken by itself, but a reciprocal relation between two such rods moving relatively to each other, and this relation is in principle observable" (*The Theory of Relativity*, Dover Publications, 1958, pp. 12-13); R. C. Tolman: "Entirely real but symmetrical" (*Relativity Thermodynamics and Cosmology*, pp. 23-24).
(2) "The contraction is not real." E. F. Taylor and John Wheeler write: "Does something about a clock really change when it moves, resulting in the observed change in the tick rate? Absolutely not!" (*Spacetime Physics: Introduction to Special Relativity*, p. 76).
(3) "The contraction is only apparent." Aharoni writes: "The moving rod appears shorter. The moving clock appears to go slow" (*The Special Theory of Relativity*, p. 21); McCrea writes: "The apparent length is reduced. Time intervals appear to be lengthened; clocks appear to go slow" (*Relativity Physics*, pp. 15-16); Nunn: "A moving rod would appear to be shortened" (*Relativity and Gravitation*, pp. 43-44); Whitrow: "Instead of assuming that there are real, *i.e.*, structural changes in length and duration owing to motion, Einstein's theory involves only apparent changes" (*The Natural Philosophy of Time*, p. 255).
(4) "The contraction is the result of the relativity of simultaneity." Bohn writes: "When measuring lengths and intervals, observers are not referring to the same events" (*The Special Theory of Relativity*, p. 59). See also William Rosser,

As it stood, everyone agreed on a "contraction," but no one was certain what it meant or how it should be applied. The only thing they knew for certain was they needed it to keep the Earth moving or they would soon be asking for baptism in the Catholic Church. As noted, the difference between Lorentz's contraction and Einstein's contraction was the means by which it occurred. Lorentz claimed the cause was ether pressure; Einstein dismissed the ether and said the cause was the "nature" of movement through space. What Einstein meant by "nature" is best described by relativist, Richard Wolfson:

Introductory Relativity, p. 37; and A. P. French, *Special Relativity*, p. 97; and Stephenson and Kilmister, *Special Relativity for Physicists*, pp. 38-39.

(5) "The contraction is due to perspective effects." Rindler writes: "Moving lengths are reduced, a kind of perspective effect. But of course nothing has happened to the rod itself. Nevertheless, contraction is no illusion, it is real" (*Introduction to Special Relativity*, p. 25).

(6) "The contraction is mathematical." Herman Minkowski writes: "This hypothesis sounds extremely fantastical, for the contraction is not to be looked upon as a consequence of resistances in the ether, or anything of that kind, but simply as a gift from above, – as an accompanying circumstance of the circumstance of motion" ("Space and Time," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, Dover Publications, 1952, p. 81).

(7) "The contraction is real but invisible." James Terrell writes: "…the Lorentz contraction will not be visible, although correction for the finite velocity of light will reveal it to be present" ("Invisibility of the Lorentz Contraction," *Physical Review*, Vol. 116, No. 4, Nov. 15, 1959, p. 1041).

(8) "The contraction is real and not real": Einstein writes: "The author unjustly posited a distinction between Lorenz's conception and my own with regard to the physical facts. The question of whether the Lorenz contraction really exists or not is deceptive. It doesn't 'really' exist insofar as it doesn't exist for a non-moving observer; it does 'really' exist, in that it can be proven principally through physical means for a non-moving observer" ("Zum Ehrenfestschen Paradoxon. Eine Bemerkung zu V. Variĉaks Aufsatz." *Physikalische Zeitschrift* 12: 509-510.; Original German: "Der Verfasser hat mit Unrecht einen Unterschied der Lorentzschen Auffassung von der meinigen mit Bezug auf die physikalischen Tatsachen statuiert. Die Frage, ob die Lorentz-Verkürzung wirklich besteht oder nicht, ist irreführend. Sie besteht nämlich nicht 'wirklich,' insofern sie für einen mitbewegten Beobachter nicht existiert; sie besteht aber 'irklich,' d. h. in solcher Weise, daß sie prinzipiell durch physikalische Mittel nachgewiesen werden könnte, für einen nicht mitbewegten Beobachter.")

So Lorentz and Fitzgerald got it partly right, in that they correctly predicted a motion-induced contraction of material objects. But they remained philosophically mired in a relativistically incorrect way of thinking, because for them the contraction occurred against a background of absolute space and time. Theirs was a contraction of material objects in an uncontracted space. The relativistically correct interpretation of length contraction is that measures of space itself differ in different reference frames and that differing measures for the length of material objects reflect this underlying relativity of space.[858]

In other words, Lorentz's space was composed of an immovable ether. When an object moved against it, the object contracted by some sort of electrical distortion in the atoms of the object. But for Einstein, there was no physical process of atoms contracting. Since he dispensed with the ether, then obviously physical ether could not be causing a contraction on physical atoms. But this left nothing physical to cause the contraction. So Einstein postulated that space itself – even though he understood it as a vacuum that contains nothing physical – contracts when an object moves through it. It is thus the contraction of space, and we assume this includes the space between the atoms of the object that contracts, which then makes it appear as if the object itself has contracted. As Einstein himself put it:

H. A. Lorentz was the first to introduce the hypothesis that the form of the electron experiences a contraction in the direction of motion in consequence of that motion, the contracted length being proportional to the expression $\sqrt{1 - v^2/c^2}$. This hypothesis, which is not justifiable by any electrodynamical facts, supplies us then with that particular law of motion which has been confirmed with great precision in recent years. The theory of relativity leads to the same law of motion, without requiring any special hypothesis whatsoever as to the structure and the behavior of the electron.[859]

In other words, Eisntein explicitly rejects Lorentz's explanation for the contraction but offers us no other physical or scientific reason in place of it. In Einstein's world 'it just happens 'cause it happens,' and he can then

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[858] Richard Wolfson, *Simply Einstein: Relativity Dymystified*, 2003, p. 117.

[859] "Relativity – The Special and General Theory," in Stephen Hawking's, *A Stubbornly Persisten Illusion*, 2007, p. 168.

call it a "law of motion" because the experiments keep giving him the same results! This is what has passed for "science" for the last one hundred years and counting.

Big Bang science would later use the same flexible concept of space, only in reverse. Whereas Einstein said space contracted, Big Bang theoriest say space is expanding. It is amazing how versatile the "space" of modern science is, especially when it is composed of nothing. We must add, however, that in Einstein's world it is no longer just space. It is space-time. Time and space will thus contract together, since they are joined at the hip, as it were.

Why does Einstein's space-time contract? Once again, for no other reason than the fact that it is demanded by the previous "knowledge" they acquired from Copernicus and Galileo. Space-time contracts for Einstein when an object moves due to the same reason that ether causes an object to contract for Lorentz – it is because both Einstein and Lorentz "know" the Earth is moving but neither can detect its movement, which then requires the invention of an *ad hoc* process to make it appear to be moving.

For Lorentz, the syllogism turns out to be:

Major Premise:	We cannot detect Earth moving
Minor Premise:	We "know" Earth is moving
The Conclusion:	Ether causes objects to contract when they move through it, and the contraction hides the movement of the Earth from our experimental observations.

For Einstein, the syllogism is:

Major Premise:	We cannot detect Earth moving
Minor Premise:	We "know" Earth is moving
The Conclusion:	Space-time contracts when objects move through it, and the contraction hides the movement of the Earth from our experimental observations.

Although this replacement of Lorentz's ether with Einstein's "nature of space-time" gave a mysterious aura around Einstein's theory, the dismissal of ether and the adoption of vacuum space as his preferred frame would come back to haunt him. Within ten years Einstein was wishing to have back the ether, at least under his own terms. In 1916 Einstein wrote:

…in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, *i.e.*, no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity….Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together.[860]

It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the ether, for I can see that with the word *ether* we say nothing else than that space has to be viewed as a carrier of physical qualities.[861]

In dispensing with ether and adopting vacuum space in its place, Einstein gave no physical reason for this mystical power of motion to change either time, dimensions or mass. As noted, it was formulated on one basis only – the two premises of his syllogism: Premise A: We can't detect Earth moving, and Premise B: We "know" the Earth moves. So, the only resolution out of this intractable conundrum was to posit that a moving Earth contracts our measuring instruments and slows down our clocks. It's like trying to fit a square peg in a round hole. The only way to

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[860] Albert Einstein, "Grundgedanken und Methoden der Relativitätstheorie in ihrer Entwicklung dargestellt," *Morgan Manuscript*, EA 2070, as cited in Ludwik Kostro, *Einstein and the Ether*, Aperion, 2000, p. 2. For a good summation of Einstein's reasoning in regard to reviving the ether concept, see Galina Granek's "Einstein's Ether: Why Did Einstein Come Back to the Ether?" *Apeiron*, vol. 8, no. 3, July 2001; "Einstein's Ether: Rotational Motion of the Earth," *Apeiron*, vol. 8, no. 2, April 2001; Ludwik Kostro, "Einstein and the Ether," *Electronics and Wireless World*, 94:238-239 (1988). Kostro writes: "the notion of ether was not destroyed by Einstein, as the general public believes" (*ibid*., p. 239); "Lorentz wrote a letter to Einstein in which he maintained that the general theory of relativity admits of a stationary ether hypothesis. In reply, Einstein introduced his new non-stationary ether hypothesis" (*ibid*., p. 238).
[861] Albert Einstein, "Letter to H. A. Lorentz, November 15, 1919," EA 16, 494, as cited in Ludwik Kostro, *Einstein and the Ether*, *Aperion*, 2000, p. 2.

accomplish the feat is to shave off some of the peg or drill out some of the hole. Pure motion became Einstein's shaver and/or drill bit. It was rather convenient, however, that the 'shaving' was just enough to mask the presumed speed of the Earth around the sun.
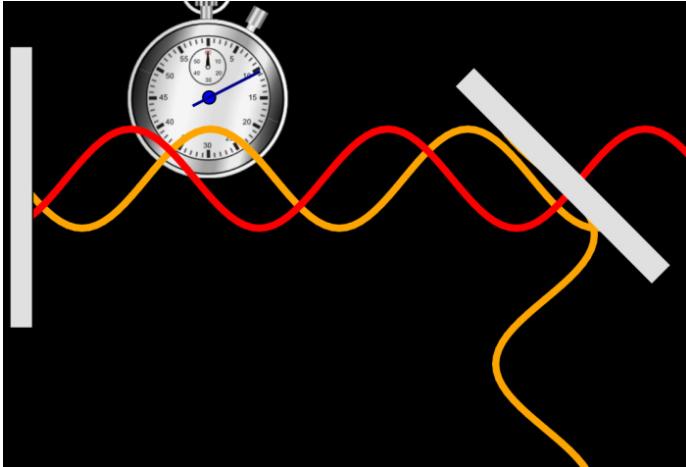
Expected results of the Michelson-Morley experiment: waves separated due to presumed motion of Earth; ticking clock is unaffected; keeps normal time
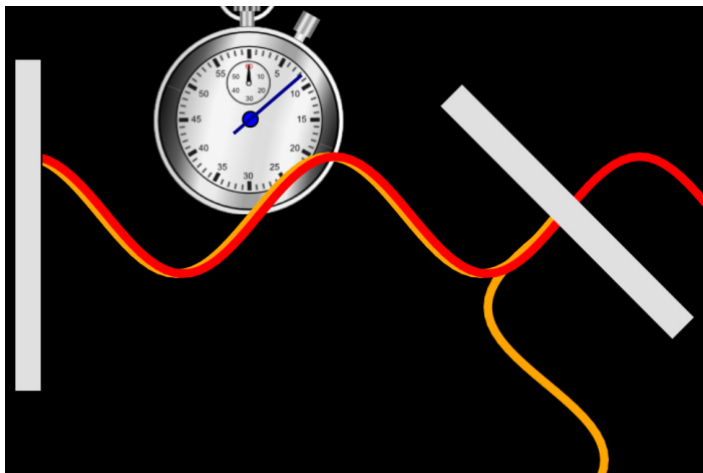
Contrived results: light waves coalesce because the contracting space contracts the longitudinal arm of the apparatus. Time also contracts because it is an integral part of space (*i.e.*, "spacetime")

The "masking" would then be turned into a mathematical equation to be used as the foundation for every motion problem faced in modern physics. In the end, as motion changed the physics of the universe, and since everything was in motion, then there could be no absolutes. Essentially, the "Principle of Relativity" became the only absolute. As physicist John Norton puts it:

> That Einstein should believe the principle of relativity should not come as such a surprise. We are moving rapidly on planet earth through space. But our motion is virtually invisible to us, as the principle of relativity requires.[862]

Notice that the "principle of relativity" makes sweeping demands on how physics is to be understood, yet this very "principle" was derived by presuming as fact the very thing that the empirical evidence could not determine as fact – a moving Earth. It is no exaggeration to say, then, that the whole of modern physics is based on the unproven premise that the Earth is moving, and that modern physics will fall like a house of cards once it is realized that "the Earth stands firm."

As we noted earlier, after Galileo and Newton dispensed with a motionless Earth, their followers subsequently had to depend on the ether to give them an absolute and universal frame of reference. After Einstein dispensed with ether, there was no longer any absolute reference point. But no theory can work without some kind of absolute. Even the theory of Relativity needs an absolute to serve as the standard from which all other things are measured. For Einstein, there was only one absolute left, the speed of light. Although it would be like trying to grasp a cloud, the speed of light would have to serve as the giant ruler to measure all things in the universe. Even today astronomers use it to measure the distance to the stars in "light-years."[863] Since for Einstein there was no longer ether to impede light's speed, light could remain an absolute throughout the whole universe. The speed of light is the foundation for all of modern physics. As one author put it:

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[862] "Special Theory of Relativity: The Basics" in *Einstein for Everyone*, classnotes by professor John D. Norton, University of Pittsburgh, p. 4. Norton adds: "No experiment aimed at detecting a law of nature can reveal the inertial motion of the observer. Absolute velocity has no place in any law of nature" (p. 3).

[863] A "light year" is the distance light travels in a year at a speed of 299,792,459 meters/second. According to current theory, the nearest stars, *Proxima Centauri* and *Alpha Centauri*, are 4.3 light-years from Earth.

Einstein made space and time relative, but in order to do this he had to take something else, which was the velocity of light, and make it absolute. The velocity of light occupies an extraordinary place in modern physics. It is *lèse-majesté* to make any criticism of the velocity of light. It is a sacred cow within a sacred cow, and it is just about the Absolutest Absolute in the history of human thought. There is a text book on physics which openly says, "Relativity is now accepted as a faith." This statement, although utterly astounding in what purports to be a science, is unfortunately only too true.[864]

No proof for the constant speed of light was offered by Einstein. It was only measured in terrestrial environments as propagating at 300,000 km/sec, and nothing, of course, could be concluded about how fast light could travel in deep space.[865] In short, there was no empirical evidence that the speed of light was constant. It was merely a "postulate" required by the "principle of relativity." But the principle of relativity was based on the presumed but unproven notion that the Earth was moving; and consequently, in order to keep light moving at a constant speed of c, time and space had to be contracted, and since they both contracted by the same amount (*i.e.*, the Lorentz transform equation), then they were virtually one entity, "spacetime." In the end, it can be said that a constant speed of light was required as a consequence of presuming the Earth was moving, even though it could not be detected moving.

The "Observer"

Whereas prior to Copernicus the absolute was a motionless Earth, and for Galileo and Newton it was a motionless space, for Einstein it became the observer viewing the absolute speed of light entering his retina. As Herbert Dingle puts it:

An almost equally effective means of escaping difficulties is the introduction of 'the observer.' When the Einstein theory appears to lead to incompatible objective results, they are written off as

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[864] Anthony Standen, *Science is a Sacred Cow*, 1952, pp. 52-53, referring to Robert A. Houstoun book: *Treatise on Light*, Longmans, Green and Co, 1946.
[865] This also meant that if someday someone discovered that light's speed varied in the same medium, it would be the immediate demise of Relativity.

merely different *appearances*, but claimed as *realities* when some actual phenomenon has to be explained.[866]

Obviously, if light is the only absolute in the universe yet its speed is finite, Einstein had to compensate for this annoying limitation in some fashion. Thus he postulated that each observer sees the light coming into his eyes as an absolute speed. Virtually every idea and formula surrounding Special Relativity is based on "what the observer sees." More specifically, each "observer" is said to have his own "inertial frame of reference." If there were a million observers to an event, there would be a million inertial frames of reference, and Relativity can create as many observers, and thus inertial frames, as it needs to reinforce its theory.[867]

The inordinate creation of an infinite variety of inertial frames relates directly to the heliocentrism versus geocentrism issue. As one modern physics text explains concerning the two sides of the debate:

> …within a century of Copernicus' death the heliocentric model had been fully accepted by the scientific community….This is because the objections to relativity that had seemed so irrefutable since ancient times could now be answered, but only because of a profound re-interpretation of the relativity principle brought about by the successors of Copernicus, including Kepler, Galileo, Descartes, Huygens, and Newton. These men developed a physically viable theory of relativity based not on purely kinematical relations, but on the dynamical principle of inertia,

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[866] *Science at the Crossroads*, p. 180. For a summation to Einstein's view that in "Relativity: There is no hitching post in the universe – so far as we know," Einstein retorted: "Read, and found correct" (*Einstein: The Life and Times*, p. 521). Of note, Max Planck, a firm supporter of Special Relativity and an equally firm opponent of Ernst Mach's view that "nothing is real except the perceptions," held the ironic position that the basic aim of science is "the finding of a *fixed* world picture independent of the variation of time and people…the complete liberation of the physical picture from the individuality of the separate intellects" (cited in Holton's *Thematic Origins of Scientific Thought*, p. 245, emphasis his). Since Relativity did not give Planck what he desired and, in fact, based everything on the "observer" who had "variation of time" and a "separate intellect," we wonder if he would have been amenable to a "fixed" Earth to satisfy his search. Einstein gave him anything but that.

[867] An inertial frame is the foundation frame, the place of no change. If the foundation is not moving, the law of inertia says it remains motionless; if it is moving, the same law says it remains in motion unless compelled upon by a net external force. The opposite is an accelerated frame, which is considered non-inertial.

according to which there exists an infinite class of relatively moving coordinate systems that are all equivalent from the standpoint of mechanical dynamics. The principle of relativity founded on the concept of inertia became the operational basis of the Scientific Revolution.[868]

Later in the same book, the author attempts to use the "concept of inertia" for at least circumstantial evidence for the Copernican solar system, but in the end he admits that it offers no solid proof:

The historical parallel between Special Relativity and the Copernican model of the solar system is not merely superficial, because in both cases the starting point was a pre-existing theoretical structure based on the naive use of a particular system of coordinates lacking any inherent physical justification. On the basis of these traditional but eccentric coordinate systems it was natural to imagine certain consequences, such as that both the Sun and the planet Venus revolve around a stationary Earth in separate orbits. However, with the newly-invented telescope, Galileo was able to observe the phases of Venus, clearly showing that Venus moves in (roughly) a circle around the Sun. In this way the *intrinsic* patterns of the celestial bodies became better understood, but it was still possible (and still *is* possible) to regard the Earth as stationary in an absolute extrinsic sense. In fact, for many purposes we continue to do just that, but from an astronomical standpoint we now almost invariably regard the Sun as the "center" of the solar system. Why? The Sun, too, is moving among the stars in the galaxy, and the galaxy itself is moving relative to other galaxies, so on what basis do we decide to regard the Sun as the "center" of the solar system?

The answer is that the Sun is the *inertial* center. In other words, the Copernican revolution (as carried to its conclusion by the successors of Copernicus) can be summarized as the adoption of *inertia* as the prime organizing principle for the understanding and description of nature. The concept of physical inertia was clearly identified, and the realization of its significance evolved and matured through the works of Kepler, Galileo, Newton, and others. Nature is most easily and most perspicuously described

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[868] *Reflections on Relativity*, "Math Pages," Preface. Internet study course on Special and General Relativity (www.mathpages.com), author's name not given.

in terms of inertial coordinates. Of course, it remains possible to adopt some non-inertial system of coordinates with respect to which the Earth can be regarded as the stationary center, but there is no longer any imperative to do this, especially since we cannot thereby change the fact that Venus circles the Sun, *i.e.*, we cannot change the intrinsic relations between objects, and those intrinsic relations are most readily expressed in terms of inertial coordinates.[869]

Notice how the author seeks to make an impression on his reader so as to convince him that the Copernican model is the true system. We know this is his goal since he stated it very plainly: "so on what basis do we decide to regard the Sun as the "center" of the solar system?" Being an avowed Copernican, he, of course, chooses the sun as his center based on the principle of "inertia" (although he offers no proofs for his choice). Perhaps convicted by his intellectual conscience, however, he then admits it is still "possible to adopt…the Earth…as the stationary center," but his only excuse for not doing so is that, in his opinion, "there is no longer any imperative to do this," and as he sees it, having a system of "inertial coordinates" is preferable to having only one inertial point, the Earth, as the center. We must add that the author's arbitrary choice comes from a 600-page treatise that is saturated with everything from philosophical analysis, to elaborate charts and graphs, to dozens of pages of differential calculus, all very impressive and all seeking to support Special and General Relativity. Although he opens his Preface asserting the correctness of Copernicanism ("…within a century of Copernicus' death the heliocentric model had been fully accepted by the scientific community….This is because the objections to relativity that had seemed so irrefutable since ancient times could now be answered"), he then admits that neither Newtonian mechanics nor Relativity theory provides him with any proof. Instead, he relies on an old but useful canard from Galileo concerning "the phases of Venus" to convince his reader heliocentrism is true, a fallacy we exposed in Chapter 2.

In the end, Einstein's attempt to base physics on arbitrarily selected inertial systems wherein each observer is his own preferred reference frame is akin to a universe in which, to borrow a cliché, 'everyone lives in his own little world.' If there is no immovable Earth, then each observer

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[869] *Reflections on Relativity*, "Math Pages," Internet study course on Special and General Relativity (www.mathpages.com), pp. 523-524, emphasis added, author's name not given.

will act as his own immovable frame, and all the laws of motion will act upon him as if he were an absolute. As D. and S. Birks state:

> Einstein theorized...that the movement of light is a mathematical absolute for any circumstance of motion...Where Ptolemy theorized a geocentric universe, Einstein, upon the basis of the Michelson-Morley experiment, theorized a "light-centric" universe... In essence, Einstein theorized a "self-centric" universe, where the entire universe of the individual conforms to the individual's motion.[870]

As Fresnel used his "drag" mathematics rather than physical experiments to dismiss the geocentric implications of the Arago and Airy experiments, Einstein took up the mantle and forged ahead much farther, changing time, dimensions and mass in Special Relativity and introducing the complex equations of tensor calculus and non-Euclidean geometry of General Relativity to explain Fresnel's hitherto unexplainable astral phenomena. As Einstein saw it, Fresnel had "failed" due to his insistence on incorporating ether into the equation, so Einstein had to tweak Fresnel's equations, while at the same time dismiss the ether. How does one do this? Rely on the wax nose of your whole theory, "the observer," to make things fit as they need be. In this case, the velocity of light that went through Airy's telescope is framed in terms of the "observer":

> "…*as seen by the observer* [it] is changed by the fraction $1-1/\eta^2$…No assumption of any 'dragging' is involved in the relativity arguments, nor is the existence of an ether even postulated."[871]

Of course, the obvious question that arises in this situation is: if two observers are moving relative to each other, then the length for one observer as compared to the other should be less by a factor of $1 - 1/\eta^2$, but since there is no preferred observer, this would mean that each observer must see the other as being shorter, which is an obvious contradiction. Relativity theory attempts to answer this paradox. As Martin Gardner explains it for the student:

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[870] "A Disproof of Relativity (Relativity as a Mathematical Virus)," by D&S Birks, *The General Science Journal*, http://gsjournal.net/Science-Journals /Research%20Papers-Relativity%20Theory/Download/ 1215.

[871] Quoted from *Fundamentals of Optics*, Francis Jenkins and Harvey White, 1957, pp. 404-405, cited in *De Labore Solis*, p. 46, emphasis added.

For Lorentz and Fitzgerald the contraction was a physical change, caused by pressure of the ether wind. For Einstein it had only to do with the results of measurement… Lorentz and Fitzgerald still thought of moving objects as having absolute "rest lengths." When the objects contracted, they were no longer their "true" lengths. Einstein, by giving up ether, made the concept of absolute length meaningless. What remained was length as measured, and this turned out to vary with the relative speed of the object and observer….How is it possible for each ship to be shorter than the other? You ask an improper question. The theory does not say that each ship is shorter than the other; it says that astronauts on each ship measure the other ship as shorter.[872]

What, precisely, causes "each ship to measure the other ship as shorter," Gardner does not explain, except to refer to a "thought experiment" about similar changes in the slowing down of time. He writes:

Imagine that you are looking out through the porthole of one spaceship into the porthole of another ship. The two ships are passing each other with a uniform speed close to that of light. As they pass, a beam of light on the other ship is sent from its ceiling to its floor. There it strikes a mirror and is reflected back to the ceiling again.

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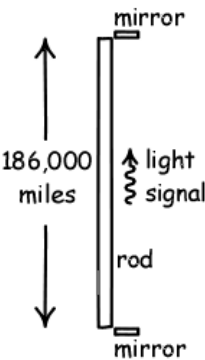
[872] *Relativity Explosion*, pp. 50-51.

You will see the path of this light as a V.[873]
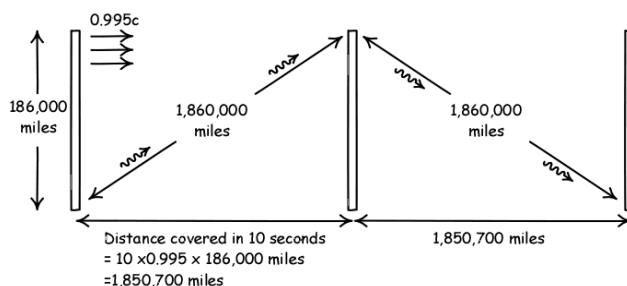
Now suppose that while you clock the light beam on its V-shaped path, an astronaut inside the other ship is doing the same thing. From his point of view, assuming his ship to be the fixed frame of reference, the light simply goes down and up along the same line, obviously a shorter distance than along the V that you observed. When he divides this distance by the time it took the beam to go down and up, he also obtains the speed of light. Because the speed of light is constant for all observers, he must get exactly the same final result that you did: 299,800 kilometers per second. But his light path is shorter. How can his result be the same? There is only one possible explanation: his clock is slower.[874]

Gardner's is one of the most popular explanations for the rationale behind Special Relativity. The fact is, however, it is very misleading. First of all, man has not reached anywhere near the speed of light, and thus we certainly do not know for certain what would happen if we did. Gardner's explanation is based on *gedanken*, *i.e.*, thought experiments without empirical evidence. But for the sake of argument, let's assume we could travel at near the speed of light. In that case we are told that the only way to explain the discrepancy is that one of the clocks runs slower due to motion, thus implying that time itself slows down due to motion. But does it? Logically, the same time will pass whether the spaceship experiment is performed or not. The only thing that Gardner knows for sure is that light does not make a good clock if the observer who is keeping time is traveling near the speed of light. In other words, Gardner cannot exploit

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[873] These graphs are taken from John D. Norton's paper, "Special Theory of Relativity: The Basics" in *Einstein for Everyone*, pp. 5-10, since he uses the same argument as Gardner.
[874] *Relativity Explosion*, pp. 52-53, emphasis added.

the limitations on the speed of light to conclude that time slows down for moving objects. If clocks slow down it does not mean that time slows down. It only means that something is making the clock tick slower. If, for example, the clock is moving against ether, then a resistance will be created, and the clock rate will vary depending on the density of the ether at a given location.[875]

Gardner then shows another facet of his theory:

> Consider, for example, this simple situation. A spaceship, traveling at three-fourths the speed of light, passes overhead going due east. At the same instant another spaceship, also traveling at three-fourths the speed of light, passes overhead going due west. From your frame of reference, attached to the inertial frame of the Earth, the two ships pass each other with a relative velocity of one and one-half times the speed of light. They approach at that speed, move apart at that speed. There is nothing in relativity theory to deny this. However, the special theory does insist that if you were riding on either ship, you would calculate the relative speed of the ships to be less than that of light.[876]

The problems with Gardner's thought experiment are quite evident. First, his own Relativity theory will not allow him to assume that the observer is "attached to the inertial frame of the Earth." Relativity holds that, in addition to the Earth's rotational and translational motion, it is in relative motion to the spaceships, and thus Earth cannot arbitrarily serve as "an inertial frame." Tempting as it may be for him, Gardner cannot use geocentric principles in order to answer the anomalies in his non-geocentric universe.

Second, Gardner's attempted explanation of the anomaly (which insists: "if you were riding on either ship, you would calculate the relative speed of the ships to be less than that of light") only misleads the reader. Gardner has already admitted that the *true* relative speed of the ships (as observed from an inertial Earth) is "one and one-half the speed of light." Obviously, then, a "calculation" by one of the ships that measures a relative speed less than the speed of light is simply an erroneous calculation. It is erroneous because, in order to know the *true* calculation, he must triangulate his measurement of the other ship with the inertial

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[875] See Dr. Robert Bennett's explanation of the V-shape appearance of the light for the observer in Appendix 4.
[876] *Relativity Explosion*, p. 62.

Earth, which will then give him the precise relative speed of his ship compared to the other ship. But Gardner conveniently eliminated the inertial Earth's part in this "thought experiment" in the second leg of his paragraph.

We find the same kind of special pleadings in college physics textbooks. In attempting to explain the famous "twin paradox," one text states:

> But what about the traveling twin? If all inertial frames are equally good, won't the traveling twin make all the claims the Earth twin does, only in reverse?….They cannot both be right, for after all the spacecraft returns to Earth and a direct comparison of ages and clocks can be made. There is, however, not a paradox at all. The consequences of the special theory of relativity – in this case time dilation – can be applied only by observers in inertial reference frames. The Earth is such a frame (or nearly so), whereas the spacecraft is not.[877]

Once again, the author assumes Earth is an "inertial frame" but Relativity will not allow this choice since relative motion can never be determined to be uniform. We can sense that the author is hesitant to make Earth an inertial frame for he adds the qualification "or nearly so." He knows that in his preferred cosmology the Earth is at least understood to be moving through space by its own rotation and translation, not to mention that it is also carried by the sun's movement through the galaxy, and the galaxy's movement through other groups of galaxies, and so on, *ad infinitum*. For all he knows, compared to some fixed point the Earth could be accelerating in many different frames, which would hardly make it an "inertial frame." Moreover, the simple fact that the author has made Earth an inertial frame implies the validity of geocentrism and shows that Relativity lacks the ability to solve its own paradoxes without depending on geocentrism. The way around this problem is to invoke the Lorentz transform to make it appear as if Earth is an inertial frame. The irony in that solution, as we have seen, is that the Lorentz transform was invented in order to answer the Michelson-Morley experiment that showed the Earth was motionless in space! A magician couldn't use smoke and mirrors better than modern physics has.

Another attempted explanation of the twin paradox claims that although the one twin zooms away from earth at uniform speed, the instant

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[877] *Physics: Principles with Applications*, fourth edition, Douglas Giancoli, 1995, p. 757.

that he turns around to come back to earth means that the "relativistic frame" has changed from inertial (uniform speed) to non-inertial (acceleration), and since Special Relativity does not include acceleration, then we cannot impose upon it to answer the paradox! As G. Burnison Brown notes:

> The most outstanding contradiction is what the relativists call the clock paradox.... It is not possible for each of two clocks to go slower than the other. There is thus a contradiction between the Lorentz transformations and the principle....

> A more intriguing instance of this so-called "time dilation" is the well-known 'twin paradox,' where one of two twins goes for a journey and returns to find himself younger than his brother who remained behind. This case allows more scope for muddled thinking because acceleration can be brought into the discussion. Einstein maintained the greater youthfulness of the travelling twin, and admitted that it contradicts the principle of relativity, saying that acceleration must be the cause (Einstein 1918). In this he has been followed by relativists in a long controversy in many journals, much of which ably sustains the character of earlier speculations which Born describes as "monstrous" (Born 1956).

> Surely there are three conclusive reasons why acceleration can have nothing to do with the time dilation calculated:

> (i) By taking a sufficiently long journey the effects of acceleration at the start, turn-round and end could be made negligible compared with the uniform velocity time dilation which is proportional to the duration of the journey.

> (ii) If there is no uniform time dilation, and the effect, if any, is due to acceleration, then the use of a formula depending only on the steady velocity and its duration cannot be justified.

> (iii) There is, in principle, no need for acceleration. Twin A can get his velocity V before synchronizing his clock with that of twin B as he passes. He need not turn round: he could be passed by C who has a velocity V in the opposite direction, and who adjusts his clock to that of A as he passes. When C later passes B they can compare clock readings. As far as the theoretical

experiment is concerned, C's clock can be considered to be A's clock returning without acceleration since, by hypothesis, all the clocks have the same rate when at rest together and change with motion in the same way independently of direction. [I am indebted to Lord Halsbury for pointing this out to me.][878]

Relativists are saddled with constant absurdities that arise from their theory. For example, Relativity holds that if a person, moving at the speed of light, is chasing a particle in a light beam ahead of him, the particle will continue to increase its distance from the person at the speed of light; whereas previous to Einstein, it was understood that light's speed was constant only with respect to the ether, not the observer. As Einstein himself said:

"If I pursue a beam of light with the velocity c, I should observe such a beam of light as a spatially oscillatory electromagnetic field at rest. However, there seems to be no such thing, whether on the basis of experience or according to Maxwell's equations."[879]

But as E. Butterfield wrote to Herbert Ives:

I just can't see riding on a moon beam at its take-off and having it get 300,000 km ahead of me in the first second. If that's what Einstein means by the constancy of the velocity of light, then his whole structure falls to the ground as soon as somebody kicks that out, for that is the keystone.[880]

Or as John Norton noted:

This thought experiment has proven immensely popular in accounts of the discovery of special relativity. Who could not

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[878] "What is wrong with Relativity?" G. Burniston Brown, Vol. 18, 1967, p. 74.

[879] *Autobiographical Notes*, written in 1946, published in 1949, cited in Holton's *Thematic Origins of Scientific Thought*, pp. 311, 359. Van der Kamp concludes: "And deliberately set against the possibility of an Earth-centered cosmos he [Einstein] has persuaded all those on that score agreeing with him to put their faith in an ontological impossibility. That is: with whatsoever speed we approach or leave a light source, our instruments register the appropriate Doppler shifts but measure the velocity of radiation received as if we are at rest with regard to the source" (*De Labore Solis*, p. 95).

[880] April 24, 1951, cited in *The Einstein Myth*, p. 136.

fail to be charmed by the image of a precocious sixteen year old whose innocent imaginings lay the groundwork for a great discovery? What is rarely mentioned, however, is that the thought experiment does not quite make sense.[881]

Having rejected an immobile Earth and even the theoretical existence of ether, Relativists can find no other viable solutions to the complexities of macro physics, and thus are more or less forced to absurd and obtuse positions which can only be presented by even more obtuse mathematics.

Herbert Dingle's Critique of Einstein

Since these issues are so important, we should review and flesh them out a bit more. Since Einstein discarded absolute rest and the ether, his only method of filling in the gaps was to make time and space the variables, yet keep light as the constant.[882] Dingle writes:

…Einstein's special relativity theory…has nothing to do with time in the sense of "eternity"; it is concerned only with *instants* and *durations*… creating the illusion…that it has something to

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[881] *Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905*, John D. Norton, University of Pittsburgh, Dept. of History and Philosophy of Science, Jan. 28, 2004, pp. 28-29. Norton goes on to show the impracticalness of the thought experiment, as well as showing how Maxwell's equations demonstrate that "rapid motion would bring the light to rest…the wave has been brought to rest; it is a frozen sine wave ('spatially oscillating')." Norton adds, however, that "no field law expressed in differential equations can (a) be an emission theory of light; (b) be a Galilean covariant, even with field transformation laws; and (c) characterize light waves by intensity, color and polarization alone." Louis Essen adds: "A thought-experiment…cannot provide new knowledge; if it gives a result that is contrary to the theoretical knowledge and assumptions on which it is based, then a mistake must have been made. Some of the results of [Einstein's] theory were obtained in this way and differ from the original assumptions (Essen 1957, 1963a, 1965, 1969). Einstein himself calls one of the results peculiar, but in fact it must be wrong, since it disagrees with the initial assumptions….The fact that the errors in the theory arise in the course of the thought-experiments may explain why they were not detected for so long" (*The Special Theory of Relativity: A Critical Analysis*, pp. 2-3). Later Essen observes: "…making the velocity of light have the constant value *c* even to observers in relative motion is comparable to making it a unit of measurement…The contraction of length and the dilation of time can now be understood as representing the changes that have to be made to make the results of measurement consistent" (*ibid.*, p. 6).
[882] The equation takes the form $t' = t - vx/c^2 / \sqrt{(1 - v^2/c^2)}$.

say…about the *nature* of "time," of the continuum that St. Augustine and Kant and other philosophers have puzzled themselves about. In fact, time, the ever-rolling stream, has no more to do with the existence of clocks than with that of sausages, while time, in Einstein's theory as in physics in

Herbert Dingle (1890 – 1978)

general, means only clock-readings. It is because of this confusion that the "experimenters" have left relativity to the "mathematicians"…They are accepted as such, without under-standing but with blind trust….It was Minkowski who later took the fatal step of introducing "eternity" into the theory…When once the distinction between eternity, instant and duration is recognized, the general literature of the subject of relativity is seen to be in utter confusion. The writer, quite unaware that the word "time" has different meanings, unconsciously oscillates between them, and the reader, equally unconsciously, becomes the victim of one non sequitur after another, in which he can see no failure of reasoning but yet no possibility of making sense of the conclusion: thus is generated the illusion that relativity is incomprehensible to the ordinary mind….If one spoke of the time (instant) of a distant event…in the absence of any self-evident, necessary way of determining such an instant, Einstein claimed the right to define it in such a way as to save the electromagnetic theory without violating the principle of relativity of motion. Furthermore, he succeeded in discovering such a definition. It was a veritable stroke of genius, but it is

most important to notice this: Einstein had not *disproved* Newton's implied requirement that the rate of a clock was not affected by uniform motion; he had only shown it was a necessary requirement, and that, in the absence of evidence to the contrary, any other self-consistent assumption about the effect of motion on the rate of a clock was permissible….[883]

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[883] *Science at the Crossroads*, pp. 134-136, 145. Harold Nordenson adds that Einstein's fallacy is "the indiscriminate use of the word 'time' in two different meanings which makes his theory untenable from a logical point of view" (*Relativity, Time and Reality*, 1969, p. 120). Defending Minkowski in a letter to Dingle, Max Born writes:

"The simple fact that all relations between space co-ordinates and time expressed by the Lorentz transformations can be represented geometrically by Minkowski diagrams should suffice to show that there can be no logical contradiction in the theory [of relativity]."

Dingle responds:

"The error here lies in oversight of the fact that a physical theory must contain not only a mathematical structure but also a correlation between the mathematical symbols and observable quantities: a perfectly logical theory may therefore fail physically in the second of these requirements. This oversight calls for much more general consideration, because it characterizes almost the whole of modern physical theory, in which so often a mathematical possibility is assumed automatically to be a physical possibility also, whereas mathematical symbols have a far wider range of significance than is possible to the physical objects whose properties they are taken to represent. The equations, $8 - 6 = 2$ and $6 - 8 = -2$, are mathematically valid and equivalent examples of the general equation, $a - b = c$. They are both geometrically applicable to a physical situation: thus, if we walk 8 miles north (+) and then 6 miles south (-) we end 2 miles north of our starting point; and if we walk 6 miles north and then 8 miles south we end 2 miles south of our starting point. But they are not both applicable to physical objects: you can get 6 apples from 8 by leaving 2 behind, but you cannot get 8 apples from 6 by leaving -2 behind. If Professor Born's argument were sound we should be able to say: the simple fact that all numerical values of a, b and c expressed by the equation $a - b = c$ can be represented geometrically by lines drawn to north and south should suffice to show that there can be no logical contradiction (and, by implication, nothing wrong) in the theory that you can get 8 apples from 6" (*Science at the Crossroads*, pp. 231-232).

Einstein must dilate time because all his "observers" are moving. They all see light, but they all see it at different times, and there is no stationary Earth from which to judge who of the observers has the right time.[884] As they say, "everything is relative." Einstein himself said that he

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[884] The difference in the time between the two observers will be: $1/\sqrt{(1- v^2/c^2)}$, which is the same equation Lorentz used for time/length contraction, but at least Lorentz was basing his on the fact that the ether constituted absolute time and distance. Einstein had no such luxury. In any case, as Dingle states:

> …the assumption of the Lorentz transformation in mechanics requires one clock to work both faster and slower than another. The fact that this can be seen to be contradictory in advance of observation, whereas the result of the Michelson-Morley experiment could not be foreseen, is due simply to the fact that we already know far more about clocks than about light…and we know enough about clocks to know that one cannot, at the same time and in the same sense, be working both faster and slower than another" (*Science at the Crossroads*, p. 235).

Later he writes:

> If Einstein's theory is valid the following questions arise. How is it possible for the ratio of the intervals recorded by two identically constructed, regularly running clocks, between the same pair of events, to vary with the events chosen (in other words, how can the ratio of two constant quantities be variable)? Second, if it is possible, why must the events that alone give the 'correct' ratio be chosen from the set occurring on one and not the other of the clocks? Third, if they must be so chosen, how does one (consistently with a theory in which the only feature in which the clocks differ – motion – can be ascribed indifferently to one of the other) discover on which clock the valid set of events occurs? I think it is self-evident that these questions are unanswerable. There can be no doubt that, if this criticism of the theory had been made in 1906, it would at once have been seen to be fatal and Einstein would have been the first to acknowledge it, for then reason was the *de facto* as well as the *de jure* arbiter in such a matter. In 1967, however, the obvious has become the inconceivable, and it has to meet the prejudice, independent of reason, that every apparent objection to special relativity is merely evidence of incomprehension and can accordingly be ignored" (*ibid.*, pp. 237-238).

Essen says that Dingle's objection is correct "if the equations given by Einstein are used" but "the apparent contradiction is avoided [only] if we interchange the symbols." Essen goes on to comment:

Dingle's treatment of the problem deserves special mention because he was the first to point out…that the clock paradox result was an actual mistake in Einstein's paper (Dingle, *Nature*, London 177, 782, 1956). He attributes the mistake to the fact that the Lorentz transformations in two different directions do not commute…he argues more generally that if Einstein's arguments are valid the result must be symmetrical, and he [Einstein] uses the Lorentz transformations to obtain the result that the moving clock is both faster and slower than the stationary one.

Essen concludes:

…the theory [Einstein's] consists in a number of contradictory assumptions and adds nothing significant to that of Lorentz….As in the clock-paradox thought experiment, it is implied that the result follows from the time-dilation prediction, but in fact an additional assumption is made which contradicts the relativity principle….It is one of [Einstein's] basic postulates that two observers in relative motion will obtain the same results from physical measurements, but, as Culwick (1959) has pointed out, no experiment of this kind has ever been performed….Another result often quoted in support of the theory is the variation of the life-time of mesons, the life-time being greater the greater the velocity of the mesons. Again it is an important result, but it cannot be regarded as a confirmation of relativity theory (*The Special Theory of Relativity: A Critical Analysis*, pp. 9, 17-20).

In another article Essen writes:

One of the predictions of the theory was that a moving clock goes more slowly than an identical stationary clock. Taking into account the basic assumption of the theory that uniform velocity is purely relative, it follows that each clock goes more slowly than the other when viewed from the position of the other…there is no way of distinguishing between the two…This result is known as the clock paradox or, since the clocks are sometimes likened to identical twins, one of whom ages more slowly than the other, the twin paradox…Some years later, in 1918, he used another thought-experiment in an attempt to answer criticisms of the paradox result. One of the clocks again made a round trip, the changes of direction being achieved by switching gravitational field on and off at various stages of the journey, the time recorded by the moving clock was less than that recorded by the stationary clock. The result did not follow from the experiment, but was simply an assumption slipped in implicitly during the complicated procedure. The slowing down of the clocks which he had previously attributed to uniform velocity, acceleration having no effect, he now attributed to acceleration, a line of argument followed in many textbooks. (Louis

based his theory on a "free will…definition of simultaneity," a definition he said was purely arbitrary and unverifiable.[885] Relativity attempts to compensate for this anomaly by claiming that each person has his own "frame of reference" for which the laws of motion will always work the same, and thus each observer can consider himself "at rest." The logical criticism of this solution is to ask: "what frame?" and "what reference?" "Frames" and "references" are convenient words for assuming that there can be some place of absolute measurement against which to measure the frames and references. It seems that Relativity wants it both ways. It wants the observer "at rest" but also declares that he is in motion. In Relativity, everything depends on what "the observer" sees, since he has no stationary Earth upon which to rest and judge all motion in the universe.[886]

Dingle was relentless in pointing out these contradictions in Einstein's theory. He writes:

> It was almost inevitable that this paradox should arise from Einstein's 1905 paper describing the special theory, from which I quote the following passage:
>
> "If at the points A and B of [the coordinate system] K there are stationary clocks which, viewed in the stationary system, are synchronous; and if the clock at A is moved with the velocity v

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Essen, "Relativity – Joke or Swindle?" *Electronics and Wireless World*, February 1988, pp. 126-127).

It is worthy to note that Dr. Louis Essen, inventor of the atomic clock, was marginalized for his criticism of Einstein and threatened with loss of tenure if the criticisms persisted. The *London Daily Telegraph* carried this obituary of him in September 1997: "Essen put forward his criticisms so vehemently that he eventually came to be regarded as an anti-Establishment troublemaker. He was even warned that his promotion prospects, and thus his pension, might be affected if he did not desist."

[885] *Relativity: The Special and General Theory*, 15th edition, 1961, ch. 7, p. 23. See also Arthur Lovejoy's 1930 article "The Dialectical Argument against Absolute Simultaneity" in which he critiques Einstein's famous thought experiment of "lightening flashes on the railway embankment" (summary in *The Einstein Myth*, pp. 4-6); Geoffrey Builder, *Australian Journal of Physics* 11 [1958]: 457-480 for a critique on Einstein's arbitrary simultaneity; See also Arthur Lynch's, *The Case Against Einstein*, 1932, pp. 120-130 for a comprehensive mathematical and logical critique of Einstein's simultaneity.

[886] Clark writes: "As Einstein wrestled with the cosmological implications of the General Theory, the first of these alternatives, the Earth-centered universe of the Middle Ages, was effectively ruled out" (*Einstein: The Life and Times*, p. 267).

along the line AB to B, then on its arrival at B the two clocks no longer synchronise, but the clock moved from A to B lags behind the other which has remained at B by ½ $t\ v^2/c^2$ (up to magnitudes of fourth and higher order), t being the time occupied in the journey from A to B. It is at once apparent that this result still holds good if the clock moves from A to B in any polygonal line, and also when the points A and B coincide."

From this it follows that Einstein chose Y as the correct solution, and therefore must have rejected X. But he did not disprove X, which seems to follow from the postulate of relativity which is an integral part of the theory P; hence he did not resolve the paradox.[887]

In other words, because Einstein cannot extricate himself from either A or B he must choose which of the two will remain at rest so that he can judge the movement of the other. Without giving any reason for his choice, Einstein arbitrarily sides with B as his fulcrum, forgetting, apparently, that Relativity will simply not allow such biased choices, much less permit anyone to assume the vantage point of Aristotle's Unmoved Mover.

Probably Dingle's most succinct and easily comprehended criticism of Einstein's Special Relativity comes at the very beginning of his book:

It would naturally be supposed that the point at issue…must still be too subtle and profound for the ordinary reader to be expected to understand it. On the contrary, it is of the most extreme simplicity. According to the theory, if you have two exactly similar clocks, A and B, and one is moving with respect to the other, they must work at different rates, *i.e.*, one works more slowly than the other. But the theory also requires that you cannot distinguish which clock is the 'moving' one; it is equally true to say that A rests while B moves and that B rests while A moves. The question therefore arises: how does one determine, consistently with the theory, which clock works the more slowly? Unless this question is answerable, the theory unavoidably requires that A works more slowly than B and B more slowly than A – which it requires no super-intelligence to see is impossible. Now, clearly, a theory that requires an impossibility cannot be true, and scientific integrity requires,

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[887] *Science at the Crossroads*, pp. 185-186.

therefore, either the question just posed shall be answered, or else that the theory shall be acknowledged to be false.[888]

Martin Gardner and the Inherent Flaws of Relativity

As we noted earlier, **Martin Gardner**, a popular writer for the technical magazine *Scientific American*, was a valiant supporter of Einstein, but he admitted that Dingle's critique of Einstein was "the strongest objection that can be made against the paradox."[889] At one point, perhaps without realizing precisely the implications of his statement, Gardner more or less confirms Dingle's objection. Replacing Dingle's "A" and "B" with a spaceship and Earth, respectively, Gardner says:
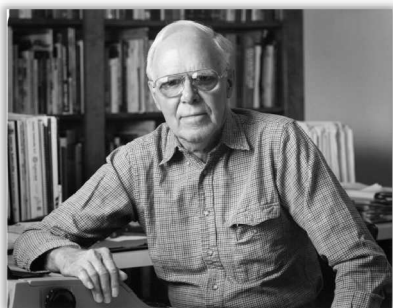
Dingle's objection still remains, however, because exactly the same calculations can be made by supposing that the spaceship instead of the Earth is the fixed frame of reference. Now it is the Earth that moves away, shifts inertial frames, comes back again. Why wouldn't the same calculations, with the same equations, show that the Earth time slowed down the same way?[890]

As any honest Relativist would be compelled to do, Gardner was forced to admit that Relativity cannot distinguish between a fixed Earth in a rotating universe or a rotating Earth in a fixed universe:

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[888] *Science at the Crossroads*, p. 17.

[889] Martin Gardner, *The Relativity Explosion*, 1976, p. 133. This is the revised edition of *Relativity for the Million*, 1962, p. 120. Gardner then adds that only General Relativity could and must provide the answer to Dingle's objection (*Relativity Explosion*, p. 137; *Relativity…Million*, p. 122), without offering a suggestion how it possibly could do so. Gardner also admits that "Today, astronomers are skeptical of this confirmation. The difficulties in making precise measurements of star positions during an eclipse are much greater than Eddington supposed, and there have been differences in the results obtained during eclipses since 1919…and we haven't even considered the influence of unconscious bias on the part of astronomers who have preconceived ideas…" (*ibid*., pp. 113-114).

[890] *The Relativity Explosion*, p. 135; *Relativity for the Million*, p. 122.

One could just as legitimately assume the Earth to be fixed and the entire universe, with its great spherical cloud of black-body radiation, to be moving. The equations are the same. Indeed, from the standpoint of relativity the choice of reference frame is arbitrary. Naturally, it is simpler to assume the universe is fixed and the Earth moving than the other way around, but the two ways of talking about the Earth's relative motion are two ways of saying the same thing…"[891]

This is precisely what happens when men reject divine revelation and depend upon themselves to answer the fundamental questions about things they simply cannot answer – it becomes a confusing hodgepodge of dualism and dichotomies in which man, literally, doesn't know whether he is coming or going. The corollary truth, of course, is that God assures us that He is not the author of confusion,[892] which leaves only two other possible sources, neither of which is very comforting.

Out of the blue, Gardner claims to have a way to distinguish between the two. He claims he can tell us which of Dingle's clocks, A or B, is running slower. The clock stationed on Earth, says Gardner, moves with the Earth, but "when the Earth moves away, *the entire universe moves with it*."[893] This is an astounding statement from Gardner, not because of its brilliance, but because of its implicit admission that, when the pressure mounts, Relativity depends upon a manufactured, hypothetical, non-Relativistic fixed point *outside* the universe to determine reality inside the universe! Yet if someone were to suggest to the Relativist that such a fixed point actually exists *inside* the universe, and that we even have experimental evidence to prove it (*e.g.*, Michelson-Morley, *et al*), he will dismiss this evidence as arbitrary, and choose, rather, to accept the absurdities of Relativity rather than admit the possibility of a fixed Earth.

Again, we see quite clearly that the very theory that was invented in 1905 to dispense with having to admit the possibility of an immobile Earth is the very theory that attempts to use immobility to escape geocentrism. Ironically, the hypothetical island that allows Gardner to peer inside the universe ends up supporting geocentrism, not heliocentrism. For if the

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[891] *The Relativity Explosion*, pp. 184-185. On another page Gardner writes: "Do the heavens revolve or does the Earth rotate? The question is meaningless. A waitress may just as sensibly ask a customer if he wanted ice cream on top of his pie or the pie placed under his ice cream" (*ibid*., p. 87).

[892] 1Cor. 14:33; Psalm 109:29; Isaiah 45:15-16.

[893] *The Relativity Explosion*, p. 135; *Relativity for the Million*, p. 122; (emphasis his). Paul Feyerabend referred to Martin Gardener as "the pitbull of Scientism" (*Against Method*, p. 122).

Earth, as he says, is moving step-for-step with the universe, then it is an immobile point within the universe, while the spaceship is sauntering away bit by bit. In effect, Gardner has tried to deny geocentrism by means of geocentrism. These are the contradictions inherent in Einstein's theory, but its adherents will continue to pretend such anomalies do not exist. In either case, they are trapped and geocentrism is vindicated.

Gardner attempts another means to solve this dilemma:

> What if the cosmos contained nothing except two spaceships, A and B? Ship A turns on its rocket engines, makes a long trip, comes back. Would the previously synchronized clocks on the two ships be the same? The answer depends on whether you adopt Eddington's view of inertia or the Machian view of Dennis Sciama. In Eddington's view the answer is "yes." Ship A accelerates with respect to the metric of space-time structure of the cosmos; ship B does not…From Sciama's point of view the answer is "no." Acceleration is meaningless except with respect to other material bodies…the two spaceships. In fact, there are no inertial frames to speak of, because there is no inertia (except an extremely feeble, negligible inertia resulting from the presence of the two ships).[894]

We see again Relativity's desire to have it both ways. It dismisses absolute space, ether, and anything else that would give substantive or inertial quality to the vast regions between the heavenly bodies, but it conveniently returns them to the scene in the form of "the metric space-time structure of the cosmos" in order to answer the difficult questions. Einstein, as we will see later in this volume, did much the same in his 1920 paper claiming that his Minkowski-Riemann metric served the same

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[894] *Relativity for the Million*, p. 124. Sciama quotes Eddington's objection to Mach: "If the earth is non-rotating, the stars must be going round it with terrific speed [a fact that Gardener has already admitted]. May they not in virtue of their high velocities produce gravitationally a sensible field of force on the earth, which we recognize as the centrifugal force? This would be a genuine elimination of absolute rotation, attributing all effects indifferently to the rotation of the earth, the stars being at rest, or to the revolution of the stars, the earth being at rest; nothing matters except the relative rotation. I doubt whether anyone will persuade himself that the stars have anything to do with the phenomenon. We do not believe that if the heavenly bodies were all annihilated it would upset the gyrocompass. In any case, precise calculation shows that the centrifugal forces could not be produced by the motions of the stars, so far as they are known" (Dennis Sciama, *The Unity of the Universe*, 1961, p. 113).

purpose as the ether of pre-Relativistic times. Sciama, as noted above, removed this little 'bit of magic' quite easily.

The Dead Ends of Relativity for Modern Cosmology

Beyond the math, most physicists have begun to see the flaws in Einstein's theories on merely a practical level. They have been quietly burying his theories for the past few decades, but are somewhat reluctant to invite the public to the funeral for fear of demoralizing them, so it has been decided to let them die a slow but inevitable death by themselves. It was no less a scientific luminary than Stephen Hawking who revealed the awful truth:

> We already know that general relativity must be altered. By predicting points of infinite density – singularities – classical general relativity predicts its own down-fall....When a theory predicts singularities such as infinite density and curvature, it is a sign that the theory must somehow be modified.[895]

Einstein knew this as well. He struggled his whole life to produce singularity-free equations, but was never successful. Hawking continues:

> If general relativity is wrong, why have all experiments thus far supported it? The reason that we haven't yet noticed any discrepancy with observation is that all the gravitational fields that we normally experience are very weak.[896]

In reality, it is not only strong gravitational fields that demonstrate the erroneous tenets of General Relativity but, as we will see in the appendices of our treatise, even what Hawking understands as the so-called "experiments thus far supporting it," in reality, do not support Relativity theory at all. When examined very closely, they actually disprove it. We

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[895]*A Briefer History of Time*, 2005, pp. 102, 84; *Black Holes and Baby Universes*, 1994, p. 92. We should mention here that the ether-based universe of geocentrism does not produce blackholes – a decided advantage when the viability of various universes is being determined. Blackholes remain only a theoretical result of General Relativity, but there are no indisputable discoveries of blackholes. Stephen Crothers has done the most work on this issue. See http://www.youtube.com/watch?v=fsWKlNfQwJU
[896] *A Briefer History of Time*, p. 102.

speak here mainly of Einstein's explanation for the perihelion of Mercury and the bending of starlight near the sun.[897]

Hence, it is not just singularities and blackholes that are the problem with Relativity. The whole theory has become suspect of being flawed. A *Discover* magazine issue commemorating the 100th anniversary of Einstein's 1905 Relativity theory put it even more candidly:

> Albert Einstein got it wrong. Not once, not twice, but countless times. He made subtle blunders, he made outright goofs, his oversights were glaring. Error infiltrated every aspect of his thinking. He was wrong about the universe, wrong about its contents, wrong about the inner workings of atoms…In 1911 Einstein predicted [by Relativity] how much the sun's gravity would deflect nearby starlight and got it wrong by half. He rigged the equations of general relativity to explain why the cosmos was standing still when it wasn't. Beginning in the mid-1920s, he churned out faulty unified field theories at a prodigious rate. American physicist Wolfgang Pauli complained that Einstein's 'tenacious energy guarantees us on the average one theory per annum,' each of which 'is usually considered by its author to be the "definitive solution."'[898]

As the popular and technical magazine *Scientific American* gently put the situation:

> Einstein has become such an icon that it sounds sacrilegious to suggest he was wrong…But if most laypeople are scandalized by claims that Einstein may have been wrong, most theoretical physicists would be much more startled if he had been right.[899]

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[897] See Volume II, "Einstein: Everything is Relative," "Do the 1919 Eclipse Photographs Prove General Relativity?"; "Does Mercury's Residual Perihelion Prove General Relativity?"; "Does the Hefele-Keating Experiment Prove General Relativity?"

[898] Karen Wright, *Discover* contributing editor, "The Master's Mistakes," September 2004, p. 50. Wright was apparently chosen to diffuse the Einstein mystique, since the other articles in the issue are mostly positive. She concludes: "Yet Einstein's mistakes could be compelling and instructive, and some were even essential to the progress of modern physics." Robert Kunzig, states: "It's just a matter of time, most physicists think, before Einstein fails. Relativity touches so much of physics that a violation could show up almost anywhere" (*ibid*., p. 60).

[899] *Scientific American*, "Was Einstein Right?" by George Musser, September 2004, p. 88. Continuing, he writes: "…when the general theory of

In 1920, just after the famous eclipse photographs produced by Sir Arthur Eddington in 1919 (which purportedly showed at least one photograph of starlight bending near the sun at the angle Einstein predicted), Einstein's "curved space" became the major plank of modern cosmology. Overnight all of modern science was turned upside down. Einstein went so far as to claim that nothing in the universe can be absolutely straight. He asserted that a disc whirling at high speed would be shorter around its rim and thus upset the value of π and all the rest of Euclidean geometry. The impact of his theory was overwhelming. But in the mid-1920s, Willem de Sitter, who made a thorough use of Einstein's equations, demonstrated that his "curved" universe could not be proven. De Sitter consulted with Einstein and showed him the mathematical proofs. By 1932, Einstein and de Sitter co-wrote an article, which included the statement: "We must conclude that at the present time it is possible to represent the facts without assuming a curvature of three dimensional space."[900] The *Science News Letter* of April 2, 1932 stated:

> *Einstein and De Sitter Return to Euclidean Idea of Cosmos*: Prof. Albert Einstein, father of relativity, says that space may be and probably is the sort of uncurved, three-dimensional space that Euclid imagined and countless generations of schoolboys have learned…Prof. Willem de Sitter, Dutch astronomer, who had built his own shape of universe on Einsteinian foundations, joins with Prof. Einstein in espousing space which is on the average Euclidean….This joint announcement… is sure to cause a furor in the world of science.…In the Euclidean universe now re-enthroned, light travels in straight lines and goes on and on forever and ever.

Four years later, the famous astronomer Edwin Hubble wrote: "if redshifts are not primarily due to velocity shifts…there is no evidence of expansion, no trace of curvature, no restriction of the time scale."[901] Hubble's complaint is related to the issue we hear about so often today concerning "Dark Matter." The main reason the majority of modern scientists are still clinging so closely to the existence of Dark Matter and its cousin Dark Energy – to the tune of having it comprise a whopping

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relativity…meets quantum mechanics…it is relativity that must give way. Einstein's masterpiece, though not strictly 'wrong,' will ultimately be exposed as mere approximation."

[900] *Proceedings of the National Academy of Sciences*, Washington, 18, 1932, pp. 213-214.

[901] *Astrophysical Journal* 84, 517, 1936, p. 553.

95% of the known universe, even though no one has ever seen a trace of them – is that without them Einstein's field equations will not work. If Einstein's field equations are invalid, so is the Big Bang to which they gave birth. As one author says:

> Dark matter is needed if one assumes Einstein's field equations to be valid. However, there is no single observational hint at particles which could make up this dark matter. As a consequence, there are attempts to describe the same effects by a modification of the gravitational field equations, *e.g.* of Yukawa form, or by a modification of the dynamics of particles, like the MOND ansatz, recently formulated in a relativistic frame. Due to the lack of direct detection of Dark Matter particles, all those attempts are on the same footing.[902]

After Hubble, three years later, in 1939, Herbert Ives suggested that the bending of starlight near the sun is a result of the *slowing down* of light in gravitational fields, not because of a warping of space-time. As a beam of light passes the sun, the part of the beam that is nearer to the sun will be slowed more than the part of the beam further away. (Analogously, hair curls because one side of the shaft grows slower than the other). The sun acts the same as a lens, since lenses slow the speed of light, which we see as refraction.[903]

The problems continue for Relativity. Physicists who have put their whole careers behind Einstein's theory admit that it cannot be reconciled with the burgeoning field of Quantum Mechanics, which has been so successful at predicting the inner workings of nature.[904] In fact, not only is

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[902] C. Lämmerzahl, O. Preuss and H. Dittus, "Is the Physics within the Solar System Really Understood," ZARM, University of Bremen, Germany; Max Planck Institute for Solar System Research, Germany, April 12, 2006, p. 2.

[903] *Jour. of the Optical Society of Amer.*, 29:183-187, 1939.

[904] In comparing this contradiction to the heliocentric/geocentric debate, Feyerabend notes: "To use modern terms: astronomers are entirely safe when saying that a model has predictive advantages over another model, but they get into trouble when asserting that it is therefore a faithful image of reality. Or, more generally: the fact that a model works does not by itself show that reality is structured like the model….And now take the best theories of modern physics, general relativity in its most recent form and general quantum mechanics. So far it has proved impossible to merge them into a coherent whole – the one theory makes assertions which are flatly contradicted by the other….All these example have immediate application to the case of the Copernican theory whose coherence and partial success were also regarded as signs of a close correspondence to reality" (*Farewell to Reason*, p. 250).

there no reconciliation for the two theories, they actually obliterate one another. Popular science writer/physicist Brian Greene adds:

> Bell's reasoning and Aspect's experiments show that the kind of universe Einstein envisioned may exist in the mind, but not in reality…we now see that the data rule out this kind of thinking; the data rule out this kind of universe.[905]

After spending over one thousand pages convincing their readers of the glories of General Relativity, Charles Misner, Kip Thorne and John Wheeler (some of the more authoritative names in modern physics), finally admit that:

> The uncertainty principle [of Quantum Mechanics] thus deprives one of any way whatsoever to predict, or even to give meaning to, "the deterministic classical history of space evolving in time." No prediction of spacetime, therefore no meaning for spacetime, is the verdict of the quantum principle. That object which is central to all of classical general relativity, the four-dimensional spacetime geometry, simply does not exist, except in a classical approximation.[906]

Long before these current scientists finally discovered the flaws in Einstein's system, his critics in earlier times were quite numerous. Herbert Dingle, at first one of the scientists chosen to write popular editions of the General Theory of Relativity in the 1920s, and whose supportive essay was included in Schlipp's 1949 compendium *Albert Einstein: Philosopher-Scientist*, eventually found serious anomalies in Relativity.[907] By the 1960s

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[905] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004, pp. 120-121. For more information on the nature of Bell's Theorem and Aspect's experiments, see Chapter 7. NB: Although we quote Greene, we are not adopting String Theory.

[906] *Gravitation*, 1973, 25th print, pp. 1182-83. That two diametrically opposed theories (General Relativity and Quantum Mechanics) can both hold center stage in physics today, reveals like nothing else the shaky foundation upon which modern cosmology is built. On the one hand, Misner states that "the standard Big-Bang model of the universe [is] predicted by General Relativity," but admit "General Relativity is incapable of projecting backward through the singularity to say what 'preceded'" the Big Bang, "and, unfortunately, no problem is farther from solution," since General Relativity breaks down at that point (*ibid*., p. 770).

[907] In Dingle's own words: "To the best of my knowledge there is no one now living who can give objective evidence that he is more competent in the subject than I am….I have been studying relativity for more than 50 years. I learnt it in the first place from the late professor A[lfred] N[orth] Whitehead, who

he became Einstein's most formidable critic. Siding with Einstein, *Nature*, the most prestigious science journal known then and today, simply refused to publish Dingle's critique, resorting instead to accusing him of "dishonesty" for his work. In Dingle's own words:

> "…one of the chief stumbling-blocks to the general reader, as I know from my wide correspondence, is the difficulty of believing that, if the theory [of Einstein] is so plainly wrong, it could have been believed by everyone for more than 50 years. The book [of Dingle's] explains the very peculiar historical circumstances that have brought this about. I think I can say without conceit that there is no one now living who has had so much experience as I of the whole course of development and had personal contact with practically all the pioneers of the subject, and so is able to give a credible explanation of the apparently incredible. That, notwithstanding its incredibility, the simple error in the theory is indeed a fact is shown by the

encouraged me to write my first book on the subject (*Relativity for All* – Methuen). During the following half-century I have studied intensively the field of investigation to which it belongs, and discussed the theory with practically all those physicists whose names are best known in connection with it – Einstein, Eddington, Tolman, Whittaker, Schrödinger, Born, Bridgman, to name a few: I knew some of them intimately. I worked for a year (1932-3) with Tolman while he was writing his now standard work, *Relativity Thermodynamics and Cosmology* (Clarendon Press)….When in 1940, I published my second book on the subject (*The Special Theory of Relativity* – Methuen)…Max Born wrote me: 'I have enjoyed it very much, as your explanations of the difficult subject are very clear and well presented.'….Whittaker…published his history of the whole field of thought of which special relativity forms a part…I sent him some comments…to which he replied: 'Many thanks for the corrections and comments. You have detected several mistakes…and some of the remarks and suggestions you make could have originated only from a vast background of knowledge, which fills me with admiration.' When the volume on Einstein in *The Library of Living Philosophers* (published in 1949) was prepared, there were only two Englishmen among the twenty-five contributors selected from the world; I was one….When Einstein died I was summoned to broadcast a tribute to him on BBC television, which I did. Later, Granada television invited me to give a course on relativity, but by that time I was fairly well convinced that the special theory was untenable, so I refused. There are two articles on the subject in the *Encyclopedia Britannica*, one by an American and the other by me. It was written before I had reason to reject the special theory….I could continue in this vein, but it is distasteful and, moreover, I consider that the question should be decided on its intrinsic merits and not by a comparison of personal records" (Herbert Dingle, *Science at the Crossroads*, pp. 106-107).

unbreakable silence of all the leading authorities (except McCrea and Lyttleton) on my criticism, and the failure of NATURE to keep its promise to comment (which could only be a climbdown)…"[908]

"The absurdity which Mr. Stadlen reaffirms illustrates 'the present state of the scientific world': <u>scientists have lost the power to believe that special relativity may be wrong</u>….they resort to any absurdity to escape the inescapable. The change in 'the state of the scientific world' is that whereas, according to accepted tradition, in these circumstances the theory would at once be rejected, I have not found one of the 'authorities' with the courage either to make this choice or to admit his change of criterion for truth; the book records ample instances of my efforts and their futility. To take but one of its examples, a universally acknowledged authority on the theory, after a long correspondence, asked me if I was hoaxing, for 'I cannot bring myself to believe that you are as stupid as you make yourself out to be' – my stupidity lying in the fact that I subjected special relativity to criticism. Not only could one of the acutest minds in the business not see through the "hoax," he could not even decide it <u>was</u> a hoax, so he gave me up. That is the universal state of affairs, and it was to inform the unsuspecting public – and with a faint hope that the exposure might stab the "establishment" broad awake before anything disastrous happens…"[909]

"I am not so much interested in the scientific reviews – after all, there is nothing they can do but evade the point and misrepresent the book, as NATURE and NEW SCIENTIST have done…"[910]

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[908] Personal letter signed by Herbert Dingle written to Timothy O'Keeffe of Martin, Brian and O'Keeffe, Ltd, London, England, on March 20, 1972. Copy on file.

[909] Letter signed by Herbert Dingle to Timothy O'Keeffe, dated Oct. 14, 1972, emphasis in the original. "Mr. Stadlen" was hired by *The Listener* to review Dingle's book, *Science at the Crossroads*, which was eventually published by O'Keeffe. Copy on file.

[910] Personal letter signed by Herbert Dingle to Timothy O'Keeffe, dated October 26, 1972. Copy on file. Emphasis, including capitals and underlining, in the original.

"A recent issue of NATURE contains a review [241, 143 (1973)], by Professor John Ziman, of my book, <u>Science at the Crossroads</u>…But Professor Ziman calls the book 'sincere, dishonest'. I do not understand how it can be both, but to the charge of dishonesty I cannot be indifferent. Not only does it defame my moral character, but also, since I have stated plainly that 'The primary and inescapable purpose of this book is to make known, to those with an indefeasible right to the knowledge, the present state of the scientific world as revealed by its practice, and to bring it into comparison with what is generally believed, and implicitly trusted, to be its state'…a conviction of dishonesty would entitle – indeed, compel – both actual and intending serious readers to dismiss my whole account as culpably untrustworthy. I must therefore ask Professor Ziman either to substantiate his charge or publicly, unambiguously and unreservedly to withdraw it."[911]

After some legal haggling, *Nature* eventually wrote an apology to Dingle that was published in its June 8, 1973, issue. *Science* also issued a similar apology on June 15, 1973.

Other well-known and accomplished physicists, many of them having received their own Nobel Prizes, rejected Einstein's Relativity theories in the early going, and more came on board as time progressed. Respected scientists such as Adler, Appell, Aspden, Assis, Barter, Beckmann, Bergson, Bouasse, Bragg, Brown, Brillouin, Callahan, Cauchy, Champeney, Cullwic, Darboux, Denisov, Dingle, Dingler, Dudley, Duport, Essen, Galeczki, Gehrcke, Graneau, Guillaume, Gut, Hatch, Heaviside, Henderson, Ives, Kantor, Kanarev, Kastler, Kraus, Lallemand, Larmour, LeCornu, Lenard, LeRoux, Levi-Civita, Lodge, Lorentz, Lovejoy, Lynch, Mach, MacMillan, Mackaye, Magie, McCausland, Michelson, Miller,

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[911] Personal unsigned letter from Herbert Dingle "To the Editor of NATURE," no date given. Copy on file. The only scientist of international repute to offer a critique of Dingle was Max Born. Born writes only the following words: "The simple fact that all relations between space co-ordinates and time expressed by the Lorentz transformations can be represented geometrically by Minkowski diagrams should suffice to show that there can be no logical contradiction in the theory." Dingle replied but there was no follow up from Born. Born's answer was hardly sufficient, since as Dr. Ian McCausland stated: "Since the Lorentz transformation is contained in the special theory, but is not the whole theory, it is illogical to claim that any property of the Lorentz transformation is a sufficient condition for the whole theory to be free of logical contradiction" ("The Twins Paradox of Relativity," *Wireless World*, July 1981).

Mohorovičić, Montague, Moon, More, Moulton, Nordenson, O'Rahilly, Painlevé, Phipps, Picard, Planck, Poincaré, Poor, Radakov, Ricci, Rutherford, Sagnac, Seeliger, Selleri, Soddy, Stark, Theimer, Turner, van der Kamp, van der Waals, Weinmann, Weyland, et al., discovered the same anomalies, and many of them wrote major critiques against Einstein between the 1920s and 1960s. Even Leopold Infeld, although authoring a book with Einstein in 1938 titled *The Evolution of Physics*, ten years later, when applying Einstein's formulas to the structure of the universe, writes: "Einstein's original ideas, as viewed from the perspective of our present day, are antiquated if not even wrong."[912]

If these evidences fail to give pause, then perhaps a few statements from Einstein himself at the end of his career will help put things in proper perspective. Whether he meant it as an omen or an obituary, nevertheless, Einstein was apparently feeling the depression of over half a century of doubt about his theories when, on his seventieth birthday he remarked in a March 28, 1949 letter to his old friend Maurice Solovine:

> You imagine that I regard my life's work with calm satisfaction. But a close look yields a completely different picture. I am not convinced of the certainty of a simple [single] concept, and I am uncertain as to whether I was both a heretic and reactionary who has, so to speak, survived himself.[913]

These thoughts were brewing in Einstein's mind for a few years. In a letter to J. Lee in 1945 he wrote:

> A scientific person will never understand why he should believe opinions only because they are written in a certain book. Furthermore, he will never believe that the results of his own attempts are final.[914]

In 1948 Einstein wrote the following words in the Foreword to a popular book on Relativity:

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[912] Leopold Infeld, "On the Structure of the Universe," in *Albert Einstein: Philosopher-Scientist*, p. 477.

[913] *Letters to Solovine*, translated by Wade Baskin from the French *Lettres à Maurice Solovine*, 1987, p. 111. Einstein's wording in the original German of the sentence "Da ist kein einziger Begriff…" more likely refers to "not a single concept," since *einzeiger* is closer to the meaning of "one" or "single," whereas *einfach* would be the more common word for "simple." In the same set of letters Einstein reveals his doubts about General Relativity.

[914] Alice Calaprice, *The Expanded Quotable Einstein*, p. 14.

Moreover, the present state of our knowledge in physics is aptly characterized. The author shows how the growth of our factual knowledge, together with the striving for a unified theoretical conception comprising all empirical data, has led to the present situation which is characterized – notwithstanding all successes – by an uncertainty concerning the choice of the basic theoretical concepts.[915]

Here we see in Einstein an introspection that he rarely revealed to his physics colleagues, many who were in intense competition with him. But they are rather disheartening words from a man who turned the world upside down with his highfalutin theories. In locating his target of derision as "the basic theoretical concepts," Einstein is casting doubt on the whole enterprise of modern physics, admitting that his and other theories may, in fact, be totally mistaken regarding how the universe operates.

Einstein's intimate thoughts were revealed only to the best of his personal friends, the people who really knew the man behind the persona. To them Einstein's negative assessment of his life's work was not merely an exercise in self-deprecation. This is noted by yet another revealing comment Einstein made to Michel Besso, his closest confidant, in a 1954 letter:

I consider it quite possible that physics cannot be based on the field concept, *i.e.*, continuous structures. In that case, *nothing* remains of my entire castle in the air, gravitation theory included, [and of] the rest of modern physics.[916]

Two months before his death, he admitted that he could not make the mathematics of his theory of gravitation work correctly. To Solovine he writes:

I have finally managed to introduce another noteworthy improvement into the theory of the gravitational field (theory of the nonsymmetrical field). But not even these simplified

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[915] Lincoln Barnett, *The Universe and Dr. Einstein*, revised edition, 1950, p. 10.
[916] Abraham Pais, *Subtle is the Lord: The Science and the Life of Albert Einstein*, 1982, 2005, p. 467. Pais argues Einstein's self-assessment was "unreasonably harsh," which shows Pais knows how damaging the quote is to Einsein's reputation. Still, Pais admits to other such sentiments from Einstein, such as the letter to Born in 1940: "Our respective hobby-horses have irretrievably run off in different directions….Even I cannot adhere to [mine] with absolute confidence" (*ibid.*).

equations can be verified by the facts as yet because of mathematical difficulties. Warmest greetings to you and your wife. Your[s], A. Einstein.[917]

After remarking about "…the odd arguments which Ptolemy advances against Aristarchus' opinion that the world rotates and even moves around the sun," Einstein ironically admits to Solovine in the same November 25, 1948, letter:

In my scientific activity, I am always hampered by the same mathematical difficulties, which make it impossible for me to confirm or refute my general relativist field theory.

As we noted previously, the mathematics Einstein employed to help bolster his Relativity theory is the same mathematics that shows geocentrism as a viable alternative to heliocentrism, therefore Einstein could never be sure which one was the correct model. Like many, he ignored the implications of his own theory and decided to "leave this question for the time being and accept Copernicus' point of view."[918]

The Case of the μ-meson

We see the same sleight-of-hand behind more recent claims that purport to have proven Special Relativity, in this case the activity of the μ-meson or the π-meson. As the story goes, μ-mesons or π-mesons appear when protons from cosmic rays enter the Earth's atmosphere and collide with its molecules. The mesons travel with great speed, but since they are inherently unstable, they will decay before they hit the Earth's surface. Yet many are found near the surface. How can this happen? Relativity's answer is: since moving clocks run slower, there is a time dilation from the point of view of the ground-based observer as he looks at the meson. From his vantage point, the lifetime of the meson is expanded by the Lorentzian factor and thus many of the mesons will reach the surface.[919]

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[917] *Letters to Solovine*, trans., by Wade Baskin from the French *Lettres à Maurice Solovine*, 1987, pp. 159, written Feb. 27, 1955, Einstein's death coming on April 18, 1955.

[918] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1966, pp. 154-155.

[919] The Lorentz factor being $\sqrt{(1 - v^2/c^2)}$. Max Born, for example, regards the particles as π-mesons with a lifetime of about 2×10^{-8} seconds. In order to reach the Earth's surface from a height of 30 km, a speed of $0.999999995c$ is needed. To show the arbitrariness of the claims, Eric Chaisson believes the particles are

The problem with this explanation, of course, is that identical to the "A or B" paradox Dingle demonstrated, the principle of *role reversal* in Special Relativity will not allow its attempt to secure a preferred frame of reference, namely, the ground-based observer. Relativity purports that time is slowed for the ground-based observer but not the meson-based observer, but this would only be the case if it could somehow be proven that the ground or Earth was immobile, and thus the privileged frame, but it certainly cannot. Again, Relativity, by what appears to be a sort of shell game with the audience, appeals to the principle of a fixed Earth in order to support a relative universe. This paradox demonstrates the hopeless quagmire into which Relativity theory is forced. To speak of "moving clocks slowing down" really means nothing of significance since Relativity neither has a means to prove the object against which the clock is supposedly moving, nor does it have a standard clock from which to judge the time of the moving clock.

Interestingly enough, in the article "The 'Time Dilation' of Mesons Re-Examined," D. T. MacRoberts turns the tables and shows the geocentric results of the meson experiments:

> The high-velocity experiments on mesons such as those at CERN, are definite evidence of the mesons' lifetimes functional relationship to their velocity with respect to the Earth, but have nothing whatsoever to do with the "time dilation" of Special Relativity. The experiments also are yet another "ether-drift" investigation with the usual answer: *the velocity of the Earth with respect to a fundamental frame is zero.*[920]

Accordingly, it appears that Einstein himself recognized the critique before Dingle spelled it out for us so simply, but Einstein merely stated the problem without following it to its logical conclusion since, obviously, it would have nullified his whole Relativity theory. He writes:

> We see thus that we cannot attribute any absolute meaning to the concept of simultaneity. Rather, two events which, considered from one system of reference, are simultaneous, can, considered

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muons with a lifetime of 2×10^{-6} seconds. But this causes problems since, if the muons travel at $0.994c$, their lifetime is extended by a factor of 9, which gives a lifetime of 18×10^{-6} seconds at $0.994c$ or 2.98×10^5m, thus allowing them to travel only 5.5km, not the needed 30km.

[920] D. T. MacRoberts, *Galilean Electrodynamics*, Sept/Oct 1992, p. 83, emphasis added.

from a system moving in relation to the former, not be considered as simultaneous.[921]

This admission by Einstein leads us to conclude that his system of variants and constants is, ironically, completely "relative." On the one hand, if, due to the Michelson-Morley experiment, one assumes that the Earth is moving and light's speed always appears the same to all observers, even if some observers are moving, then one will be forced to say that lengths contract and time dilates. There is no other choice. On the other hand, since the solution is "relative," one could opt to keep lengths and time constant but change the speed of light. Mathematically speaking, the two solutions are precisely equivalent. In this case, the "relative" nature of Relativity comes back to haunt it. The other solution, of course, is to hold that the Earth is not moving, and the necessity of having to

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[921] "Zur Elektrodynamik bewegter Körper" ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, 17, Sept. 26, 1905, p. 897. Einstein was more or less forced to his conclusions about time dilation due to his "principle of equivalence," which holds that there is no net difference between gravitational force and acceleration, and thus both effects will produce the same results. Hence, if clocks slow down in a gravitational field [as is commonly accepted in modern science based on such experiments by Pound and Rebka who used the Mössbauer effect to measure a frequency shift $(f'/f -1) = (2.57 \,\forall\, 0.20) \times 10^{-15}$ after dropping photons a distance of 22.6 meters (*Physical Review Letters* 4, 337, 1960); or by Vessot, *et al*, who launched a hydrogen maser vertically at 8.5 km/sec, and verified its frequency change as it reached an altitude of 10,000 km, wherein the frequency shift due to gravity was $(f'/f -1) = 4 \times 10^{-10}$ at the 10,000 km altitude (*Physical Review Letters* 45, 2081, 1980], the clocks must also slow down when accelerated. The relation between gravitation and acceleration was never proven, just assumed. It was also never proven that the slowing of a clock (*e.g.*, the difference in time kept by a terrestrial atomic clock as opposed to a high-altitude atomic clock; or a high-altitude clock traveling east, as in the Hefele-Keating experiment) is due, as Relativity theory holds, to gravity's distortion of the time-space continuum. Since modern science does not know the cause of gravity, it is futile to base co-equivalence on a factor whose nature is unknown. In fact, under alternative theories of gravity, a more viable explanation of the slowed clock is that it is a local mechanical affect caused either by the higher intensity of gravity and/or the higher density of the spatial medium (*e.g.*, ether) near the surface of the Earth as opposed to high-altitudes. See *Pushing Gravity: New Perspectives on Le Sage's Theory of Gravitation*, ed. Matthew R. Edwards, 2002. Assis adds: "It can be equally argued that these experiments only show that the half-lives of the unstable mesons depend on their accelerations and high velocities relative to the distant matter in the cosmos, or on the strong electromagnetic fields to which they were subject" (*Relational Mechanics*, p. 132). In any case, absolute time does not slow. Only the *measured* frequency slows.

contort light, length or time evaporates. As Van der Kamp rightly concludes:

> Not yet in the least verified, *ad hocs* fail to qualify as arguments, let alone as 'proofs.' They are by themselves only woolly excuses. Worse: until logically incontrovertible test results in their favour will have come to the fore, the skeletons of Ptolemy, Aristotle and Tycho Brahe still rattle happily in their cupboards.[922]

Einstein Admits Speed of Light is Not Constant

Since modern science has not matured enough to accept Brahe's option, we are left with the confusion seen in Einstein's prior quote concerning simultaneity being "possible and yet not possible." Thus it should not be surprising to learn what he once stated about the non-constancy of the speed of light – comments hidden in the file of inconvenient facts by the scientists who have sworn allegiance to the cult of Einstein. Already in June 1912 Einstein was probing the issue in a letter to one of his associates, Heinrich Zangger, stating: "What do the colleagues say about giving up the principle of the constancy of the velocity of light?"[923] Arthur Lynch reveals in his 1932 book, *The Case Against Einstein*, Einstein, just four years later, admitted that his theory of the constancy of light *in vacuo* had to be "modified." Below, Lynch is quoting Einstein, and gives a brief footnote (which I put in parentheses):

> Einstein continues: "In a similar manner we see 'unmittelbar' [immediately] that the principle of the constancy of the velocity of light in a vacuum must be modified. For one easily recognizes that the path of a beam of light, relative to K', must generally be

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[922] *De Labore Solis*, p. 39.

[923] Abraham Pais, *Subtle is the Lord*, p. 211. Pais attributes the comment merely to Einstein's resolve to preserve his views on "the redshift and the bending of light," but this cannot be the case. In reality, as Pais cites Einstein's prior sentence in the letter: "The generalization appears to be very difficult," it refers back to the May 1912 letter of Einstein's to Zangger which stated: "The further development of the theory of gravitation meets with great obstacles." Here Einstein is referring to his development of the General Theory of Relativity which he understands will require a modification to the constancy of the speed of light, since the *c* postulate of the Special Theory only applies in the absence of gravitational fields. Hence, if *c* must be modified to make room for the General Theory, we can understand why Einstein inquired if his colleagues would be willing to "give up" its constancy.

crooked, when the light, with respect to K, moves in a straight line with definite constant velocity." (What Einstein sees here as 'unmittelbar,' he failed to see during the many years when he was insisting on his dogma of the constancy of the velocity of light). The word 'unmittelbar' amused me so much that I have taken care to give it in the original German….The whole paragraph is interesting because it goes on to deal with one of the profound discoveries of Relativity, that the velocity of light in reference to a body is the same whether that body be at rest, or in motion towards the source of light!…I notice for the moment that Einstein, having postulated the constancy of light, is content to "modify" it when his own reasoning leads him to contradiction; but he does not touch the previous mode of thought that led him to decree this constancy.[924]

Although Lynch doesn't footnote the quote from Einstein, it comes from Einstein's submission to *Annalen der Physik* in 1916.[925] E. J. Post adds that the "modification" was not well received from Einstein's colleagues:

At the end of section 2 of his article on the foundations of the general theory, Einstein writes: "The principle of the constancy of the vacuum speed of light requires a modification." At the time, Max Abraham took Einstein to task (in a rather unfriendly manner) about this deviation from his earlier stance.[926]

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[924] *The Case Against Einstein*, Arthur Lynch, pp. 209-210. See also Stephen Hawking's citation of this quote in *A Stubborn Persistent Illusion*, 2007, p. 49. In another place, Lynch writes: "To thinkers who have confused time and space and regarded them as of the same category, if not interchangeable, anything is feasible; but the consequences of this transcendental thinking are more remarkable than they have supposed. For velocity is composed of relations between time and space, and since, as they claim, one may be expressed in terms of the other it may be taken as composed of time or, alternatively, of space. But velocity and mass are interchangeable, therefore mass may be composed of time, or alternatively, of space. If mass be expressible by time alone it acquires a fleeting character which seems to allow the material world to dissolve under our feet; but if it be expressible by space alone our situation is worse, for space, according to the Relativists, has no *point de repère* [registering point or datum point]; it is so empty that we cannot seize upon any *point de repère* to measure the velocity of light or to fix its position; it is void, absolutely, what we call void; and so therefore is mass!" (*ibid.*, p. 140).

[925] *Annalen der Physik*, 49, 769 (1916).

[926] E. J. Post, *Physics Today*, 35 (6), 11 (1982).

Similar to Lynch, in the 1940-50s, Hebert Ives wrote extensively on the "self-contradictory" nature of Einstein's principle of the constancy of the speed of light.[927] Even some of today's popular Relativists admit that the speed of light is not always constant *in vacuo*, and they go through the most strained semantic contortions in order to deny it is happening. As always, mathematics comes to the rescue. Clifford Will explains:

> The speed of light is indeed the same in every freely falling frame, but we are forced to consider a sequence of such frames all along the light path, and when we do so, we find that the observer at the end of the path determines that the light took longer to cover a given trajectory when it passed near the Sun than it would have had it passed farther from the Sun. Whether or not the observer used the words "light slows down near the Sun" is purely a question of semantics. Because he never goes near the Sun to make the measurement, he can't really make such a judgment; and if he had made such a measurement in a freely falling laboratory near the Sun, he would have found the same value for the speed of light as in a freely falling laboratory far from the Sun, and might have thoroughly confused himself. All the observer can say with no fear of contradiction is that he observed a time delay that depended on how close the light ray came to the Sun. The only sense in which it can be said that the light slowed down is mathematical: in a particular mathematical representation of the equations that describe the motion of the light ray, what general relativists call a particular coordinate system, the light appears to have a variable speed. But in a different mathematical representation (a different coordinate system), this statement might be false.[928]

Concerning a similar perspective on light, Charles Lane Poor reveals that Relativity's postulates

> indicate that light travels with different speeds in different directions, that the velocity of light depends upon the direction of transmission. That such a mathematical result represents the facts of nature is highly improbable, for in free space there is no

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[927] *Proceedings of the American Philosophical Society* 95: 125-131, 1951; *Journal of the Optical Society of America* 38: 879-884, 1948; 27: 263-273, 1937.
[928] Clifford Will, *Was Einstein Right?* pp. 112-113. Will goes on for six more pages using charts, diagrams and more math to convince the reader that his above paragraph actually makes sense.

difference between right and left, between north and south, or east and west; there is no reason why a ray of light should travel faster to the north than to the south. To overcome this mathematical difficulty, or inconvenience, as he calls it, the relativist makes a substitution, or approximation. Instead of using the direct distance between the centers of two particles of matter, the relativist adds a small, a very small, factor to this distance; or, as Eddington puts it, "we shall slightly alter our coordinates." Such an approximation is very common among physicists: it is done every day to simplify troublesome formulas. The only precaution necessary in such a procedure is to remember always that the final result is necessarily approximate, and, before drawing any conclusion, to thoroughly test the effects of the approximation.[929]

Physicist Bryan Wallace reveals that when he discovered that the NASA Jet Propulsion Laboratory was basing their analysis of signal transit time in the solar system on the Newtonian and Galilean concept of *c* + *v* (*i.e.*, the speed of light plus the speed of the source or medium of light) and not *c* as required by Einstein's theory, he was summarily censured by the editors of *Physics Today*. His July 9, 1984 letter to the magazine states:

> During a current literature search, I requested and received a reprint of a paper published by Theodore D. Moyer [*Celestial Mechanics* 23, 33 (1981)] of the Jet Propulsion Laboratory….The paper's (A6) equation and the accompanying information that calls for evaluating the position vectors at the signal reception time is nearly equivalent to the Galilean *c* + *v* equation (2) in my paper "Radar Testing of the Relative Velocity of Light in Space" [B. G. Wallace, *Spectroscopy Letters*, 2, 361 (1969)]….The fact that the radio astronomers have been reluctant to acknowledge the full theoretical implications of their

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[929] Charles Lane Poor, "Relativity: An Approximation," Paper presented to the American Astronomical Society, Thirteenth Meeting, 1923, Mount Wilson Observatory, California, p. 3. Later Poor states: "But the method is faulty and contains obvious errors, and the fundamental formula for the velocity of light, upon which the entire method is based, is in direct contradiction to the principle of equivalence, for it shows that the speed of light *decreases* as it approaches the sun, while the equivalence principle demands that such velocity should increase" (*ibid.*, p. 12). For Poor's complete paper, which makes a detailed critique of Einstein's prediction of the perihelion of Mercury and the bending of starlight near the sun, see Volume II, "Einstein: Everything is Relative."

work is probably related to the unfortunate things that tend to happen to physicists that are rash enough to challenge Einstein's sacred postulate [B. G. Wallace, *Physics Today*, 36, (1), 11 (1983)]. Over twenty-three years have gone by since the original Venus radar experiments clearly showed that the speed of light in space was not constant, and still the average scientist is not aware of this fact! This demonstrates why it is important for the APS [Astrophysical Society] to bring true scientific freedom to the PR [*Physical Review*] journal's editorial policy [B. G. Wallace, *Physics Today*, 37 (6), 15 (1984)].[930]

How would the non-constancy of the speed of light affect Relativity theory? Marilyn vos Savant tells us: "If the speed of light were discovered not to be constant, modern scientific theory would be devastated."[931] But according to one of Einstein's letters to Paul Ehrenfest, it wouldn't do any damage. He writes: "I certainly knew that the principle of the constancy of the velocity of light is something quite independent of the relativity postulate."[932] We can only say that it is amazing to watch the contortions through which Einstein puts his own theory.

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[930] B. G. Wallace, "Publication Politics" in *The Farce of Physics*, 1994. Wallace received a reply from *Physics Today* on Jan. 4, 1985 from Gloria B. Lubkin, acting editor, stating that the magazine editors reviewed the letter and decided against publication. Later, he received two more rejections. Moyer's paper is titled: "Transformation from Proper Time on Earth to Coordinate Time in Solar System Barycentric Space-Time Frame of Reference." His abstract states: "In order to obtain accurate computed values of Earth-based range and Doppler observables of a deep space probe, an expression is required for the time difference $t - \tau$, where t is coordinate time in the solar system barycentric space-time frame of reference and τ is proper time recorded on a fixed atomic clock on Earth…" (p. 33). The "A6 equation" in Moyer's paper is $R = r_{12}/c + \psi_{12} + r_{23}/c + \psi_{23} - (ET - TAI)_{t3} + (ET - TAI)_{t1} + \Delta$. Moyer writes: "The sum of the first four terms is the round-trip light time in ET [ephemeris time]…The next two terms convert this interval to an interval of TAI [International Atomic Time] (p. 47).

[931] Marilyn vos Savant holds the Guinness world record for the highest IQ, presently at 228 (although some tests put it at 186). Her above response was in answer to the question: "What one discovery or event would prove all or most of modern scientific theory wrong?" posed by a Jennifer W. Webster in *Parade* magazine in May 22, 1988. Ms. Savant offered another reason: "And if a divine creation could be proved to have occurred, modern scientists would be devastated."

[932] Einstein to Ehrenfest, June 3, 1912, Doc. 404, 409, in Papers, vol. 5, cited in "Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905," John D. Norton, University of Pittsburgh, Dept. of History and Philosophy of

Einstein Reinterprets Maxwell in Favor of Relativity

All the foregoing aside, Einstein reveals another primary motivator that caused him to invent his Special Relativity theory. It appears in

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Science, Jan. 28, 2004, p. 24. Norton goes on to show how Wilhem de Sitter debunked Einstein's hypothesis requiring the need for light's constancy in order to produce shadows; and the fallacy of Einstein's claim that there were no differential equations to account for the "many velocities" of light (pp. 25-27). Dingle critiques de Sitter's "proof" of the constancy of light (and which Einstein cites in his co-authored book *The Evolution of Physics* in 1938) as determined by binary stars. He writes: "The point to be decided, then, is said to be whether the two beams of light emitted towards the Earth by the components at an instant when one is approaching and the other receding from the Earth with velocity v, travel to the Earth with the single velocity c, or with velocities $c + v$ and $c - v$, respectively." Einstein's second postulate argues that unless the light traveled at a constant velocity of c then "an Earthbound observer would therefore see a hopeless confusion of light form the two components, bearing no resemblance at all to the orderly revolution that would actually be taking place." Dingle concludes:

> This is, I think, the most remarkable example in the history of science of the wish fathering the thought – with the possible exception of the 'proofs,' following the Copernican heresy, that it was the Sun, and not the Earth, that moved, to which, in fact, this argument bears some resemblance. A finite velocity, of course (and it is not disputed that light in *vacuo* has a finite velocity) must be measured with respect to some standard, and if we do not accept…that the standard is empty space…the only alternative with any claim to consideration is that the velocity c is maintained with respect to the emitting body. But all that de Sitter's arguments disprove is that the velocity is maintained constant with respect to the Earth, for it is with respect to the Earth that the velocities $c + v$ and $c - v$ are reckoned, and surely no one in his senses would now maintain that the Earth provided a standard of rest for all the light in the universe…these observations tell us precisely nothing to enable us to choose between Einstein's postulate…and the postulate that light keeps a constant velocity with respect to its own source (which was proposed in 1908 by Ritz as an alternative to the Maxwell-Lorentz view, but he died before de Sitter's argument was conceived). How could such a simple fact have escaped notice for half a century? It was pointed out several years ago, and universally ignored – which is to me inexplicable on any other grounds than the universal inability of present-day physical scientists to believe that any criticism of special relativity that they cannot answer can proceed from anything but misunderstanding, which entitles them to ignore it (pp. 205-207).

various places, but particularly in a December 19, 1952 letter that Einstein wrote to Shankland:

> The influence of the crucial Michelson-Morley experiment upon my own efforts has been rather indirect. I learned of it through H. A. Lorentz's decisive investigation of the electrodynamics of moving bodies (1895) with which I was acquainted before developing the Special Theory of Relativity. Lorentz's basic assumptions on an ether at rest seemed to me not convincing in itself and also for the reason that it was leading to an interpretation of the result of the Michelson-Morley experiment which seemed to me artificial. What led me more or less directly to the Special Theory of Relativity was the conviction that the electromotive force acting on a body in motion in a magnetic field was nothing else but an electric field. But I was also guided by the result of the Fizeau experiment and the phenomenon of aberration.[933]

So, if the chief motivator for Einstein to invent Relativity theory was the anomaly he saw between electromagnetism and mechanical motion, perhaps the following quote can be interpreted such that the Michelson-Morley experiment cemented in Einstein's mind the issues raised by the Fizeau and Airy experiments on the one hand, and James Clerk Maxwell's theory of electromagnetism on the other:

> It is no doubt that Michelson's experiment was of considerable influence upon my work insofar as it strengthened my conviction concerning the validity of the principle of the Special Theory of Relativity.[934]

For Einstein there was an intimate connection between the laws of electrodynamics and the Michelson-Morley type experiments. He made this connection in his famous 1905 paper:

> Examples of this sort [anomalies in electro-magnetic correspondence] together with the unsuccessful attempts to discover any motion of the Earth relative to the 'light medium,' suggests that the phenomena of electrodynamics as well as of

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[933] R. S. Shankland, *Conversations with Albert Einstein*, p. 48, cited in Holton, p. 303, with Holton's interpolations omitted.
[934] Interview, March 17, 1942, with Albert Michelson's biographer (*Einstein: The Life and Times*, p. 128).

mechanics possess no properties corresponding to the idea of absolute rest.[935]

Rather than deduce from these "unsuccessful attempts" that the Earth was motionless, Einstein was forced, by the prevailing scientific consensus to the only other conclusion – there was no "absolute rest," and this became the fundamental postulate of Relativity theory. If there were no absolute rest for macro-objects (such as Earth), Einstein hypothesized, at least in mathematical terms, there would be none in the micro-world (*e.g.*, electricity and magnetism). In the very first sentence of his 1905 paper Einstein writes:

> It is known that Maxwell's equations of electrodynamics – as usually understood at the present time – when applied to moving bodies, leads to asymmetries which do not appear to be inherent in the phenomena.[936]

In other words, although Maxwell's equations are different from one another, the actual phenomenon they represent is the same. In particular, Einstein is referring to the fact that Maxwell created one equation for finding the electromotive force produced in a conductor moving past a stationary magnet, but another equation for a magnet moving past a stationary conductor, even though both movements produced precisely the

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[935] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 37. Also cited in *On the Shoulders of Giants* by Stephen Hawking, 2002, p. 1167.

[936] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 1. As Herbert Dingle describes it: "…the whole of Einstein's special theory, as set out in his paper of 1905…treats of the relations between observable things in different 'coordinate systems'; *i.e.*, apart from trivial differences, it deals with the values which those things take when the observable physical system under consideration is regarded as having different states of uniform motion. It is a problem that had been considered for centuries and regarded as solved until an ambiguity arose when it was found that the relations accepted with the events treated in mechanics were incompatible with those which seemed to be demanded with the events treated in electromagnetism. Einstein's theory was designed to provide a relation that held for both kinds of events." (*Science at the Crossroads*, p. 137). See also L. P. Fominskiy in "The Concept of an Interval: A Basic Mistake of the Theory of Relativity" (*Spacetime and Substance*, Vol. 3, 2002, No. 2, 12, pp. 49-54). Holton remarks that Einstein's use of "asymmetries" seems out of place, at least until we consider the philosophical ramification of its meaning.

same current, a fact already known since the experiments of Faraday in 1831.[937]
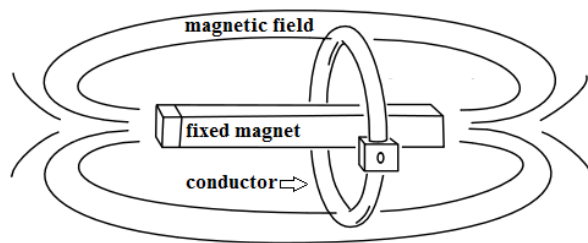
Fig. 1: stationary magnet produces no electic field; only a magnetic field
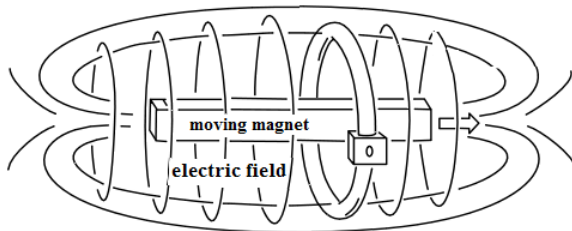
Fig. 2: magnet moving through conductor creates electric field around magnet

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[937] Maxwell had four equations: (1) δE = 4πρ (2) δƎ = 0 (3) δƎ = 4πj/c + 1/c δE/δt (4) δE = -1/c δƎ/δt. Ǝ is the magnetic field; *j* is the current flux; ρ is the charge density; E is the electric field. The two equations of interest here are (3) and (4), since they give different equations for finding the change in the magnetic field (equation 3) as opposed to the change in the electrical field (equation 4). Maxwell believed that ether was a material substance with elasticity, made up of vortices and what he called "idle wheels." Electricity and magnetism were created by a deformation of the vortices and the wheels. By the continual process of deformation and rotation of the wheels, electromagnetism could then be expressed by the four above equations.
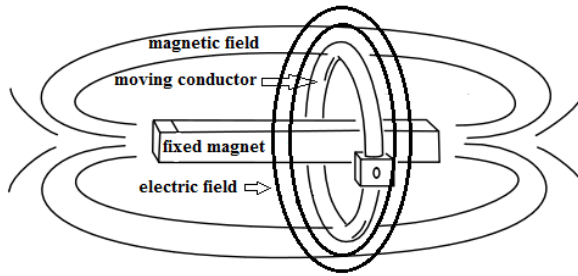
Fig 3: conductor moving over fixed magnet creates electric field around conductor

As Einstein puts it:

> Take, for example, the reciprocal electrodynamic action of a magnet and a conductor (see Fig. 1). The observable phenomenon here depends only on the relative motion of the conductor and the magnet, whereas the customary view draws a sharp distinction between the two cases in which either the one or the other of these bodies is in motion. For if the magnet is in motion and the conductor at rest (see Fig. 2), there arises in the neighborhood of the magnet an electric field with a certain definite energy, producing a current at the places where parts of the conductor are situated. But if the magnet is stationary and the conductor in motion (see Fig. 3), no electric field arises in the neighborhood of the magnet. In the conductor, however, we find an electromotive force, to which in itself there is no corresponding energy, but which gives rise – assuming the equality of the relative motion in the two cases discussed – of electric currents of the same path and intensity as those produced by the electric form in the former case.[938]

The conventional way of explaining this phenomenon was the following: if the conductor is moving toward a fixed magnet, the electrical charge in the conductor is pulled around the conductor by the force of the magnetic field. Conversely, if the magnet is moving toward the conductor, the increasing magnetic field produces an electric field that drives the charge around the conductor. Einstein apparently did not like this explanation. The reason is noted in the parenthetical statement he adds

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[938] "Zur Electrodynamik Bewegter Körper" ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 1.

toward the end of the above paragraph: "…assuming the equality of the relative motion in the two cases discussed…" If the "relative motion" is the same in both cases (that is, a conductor moving toward a stationary magnet or a magnet moving toward a stationary conductor are identical), Einstein assumed that the results should be identical, that is, in both cases the current produced should either always be around the magnet or always around the conductor, and not switch between the magnet and the conductor. Since the results were not identical, Einstein sought to find a reason, but he would do so assuming the principle of Relativity.[939]

Before we move on to discover how Einstein attempted to solve this problem, we can pause to point out that the relationship between the magnet and the conductor is analogous to the situation in Machian cosmology (and a cosmology with which Einstein agreed) wherein a rotating Earth in a stationary universe appears to be the same as a stationary Earth in a rotating universe. Since between the conductor and the magnet there seems to be a preferred place the electric current seeks depending on whether the conductor or the magnet is moving against the other, we would likewise say that there is also a preferred cosmology between the Earth and the universe, that is, of the two Machian cosmologies (a fixed Earth and rotating universe or a fixed universe and a rotating Earth) it would seem correct to postulate that the principles of the relation between electricity and magnetism discovered by Maxwell (and/or the principle between gravity and inertia), will reveal which of the two cosmologies is correct. After all, Einstein himself extrapolated principles from the results of the small-scale electromotive model and transferred them to the large-scale cosmological model since, by his own admission,

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[939] The electromagnetic field in Relativity is not merely two separate vectors (electricity and magnetism) but as components of a 4-dimensional tensor, such that a change in velocity is represented by the 4-dimensional rotation of the tensor. In any case, we would do well to pause here and remind ourselves that the difficulty that both Maxwell and Einstein faced was that neither of them knew the nature of the physical reality. They merely explained the results by mathematical equations. As mathematician Morris Kline states: "What is especially remarkable about electromagnetic waves…is that we have not the slightest physical knowledge of what electromagnetic waves are. Only mathematics vouches for their existence…The same observation applies to all sorts of atomic and nuclear phenomena. Mathematicians and theoretical physicists speak of fields – the gravitational field, the electromagnetic field, the field of electrons, and others – as though they were material waves which spread out into space and exert their effects somewhat as water waves pound against ships and shores. But these fields are fictions. We know nothing of their physical nature" (Morris Kline, *Mathematics: The Loss of Certainty*, p. 337).

this is precisely the connection he saw between Maxwell's equations and the Michelson-Morley experiment.[940]

Seeking support for Relativity and having a vested interest in denying the Earth as the immovable frame of reference, Einstein sought to explain both the Maxwell and the Michelson-Morley phenomena purely from a Relativistic standpoint so that it would make no difference whether the magnet or the conductor is at rest, or whether the Earth or the universe is at rest. Although a viable solution to contradictions created when kinematics and electromagnetism are mixed is a fixed Earth, Einstein did not want to accept that solution. Instead, he insisted there should be no absolute rest. In essence, this is the principal reason Einstein sought to eliminate the ether, since, as Maxwell's equations and Michelson-Morley's experiment dictated, ether will help us to choose which frame of reference is correct. The evidence, freely admitted but "ruled out" by Einstein, showed that the preferred frame of reference was a fixed Earth.

This solution is also admitted, in a roundabout way, by standard physics textbooks. As one text says:

> However, it appeared that Maxwell's equations did not satisfy the relativity principle. They were not the same in all inertial reference frames…Thus, although most of the laws of physics obeyed the relativity principle, the laws of electricity and magnetism…apparently did not. Instead, they *seemed to single out one reference frame that was better than any other – a reference frame that could be considered to be absolutely at rest*.[941]

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[940] As quoted above: "the unsuccessful attempts to discover any motion of the Earth relative to the 'light medium,' suggests that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest."

[941] Douglas C. Giancoli, *Physics: Principles with Applications*, first edition, 1980, p. 621; fifth edition, 1998, p. 795, emphasis added. Giancoli adds: "The question then arose: In what reference frame does light have precisely the value that is predicted by Maxwell's theory? For it was assumed that light, like other objects, would have a different speed in different frames of reference. For example, if an observer were traveling on a rocket ship at a speed of 1.0×10^8 m/s toward a source of light, we might expect that he would measure the speed of the light reaching him to be 3.0×10^8 m/s + 1.0×10^8 = 4.0×10^8 m/s. But Maxwell's equations have no provision for relative velocity. They merely predicted the speed of light to be $c = 3.0 \times 10^8$ m/s. This seemed to imply that there must be a special reference frame where c could have this value" (*ibid*).

Another text adds:

> "A more formal way of saying this is as follows: Maxwell's equations of electro-magnetism…contain the constant $c = 1/\sqrt{(\mu_o\varepsilon_o)}$ which is identified as the velocity of propagation of a plane wave in vacuum….But such a velocity cannot be the same for observers in different inertial frames, according to the Galilean transformations, so Maxwell's equations and therefore electromagnetic effects will probably not be the same for different inertial observers. But if we accept both the Galilean transformations and Maxwell's equations as basically correct, *then it automatically follows that there exists a unique privileged frame of reference*…in which Maxwell's equations are valid and in which light is propagated at a speed $c = 1/\sqrt{(\mu_o\varepsilon_o)}$."[942]

Einstein certainly had his problems to solve. If he was not going to accept a fixed Earth or ether, he then had to figure out how to deal with the two Maxwell equations that contained the speed of light. As noted above, the equations did not allow the speed to change (although Maxwell did not specify a vector to the electromagnetic field, rather, he merely said the field moved with respect to the ether). He also had to solve the paradox of Maxwell's equations with the Galilean understanding of space (also known as Galilean Relativity), which holds that if a stationary person observes a moving object then a second person who is in motion will observe a different velocity for the same object. In regard to the velocity of light, this means that the source's velocity or the observer's velocity will add to or subtract from the velocity of light. Maxwell's equations, however, state that each person will see the same velocity. Although no observed phenomena violated either Galilean or Maxwellian space, the theoretical contradiction between the two was apparent. It seemed there was one set of velocity rules for mechanics, and another set for electrodynamics.[943]

The first attempt to solve this problem was to postulate that Maxwell's equations are true only with respect to the ether, not the observer. Since waves need a medium to propagate (*e.g.*, sound waves, water waves), ether was the natural solution.[944] From Maxwell's

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[942] Robert Resnick and David Halliday, *Basic Concepts in Relativity and Early Quantum Theory*, 1985, p. 12, emphasis added.

[943] Equations 3 and 4 contain c in the denominator, which remains constant: (3) $\delta\exists = 4\pi j/c + 1/c\ \delta E/\delta t$ (4) $\delta E = -1/c\ \delta\exists/\delta t$.

[944] That Maxwell was a firm believer in the ether medium is noted in the following quote from him: "The interplanetary and interstellar spaces are not empty, but are

perspective, the ether will react differently with a moving magnet than it will with a fixed magnet, but it will adjust for the discrepancy by producing the same electric current. This takes into account that magnetism is velocity dependent, and thus directionally dependent within its absolute frame, the ether. Magnetism has no relationship to relative velocities. As such, magnetism has been the death knell for every cosmological perspective that failed to see the Earth as immobile, including Galilean relativity, Newtonian relativity and Einsteinian relativity.[945]

Still, Einstein did not like the "asymmetry" presented by the two different Maxwellian equations, even though they produced the same current. As he did to explain the results of the Michelson-Morley experiment, Einstein's solution to Maxwell's equations was to eliminate both the ether and absolute motion (the absolute motion of the magnetic field in the ether). This allows one to "relativize" the components so that one equation can be used for both cases. He makes this very suggestion in one of the last sentences of the Introduction to his 1905 paper:

> The introduction of a "luminiferous ether" will prove to be superfluous inasmuch as the view here to be developed will not require an "absolutely stationary space" provided with special properties, nor assign a velocity-vector to a point of the empty space in which the electromagnetic processes take place.[946]

In another place he writes:

> In setting up the Special Theory of Relativity, the following…idea concerning Faraday's magnet-electric induction played a guiding role for me….The idea, however, that these were two, in principle, different cases was unbearable for me. The difference between the two, I was convinced, could only be

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occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge" (*Scientific Papers of James Clerk Maxwell*, 1965, "Ether," p. 775).

[945] Magnetism, as opposed to gravity and electricity, is velocity dependent [E = v∃]. The force of magnetism is: $F = q_1q_2v_2 \times (v_1 \times r)/r^2$, where q = the electric charge.

[946] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, (1905, p. 2, as cited in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 38).

a difference in choice of viewpoint and not a real difference. Judged from the [moving] magnet, there was certainly no electric field present. Judged from the [ether] there certainly was one present. Thus the existence of the electric field was a relative one, according to the state of motion of the coordinate system used, and only the electric and magnetic field together could be ascribed a kind of objective reality, apart from the state of motion of the observer of the coordinate system. The phenomenon of magneto-electric induction compelled me to postulate the principle of relativity….The difficulty to be overcome lay in the constancy of the velocity of light in a vacuum, which I first believed had to be given up. Only after years of groping did I notice that the difficulty lay in the arbitrariness of basic kinematical concepts.[947]

We must understand the bind in which Einstein found himself: (a) the Michelson-Morley experiment has provided him with evidence that the Earth is not moving through ether; and (b) the property of magnetism requires that magnetism be understood as a velocity-vector phenomenon, but neither (a) nor (b) are "relativistic" events. Since Einstein believes a moving Earth is already proven, he must find a radical solution that will allow him to dispense with a motionless Earth and the vector-dependent state of magnetism. Einstein's solution, of course, is to do away with "absolute rest" altogether. Hence, there would be no fixed Earth, no fixed universe, no fixed magnet and no fixed conductor. All are in relative motion and there is no fixed frame of reference. It was the only way out of the dilemma. As Dingle recounts it in terms of his famous Cheshire cat:

…this was a direct contradiction of Maxwell's basic axiom…What Einstein was proposing, therefore, was to retain the finite velocity of light without the existence of any standard with respect to which that velocity had a meaning. Light consisted of waves, with a definite length, frequency and velocity, in nothing; it was the grin without the Cheshire cat….the fact that it could have been proposed at all is inexplicable until we remember the nature of the acceptance…so well expressed by Hertz – 'Maxwell's theory is Maxwell's system of equations.' The physical part of the theory was

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[947] "Fundamental Ideas and Methods of the theory of Relativity, Presented in Their Development," Collected Papers of Albert Einstein, Vol. 7, Doc. 31, as cited in John D. Norton's paper "Einstein's Investigations of Galilean Covariant Electrodynamics prior to 1905," p. 5.

expendable; only the equations needed to be saved. Einstein saw a way of saving the equations, and did not consider it worthwhile to 'explain' light…If his assumptions were granted he did save the equations, and when his theory ultimately made its general impact on the world, mathematics had so dominated physics that the non-existence of the Cheshire cat was regarded as a triviality; the grin remained, and all was well.[948]

So here was another case in which mathematics distorted the empirical evidence. As long as a temporary solution could be proffered by an equation, science would accept it and hope to figure out the actual physics sometime later (but never did). Einstein's math allowed him to relativize all the physical components and thus he turned the separate components of electricity and magnetism into "electromagnetism"; he turned the separate components of space and time into "space-time"; and he would then turn the components of acceleration and gravity into the one phenomenon of the "inertio-gravitational field," all by means of mathematical equations of which even he himself admitted that he didn't know whether they represented reality.[949]

"Spacetime's" originator was Hermann Minkowski:

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[948] *Science at the Crossroads*, pp. 155-156. Norton tries to explain the issue by noting that "if the magnet and conductor move together an extra complication enters. Because the conductor is now moving absolutely in a magnetic field, another part of Maxwell's theory tells us that a second electric current will be induced in the conductor. Remarkably that second current flows in the opposite direction to the one produced by the electric field and it turns out to cancel it out exactly. The upshot is that checking for an electric current in the conductor fails as a means of distinguishing the absolute rest of the magnet in motion…it is as if the electric field just isn't there for an observer moving with the magnet. But one at rest in the ether would say there is an electric field present" (Einstein's Pathway to Special Relativity," pp. 4-5). This is a special pleading that has no merit, since moving the magnet with the conductor is clearly a different case; and no claims of "moving absolutely" or "as if it isn't there" applications can be made. It is fallacious to deny the significance of two opposing currents simply by an appeal to an observer who has no senses to distinguish them. Norton's explanation is just another case that Relativity seeks to answer anomalies by making everything dependent on what the observer sees, not by what the reality dictates.
[949] One of Einstein's more famous quotes is: "As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality" (*Sidelights on Relativity*, Dover Publications, 1983, p. 28). Other quotes along these same lines are: "Do not worry about your problems with mathematics, I assure you mine are far greater"; "Mathematics are well and good but nature keeps dragging us around by the nose."

The views of space and time which I wish to lay before you have sprung from the soil of experimental physics and therein lies their strength. They are radical. Henceforth space by itself and time by itself are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.[950]

Hermann Minkowski
(1864 – 1909)

Indeed, they were "radical." So radical that they didn't make a bit of sense. Not even the mathematics could be called upon to make it work. As he did with Einstein's theory, Charles Lane Poor shows the fallacies of the Minkowski math:

Let us turn for a moment to some tenets that preceded the Einstein Theory of Relativity and led up to it. First comes the gloomy forecast of Minkowski that 'From henceforth [1908] space in itself and time in itself sink to mere shadows and only a kind of union of the two remains independent.' The layman is puzzled to know just what this sinking of space and time into mere shadows means, as also just what the union product is, and

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[950] From Minkowski's September 21, 1908 "Raum and Zeit" ("Space and Time") lecture in Cologne to the 80th Assembly of German Natural Scientists and Physicians, cited in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 75.

why the union has independence when its constituents have none.[951]

After instructing the reader on the Pythagorean theorem concerning the length of the hypotenuse (D) of right triangle, such that $D^2 = x^2 + y^2$ or $D = \sqrt{(x^2 + y^2)}$, Poor expands to $D = \sqrt{(x^2 + y^2 + z^2)}$ to show how the same principle applies to three dimensions. He writes:

> This equation, therefore, represents a definite, fundamental relation between the coordinates of point in ordinary space: the distance [D] is the same, no matter upon what system the individual measures are made. In the terms of the mathematician, D is *invariant*. Now Minkowski showed that, when the Lorentz transformation equations are used, there is a similar *invariant* quantity connecting the four coordinates necessary to locate an event in space and time. This quantity is $D' = \sqrt{(x^2 + y^2 + z^2 - c^2 t^2)}$ where c is the velocity of light and t, the interval of time between two events, and x, y, z, the ordinary three distance coordinates. Now Minkowski showed that, no matter in what direction the measures are made, no matter what system of coordinates be used, then D' always has the same value; it is *invariant*, absolute, and thus furnishes a definite and fixed relation between the space coordinates and the time coordinate…. This mathematical expression of Minkowski for a space-time interval corresponds closely to our ordinary expression for the distance between two objects, but not exactly. The term involving the time is preceded by a minus sign instead of a plus sign. The correspondence, however, can be made complete, if the time coordinate, ct, is replaced by the imaginary quantity $ct \times \sqrt{-1}$. This is a mathematical symbol for an imaginary quantity, for something we can neither visualize, nor conceive of. It is useless to attempt to illustrate or visualize the connection between time and space; the very mathematical symbol used to denote the form of the connection indicates the impossibility of our doing so. Thus the very mathematical symbol, used by the followers of relativity, indicates the purely imaginary character of all their reasoning. From these postulates and principles Einstein has built up his entire theory of relativity.[952]

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[951] *Gravitation versus Relativity*, p. xviii.
[952] *Gravitation versus Relativity*, pp. 40-44.

"If Michelson-Morley is wrong, then Relativity is wrong."

Albert Einstein[953]

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong." Albert Einstein[954]

"I am really more of a philosopher than a physicist."

Albert Einstein[955]

"…by the reading of David Hume's and Ernst Mach's philosophical writings….It is very well possible that without these philosophical studies I would not have arrived at the special theory of relativity."

Albert Einstein[956]

"General Relativity has passed every solar-system test with flying colors. Yet so have alternative theories." Clifford Will[957]

"Apropos of your characterization of Einstein, I think of him as the great paradox swallower; e.g., the velocity of light is independent of the velocity of the source, and also shares the velocity of the source; light is waves and also is particles. His technique for solving a problem is always to say that both of two contradictory explanations are true."

Herbert Ives[958]

"Thus, general relativity brings about its own downfall by predicting singularities."

Stephen Hawking[959]

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[953] Einstein's words to Sir Herbert Samuel on the grounds of Government House, Jerusalem, Israel, cited in *Einstein: The Life and Times*, p. 107.
[954] Cited in Alice Calaprice's, *The Expanded Quotable Einstein*, p. 315.
[955] Einstein's words to Leopold Infeld, *Quest – An Autobiography*, p. 258.
[956] Letter to Carl Seelig, as cited in *Albert Einstein—A Documentary Bibliography*, p. 67, cited in Max Jammer's *Einstein and Religion*, pp. 40-41.
[957] Clifford Will, "The Confrontation Between Gravitation Theory and Experiment," *General Relativity: An Einstein Centenary Survey*, ed., Stephen W. Hawking, 1979, p. 62.
[958] Letter from Herbert Ives to Butterfield, March 19, 1953, cited in *The Einstein Myth and the Ives Papers*, eds. Dean Turner and Richard Hazelett, p. 219.
[959] *Black Holes and Baby Universes*, p. 92.

Chapter 5

More Experiments Point to Geocentrism

There has been much debate about whether the Michelson-Morley experiment was correctly interpreted. The 1887 experiment found fringe shifts that corresponded to about a 5 km/sec speed of ether against the Earth, but since Michelson and Morley assumed the Earth was already moving at 30 km/sec around the sun, they reasoned the experiment should have shown fringe shifting equating to a speed of at least 30 km/sec. Since the results were a mere fraction of that value, they interpreted them as "null" and concluded there was no appreciable ether movement against the Earth and no impedance of the light beams in their experiment. Please note here that, based on their presupposition of a moving Earth (which had not been proven, only assumed) they confidently made their conclusions. Obviously, if the Earth were not moving, Michelson and Morley's conclusions would be totally erroneous. As we noted earlier from Whitrow:

> It is both amusing and instructive to speculate on what might have happened if such an experiment could have been performed in the sixteenth or seventeenth centuries when men were debating the rival merits of the Copernican and Ptolemaic systems. The result would surely have been interpreted as conclusive evidence for the immobility of the Earth, and therefore as a triumphant vindication of the Ptolemaic system and irrefutable falsification of the Copernican hypothesis. The moral of this historical fantasy is that it is often dangerous to believe in the absolute verification or falsification of a scientific hypothesis. All judgments of this type are necessarily made in some historical context which may be drastically modified by the changing perspective of human knowledge.[960]

The 5 km/sec shows that at least *something* was present for which they had to give an explanation, for vacuums in space do not give such resistances.[961] In addition, since this *something* is moving at a rate much

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[960] G. J. Whitrow, *The Structure and Evolution of the Universe*, 1949, 1959, p. 79.

[961] We pause to note that 5 km/sec is a rough average accumulated by the interferometer experiments. We use 5 because it correlates to Michelson's statement that the speed was "one sixth" of 30 km/sec. This value fluctuates

less than 30 km/sec, they must explain how this entity could cause such noticeable effects upon *all* subsequent interferometer experiments if the Earth was not moving through it. As physicist Héctor Múnera observes: "…what then is the origin of the small amplitude (hence, small laboratory velocity) observed by Michelson-Morley?....This is the remaining puzzle in the whole story."[962] It would have been much easier for them if the experiment had registered zero km/sec instead of five, since the former figure would have easily allowed them to claim that ether did not exist. In fact, Einstein's whole theory of Relativity is based on the supposition that there is *nothing* in outer space, and thus the theory requires that there be an interferometer result with absolutely no fringe shifting corresponding to a speed of zero km/sec. If the Earth doesn't move and yet there is any fringe reading above zero, no matter how small, this should immediately nullify Relativity theory.

What we will find in virtually all of the interferometer experiments is this: the experimenters took advantage of the fact that since 5 km/sec was much closer to zero km/sec than it was to 30 km/sec, this difference was used to justify eliminating a material ether for their new cosmological concepts. Consequently, each time an interferometer experiment was performed subsequent to 1887, the experimenters would give the same interpretation that Michelson and Morley gave, *i.e.*, no appreciable ether movement against the Earth. Nobody paid any attention to, or didn't know what to do with, the single-digit movement of the ether found in all the experiments, since, obviously, they were all convinced that the Earth was moving through space and that its 30 km/sec speed around the sun made

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depending on the latitude and altitude of the apparatus, as it should in principle. Apparatus closer to the equator should register higher speeds, whereas those at the poles should register near zero. Similarly, lower altitudes should register slower speeds.

[962] Héctor Múnera, "The Evidence for Length Contraction at the Turn of the 20th Century: Non-existent," in *Einstein and Poincaré: The Physical Vacuum*, p. 89. Múnera, being a heliocentrist, still believes that "the earth moves with a net velocity V equal to the vector addition of V_s and V_0, the orbital velocity of earth around the sun." Seeking for a non-relativistic solution to the anomaly, he thus looks for "what changes, if any, would the design of the Michelson-Morley experiment require?" and answers it by postulating that Michelson-Morley's "expectations" need to be "recalculated for the net V," implying that Michelson and Morley did not calibrate their findings correctly (*ibid.*, p. 95). Later he adds: "Hence, all Michelson-Morley-type experiments up to 1930 that used the same incorrect data gathering process were bound to obtain apparent earth speeds that were too low" (*ibid.*, p. 100). Suffice it to say that it is highly unlikely that "all" the inferometer experiments could be wrong, since they were all capable of measuring even the minutest deviations in light's speed.

the 5 km/sec fringe shifts totally insignificant. Lorentz, for example, attempted to attribute the 5 km/sec to experimental errors, stating: "If we make the necessary correction, we arrive at displacements no greater than might be masked by errors of observation."[963] The same kind of objections are voiced today. But here is the reality: if something substantive constitutes space and is causing the consistent single-digit readings, then there is no "error of observation." As **Charles Lane Poor** stated:

> The Michelson-Morley experiment forms the basis of the relativity theory: Einstein calls it decisive…if it should develop that there is a measurable ether-drift, then the entire fabric of the relativity theory would collapse like a house of cards.[964]

Scientific experiments are all a matter of interpretation and perspective. If the scientist comes to the experiment with various presuppositions and prejudices that are not true, this will turn even the most accurate experiment into an exercise in futility. We have already cited Arthur Eddington's admission: "There are no purely observational facts about the heavenly bodies…it is only by theory that they are translated into knowledge of a universe outside." The Michelson-Morley experiment brought this truth out better than any other, since its results were so devastating to science. As Clark reveals:

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[963] "Michelson's Interference Experiment," H. A. Lorentz, cited in *The Principle of Relativity*, 1952, p. 4.
[964] *Gravitation versus Relativity*, p. 261.

It [Michelson-Morley] suggested, furthermore, that the best path to be followed might not be that of observation followed by the induction of general laws, but the totally different process of postulating a theory and then discovering whether or not the facts fitted it. Thus a theory should start with more scientific and philosophical assumptions than the facts alone warranted. A decade later the method was to provide the startling results of the General Theory.[965]

Blinded by the unproven premise of heliocentrism, scientists would resort to all kinds of twisted and *ad hoc* explanations of the factual data and make up extravagant new theories as they went along, concocting bizarre concepts that brought common sense, and even personal sanity, to the brink of destruction. It was as if a pandemic disease had spread across the landscape, and hardly any scientist would escape its grip. Science was now working by this simple syllogism:

Major Premise:	It is self-evident the Earth moves.
Minor Premise:	No interferometer has ever measured such movement.
The Conclusion:	Earth moves, matter shrinks, time dilates, and neither ether nor absolute motion exist. Everything is relative. Case closed.

We see this even among some of Einstein's critics. Max von Laue, who had critiqued the use of $E = mc^2$ by noting that Einstein arbitrarily eliminated kinetic energy, was still sold on the idea of Relativity and, like Einstein, never gave a thought to a fixed-Earth to explain the perplexing results from various experiments. For example, in reference to the Trouton-Noble experiment, which attempted to show that electrically charged plates would assume a position of least resistance caused by the Earth's movement, von Laue writes:

Thus it appeared reasonable that an electrically charged condenser… would assume a particular orientation relative to the velocity of the Earth, the one in which the angular momentum vanishes. This conclusion is inescapable in Newtonian mechanics. However, in 1903 Fr. T. Noble and H. R. Trouton searched for this effect in vain, and even the more accurate repetition of their experiment by R. Tomaschek (1925-26)

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[965] *Einstein: The Life and Times*, pp. 126-127.

showed no trace of the effect. Their result is just as convincing a proof of the principle of relativity as Michelson's interference experiment. Both of these experiments proved the necessity for a new mechanics; Michelson's experiment because it showed the contraction of moving bodies in the direction of motion, and the experiment of Trouton and Noble because it showed that an angular momentum does not necessarily lead to a rotation of the body involved…. Thus, a new epoch in physics created a new mechanics…it began, we might say, with the question as to what effect the motion of the Earth has on physical processes which take place on the Earth…we can assign to the dividing line between epochs a precise date: It was on September 26, 1905, that Albert Einstein's investigation entitled "On the Electrodynamics of Bodies in Motion" appeared in the *Annalen der Physik*.[966]

One might think that if the plates showed "no trace of the effect" that a reasonable conclusion would be that there was no angular momentum from a moving Earth against which they had to orient themselves. But having accepted Copernicanism as gospel, von Laue is led to the incredible conclusion that "angular momentum does not necessarily lead to a rotation of the body involved." Rather than question Copernicanism, von Laue would rather modify one of the most sacrosanct principles of physics, and one that had never heretofore been disproved by anyone – the law of angular momentum. Here we see that an intelligent man will not save himself and the science of physics a degree of self-respect by perhaps considering that a possible reason Trouton-Noble's results were negative was that the Earth was motionless, thus showing quite clearly how presuppositions hold ultimate sway over reasonable conclusions.

Accordingly, when Relativistic scientists consistently saw the 5 km/sec results of virtually all the interferometer experiments, we invariably see the following conclusion written in their textbooks: "These results are consistent with the Special Theory of Relativity." Thus everyone thinks that the theory has been verified countless times. But the only thing that has been verified is that Relativists continue to think the Earth is moving without any physical proof that it is actually doing so. Moreover, since Special Relativity was invented to compensate for the fact that the interferometer and other experiments were showing that the Earth wasn't moving (or, either it or the ether was moving at 5 km/sec instead of the required 30+ km/sec), happily, but presumptuously, they concluded

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[966] *Albert Einstein: Philosopher-Scientist*, pp. 522-523.

that each subsequent experiment which showed a 5 km/sec result (or thereabouts) would invariably be interpreted as "consistent with the Special Theory of Relativity." In short, this became a vicious circle of self-attestation. The sad fact is there seems to be no escape from this viciousness, unless, of course, there comes about the same overhaul of physics to the same degree that Special Relativity foisted itself upon the world in 1905. Returning to a motionless Earth in the center of the universe is just such an overhaul. We will examine this more in later chapters. For now, we will trace the history of the interferometer experiments subsequent to the writing of Einstein's 1905 paper that reported the same "null" results as those done prior to 1905.

Interferometer Experiments Subsequent to 1905

In 1926 Roy Kennedy performed an experiment, placing an interferometer in a pressurized metallic chamber at a high altitude but it yielded what he interpreted as "null" results, and in 1932 he wrote a paper with Edward Thorndike on those results.[967] In 1926 the experiment by A.

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[967] R. J. Kennedy at the Conference on the Michelson-Morley Experiment held at Mount Wilson Observatory, Feb. 4-5, 1927, in *The Astrophysical Journal* 68, 1928, 367-373; R. J. Kennedy, "A Refinement of the Michelson-Morley experiment," Proc. National Academy of Science, 12, 621-629, 1926; R. J. Kennedy and E. M. Thorndike, *Experimental Establishment of the Relativity of Time*, *Physical Review* 42, 1932, 400-418. They used an interferometer similar to Michelson's but with different arm lengths and none at right angles to the others. They also kept the apparatus at 0.001 degree Celsius, as well as using photographs of the fringes for calibration. Kennedy and Thorndike are quite transparent, however, in their bias towards Relativity, stating: "With the apparatus finally employed, we have shown that there is no effect corresponding to absolute time unless the velocity of the solar system in space is no more than about half that of the Earth in its orbit. Using this null result and that of the Michelson-Morley experiment we derive the Lorentz-Einstein transformations, which are tantamount to the relativity principle….there can be little doubt that the experiment yields a strictly null result." Perhaps Kennedy's choice of language, "there can be little doubt" betrays the fact to the keen observer that, unless their result was zero, then at least a "little doubt" exists as to whether there, was, in fact, a completely null result. In actuality, Kennedy and Thorndike did not find a "null" result, but one which showed a resistance (*i.e.*, the ether moving against the Earth) at "10 ∀ 10 km per sec," which in terms of these kinds of experiments, is not "scarce" at all. So how did they justify interpreting this as a "null" result? They did so by comparing their results against the hypothesized speed of receding nebulae: "In view of relative velocities amounting to thousands of kilometers per second known to exist among the nebulae, this can scarcely be regarded as other than a

Piccard and E. Stahel at Mt. Rigni also produced what they understood as a "null" result.[968] In 1927, K. K. Illingworth improved the sensitivity of

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clear null result; it is of the same order of precision as that of the Michelson-Morley experiment." Múnera adds: "since Kennedy was looking for shifts produced by 90° rotations from a reference position, equation $D_A = 2A\cos 2\omega_N$ tells that, if RA points north, the expected shift tends to zero when $\cos 2\ \omega_N \approx 0$, *i.e.*, when ω_N is close to being a multiple of 45°. For September 16 at Pasadena this occurs four times during the day, around 02:30, 08:50, 17:05 and 18:30 local apparent time….Kennedy says that 'the experiment was performed….at various times of day, but oftenest at the time when Miller's conclusions require the greatest effect' which for 'the middle two weeks of September, when the present work was done corresponds to local solar times varying from 6:30 A.M. to 5:30 A.M' (Kennedy, p. 628). This time period seems to be midway between 02:30 and 08:50, but Kennedy does not explicitly state the *initial* orientation of his interferometer, so that we cannot draw any definite conclusions" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, p. 46).

[968] Lynch writes: "…a series of experiments of Professor Piccard of Brussels which at first failed to show, even at the summit of the Rigi, at over six thousand feet of altitude, an ether wind of more than one and a half kilometers a second. Experiments by balloon gave a very different result, the ether wind at eight thousand feet being nine kilometers a second" (*The Case Against Einstein*, p. 45). Galaev reports that the results were 7 km/sec and that the team concluded that "We cannot discuss Miller's result on the basis of this experimental series, as our measurement's accuracy is just on the border of Miller's observations" ("Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 213). Galaev's observation will become more meaningful when we address Miller's results. Analyzing Piccard's data, Múnera writes: "From 96 turns of an interferometer in a balloon over Belgium they obtained a speed of 6.9 km/s with a probable error of 7 km/s. According to conventional statistical practice, the result simply means that at 50% confidence level the true speed is in the interval from 0 to 13.9 km/s. Moreover, there is no reason to believe that one particular value (say, 0 km/s, or 13 km/s) is more likely than another. Then, Piccard and Stahel result is completely consistent with those of Miller….They repeated the experiment in Brussels. Their results are (translating from the French) '60 turns of the apparatus produced an average displacement of 0.0002 ± 0.0007 fringes, which are incompatible with Miller's results.' Not so. Using equations $V = V_0 \sqrt{(|D| /D_R)} = C \sqrt{|D|}$ and $V_0 = V_I$ for $D = D_0$ for their equipment, we get 1.7 ± 3.1 km/s. Assuming that 3.1 km/s was a probable error (as in the balloon experiment), a one-tailed test says that [the] true speed was lower than 9.3 km/s at 95% C.L. Again, compatible with Miller's results. Brylinski long ago criticized the interpretation of Piccard and Stahel on similar grounds (E. Brylinski, "Sur la vitesse relative de la terre et de éther avoisinant," *Comptes Rendus* 184, 1927, 192-193). They unconvincingly

Kennedy's device but still produced a "null" result.[969] Although not an interferometer experiment, nevertheless, in 1927, Pieter Zeeman's work with the speed of light in different materials showed similar null results.[970]

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replied thus (our translation): 'all our measurements have given ether winds lower than the probable error of our measures, so that we cannot conclude in favor of Miller, as Brylinski does' (A. Piccard and E. Stahel, "Sur le vent d éther," *Comptes Rendus*, 184, 1927, 451-452….Piccard and Stahel repeated the experiment at Mt. Rigi in Switzerland. From 120 turns of the interferometer they found (translating from French): 'a sinusoidal curve whose amplitude is 40 times smaller than the curve that Miller would have predicted, all these within the limits of our probable errors….this curve corresponds to an ether wind of 1.45 km/s' ("L absence du vent d ether au Rigi," *Comptes Rendus*, 185, 1927, 1198-1200). Again, note [third systematic error]. Also, this is not a zero speed. Unfortunately, they did not report the probable error" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Jan.-April 1998, p. 45).

[969] K. K. Illingworth, "A repetition of the Michelson-Morley experiment using Kennedy's refinement," *Physical Review*, 30, 692-696, 1926. Múnera writes: "…most papers exhibit an inconsistency between observation (a non-zero velocity) and interpretation (a null result). This paper is no exception….As usual in other papers, a high experimental resolution is suggested by quoting small fringe-shifts. However, Illingworth's Table I immediately tells us that the quoted sensitivity (1/1500 to 1/500 fringe-shift) is not that good: 3 to 5 km/s. This velocity resolution is from 10% to 17% of the velocity to be measured! (Not an excellent resolution as suggested by the experimenters)….As noted…for the Piccard and Stahel case, the standard interpretation of statistical errors is that the true ether velocity is within the error bounds at some specified C.L. For instance for session 1A at 11 a.m., the average velocity is 2.12 km/s, the true velocity being between 0.89 and 3.35 km/s at 50% C.L. Of course, for higher confidences the uncertainty band is wider. Similarly for the other seven sessions. Clearly, Illingworth's results were not null. However, Illingworth was not very certain as to what the interpretation should be, as exemplified by the following rather obscure paragraph from his conclusions: 'Since in over one half the cases the observed shift is less than the probable error the present work cannot be interpreted as indicating an ether drift to an accuracy of one kilometer per second' (page 696)" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, pp. 46-47).

[970] Jozef Wilczynski writes regarding Zeeman's experiments: "They are proper ones to find or test the speed V of the Earth's surface with respect to an ether. The results deny the existence of such a speed" (*Toth-Maatian Review*, November 1994, as cited in *The Biblical Astronomer*, Vol. 4, No. 67, 1994). Moreover, Zeeman's experiments are 'first order' in that they are designed to measure the Earth's speed divided by the speed of light, that is v/c, as opposed to 'second

In 1926-1929, Albert Michelson teamed up with F. G. Pease and F. Pearson and declared again that he produced a "null" result.[971] In 1930, Von Georg Joos conducted the final *optical* interferometer test and reported that he found the same "null" result.[972] After Joos, those

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order' experiments which measure v^2/c^2. Zeeman's experiment appears in *Arkhs. Nederl. Sci.* 10, pp. 131-220. See also "Zeeman Effect in Astrophysical Spectra," *Observatory*, No. 850, 69, June 1949, p. 110; "Solar Flares and Zeeman Effect," *Nature*, 164, August 1949, p. 280.

[971] A. A. Michelson, F. G. Pease and F. Pearson, "Repetition of the Michelson-Morley experiment," *Nature* 123, 1929, 88. Also printed in *Journal of the American Optical Society* 18, 1929, 181-182. Múnera responds: "They reported their findings in a sketchy paper with no error bounds, concluding that: 'The results gave no displacement as great as one-fifteenth of that to be expected on the supposition of an effect due to a motion of the solar system of three hundred km/s' (paper in *Nature*). Since they report a relative displacement, the corresponding solar velocity is then $300(1/15)^{1/2} = 77.5$ km/s, which is not null by any means. In the JOSA paper, they say that the relative displacement was one-fiftieth (= 1/50, a misprint?), leading to a solar velocity of 42.4 km/s. Again, a clearly non-null speed" (H. Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, & Compatibility with Absolute Space," *Apeiron*, v. 5, Nr. 1-2, Jan-Apr 1998, p. 48).

[972] G. Joos, "Die Jenaer Wiederholung des Michelsonversuchs," *Annalen der Physik S.* 5, vol. 7, No. 4 (1930), 385-407. Joos used a quartz-based optical interferometer placed in a vacuum-metallic chamber with photographic detectors. He found that the "required" ethereal wind did not exceed a value of 1 km/sec. One reason Joos' results may have been low, as posited by V. A. Atsukovsky, is that the electrons in Joos' metal covering created a Fermi surface and thus partially shielded the apparatus from the ether's movement. He writes: "It is the same as making the attempt to measure the wind, which blows outdoors, looking at the anemometer in a closed room" (Yuri Galaev, "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 212, translation improved). Galaev concludes: "The known works…cannot be ranked as experiments which could confirm or deny Miller's results [or] confirm or deny the hypothesis about the ether's existence in nature." Múnera adds: "…Joos' curves for individual measurements do not need to have the same amplitude and shape. Indeed, Joos observed such differences (see his figure 11, page 404). Unfortunately, Joos did not expect such variations (again, another instance of systematic error #2), so that he rejected all large amplitudes as due to experimental errors (he particularly mentions session 11 at 23:58). From smaller amplitudes, Joos obviously obtained a small velocity that he reported (translating from German) as 'an ether wind smaller than 1.5 km/s' (page 407). Even then, this is not a zero velocity" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, pp. 48-49).

interested in testing the "null" results switched to resonators, lasers, masers and other such sophisticated equipment.

In 1960 the team of Charles Townes and John Cedarholm tested the frequencies of microwaves emitted from two ammonia masers discharged in opposite directions, interchanging their positions every 24 hours. They reported a "null" result. In 1964, a team headed by T. S. Jaseja did a revision of Michelson-Morley's using lasers as the two sources of light, providing sharper lines to the fringe shifts. The results were again interpreted as "null."[973] In 1969 Jacob Shamir and R. Fox did an

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Robert Shankland categorized the experiments from Michelson to Joos in a 1955 article. He separates them into "Fringe Shift Expected" (FSE) and "Fringe Shift Measured" (FSM). The results he records are as follows:

1881 Michelson: FSE: 0.04, FSM: 0.02 [r = 50%];
1887 Michelson-Morley: FSE: 0.4, FSM: <0.01 [r = 2.5%];
1902-04 Morley-Miller: FSE: 1.13, FSM: 0.015 [r = 1.3%];
1921 Miller: FSE: 1.12, FSM: 0.08 [r = 7.1%];
1923-1924 Miller: FSE: 1.12, FSM: 0.03 [r = 2.6%];
1924 Miller (sunlight): FSE: 1.12, FSM: 0.014 [r = 1.2%];
1924 Tomascheck: FSE: 0.3, FSM: 0.02 [r = 6.62%];
1925-26 Miller: FSE 1.12, FSM: 0.088 [r = 7.8%];
1926 Kennedy: FSE: 0.07, FSM: 0.002 [r = 2.8%];
1927 Illingworth: FSE: 0.07, FSM: 0.0002 [r = 0.28%];
1927 Piccard and Stahel: FSE:0.13, FSM: 0.006 [r = 4.6%];
1929 Michelson: FSE: 0.9, FSM: 0.01 [r = 1.1%];
1930 Joos: FSE: 0.75, FSM: 0.002 [r = 0.26%]

(R. S. Shankland, et al., *Review of Modern Physics* 27:2, 167-178 (1955), my ratios supplied in brackets. Except for Illingworth and Joos, whose results may be accounted for by Atsukovsky's explanation; and Michelson's 1881 effort which Lorentz discounted, all the other experiments show a ratio of FSE:FSM ranging from 1.1% to 7.8%, which means that all the experiments were basically seeing the same thing – a slight ether drift within the same parameters. Interestingly enough, the 1887 Michelson-Morley has a FSE:FSM ratio of 2.5%, and here Shankland inserts "8 km/sec" as the "Upper Limit on Velocity of Ether." Although he shows no other "Upper Limit" values except for Illingworth at "1 km/sec," we would assume that the higher the ratio the higher the ether velocity. Proportionately, then, Miller's 1925 ratio of 7.8% would correspond to his findings of "10 km/sec."

[973] T. S. Jaseja, A. Javan, J. Murray and C. H. Townes, "Test of Special Relativity or of the Isotropy of Space by use of Infrared Masers," *Physical Review* 1, 133a: 1221-1225, 1964. The team used two Helium-Neon microwave masers mounted perpendicularly on a rotating table and recorded the periodic frequency between the two. They found that the frequency shift between the two masers was 275

Name	Year	Arm length (meters)	Fringe shift expected	Fringe shift measured	Experimental Resolution	Upper Limit on V_{aether}
Michelson	1881	1.2	0.04	0.02		
Michelson and Morley	1887	11.0	0.4	< 0.01		8 km/s
Morley and Morley	1902–1904	32.2	1.13	0.015		
Miller	1921	32.0	1.12	0.08		
Miller	1923–1924	32.0	1.12	0.03		
Miller (Sunlight)	1924	32.0	1.12	0.014		
Tomaschek (Starlight)	1924	8.6	0.3	0.02		
Miller	1925–1926	32.0	1.12	0.088		
Mt Wilson)	1926	2.0	0.07	0.002		
Illingworth	1927	2.0	0.07	0.0002	0.0006	1 km/s
Piccard and Stahel (Rigi)	1927	2.8	0.13	0.006		
Michelson et al.	1929	25.9	0.9	0.01		
Joos	1930	21.0	0.75	0.002		[974]

experiment similar to Michelson-Morley using a laser-based optical system with a sensitivity of determining fringes to within 0.00003 of a fringe width. They report a "null" result but with an upper limit to the ether's velocity against Earth of 6.64 km/s,[975] (which, again, is very close to the 5 km/sec found by Michelson and Morley). In 1970, R. Latham and J. Last performed a similar set of experiments and claimed to have produced a "null" result.[976]

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cycles/second, and they put an upper limit on the anisotropy of space at 30 m/sec. Prior to this C. H. Townes did a maser oscillator experiment in 1958, with similar results (*Physical Review Letters* 1, 352, 1958). See also Alan Kostelecký, "The Search for Relativity Violations." Speaking of the same helium-neon masers, he writes: "Exceptional sensitivity to relativity violations has also been achieved in clock-comparison experiments….These experiments have attained the remarkable sensitivity of 10-31….Various clock-comparison experiments with atoms as clocks have been performed at other institutions, achieving sensitivities of 10^{-27} to 10^{-23} for different types of relativity violations involving protons, neutrons and electrons" (*Scientific American*, Sept. 2004, p. 100).

[974] Chart from Wikipedia article showing each experiment had a positive result, although not what would be expected if the Earth were moving around the sun at 30km/sec (http://en.wikibooks.org/wiki/Special_Relativity/Aether). The chart fails to record the ether velocities from Morley-Miller, Miller, Piccard, Michelson, et al, which all range from 5 to 10 km/s.

[975] J. Shamir and R. Fox, *Il Nuovo Cimento* 62B, No. 2, 1969, p. 258.

[976] R. Latham and J. Last, *Proceedings of the Royal Society of London*, A320, 131, 1970.

Author	Year	Description	Upper bounds
Louis Essen[21]	1955	The frequency of a rotating microwave cavity resonator is compared with that of a quartz clock	~3 km/s
Cedarholm et al.[22][23]	1958	Two ammonia masers were mounted on a rotating table, and their beams were directed in opposite directions.	~30 m/s
Mössbauer rotor experiments	1960 –63	In a series of experiments by different researchers, the frequencies of gamma rays were observed using the Mössbauer effect.	~3–4 m/s
Jaseja et al.[24]	1964	The frequencies of two He–Ne masers, mounted on a rotating table, were compared. Unlike Cedarholm et al., the masers were placed perpendicular to each other.	~30 m/s
Shamir and Fox[25]	1969	Both arms of the interferometer were contained in a transparent solid (plexiglass). The light source was a Helium–neon laser.	~7 km/s
Trimmer et al.[26][27]	1973	They searched for anisotropies of the speed of light behaving as the first and third of the Legendre polynomials. They used a triangle interferometer, with one portion of the path in glass. (In comparison, the Michelson–Morley type experiments test the second Legendre polynomial)[A 24]	~2.5 cm/s

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In 1979, Alain Brillet and J. L. Hall repeated Jaseja's experiment with even more precision and reported that they also found "null" results.[978] Of course, although all of these experiments found the same "null" results, no one was giving consideration to the fact that a perfectly viable

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[977] http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment

[978] Brillet and Hall report: "Rotation of the entire electro-optical system maps any cosmic directional anisotropy of space into a corresponding frequency variation. We found a fractional length change $\Delta l / l = (1.5 \pm 2.5) \times 10^{-15}$, with the expected $P_2 (\cos \theta)$ signature. This null result represents a 4000-fold improvement on the best previous measurement of Jaseja *et al*" (*Physical Review Letters* 42, 549-552, 1979. H. C. Hayden disputes these null results, saying they originate from the way data has been interpreted (Hayden, *Galilean Electrodynamics* 1, 1990, pp. 10-71). Accordingly, Brillet and Hall also reported a frequency shift of 17 Hz, which was double the rotation rate of the interferometer table, but which they could not explain and left it as an "unknown." Later, others interpreted the 17Hz result as due to "the rotation of the Earth" (Aspden, *Physical Letters* 8, No. 9, 1981, p. 411). This "interpretation," of course, begs the question, since a rotating Earth has not been proven, subsequently leaving ether, in slight movement against Earth, to answer the discrepancy. Their difficulty, interestingly enough, leads right to the "ether entrainment" theory, that is, that a dynamic ether exists but remains with Earth, since Earth is imbedded in it. This leaves room for an explanation of the 1913 Sagnac interferometer experiment, which we will address later. In light of Brillet and Hall's results, some scientists have begun to speak of "quantum ether." In 1990 Hils and Hall did a similar experiment but with lasers mounted to the Earth for greater stability, and found the same results as Brillet and Hall (*Physical Review Letters* 64 (1990), p. 1697). In any case, Galaev reports that the reason those after Joos kept seeing a "null" result was due to the use of metal chambers. Since most of the experiments used gamma radiation as the light source, the experimenters covered their apparatus with metal to protect themselves from harm. Dayton Miller, whom we will address later, warned of using metal chambers for this very reason (Yuri Galaev, "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 212).

interpretation was that the Earth was standing still against a slow moving ether. Due to the popularity of Einstein's Relativity theory, all the interpretations sought to maintain a moving Earth without ether.

The Geocentrism Connection

Before we analyze those results, let us address the important question of what a positive result to the interferometer experiments means for both the theory of Relativity and the concept of a stationary Earth. On the one hand, a positive result would completely destroy Einstein's theory of Relativity, since it would show that: (1) ether exists, and (2) either the ether or the Earth serves as the absolute reference frame by which all motion can be measured. As Einstein himself said: "If Michelson-Morley is wrong, then relativity is wrong."[979] It would mean that science has no rebuttal to the very experiment designed to show that the Earth was moving. It would mean that most, if not all, current physics would literally have to go back to the drawing board. But since modern science has put so much stock in Relativity, it has, to put it mildly, a vested interest in preferring a "null" result to the interferometer experiments. At the same time, however, each verification of a "null" result leaves open an equally viable interpretation, that is, the Earth is not moving. Obviously, then, with regard to "null" results from an interferometer, modern science is in a *Catch-22* situation.

On the other hand, a positive result could mean one of two things regarding the Earth. It could mean either that the Earth was traveling through the ether, or it could mean that Earth was stationary, and the ether was slowly moving against it. To support Copernicanism, modern physics could opt for the former, but this choice would automatically negate Relativity theory – a cherished commodity that few, if any, were willing to give up. A negative or null result, as we have seen, meant that physics had to find a reason why the speed of light was not impeded as it traveled in the direction of the Earth's apparent motion through the ether. Lorentz and Fitzgerald tried to solve this problem by saying that the apparatus measuring the speed of light contracted and thus wasn't able to measure any difference in speed. Einstein's solution was to dispense with the ether and say that there was no difference in light's speed. But neither Lorentz nor Einstein ever had to face *positive* results from an interferometer, or, as the history of interferometer experiments show, they made a concerted effort to deny or trivialize any positive results. If the result turned out to be

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[979] Stated to Sir Herbert Samuel on the grounds of Government House, Jerusalem (*Einstein: The Life and Times*, p. 107).

positive, it would have made a laughing stock of the hypothetical contortions into which science allowed itself to fall when they thought the results were negative (*e.g.*, contracting matter, time dilation, twins aging at different rates, etc).

What about the Copernican Non-Relativists?

From another angle, perhaps we should not be so hard on the Relativists, for the non-Relativists also believe that the Earth moves even though they accentuate the positive results of the interferometer experiments against the Relativist's wish for negative results. It comes down to this: on the one hand, the non-Relativists are correct in their critiques of the illogical nature and absurd results of Relativity theory, but they have little in the way of proving their own position, since they cannot find irrefutable evidence for the elusive ether (that is, they only see effects, not substance) – an absence that has plagued their case since the time of Newton, Fresnel and Maxwell. Having no proof of ether, and having no immobile Earth, the non-Relativists are in almost as much of a dilemma as the Relativists, since wishing for absolutes is not nearly the same as possessing them. Notice how one non-relativist expresses this "wish":

> The relativists talk about accelerative (inertial) forces applying to some body when that body speeds up relative to some highly tangible reference, namely, all the mass in the universe [as did Einstein and Ernst Mach]. All that is necessary to convert this reference frame is to identify some representative central position for all mass, with respect to which inertial forces in accelerating bodies actually occur. Our knowledge of the universe does not at present permit one to say precisely how to define this representative central position. But one possibility that presents itself *is that of the centroid of the universe (center of mass), the point at which the universe would balance if the universe could somehow be weighed*. But the precise definition of this representative central position of all matter is not needed in order to suppose that it exists as physically relevant, as the reference point with respect to which all accelerations occur.[980]

Suffice it to say that, geocentrism holds precisely to what Turner envisions as the solution to the "Relativity" problem, only it is Earth that is the "centroid of the universe (center of mass), the point at which the

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[980] Dean Turner in *The Einstein Myth*, Part 1, p. 39, emphasis added.

universe could balance if…weighed." That's why Earth doesn't move. As we noted earlier, contrary to popular opinion, Newton's laws of motion do not hold that the smaller body will necessarily revolve around the larger body; rather, both bodies will revolve around the "center of mass." If there are more than two bodies involved, then all the bodies, even if there are trillions of them, will all revolve, in some way, around the center of mass.[981] Hence, if we could "weigh" all the bodies of the universe, they would have one center of mass. It is no stretch of logic to say that the center of mass would be in the approximate center of all the masses; and thus, there is one central point in the universe upon which all the bodies of the universe revolve. That being the case, there is absolutely no reason why that central point cannot have Earth as its base.

Another such admission by a well-known, non-relativist, Arthur Lynch, is worth noting:

> Descartes is, however, doubly interesting to us in the discussion of Relativity, for at one time when the Inquisition was becoming uneasy about his scientific researches, he gave them a reply that satisfied them, or perhaps he merely gained time, which was long, while they were trying to understand its meaning. He declared that the sun went around the Earth, and that when he said that the Earth revolved around the sun that was merely another manner of expressing the same occurrence. I met with this saying first from Henri Poincaré, and I thought then that it was a witty, epigrammatic way of compelling thought to the question; but on reflexion I saw that it was a statement of actual fact. The movements of the two bodies are relative one to the other, and it is a matter of choice as to which we take as our place of observation.[982]

How to Correctly Interpret an Interferometer

Let us return to the war of the interferometers. Once again, what is significant about the results in the foregoing interferometer experiments is that each of them actually showed a small positive result, but because the result did not match expectations for what was assumed to be the only

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[981] Newton's Corollary IV under Laws of Motion, Law III, states: "The common center of gravity of two or more bodies does not alter its state of motion or rest by the actions of the bodies among themselves: and therefore the common center of gravity of all bodies acting upon each other (excluding outward actions and impediments) is either at rest, or moves uniformly in a right line."

[982] Arthur Lynch, *The Case Against Einstein*, p. 22.

possible result if the Earth were moving through ether, each experimenter declared his results "null." But they were not null. Michelson and Morley write about their small positive results as follows:

> On the Relative Motion of the Earth and the Luminiferous Ether: The actual displacement was certainly less than the twentieth part of this...It appears, from all that precedes, reasonably certain that if there be any relative motion between the Earth and the luminiferous ether, it must be small; quite small enough entirely to refute Fresnel's explanation of aberration, and that the velocity of the Earth with respect to the ether is probably less than one-sixth the Earth's orbital velocity, and certainly less than one-fourth.[983]

While it is extremely difficult to find in the scientific literature that Michelson-Morley found a small positive result (since, as Einstein himself said, it would nullify his Relativity theory), today, those that have little vested interest in saving Relativity theory but seek to find a more precise and comprehensive answer to how the universe works, are not ashamed to admit the result. For example, in a throwback to Michelson-Morley, Craig Hogan, director of Fermilab, is planning to use a dual Michelson-Morley apparatus to find the Planck ether. One of the reasons he is pursuing this experiment is, as Michael Moyer of *Scientific American* indicates, is that…

> Back when Michelson and Morley were investigating the (nonexistent) ether, their interferometer measured a tiny change– the change in the speed of light as the earth moved around the sun–by comparing two light beams that had traveled a reasonably long way. So it is with Hogan's Holometer.[984]

What, precisely, do all these figures mean in regard to the heliocentric/geocentric debate? In the heliocentric theory, the Earth is moving through the ether with both a diurnal and translational movement, that is, it spins on its axis at about 1054 mph (0.45 km/sec) and orbits the sun at about 66,000 mph (30 km/sec), which means that the Earth's rotation speed is 1.6% of its revolution speed.[985] Clearly, then, the bulk of

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[983] "On the Relative Motion of the Earth and the Luminiferous Ether," Art. xxxvi, *The American Journal of Science*, editors James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341.

[984] Michael Moyer, "Is Space Digital," *Scientific American*, February 2012, p. 36.

[985] However, in terms of acceleration, where $a = v^2/r$, the translation is only 5% of the rotation.

the ether resistance against the Earth will come from the translational movement as opposed to the diurnal rotation. But if we subtract the translational movement, the remaining resistance will come only from the diurnal movement. This situation is identical to what would occur in the geocentric model, since in the geocentric system there is no translational movement of the Earth against the ether, yet there is a diurnal movement. In other words, the universe's ether is rotating around a fixed Earth at the same rate that the Earth in the heliocentric system would be rotating against the fixed ether, that is, on a 24-hour basis. Accordingly, in the geocentric system only the diurnal movement of the Earth against the ether will show up as fringe shifts in the interferometer experiments, and thus we would expect a measurement of shifts much less than the fringe shifts corresponding to the translational movement of 30 km/sec. All things being equal, we would expect the diurnal movement to produce fringe-shifting corresponding to a mere fraction of the fringe-shifting expected for 30 km/sec. This is precisely what we find in the description given above by Michelson and Morley (albeit, they did not attribute it to a non-translating Earth). They tell us that: "The actual displacement was certainly less than the twentieth part of this."[986] A "twentieth part" of the fringe shifting corresponding to 30 km/sec yields fringe shifting of at least 1.5 km/sec.

After Michelson and Morley run these figures through their calculations in order to make the square of the velocity proportional to the displacement, they then tell us: "the velocity of the Earth with respect to the ether is probably less than one-sixth the Earth's orbital velocity, and certainly less than one-fourth." One sixth of 30 km/sec is 4.8 km/sec, which agrees closely with the average of 5 km/sec in the other interferometer experiments. In brief, the geocentric model has a simple explanation for the unexpected results of the Michelson-Morley experiment: the Earth is fixed and the universe and ether rotate around it.

Perhaps just as important concerning the Michelson-Morley experiment was, even with this small evidence of ether movement, the two scientists concluded that Fresnel's "explanation of aberration" was "refuted" by their 1887 interferometer experiment. We will recall that Fresnel explained Arago's stellar aberration results by postulating that it was caused by glass mediums "dragging" ether against an *immobile* ether that surrounded the glass. Interestingly enough, Michelson and Morley had previously stated in 1886 that, after the repeat of Fizeau's experiment in

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[986] "On the Relative Motion of the Earth and the Luminiferous Ether," Art. xxxvi, *The American Journal of Science*, eds. James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341.

1884, they had, at that time, confirmed Fresnel's formula stating: "the result of this work is therefore that the result announced by Fizeau is essentially correct: and that *the luminiferous ether is entirely unaffected by the motion of the matter which it permeates*."[987] So we have Michelson and Morley giving us two different stories, but the one to which they adhere is the 1887 judgment showing that science had no answer to Arago's experiment and that the Earth's 30 km/sec clip through space was coming to a screeching halt unless somebody could come up with an explanation.

Still, since the measured ether movement came nowhere near the expected 30 km/sec, the science community invariably considered the Michelson-Morley results as "null." There were a few voices, however, that did not consider the results trivial. As early as 1902, W. M. Hicks, made a thorough criticism of the experiment and concluded that instead of giving a null result, the numerical data published in Michelson-Morley's paper shows distinct evidence of an expected effect (*i.e.*, ether drift). Unfortunately, the science community has completely ignored Hicks' paper.[988]

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[987] "Influence of Motion of the Medium on the Velocity of Light," *American Journal of Science*, 31:386-377, 1886, emphasis in the original.

[988] Hicks writes: "…the adjustment of the mirrors can easily change from one type to the other on consecutive days. It follows that averaging the results of different days in the usual manner is not allowable unless the types are all the same. If this is not attended to, the average displacement may be expected to come out zero – at least if a large number are averaged" (W. M. Hicks, "On the Michelson-Morley Experiment Relating to the Drift of the Ether," *Philosophical Magazine,* Series 6, vol. 3, 1902, p. 34, see also pp. 9-42. Hicks is cited in Héctor A. Múnera's "An Absolute Space Interpretation of the Non-Null Results of Michelson-Morley and Similar Experiments" in *Apeiron*, Vol. 4, No. 2-3, April-July 1997, who, in turn, cites E. T. Whittaker's two volume work *A History of the Theories of Ether and Electricity* (1887), which mentions Hicks' work, minus the negative conclusion of Michelson-Morley. A year later, Múnera wrote "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space." He states: "Despite the null interpretation of their experiment…it is quantitatively shown that the outcomes of the original experiment, and all subsequent repetitions, never were null. Additionally, due to an incorrect inter-session averaging, the non-null results are even larger than reported" (*Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, p. 37). Summarizing the findings, M. Consoli and E. Costanzo write: "The Michelson-Morley experiment was designed to detect the relative motion of the Earth…by measuring the shifts of the fringes in an optical interferometer. These shifts…were found to be much smaller than expected….However…the fringe shifts observed by Michelson and Morley, while certainly smaller than the classical prediction corresponding to the orbital velocity of the Earth, were *not* negligibly small. This point was clearly expressed by Hicks: '…the numerical data published in the Michelson-Morley

Georges Sagnac's 1913 Interferometer Experiment

There have been few interferometer results that have been more puzzling to Relativists, and by the same proportion more ignored, than the 1913 experiment performed by the French physicist, Georges Sagnac (pronounced: Sanyak). Sagnac was a professor of theoretical physics at the University of Paris. Among his previous contributions are the assisting of Pierre Curie in determining the properties of radium, as well as the discovery of secondary X-rays and various other optical effects. His interferometer results have been repeated several times, so it is rather curious why the science establishment has been so averse to publicizing Sagnac's work the same way they advertise Einstein's.[989] Interestingly enough, Sagnac employed the same principle as the Michelson-Morley

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paper, instead of giving a null result, show a distinct evidence of an effect of the kind to be expected' and also by Miller. In the latter case, Miller's refined analysis of the half-period, second-harmonic effect observed in the original experiment, and in the subsequent ones by Morley and Miller [1905], showed that all data were consistent with an effective, observable velocity lying in the range of 7-10 km/s. For comparison, the Michelson-Morley experiment gave a value $v_{obs} \sim 8.8$ km/s for the noon observations and a value $v_{obs} \sim 8.0$ km/s for the evening observations" ("The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 1). The authors add: "Our findings completely confirm Miller's indication of an observable velocity $v_{obs} \sim 8.4$ km/s in their data."

[989] Notable exceptions are E. J. Post in *Reviews of Modern Physics* 39, 1967, pp. 475-493; Herbert Goldstein, *Classical Mechanics*, 1980; and Stefan Marinov in *Foundations of Physics* 8, 1978, pp. 137-156. The first to suggest a Sagnac-type rotating interferometer was Sir Oliver Lodge in 1897 (*Philosophical Transactions of the Royal Society*, London, 189, 149 (1897); R. Anderson, et al., *American Journal of Physics*, 62, 975, 1994). Based on classical physics, Lodge predicted the fringe shifts to be in accord with the formula $\Delta z = 4\Omega S/\lambda c$ where Ω is the constant angular velocity vector of the turntable, S is the vector representing the area enclosed by the light path, and λ is the wavelength of light *in vacuo*. The time difference of the fringe shifts comes out to be $\Delta t = \lambda \Delta z/c = 4\Omega S/c^2$. A few years prior to Sagnac's experiment, Franz Harres, graduate student of Jena, had unknowingly produced the Sagnac effect during experiments testing the Fresnel drag ("Die Geschwindigkeit de Lichtes in bewegten Korpern," Ph.D. dissertation, Univ. of Jena, Germany, 1912). It was P. Harzer, in 1914 (*Astronomische Nachrichten*, 199, 337) who discovered the anomaly in Harres' work as the Sagnac effect, after Sagnac had successfully produced it in 1913. Harres showed that the Sagnac fringe shift is unaffected by refraction.

experiment.[990] As Sagnac himself describes it, his is the typical **interferometer** methodology:

> "I cause to revolve uniformly, at one or two revolutions per second, around a vertical axis, a horizontal platform (50 centimeters in diameter) carrying, solidly screwed down, the various pieces of an interferometer similar to that which I have used in my previous researches and described in 1910. The two interfering beams, reflected by four mirrors placed at the edge of the revolving platform, are superimposed in opposite directions upon one self-same horizontal circuit encompassing a definite area S. The rotating assemblage includes also the luminous source (a small electric lamp), and the receiver – a fine-grained photographic plate, which registers the interference fringes localized at the focus of a telescope. Photographs designated *cw* are obtained during a clockwise rotation of the platform; photos designated *ccw* are obtained during a counter-clockwise rotation of the same frequency. In these two kinds of photos, the center of the central fringe presents two different positions. I measure this displacement of the center of interference."[991]

**Sagnac's rotating interferometer producing
a difference in photon velocity[992]**

The difference between the Michelson-Morley experiment and the Sagnac experiment is that the former directs the light beam to traverse back and forth along the diameter of a rotating table, whereas the latter directs the light beam to travel in a closed circle on a rotating table. As such, the Michelson-Morley experiment seeks to detect the translational movement of the Earth, whereas the Sagnac experiment seeks to detect the rotation of the Earth (or, in geocentric terms, the rotation of the universe around the Earth). Sagnac explains what he will be observing:

> In clear conception, it ought to be regarded as a direct manifestation of the luminiferous ether. In a system moving as a whole with respect to the ether, the elapsed time of propagation between any two points of the system should be altered as though the system were immobile and subject to the action of an *ether wind* which would blow away the light waves in the manner of atmospheric wind blowing away sound waves. The observation of the optical effect of such a relative wind of ether would constitute *evidence for the ether*, just as the observation of the influence of the relative wind of the atmosphere on the speed of sound in a system in motion would (in the absence of a better

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[992] See CDROM animation of the Sagnac experiment.

explanation) constitute evidence of the existence of the atmosphere around the system in movement.[993]

He then explains his results:

> It has been very easy for me to find at the outset the evidence for the ether by causing a small optical circuit to rotate. A frequency N of 2 revolutions per second (successively in each direction) has furnished me a degree of relative whirling of the ether of $4\pi N$ or 25 radians per second. A uniform clockwise rotation of the interferograph produces, relatively, a counter-clockwise ether wind….The distance between the fringes is here from 0.5 to 1 millimeter….The observed interference effect is clearly the optical whirling effect due to the movement of the system in relation to the ether and directly manifests the existence of the ether, supporting necessarily the light waves of Huygens and of Fresnel.[994]

What is probably equally important is Sagnac's explanation for what appear to be "null" results in his experiment and, by extension, the null results of other similar experiments, namely, Michelson-Morley.

> The total interferential displacement z is a constant fraction of the distance between fringes, for the same frequency N of rotation. The displacement becomes invisible on the photographs when the fringes have been adjusted to be narrow enough. Such a nullified result demonstrates that the normally observed displacement is clearly due to a difference of phase associated with the rotational movement of the system.[995]

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[993] *Comptes Rendus*, *ibid*., emphasis added.

[994] *Comptes Rendus*, *ibid*. In a more detailed explanation in the *Comptes Rendus* of December 22, 1913, pp. 1410-1413, Sagnac adds: "The result of the measurements demonstrates that, in ambient space, light is propagated with a velocity V_0, independent of the movement as a whole of the luminous source O and the optical system. That is a property of space which experimentally characterizes the luminiferous ether. The interferograph measures, as $\frac{1}{4} z\lambda V_0$, the relative circulation of the ether within the closed optical circuit." (Translated by Richard Hazlett). Sagnac added another article in *Journal de Physique et le Radium*, fifth series, 4, 1914, pp. 177-195.

[995] *Comptes Rendus*, *ibid*. Interestingly enough, Sagnac's 1913 discovery of the ether was predicted by none other than Albert Michelson, as noted in *Philosophical Magazine*, London, sixth series, 8, 1904, pp. 716-719. He predicted

In brief, what Sagnac's experiment shows is, because one of the light beams took a longer time to reach the mirror moving away from it than the other light beam whose mirror was moving toward it, the postulate of Special Relativity (which holds that *the speed of light is the same for all observers*), does not hold. Clearly, there were two different speeds for the light beams traveling the same distance. So what is making one of the light beams travel slower? Sagnac said it was due to the ether impeding its velocity – a resistance that is easily generated by rotating the table. So predictable and precise are these results that the "Sagnac effect," as it is commonly called, is used routinely in today's technology for the purpose of sensing rotation, as well as in mechanical gyroscopes. As noted above, in 1904 Albert Michelson had already predicted that observers on Earth, if they are co-moving and co-rotating with the light source and screen, will observe an interference pattern that is dependent on the absolute rotation of the system. This is precisely what Sagnac demonstrated, but using a laboratory turntable with two mechanical receivers instead of two human observers. Sagnac's interferometer is the "observer," and its light source and reflecting mirrors were all co-moving and co-rotating in one and the same fixed system. The only thing that Sagnac added from outside the system was putting the turntable in motion. Sagnac saw the equipment rotating, but the interferometer was the real, objective "observer," and it recorded fringe shifts in that observation, demonstrating that the speed of light was not constant. Today's Relativists conveniently dismiss this evidence and claim that Special Relativity does not work for rotating systems; or, they may insist it *does* work in rotating systems, but without

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that observers on Earth, if they are co-moving and co-rotating with the light source and screen, will observe an interference pattern that will be dependent on the absolute rotation of the system. Michelson did a similar experiment to Sagnac's with Henry Gale in 1925 and produced the same results. In 1925 B. Pogany reports a repeat of Sagnac's experiment with the same results (Über die Wiederholung des Harres – Sagnaschen Versuches. *Ann. Phys*., 1926, 80, p. 217-231). The same results were repeated by Dufour and Prunier and reported in 1937 (*Comptes Rendus* 204, 1925, 1937). The results were later confirmed with modern equipment and high precision by W. M. Macek and D. T. M. Davis, Jr., and as described in *Applied Physics Letters* 2, 1963, pp. 67-68. Sagnac interpreted his results, as did others in the scientific community, to nullify Special Relativity. (See: John Chappell, "Georges Sagnac and the Discovery of the Ether," *Arch. Internat. d'Histoire des Sciences*, 18:175-190, 1965; F. Selleri, *Foundations of Physics*, 26, 641, 1996; *Foundations of Physics Letters* 10, 73, 1997; J. Croca, *Nuovo Cimento B*, 114, 447, 1999; F. Goy, *Foundations of Physics Letters* 10, 17, 1997; J. P. Vigier, *Physical Letters A*, 234, 75, 1997; P. K. Anastasowski et al., *Foundations of Physics Letters*, 12, 579, 1999).

revealing that it will not do so unless it adds in foreign elements belonging to General Relativity, such as "metric tensors" and the like.[996]

We pause here to mention a very important consequence of Sagnac's experiment. In light of the experiment's clear demonstration of absolute motion, physicists of the Copernican yet non-Relativity variety have commonly interpreted Sagnac's results as being evidence for the absolute rotation of the Earth. From their cosmological perspective, this conclusion is certainly understandable. By the same token, however, if other evidence shows that Earth is not moving diurnally (which is strongly indicated by the stellar aberration experiments of Arago, Airy, *et al*.), then Sagnac's results would be positive proof for the absolute rotation of the universe around the Earth, as well as for the existence of ether and absolute space. Sagnac's results (which bring science right back to the Maxwell/Fresnel/Arago/Airy ether) are so solid and irrefutable that current physics finds itself in the unenviable position of having to use Sagnac's discovery to make their Relativistic formulas function. The popular Global Positioning System, for example, cannot function properly without adjustments based upon Sagnac's experimental results. Not surprisingly, then, whenever the need arises for inertial navigation (*i.e.*, an absolute frame from which to measure all other coordinates), the Sagnac effect is always included.[997] The Sagnac effect is a universal principle for all

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[996] Post and Goldstein, to coincide Sagnac with the assertion that the speed of light is constant only in an inertial frame, answer Sagnac by imposing an infinite sequence of inertial coordinate frames in the circumference of the rotating apparatus. Almost all others use General Relativity to explain Sagnac, *e.g.*, W. Schleich and M. O. Skully, "Course 10: General Relativity and Modern Optics," *New Trends in Atomic Physics*, Elsevier Science Publishers, Amsterdam-New York, 1982; M. A. Tonnelat, *Les principes de la théorie électromagnétique et de la relativité*, Masson, Paris, 1959; Oyvind Grøn, "Relativistic Description of a Rotating Disk," *American Journal of Physics* 43, 10:869f, 1975; G. Rizzi and M. Ruggiero, *Relativity in Rotating Frames*, Kluwer Academic Publishers, Dordrecht, 203; G. Rizzi and A. Tartaglia, "Speed of Light on Rotating Platforms," *Foundational Physics*, 28:1663, 1998; Berenda, "The Problem of the Rotating Disk," *Physical Review* 62:280f, 1942; Ashtekar and Magnon, "The Sagnac Effect in General Relativity," *Journal of Mathematical Physics*, 16, 2:341, 1975; J. –F. Pascual Sánchez et al., "Geometry of an Accelerated Rotating Disk," Universidad de Valladolid, Spain, 2003. See section in "Does Ether Exist" for General Relativity's answer for rotating discs.

[997] *Laser Applications*, ed. Monte Ross, written by F. Aronowitz, New York, Academic Press, 1971, vol. 1, pp. 133-200; E. J. Post, *Review of Modern Physics*, 39, 2, 475, 1967; W. W. Chow et al., *Review of Modern Physics*, 57, 61, 1985; V. Vali and R. W. Shorthill, *Applied Optics*, 15, 1099, 1976; G. E. Stedman, *Rep. Prog. Phys*. 60, 615, 1997. The Sagnac effect has been measured not just with

electromagnetic counter-propagating beams, as well as neutron beams, de Broglie waves and even sound waves, that is, any waves which travel in opposite paths.[998] All the various beams and waves show the same time differences, both for matter and light, independent of the physical nature of the interference. These various testing elements show that the Sagnac effect is not dependent on the nature of light, *per se*, but solely on the principle of absolute motion. Ring laser experiments have confirmed the Sagnac effect to within one part in 10^{20}, a truly remarkable verification.[999]

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light waves, but also with matter waves using Copper pairing (J. E. Zimmermann and J. E. Mercerau, *Physical Review Letters*, 14, 887, 1965); with neutrons (D. K. Attwood, *et al.*, *Physical Review Letters*, 52, 1673, 1984; S. A. Werner et al., *Physical Review Letters*, 42, 1103, 1979); and Ca^{40} atom beams (F. Riehle et al., *Physical Review Letters*, 67, 177, 1991); and with electrons (F. Hasselbach and M. Nicklaus, *Physical Review A*, 48, 143, 1993).

[998] *Cf.*, Anderson et al., *American Journal of Physics*, 62, 11:975, 1994 and Post, "Sagnac Effect," *Review of Modern Physics* 39, 2:475, 1967 showing the Sagnac effect in ring interferometers; Hasselbach and Nicklaus, *Physical Review A*, 48, 1:143, 1993 showing Sagnac effect using electrons.

[999] Much of the research comes from the Canterbury Project. Some of the many reports include: H. R. Bilger, G. E. Stedman, Ziyuan Li, U. Schreiber and M. Schneider, Ring lasers for geodesy, IEEE Transactions on Instrumentation and Measurement (special issue for CPEM/94: Conference on Precision Electromagnetic Measurements, Boulder CO, June 27-July 1, 1994) 44: 468-470, 1995; H. R. Bilger, U. Schreiber, and G. E. Stedman, "Design and application of large perimeter ring lasers," Symposium Gyro Technology, Stuttgart, Germany, 17-18 September 1996; V. Rautenberg, N. P. Plag, M. Burns, G. E. Stedman and H. U. Juttner, "Tidally induced Sagnac signal in a ring laser," *Geophys. Res. Lett.* 24, 8, 893-896, 1997; R. Anderson, H. R. Bilger and G. E. Stedman, "The 'Sagnac' effect: a century of earth rotated interferometers," *American Journal of Physics* 62: 975-985, 1994; H. R. Bilger, G. E. Stedman, M. P. Poulton, C. H. Rowe, Li Ziyuan and P. V. Wells, "Ring laser for precision measurement of non-reciprocal phenomenas," IEEE Transactions on Instrumentation and Measurement 42: 407-411, 1993; G. E. Stedman, K. U. Schreiber and H. R. Bilger, "On the detectability of the Lense-Thirring field from rotating laboratory masses using ring laser gyroscope interferometers," *Classical Quantum Gravity* 20, 13: 2527-2540, 2003; G. E. Stedman and B. G. Wybourne, "Beyond the sixth place of decimals: From Michelson to large ring lasers," *Bulletin de la Société des Sciences et des Lettres de Lódz 53* (Série: Recherches sur les déformations vol 39): 47-56, 2003; U. Schreiber, M. Schneider, C. H. Rowe, G. E. Stedman, S. J. Cooper, W. Schlüter and H. Seeger, "The C-II ring laser project," *Phys. Chem. Earth* A 25 (12): 805-807, 2000; C. H. Rowe, K. U. Schreiber, S. J. Cooper, B. T. King, M. Poulton and G. E. Stedman, "Design and operation of a very large ring laser gyroscope," *Applied Optics* 38 (12): 2516-2523, 1999; G. E. Stedman, "Ring laser tests of fundamental physics and geophysics," *Rep. Prog. Phys*. 60: 615-688, 1997.

To escape the embarrassment, Relativists will claim many and varied reasons for Sagnac's results.[1000] One theory, promoted by French physicist **Paul Langevin** in 1921,[1001] held that due to Relativity's principle of co-variance, the universe can be thought of as rotating around Sagnac's stationary platform, and thus the universe's "radiant energy" is dragging the light in the interferometer around with it. This circular motion of the universe creates a centripetal acceleration toward the center of rotation. It was admitted later, however, that this solution would involve changing the speed of light from a constant value, not to mention allowing for an Earth in the center of a rotating universe.

In 1937, Langevin proposed another solution. This time he introduced the idea of "non-uniform local time," thus allowing for a constant value for the speed of light. In the following year of 1938, Herbert Ives showed that Langevin's 1937 proposal would end up making two clocks that were operating on "non-uniform local time" tell different times in the same place. As Ives put it: "The performer of the experiment must avoid looking at both clocks at once!"

Ives also showed that Langevin's 1921 solution was not viable, since Sagnac's experiment involves no consideration of rotation.[1002] In other

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[1000] For example, "The Sagnac Phase shift suggested by the Aharonov-Bohm effect for relativistic matter beams," Guido Rizzi et al., May, 2003. Rizzi includes a list of about a half-dozen Relativists. Suffice it to say, Rizzi's paper is filled with a dizzying array of mathematical contrivances and contortions in order to explain Sagnac from a Relativistic point of view.

[1001] *Comptes Rendus* 173, 831-834, 1921.

[1002] "Light Signals Sent Around a Closed Path" in the *Journal of the Optical Society of America*, April 16, 1938, Vol. 28. Ives writes: "The net result of this

words, Ives discredited the common notion, even one that is believed today by Global Positioning Satellite engineers, that the Sagnac effect is caused by rotation. As Wang notes from his extensive empirical testing: "A rotating frame of reference is usually used in explanations but….the travel-time difference of two counter-propagating light beams in moving fiber is proportional to both the total length and the speed of the fiber regardless of whether the motion is circular or uniform."[1003]

Unfortunately, Ives' explanation has been totally ignored in the physics literature. This is no surprise, considering Langevin's *ad hoc* attempts at trying to deal with Sagnac's results to salvage Relativity. Langevin also tried to argue that, although Special Relativity could not answer the centrifugal effect, General Relativity could offer an answer, since a centrifugal force would not exist if all other gravitational forces were eliminated from the universe. This was obviously a question-begging proposal, since its terms would be impossible to satisfy, and as such, it disproved Langevin's proposal by itself.

There is even more here than meets the eye. In the first case, although Langevin's suggestion that the universe's rotation causes the Sagnac effect was a convenient Relativistic attempt at solving the problem, in effect, it helps show precisely what the geocentrist argues regarding the Earth's motionlessness. That is, if Relativists insist on resorting to a universe in rotation against a stationary Earth in order to explain the Sagnac experiment, then there is no great leap in proposing that this is precisely

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study appears to be to leave the argument of Sagnac as to the significance of his experiment as strong as it ever was. The suggested use of 'local time' merely offers another way of measuring the effect of rotating the apparatus, namely in terms of the differences between two clocks carried around a circuit, instead of difference of arrival time of two light signals sent around the same circuit. The rotation, which can be measured in either of these ways, is not relative rotation of the apparatus with respect to the platform on which it is mounted, or to the laboratory – either of these might be rotated with respect to the apparatus, with no resultant Sagnac effect. The observer on the apparatus has just one reference framework by which he can predict whether the Sagnac effect will appear or not; that framework is the pattern of radiant energy from the stars. If his apparatus rotates with respect to the stars he will observe a Sagnac effect, if it does not, then no matter how great relative rotation it exhibits with respect to its material surroundings, there will be no Sagnac effect." See also "Sagnac effect: A century of Earth-rotated interferometers," R. Anderson, et al, American Journal of Physics 62(11), November 1994. Anderson states: "Harress…demonstrates that the Sagnac fringe shift is unaffected by refraction."

[1003] "Modified Sagnac experiment for measuring travel-time difference between counter-propagating light beams in a uniformly moving fiber," Ruyong Wang, *et al.*, *Physics Letters* A 312 (2003), pp. 1, 4.

what occurs in reality, and against which the Relativist cannot mount any satisfactory objections, since the very principle of equivalence posits that there is no difference between a rotating universe around a stationary Earth and the Earth spinning inside a stationary universe. In effect, the only thing Relativity's equivalence principle accomplishes is a reopening of the dispute between Galileo and the Catholic Church, with the latter side holding much more scientific evidence than it did in 1633. As Einstein admitted: "It follows from this that our notions of physical reality can never be final. We must always be ready to change these notions…"[1004] Or, as Martin Gardner stated it for the Relativity enthusiast:

> Indeed from the standpoint of relativity the choice of reference frame is arbitrary. Naturally, it is simpler to assume the universe is fixed and the Earth moving than the other way around, but the two ways of talking about the Earth's relative motion are two ways of saying the same thing.[1005]

As we will see later, it is precisely this matter of the equivalency principle that Mach argued with Einstein in their personal letters, and the very principle from which Einstein formed his own Relativity theory. In fact, in the Machian model, the gravity of the stars (in rotation with the universe around a stationary Earth) provided the long sought-after physical/mechanical answer to why centrifugal force exists, that is, because the gravity of the stars is pulling on the object. As Clark writes of Einstein:

> The idea that the system of fixed stars should ultimately determine the existence of centrifugal force was an important part of the conceptual background to the General Theory of Relativity. This was not a new idea and had been put forward in general terms by both Berkeley and Mach.[1006]

Models that depend solely on a moving Earth (without consideration of the gravity of the stars) have no such recourse and must resort to viewing the centrifugal and Coriolis phenomena as secondary effects, not as primary forces.

Second, Langevin's dependence on the "radiant energy" of the universe as the medium which moves against Sagnac's stationary

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[1004] Albert Einstein, *Ideas and Opinions*, 1984, p. 266.

[1005] Martin Gardner, *The Relativity Explosion*, 1976, p. 185.

[1006] *Einstein: The Life and Times*, p. 266.

apparatus shows, once again, that, although Relativists keep insisting that there is no ether medium between Earth and the stars, they are forced, nevertheless, to resort to it to explain the effects of experiments that are utterly dependent on its inclusion. To paraphrase Shakespeare, a rose by any other name is still a rose, and "radiant energy," by any other name, is still some type of ether medium.

The 1925 Michelson-Gale Experiment Discovers Sidereal Rate of Relative Rotation between Earth and Universe

Since, with Langevin's admission, Sagnac's experiment was performed with reference to the stars, not the apparatus, Albert Michelson must have been very intrigued by the result of Sagnac's 1913 experiment, for it showed an effect that was demanding an adjustment to his conclusion from the experiment he performed with Edward Morley in 1887. Sagnac had established quite conclusively that light does not have a constant speed unless it is understood to be traveling in absolute space. With Langevin's failure, and with that, General Relativity's failure to explain Sagnac's results (since the Sagnac effect is not due to rotation, which eliminates acceleration as the cause), Michelson was forced back to the drawing board. Michelson knew he had to create a more sophisticated apparatus to test for ether than his 1887 effort. Since Morley had died in 1923, Michelson found a new partner, Henry G. Gale, a man who demonstrated such devotion to the effort that he was named as a co-author. The newspapers had picked up on the story and, advertising it with all the drama of Hollywood, wrote headlines such as "Einstein on Trial" or "Michelson Leads Flank Attack upon the German Scientist." In any case, Michelson's abstract states the following:

> Theory of the effect of the rotation of the Earth on the velocity of light as derived on the hypothesis of a fixed ether. Historical Remarks: The theory was given originally in 1904. The experiment was undertaken at the urgent instance of Dr. L. Silberstein. A preliminary experiment at Mount Wilson in 1923 showed that it was necessary to resort to an exhausted pipeline.

Ludwik Silberstein, a physicist himself, was so insistent because he had written an article in 1921 discussing the difficulty Relativity theory might have in explaining optical rotational phenomena.[1007] Perhaps

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[1007] *Journal Optical Society of America* 5: 291-307, 1921. See also "Sagnac effect: A century of Earth-rotated interferometers," by R. Anderson, *et al.*,

Silberstein, unlike Einstein, had not dismissed the Sagnac experiment that occurred just eight years earlier. In any case, the preliminary experiment performed at Mt. Wilson used a mile-long circuit for the light path. The tests showed that

> The interference fringes…were observed most clearly during the half-hour before and after sunset. But even under the best conditions, the interference fringes were so unsteady that it was found impossible to make any reliable measurements.[1008]

To eliminate the effects of air, Michelson and Gale reassembled the mile-long, one-foot-wide watermain pipe. The second abstract reads:

> Experimental Test of Theory: Air was exhausted from a twelve-inch pipe line laid on the surface of the ground in the form of a rectangle 2010 × 1113 feet. Light from a carbon arc was divided at one corner by a thinly coated mirror into direct and reflected beams, which were reflected around the rectangle by mirrors at the corners. The two beams returning to the original mirror produced interference fringes. The beam traversing the rectangle in a counter-clockwise direction was retarded. The observed displacement of the fringes was found to be 0.230 ∀ .005, agreeing with the computed value 0.236 ∀ .002 within the limits of experimental error.[1009]

[1008] "The Effect of the Earth's Rotation on the Velocity of Light," Part I, by A. A. Michelson. *The Astrophysical Journal*, April 1925, Vol .LXI, No. 3.

[1009] *Ibid.*, Part II.
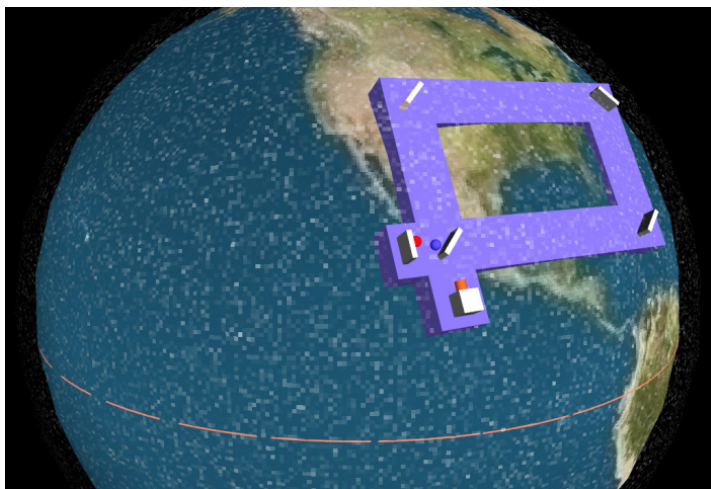
Michelson-Gale experiment: Heliocentric view:
Earth rotates left to right producing difference in light's velocity[1010]
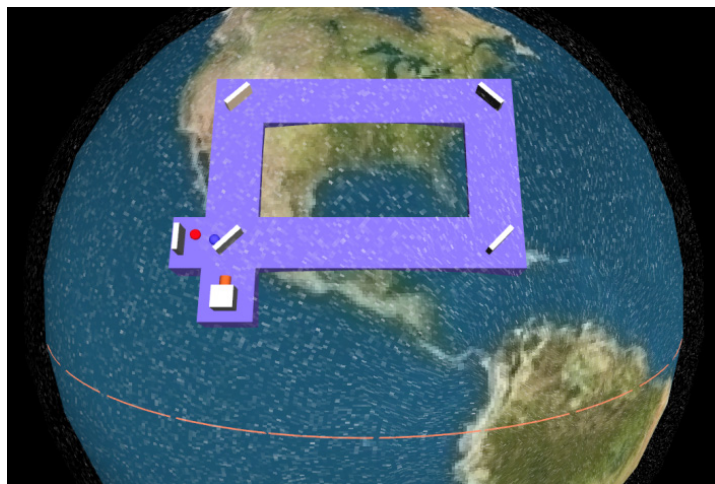
Michelson-Gale Experiment: Geocentric view: universe/ether rotates
right to left producing difference in light's velocity.

[1010] See CDrom animation of the Michelson-Gale experiment.

The tests were made on thirteen different days with a total of 269 observations, almost always with the same results. The lowest value for the displacement in the fringes was 0.193 while the highest was 0.255 with the mean displacement coming in at 0.230. Thus, right before Michelson's own eyes, the 1913 Sagnac results were confirmed and his 1887 interpretation was put in question, as was Relativity. Here was further proof, to the order of ten times the power of the Sagnac experiment, that there is, indeed, an absolute space in which absolute rotation occurs. Something was affecting the light in order for it to consistently produce the fringe displacement. Sagnac (1913) and Michelson (1925) demonstrated it was ether, which was quite an irony for the latter. Although Michelson would sum up the experiment with the sardonic comment: "All we can deduce from this experiment is that the earth rotates on its axis,"[1011] in reality, the experiment did not distinguish between an Earth rotating against the ether as opposed to the ether circling around a fixed-Earth. In other words, it provided no proof that the Earth rotates, but opened the door very wide to suggest that Copernicus was wrong, since no translational motion corresponding to 30 km/sec was found by Michelson and Gale.

Analyzing the results of the Sagnac and Michelson-Gale experiments, Hayden and Whitney, in the revealing title: "If Sagnac, Why Not Michelson-Morley?" write:

> The logical existence of the incremental Sagnac effect implies… that there is some compelling physical reason why the effect cannot be observed at the surface of the Earth….We hold that until something new is brought to the table, this question simply cannot be resolved. No currently accepted theory reveals why, like a Cheshire cat, the Sagnac effect shows itself in one kind of experiment but not in another.[1012]

The authors are certainly correct in concluding, "until something new is brought to the table, this question simply cannot be resolved." The resolution staring them in the face but which has been "unthinkable" since the days of Lorentz and Einstein is that the Earth is not moving. Whereas Sagnac and Michelson-Gale, being themselves Copernicans, were testing for "The Effect of the Earth's Rotation on the Velocity of Light," the

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[1011] Quoted by A. H. Compton in an interview with Michelson's daughter Dorothy Michelson Livingston, as cited in *The Master of Light*, p. 310.

[1012] Howard C. Hayden and Cynthia K Whitney, "If Sagnac and Michelson-Gale Why Not Michelson-Morley?" *Galilean Electrodynamics*, vol. 1, no. 6, Tufts University, Nov./Dec. 1990, pp. 73-74.

interpretation of their results in regard to a geocentric universe is, as we stated earlier, that Earth is motionless at the center of the universe. There is a slight movement of the ether against "the surface of the Earth" due to the rotation of the universe, which then shows up in miniscule fringe shifts in the interferometer experiments. Accordingly, since the Earth has no translational motion, experiments seeking to detect such motion will always come to a "null" result. The result, as we have seen, is not actually null; rather, all the experiments show a slight positive result (as did the original Michelson-Morley experiment in 1887), but the physicists and astronomers interpreting the results consider them null because they do not produce the *expected* fringe shifts if the Earth is understood to be moving through the ether by revolving around the sun at 18.5 miles/sec. In other words, if one presupposes a revolving and rotating Earth, the fringe shifts are always too small to account for such double motion. But if we assume a stationary Earth in the center of a universal ether, there will, indeed, be as slight a movement of the ether against Earth as there would be against a ship in the eye of a hurricane.

Considering the unanswerable problems the Sagnac and Michelson-Gale experiments present to modern physics and cosmology, it is no surprise that both experiments are hardly mentioned, if at all, in the physics literature,[1013] and it is likewise no puzzle why Einstein makes no

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[1013] Hayden and Whitney write: "More so than the original Sagnac experiment, the subsequent Michelson-Gale demonstration of the Sagnac effect is curiously neglected in the literature. R. D. Sard [*Relativistic Mechanics*, W. A. Benjamin, Inc., New York, 1970] comments only that the Michelson-Gale experiment determined the Earth's angular velocity to within 2.5%. L. S. Swenson ["Michelson and Measurement," *Physics Today* 40, 24, 1987] recently devoted only 22 words to the experiment, calling it 'an attempt at a large field in Clearing, Illinois, to measure the effect of the Earth's rotation on the velocity of light.' In 55 references, E. L. Hill ["Optics and Relativity Theory," *Handbook of Physics*, E. U. Condon, ed., McGraw Hill, 1967] does not list the Michelson-Gale experiment. In a list of some 1600 references, C. W. Misner, K. S. Thorne, and J. A. Wheeler [*Gravitation*, 1973] make no mention of Michelson-Gale [neither do they mention Sagnac]…Moreover, the Michelson-Gale paper is not mentioned in *any* of the famous papers which claim to measure the velocity of light, or to compare light speeds in various directions" ("If Sagnac and Michelson-Gale Why Not Michelson-Morley?" Howard C. Hayden and Cynthia K Whitney, Tufts University, Nov./Dec. 1990). Dean Turner, writing in 1979, points out that the 1971 *McGraw-Hill Encyclopedia of Science and Technology*, the 1974 *Encyclopedia Brittanica*; the 1976 *Encyclopedia Americana*, and the *Encyclopedia of Philosophy* of 1967 all fail to mention the Sagnac or Michelson-Gale experiments. McGraw-Hill consented to write an article on ether for the 1977 edition, but still failed to mention Sagnac and Michelson-Gale, two of the

mention of these crucial experiments in <u>any</u> of his writings.[1014] Obviously, without at least Sagnac's results in hand, Einstein was on a wild goose chase. As noted above, it was left to Langevin to explain Sagnac, but he found it impossible to do.

As Tom Bethell relates it,

> Einstein knew of the experiment, and in fact discussed it with Michelson in Chicago in 1921. He admired the "ingenious" way he overcame the difficulty "that we are not able to change the direction of the Earth's rotation." The Earth could not be rotated back, to see if the interference fringes had shifted during its rotation. Michelson did this by adding a second, much smaller interference loop that served to produce a "fiducial mark from which to measure the displacement" in the larger circuit. The experiment demonstrated a small fringe shift, close to the predicted value. But the

> Einsteinians were able to find an escape route, thereby protecting the special theory from falsification. SRT applies only to inertial reference frames, in which no unbalanced forces are allowed. But because Michelson-Gale depended on the Earth's rotation, centrifugal forces and curvilinear paths are inevitably present. Therefore it was non-inertial. A similar argument was used against the Sagnac experiment, in which the apparatus was rotated. The equations of special relativity cannot incorporate an acceleration even as small as the three thousandths of one-g

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most important experiments in the annals of physics (*The Einstein Myth*, pp. 44, 102).

[1014] Einstein's biographer, Ronald Clark, makes no mention of either the Sagnac or the Michelson-Gale experiment in the entire 878 pages of the book. He makes brief mention of Dayton Miller but only to downplay his results. Stephen Brush in "Why was Relativity Accepted?" (*Physics in Perspective* 1: 184-214, 1999), makes no mention of Sagnac, Michelson-Gale or Miller, but has at least a dozen references to Michelson-Morley. Bernard Jaffe cites Miller, but makes the erroneous conclusion: "…no shift in interference effect was observable," when, in fact, a shift was, indeed, observable (Bernard Jaffe, *Michelson and the Speed of Light*, p. 107). Also during this time came the experiment by Mixer in 1925, who used sunlight rather than artificial light in the interferometer (as had been suggested by both Tolman (*Physical Review* 35:136, 1912 and La Rosa (*Phys. Zeitschrift* 13:1129, 1912), but apparently with the same results. (See also Edmund Whittaker's *A History of the Theories of Ether and Electricity: The Classical Theories*, first edition 1910; revised 1951, Nelson and Sons, Ltd., London).

experienced in Michelson Gale. But both the Sagnac and the Michelson-Gale results could be predicted using the complicated mathematics of general relativity. So the Einsteinians succeeded in turning the tables on their critics. Instead of falsifying special relativity, these two experiments were construed as having confirmed general relativity. Petr Beckmann pointed out how unsatisfactory this was. The big difference between the ether-based explanation of Michelson-Gale, and GRT was this: The classical explanation "follows from the Galilean principle of relativity in a few lines of high school algebra, whereas Einstein's general theory does it with multidimensional complex tensors in space-time and non-Euclidean geodesics." In an interview, John Hall raised the question whether any experiment done on the surface of the Earth can be considered truly inertial. All such experiments are all done on the "surface of a spinning ball," he said. Gravitational forces are inevitably present. So "if you turn up the sensitivity, it is completely sure that there is some effect," such as the fringe shift that Michelson eventually showed in Michelson-Gale, or (perhaps) that he himself had shown in Brillet-Hall but considered to be "spurious."[1015]

It is quite apparent that Relativists have made a practice of creating the proverbial moving target in order to keep the illusion of "Relativity" propped up in the public consensus. As they juggle one theory against the other, Special Relativity becomes virtually unfalsifiable because it can never apply to the real world, since the real world does not contain any inertial frames free of unbalanced forces. Consequently, Special Relativity exists only as a theoretical phantom to allow Einstein and his followers to escape the consequences of the experimental results. The question of why Special Relativity allows itself to be used for the angular motion of the Earth around the sun but not the angular motion of the Earth on its axis is certainly a glaring contradiction, especially since both angular motions must be considered non-inertial. Moreover, it is also contradictory for Special Relativity to use the Lorentz transform for the Earth's angular movement around the sun, but eliminate the Lorentz transform when analyzing the Earth's angular movement on its axis. But this is the nature of Relativity – even the theories are relative with respect to one another – and thus contradictions abound whenever they are present.

[1015] "Questioning Einstein: Is Relativity Necessary?," *Proceedings of the NPA*, Long Beach, California, 2010, p. 3.

The Interferometer Experiments of Dayton C. Miller

Next in this line of argumentation are the comprehensive results of **Dayton Miller's** interferometer experiments. As noted previously, although Einstein escaped direct confrontation with Sagnac's results, this was not the case with Miller. In addition to the previous quotes from Einstein we cited showing that Miller was hot on his trail, several more show how nervous Einstein became over Miller's undaunted quest. In a letter Einstein once wrote to Edwin E. Slosson, he states:

> My opinion about Miller's experiments is the following.… Should the positive result be confirmed, then the special theory of relativity and with it the general theory of relativity, in its current form, would be invalid.…Only the equivalence of inertia and gravitation would remain, however, they would have to lead to a significantly different theory.[1016]

Miller's experiments, conducted over a period of 20 years, showed time and time again the same thing that Sagnac and Michelson-Gale had found – slight fringe shifts in the interferometer that indicated ether as the cause. In fact, Miller wasn't boasting of anything he had discovered; rather, he made it clear that he was acquiring the same positive results that Michelson-Morley obtained way back in 1887. As Arthur Lynch reveals:

> Dayton Miller, in a letter dated 4th October, 1930, says that 'It is true that nearly all the writers at the present time interpret the experiments as giving a definite null effect, and most of them assume that it is final. The truth of the matter is the experiment never gave a null effect. My present determinations are exactly in agreement with the 1887 results of Michelson and Morley. This fact has been widely announced especially in England, but the theory of relativity seems to be so acceptable to many persons that they overlook the apparent discrepancy.'[1017]

[1016] July 1925. As quoted from the paper by Dr. James DeMeo: "Dayton Miller's Ether-Drift Experiments: A Fresh Look," 2002. (NB: This book does not endorse any of the other theories of DeMeo, *e.g.*, his "orgone biophysical" research). Miller performed his experiments on the top of Mr. Wilson. Sadly, DeMeo reports: "Today, I am informed, there is no record of Miller's extensive work at Mt. Wilson, only a memorial plaque dedicated to Michelson and Einstein" (p. 12).
[1017] *The Case Against Einstein*, p. 45.

Dayton Clarence Miller (1866 – 1941)

Miller's experiments even went a little beyond Sagnac and Michelson-Gale. Whereas the latter discovered absolute motion by detecting differences in the speed of two light beams in the same medium, they were not designed to detect the actual drift of the medium against Earth. Miller's results showed that an ether drift was originating from the southern celestial hemisphere in the direction of the constellation Draco in the middle of the Great Magellanic Cloud.[1018] It wasn't as easy for Einstein

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[1018] The right ascension from Draco was 4 hours 54 minutes, with declination of – 70° 33', in the middle of the Great Magellanic Cloud and 7° from the southern pole of the ecliptic. Since Miller believed the Earth moved, he phrased his results in the language that the Earth was drifting toward Dorado rather than the ether drifting toward Draco. Because he believed the sun was revolving around the Milky Way and carrying the Earth, Miller concluded that the total ether drift should be 208 km/sec, but was only 10 km/sec at Earth because the ether was entrained at the Earth's surface ("The Ether-Drift Experiments at Mount Wilson Solar Observatory," *Physical Review*, 19:407-408, 1922). The fact remains that Miller had no way of distinguishing whether the Earth was moving toward Dorado or the ether was moving toward Draco against a fixed earth. His results in Cleveland showed a 3 km/sec drift, which was very close to what Michelson-Morley had found in 1887 in their basement facility. The contrast between the Cleveland and Mt. Wilson results shows that the closer the equipment is to the surface of the Earth, the less movement of ether against it. The science community (which was favoring Relativity) could tolerate Miller's 3 km/sec results, since those results correlated with Michelson-Morley and were already considered

to ignore Miller as to ignore Sagnac. Sagnac was a French physicist, and except for Paul Langevin noted earlier, most French scientists were ignoring or had outright rejected Relativity, until at least about 1950.[1019] Miller was an American. After Germany, the United States was the next country to fully embrace Relativity, and Einstein had already emigrated to the United States. Moreover, Miller earned his doctorate in science in 1890 from the prestigious Princeton University (the same institution at which Einstein would eventually have a professorship), as well as being president of both the American Physical Society (1925-1926) and Acoustical Society of America (1913-1933). He was chairman of the division of Physical Sciences of the National Research Council (1927-1930), and chairman of the physics department of Case School of Applied Science (aka: Case Western University). He was also an active member of the National Academy of Sciences. In short, Miller was a force with which to be reckoned. It is safe to say that, with his expertise Miller performed the most extensive and sophisticated interferometer experiments ever devised. He used the largest and most sensitive equipment to date. He floated the device on a pool of mercury to eliminate friction (at great expense), and used different bases: wood, metal and concrete. He did tests at different times of the day, different seasons of the year, different altitudes, different latitudes and with different light sources. He took precautions against thermal distortions by insulating the apparatus in one-inch cork and by applying uniform parabolic heaters and taking account of human body heat. He covered the interferometer in glass so that drift would not be inhibited. He used a 50× magnification telescope to observe the fringes, which allowed him to see down to the hundredth scale. Miller even switched to an interferometer made of aluminum and brass to eliminate possible effects from magneto-constriction. Over all, he took over 200,000 different readings from 1902-1926. By contrast, the 1887 Michelson-Morley had a grand total of 36 readings on an apparatus that was much smaller and less accurate. It was covered in wood and situated in the basement of a large stone building, both of which limit the sensitivity since such insulated locations will shield much of the ether drift. And still, they managed to obtain a small positive result, as they themselves admitted. Thus, Einstein had a lot to worry about since, if Miller's result was correct, and it seemed so, by Einstein's own verbatim admission, Miller would

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"null." But they did not like his 10 km/sec results, which he first obtained in 1921 using the same equipment that he and Morley had used in 1905. The same results were obtained again in 1922-1924 using controlled experiments.

[1019] See Brush, "Why Was Relativity Accepted?" p. 194. Langevin, not Einstein, was also responsible for inventing the twin paradox to explain Special Relativity (Cohen, *Revolution in Science*, p. 411).

totally destroy Relativity theory. The battle between Miller and Einstein went on for some years. Miller never conceded his findings, and Einstein never conceded that Miller was correct. Between 1921 and 1933, Miller, who had previously teamed up with Edward Morley in 1903 and 1904 in two separate interferometer experiments, performed over 100,000 trials. This was hardly a scientific force that Einstein could ignore.[1020]

Miller and Einstein were exchanging letters for a few years. So alarmed was Einstein by the results of Miller's experiments that he stated quite plainly to one of his colleagues: "If Michelson-Morley is wrong, then relativity is wrong."[1021] In a private letter to Robert J. Millikan, Einstein wrote:

> I believe that I have really found the relationship between gravitation and electricity, assuming that the Miller experiments are based on a fundamental error. Otherwise the whole relativity theory collapses like a house of cards.[1022]

A follow-up letter three months later stated: "Privately I do not believe in the accuracy of Miller's results, although I have no right to say this openly."[1023] But Einstein had said it openly enough that in 1926 a Cleveland newspaper picked up the story and wrote both the following headline: "Goes to Disprove Einstein Theory: Case Scientist Will Conduct Further Studies in Ether Drift: Einstein Discounts Experiments" and this subsequent article:

> Speaking before scientists at the University of Berlin, Einstein said the ether drift experiments at Cleveland showed zero results, while on Mount Wilson they showed positive results. Therefore, altitude influences results. In addition, temperature differences have provided a source of error. "The trouble with Prof. Einstein is that he knows nothing about my results," Dr. Miller said. "He

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[1020] D. C. Miller, "The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics* 5, 352-367, 1933.

[1021] Stated to Sir Herbert Samuel in the grounds of Government House, Jerusalem (*Einstein: The Life and Times*, p. 107).

[1022] Letter to Robert Millikan, June 1921 (*Einstein: The Life and Times*, p. 400). Or as Einstein once said to astronomer Erwin Freundlich in 1913: "If the speed of light is in the least bit affected by the speed of the light source, then my whole theory of relativity and theory of gravity is false" (*ibid*., p. 207).

[1023] Letter to Robert Millikan, September 1921, *ibid*. Clark adds these words from Michael Polanyi: "Instead, as Sir Charles Darwin once described it, they sent Miller home to get his results right" (*Einstein, The Life and Times*, p. 400).

has been saying for thirty years that the interferometer experiments in Cleveland showed negative results. We never said they gave negative results, and they did not in fact give negative results. He ought to give me credit for knowing that temperature differences would affect the results. He wrote to me in November suggesting this. I am not so simple as to make no allowance for temperature."[1024]

One of the interesting features of Miller's results is that they were calculated in relation to sidereal time, that is, against the displacement between a star and the Earth, as opposed to the sun and the Earth. The former time yields 23 hours, 56 minutes and 4.09 seconds; the latter 24 hours exactly.[1025] This shows that the ether is drifting in relation to the stars, and thus gives a more definitive picture of absolute motion.

But we must pause at this juncture to critique Miller's thinking process, for he, being a Copernican, is basing his interpretation of data on his belief that the Earth is moving at least 30 km/sec through space. Interestingly enough, it is precisely because of this presupposition that Miller runs into some unexplained difficulty, since his observations begin to conflict with his mathematical calculations. The one anomaly in all past interferometer experiments that Miller discovered was the experimenters *assumed* they knew the precise velocity of the Earth through the ether in combination with the solar system's supposed motion toward the constellation of Hercules, but did they really know? The geocentrist, of course, would answer that they *did not* know. In any case, Miller's 1925 experiment took into account this "anomaly" and he made his calculations accordingly. Since he assumed the Earth was moving 30 km/sec, he combined this with the four positions (February, April, August, September) that he examined of the Earth's orbit around the sun and then used Pythagorean geometry to determine the speed of the Earth toward the constellation Dorado, which came to 208 km/sec.[1026] In other words, 208

[1024] The Cleveland *Plain Dealer*, 27 Jan. 1926. In 1930, *Scientific American* remarked on the issue: "Let a world of blind admirers and enraged detesters of a theory beat the air with super-heated syllables, Einstein serenely smokes his pipe and says 'If Professor Miller's research is confirmed, my theory falls, that's all.' And Miller, standing before his assembled peers in science, is almost apologetic about his findings, but indicates that "there they are" (March 1930). Einstein wrote this article for *Scientific American* for the April 1950 issue.

[1025] In the same way, in sidereal time (*i.e.*, star time), the moon travels around the Earth in 27.33 days, as opposed to 28-29 days as measured only from Earth.

[1026] Miller configured the four interferometer readings in the form of a parallelogram (February, April, August, September), which assumes the Earth is

km/sec is what Miller believed to be the Earth's absolute speed through the ether. Of course, being a heliocentrist, Miller is assuming that the ether is motionless and that the Earth is moving through it. In any case, Miller's 1933 paper reveals that his Pythagorean calculations do not match what he observed in the fringe shifts. As we will recall, his experimental fringe shifts showed a maximum of 10 km/sec, but this figure is less than his computed value by a factor of twenty! Except for the possibility of entrained ether at the surface of the Earth, Miller did not have an answer for this problem, and it is left as an open-ended question in his 1933 paper. The answer, of course, is that Miller's Pythagorean calculations were based on a faulty premise (*i.e.*, that the Earth was moving). If that factor were eliminated, his calculations would be in accord with his observations. The same can be said of recent experiments performed by Stefan Marinov, in the late 1970s, using coupled-mirror interferometry.[1027] If, on the other

in orbit around the sun. The diagonal of each of the four parallelogram points represents the apex of that period, while the long side represents the motion, which is coincident with the center of orbit; the short side of the parallelogram represents Earth velocity of 30 km/sec. Hence, knowing the direction of the three sides of the triangle, and the magnitude of one side, allows one to calculate the magnitude of the other sides, which for Miller was 208 km/sec toward Dorado. (See also Laurence Hetch in *21ˢᵗ Century – Science and Technology*, Spring 1988, pp. 47-48).

[1027] Stephan Marinov, whose experiments show an ether-drift of 279-327 km/sec, declares that the Earth is moving through it toward the midpoint of the constellations Virgo, Hydra and Libra (J. P. Wesley, *Galilean Electrodynamics*, "In Memorium: Stefan Marinov, Spring 1999, pp. 11-12; S. Marinov, *General Relativity and Gravity* 12, 57, 1980b). Also *Czechoslovakia Journal of Physics* B24:965, 1974, and *Eppur Si Muove* (Brussels: CBDS-Pierre Libert, 1977, pp. 101-111, the latter cited in Bouw, *Geocentricity*, p. 257). Obviously, Marinov's calculations are close to those of Dayton Miller's 1925 interferometer experiments, but as Miller had, he used heliocentric geometry in arriving at his 300+ km/sec. E. W. Silvertooth, after having had "null" results in 1972 with frequency-doubling crystals (*Journal of the Optical Society of America*, 62:1330), had similar results to Marinov in a 1983 experiment. He claims that laser-interferometer experiments analogous to the Michelson-Morley apparatus give a null result because frequencies of the interfering beams are dependent upon velocity relative to a stationary frame. Hence, the frequency adjusts precisely enough to cancel any effects due to the motion through the light's reference frame, and a null result is the inevitable consequence. This, claim, of course, assumes that the "velocity" is caused by an Earth moving at 30 km/sec and that light has its own "reference frame." Another study performed by Smoot, Gorenstein and Muller also sought to find motion of the Earth (*Physical Review Letters*, 39, 898, 1977). As reported by Michael Rowan-Robinson, the quest was to find a "dipole anisotropy of order 10^{-4} to 10^{-3}…due to the random motions that galaxies have

hand, Miller's and Marinov's calculations of 200 to 300 km/sec are correct, this does not prove the Earth is moving through it. As Bouw notes: "Every center of revolutionary motion, such as the sun, the Milky Way, or a cluster of galaxies, each introduces another motion of the aether sweeping past the earth."[1028] In other words, if ether dragged by the movement of the sun is added to ether dragged by the movement of the Milky Way and other galaxies so that the sum is 200 to 300 km/sec of

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with respect to each other and to the cosmological frame of reference. The radiation should look slightly hotter in the direction we are traveling towards, and slightly colder in the direction we are traveling from, by an amount $\Delta T/T \approx v/c$, due to the Doppler shift." This study was important to them because "Failure to detect this effect would put us in the uncomfortable position of happening to be exactly at rest with respect to the cosmological frame." In other words, it would show the Earth at the center and immobile in space. Although the Smoot team, similar to the Rubin team, found an anisotropy, it made little sense and did not get them out of the "uncomfortable position." As Rowan-Robinson reveals, "the magnitude of the velocity deduced for the Milky Way, 600 km/sec, is so large as to throw existing ideas about our cosmic environment into disarray." In addition, "The authors note that the velocity they have found conflicts with various attempts to measure our velocity with respect to nearby galaxies, but offer no explanation of this. With respect to the Local Group of galaxies, the motion of the Solar System hardly differs from that expected due to our circular motion round the Galaxy. This suggests that the whole Local Group has to be moving along together at this velocity of 600 km/sec with respect to the microwave background" (Michael Rowan-Robinson, "Ether drift detected at last," *Nature*, Vol. 270, November 3, 1977, p. 9). We note here that the Smoot team did not find a velocity of the Earth, but only a velocity of the solar system and the Local group. Reginald T. Cahill reports that at least seven experiments have detected a translational velocity; some with gas-mode interferometers and others with coaxial cable (DeWitte 1991), with a result of around 430 km/sec (R. T. Cahill, "Quantum Foam, Gravity and Gravitational Waves," *Relativity, Gravitation, Cosmology*, eds. V. V. Dvoeglazov and A. A. Espinoza, New York: Nova Science Publication, 2004, pp. 168-226; R. T. Cahill, "Absolute Motion and Gravitational Effects," *Apeiron*, 11, No. 1, 2004, pp. 53-111). In another paper Cahill writes: "Physics has been in an era of extreme censorship for a considerable time; Miller was attacked for his major discovery of absolute linear motion in the 1920's, while DeWitte was never permitted to report the data from his beautiful 1991 coaxial cable experiments. Amazingly these experimenters were unknown to each other, yet their data is in perfect agreement….All discussions of the experimental detections of absolute motion over the last 100 years are now banned from the mainstream physics publications" (Reginald T. Cahill, *The Einstein Postulates: 1905-2005: A Critical Review of the Evidence*, Flinders University, Adelaide, Australia, December 7, 2004).
[1028] G. Bouw, *Geocentricity*, p. 258.

ether moving past a fixed Earth, the higher alternative readings offer no escape from the geocentric system.

A more extensive analysis of Miller's results indicates an amazing correlation with alignment of the Cosmic Microwave Background Radiation (CMB) and the universal ether flow. Miller found the following variations by season in his ether flows:

February (early)	9.8 kps
April (early)	10.1 kps
June (early)	maxima
August (early)	11.2 kps
September (mid)	9.6 kps
December (early)	minima

This shows an apparent fluctuation based on the sun's position with respect to the northern hemisphere where Miller performed the experiments. The ether drift is at its maximum (app. 11 kps) when the sun is at the maximum latitude of its 47° annual ecliptic movement, and the ether drift is at its minimum (app. 9) when the sun is at the minimum of its 47° annual ecliptic (23.5° in the northern hemisphere and 23.5° in the southern). As is apparent by the figures, the ether drift also varies between the maximum and minimum by a proportion commensurate with the remaining positions of the sun. In other words, the farther away the sun is (or the steeper the angle) from Miller's apparatus, the less the ether drift speed.

There also exists a direct relationship between the maxima and minima velocity and the vector motion of the averaged data. The velocities oscillate around a geographic vector of 23.75° East. Within the margin of error, it can be safely said that Miller's results precisely coincide with the ecliptic plane of the Earth at 23.50° toward the East. The next interesting fact is that the CMB quadrupole and octupole are aligned precisely with the 23.5° ecliptic, while the CMB dipole is aligned with the Earth's equator at 0 degrees. This is precisely what we would expect in a geocentric universe. As the CMB radiation, with the ether, rotates around a fixed Earth on an annual basis, Miller finds an average ether drift aligned almost precisely with 23.5° ecliptic bearing "East," and the CMB quadrupole and octupole show the same annual alignment with the 23.5° ecliptic. In effect, the CMB anisotropy and the Miller ether drift are caused by the same mechanical structure – the rotation of the universe within the 23.5° ecliptic around the Earth. This only leaves to explain why Miller

found a fluctuation of ether drift between 9 and 11 kps. That is apparently explained by the fact that the sun lags behind 4 minutes per day to form the ecliptic plane, and as it does so its velocity round the Earth and its radiation affect the velocity of ether drift going toward Earth as sure as sun spots affect Earth's electro-magnetic fields.

Shankland Dismisses Millers Findings

A number of years after Miller's death in 1941 his experimental results were formally addressed. Perhaps not being able to dismiss Miller's haunting words, in 1954, a year before his own death, Einstein employed the services of Robert S. Shankland to investigate Miller's findings. The notes reveal that the two men had "extensive consultations" about Miller. Ironically, Shankland was one of Miller's students for many years, and only began to favor Einstein's Relativity after Miller died. His career soared after he decided to declare Miller's work worthless. He also accused Miller of indirectly prohibiting Einstein from receiving the Nobel Prize for Relativity.

Perhaps another irony is that Shankland's report on Miller was published in 1955, in the same month and year of Einstein's death.[1029] It was full of misrepresentations as well as appeals to criticisms that had already been thoroughly addressed years earlier. He searched for and emphasized the random errors in Miller's data (which every experiment has) and selected only certain data sheets to examine – those in which Miller used a parabolic heater.

[1029] "R. S. Shankland, S. W. McCuskey, F. C. Leone and G. Kuerit, "Analysis of the Interferometer Observations of Dayton C. Miller," *Reviews of Modern Physics*, 27(2):167-178, April, 1955. Shankland writes, "…variations of only 0.001 [degree Celsius] in the air of the optical arms would produce fringe shifts as large as the average effects produced at Mt. Wilson….In what follows, we…must admit that a direct and general quantitative correlation between amplitude and phase of the observed second harmonic on the one hand and the thermal conditions in the observation hut on the other hand could not be established" (p. 175). As Bouw notes: "In other words, they couldn't prove that a temperature difference across the arms was responsible for Miller's results. The evidence presented by Shankland and co-workers appears to be consistent and convincing; but Miller was well aware of the effects of temperature on his experiment and, in fact, had thermometers along the arms for just such a check" (*Geocentricity*, p. 249).
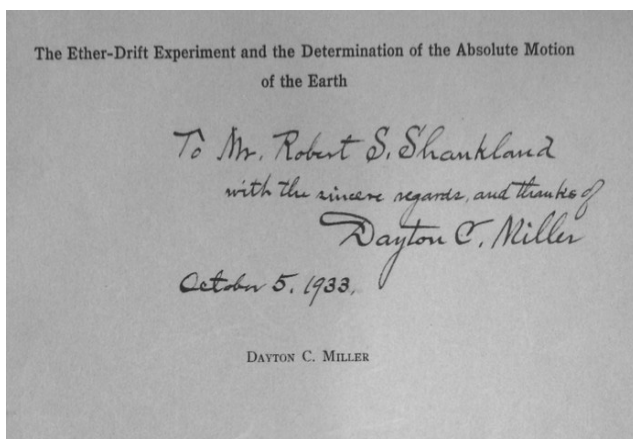
Letter from Dayton Miller to Robert Shankland, 1933

Since Miller himself noted in preliminary trials that heat added to the fringe shifts,[1030] Shankland's team seized on these control experiments and used them against Miller, declaring that they "might" have affected his overall results. As DeMeo reports:

> …the Shankland team…selected only those data sets which appeared to support their argument of a claimed thermal anomaly…leaving one to wonder if the unselected and excluded data, which constituted the overwhelming majority of it, simply could not provide support for their criticisms….For the casual

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[1030] Miller wrote: "Inequalities in the temperature of the room caused a slow, but steady, drifting of the fringe system to one side, but caused no periodic displacements….When the heaters were directed to the air in the light-path which had a covering of glass, a periodic effect could be obtained only when the glass was partly covered with opaque material in a very nonsymmetrical manner….These experiments proved that under the conditions of actual observation, the periodic displacements could not possibly be produced by temperature effects" ("The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, vol. 5 (2), July 1933, p. 220). Unfortunately, historians such as Gerald Holton, otherwise very thorough in their research, turn a blind eye to certain results – as does Holton toward Shankland's miscues. Holton writes: "Again, on 14 March 1926, in a letter to A. Piccard, Einstein wrote, 'I believe that in the case of Miller, the whole spook is caused by temperature influences (air).' As it turned out, Einstein's intuitive response was right" (*Thematic Origins of Scientific Thought*, p. 335). This is not surprising to find in Holton's treatise on Einstein, since he rarely, if ever, faults Einstein with any bad motives or faulty reasoning.

reader, who had not undertaken a careful review of Miller's original experiments, the Shankland paper might appear to make a reasoned argument. However, the Shankland paper basically obfuscated and concealed from the reader most of the central facts about what Miller actually did, and in any case was so unsystematic and biased in its approach, excluding from discussion perhaps 90% or more of Miller's extensive Mt. Wilson data, as to render its conclusions meaningless.… From all the above, it appears the Shankland group, with some degree of consultation with Einstein, decided that "Miller must be wrong" and then set about to see what they could find in his archive that would support that conclusion — which is not a scientific method.[1031]

[1031] "Dayton Miller's Ether-Drift Experiments: A Fresh Look," pp. 23-25. DeMeo provides excruciating detail and expert commentary on the Shankland review of Miller's work. He concludes: "My review of this important but sad chapter in the history of science left me both astonished and frustrated. Miller's works on ether drift was clearly undertaken with more precision, care and diligence than any other researcher who took up the question, including Michelson, and yet, his work has basically been written out of the history of science. When alive, Miller responded concisely to his critics, and demonstrated the ether-drift phenomenon with increasing precision over the years. He constantly pointed out to his critics the specific reasons why he was getting larger positive results, while others got only small results, or no results. Michelson and a few others of the period took Miller's work seriously, but Einstein and his followers appeared to view Miller only as a threat, something to be 'explained away' as expeditiously as possible. Einstein in fact was catapulted into the public eye following the end of World War II. Nuclear physics was then viewed as heroic, and Einstein fast became a cultural icon whose work could not be criticized. Into this situation came the Shankland team, with the apparent mission to nail the lid down on Miller's coffin. The Shankland conclusions against Miller were clearly negative, but the one systematic statistical analysis of his Mt. Wilson data merely confirmed what Miller said all along, that there was a clear and systematic periodic effect in the interferometer data. The Shankland paper also confirmed Miller's contention that this periodic effect was *not the product of random errors or mechanical effects.* The Shankland team subsequently searched for temperature artifacts in Miller's data, but failed to undertake any systematic analysis of his centrally-important Mt. Wilson data in this regard. Instead, they made a biased selection of a few published and unpublished data sets obtained from different periods in Miller's research, from different experimental locations, including [those] from his control experiments at Case School…Miller's most conclusive 1925-26 Mt. Wilson experiments encompassed a total of 6,402 turns of the interferometer, recorded on over 300 individual data sheets. That was the data the Shankland team should have been focused upon and evaluated systematically. Instead, only a few of

Miller, himself, addressed these concerns as any honest scientist would. In a 1926 paper he wrote the following concerning his own careful methodology:

> It is exactly for answering these questions and others, that the experiments have been continued over a period of six years, in which time thousands of readings have been made. Every disturbing cause that could be thought of has been exhaustively studied; among these are: daily and annual variations in temperature, meteorological conditions, radiant heat, magnetism,

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Miller's data sheets from these most centrally-important experiments were selected — certainly less than 10% of the data available to them was brought into discussion — and then only after being firstly dissected to extract only those data which could most easily be misconstrued as evidence for presumed temperature anomalies. For certain, some of the data held up for public critique came from Miller's control experiments at Case, or possibly from trial runs when technical 'bugs' were being worked out in the apparatus and building. Miller is no longer alive to inform us about his data, but the Shankland team willy-nilly lumped together both published and unpublished data, without comment….The Shankland group undertook no new experiments of their own, neither on the question of ether-drift, nor on the subject of thermal perturbations of light-beam interferometry — they made essentially an 'armchair analysis' of Miller's data. Only *some* of Miller's original data was carefully selected to make a rather unbelievable claim that small natural ambient temperature gradients in Miller's Mt. Wilson observation hut *might* produce fringe shifts in the insulated interferometer similar to what Miller himself previously observed in his control experiments using strong radiant heaters. The Shankland paper argued there *must have been* 'thermal effects' in Miller's Mt. Wilson measurements, but provides no direct evidence of this. *At no time did the Shankland group present evidence that temperature was a factor in creating the periodic sidereal fringe shifts observed by Miller in his published data, even though this was their stated conclusion.* In fact, they presented evidence from Miller's own lab notebooks which implied thermal gradients in the Mt. Wilson interferometer house would have been *below the observational limits* of the insulated apparatus….The fact that the present-day situation is totally [the] opposite of my example is a testament to the intensely political nature of modern science, and how major theories often develop into *belief-systems*, which demand the automatic suppression of any new finding which might undermine the faith and 'popular wisdom' of politically-dominant groups of academics. And that 'wisdom' today is: *Space is empty and immobile, and the universe is dead.* I submit, these are unproven, and even *disproven* assertions, challenged in large measure by Dayton Miller's exceptional work on the ether drift." NB: we emphasize here that, although DeMeo may have his own biased reasons for bringing the Shankland/Miller controversy to light (*e.g.*, his work with Orgone Labs), nevertheless, the facts of the case remain what they are.

magnetostriction, differential gravitation, gyrostatic action, influence of method of illumination, transparent and opaque coverings of the light path, speed and direction of rotation [of the apparatus], lack of balance in rotating parts [of the interferometer], position of the observer, and other conditions. One after another, these disturbances have been shown not to produce the observed effects….The solution is entirely consistent with the observations of Michelson and Morley of 1887, and those of Morley and Miller of 1902-1906….The reported effect has always been present; it is clearly shown to be directly related to sidereal time, that is, to a cosmic cause.

In making the observations, two independent quantities are noted, the direction in which the interferometer points when the effect is maximum, and the amount of periodic displacement of the interference fringes. Each of these two sets of readings leads to an independent determination of the right ascension and declination of the apex of the supposed motion of the earth in space. It is very significant that these two determinations are wholly concordant.[1032]

The only redeeming quality of the Shankland report is that within its own pages it registered some reserve regarding its own conclusions. As Consoli and Costanzo report:

Within the paper the same authors [the Shankland team] say that "there can be little doubt that statistical fluctuations alone cannot account for the periodic fringe shifts observed by Miller." In fact, although "there is obviously considerable scatter in the data at each azimuth position…the average values…show a marked second harmonic effect."[1033]

Added to this is the Shankland team's admitted failure to establish a direct link between the appearance of second harmonic effects and thermal conditions. Consoli and Costanzo cite these words from the Shankland report:

[1032] Dayton C. Miller, *Nature*, 117:890, 1926.
[1033] M. Consoli and E. Costanzo, "The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 9, citing R. S. Shankland, et al., *Review of Modern Physics*, 27, 167, 1955, p. 171.

"…we must admit that a direct and general quantitative correlation between amplitude and phase of the observed second harmonic on the one hand and the thermal conditions in the observation hut on the other hand could not be established."[1034]

Perhaps the Shankland team admitted to these facts in order to save themselves from any accusations of bias, but it is unfortunate that the admissions were completely overwhelmed by their general dismissal of Miller's results. In any case, we only wish that Shankland had been as critical of the original Michelson-Morley experiment, or the dozens of others that supposedly found a "null" result in the interferometers. But not only did Shankland claim that the 1887 Michelson-Morley experiment had a "null" result, he asserted that all other such experiments yielded a null result. This simply was not true, as we have clearly seen in the case of Sagnac and Michelson-Gale, and others that will come to light.

Nevertheless, a preliminary report was sent to Einstein in August 1954, upon which Einstein replied with the following letter:

I thank you very much for sending me your careful study about the Miller experiments. Those experiments, conducted with so much care, merit, of course, a very careful statistical investigation. This is more so as the existence of a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted. You have shown convincingly that the observed effect is outside the range of accidental deviations and must, therefore, have a systematic cause [having] nothing to do with 'ether wind,' but with differences of temperature of the air traversed by the two light bundles which produce the bands of interference.[1035]

[1034] M. Consoli and E. Costanzo, "The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 9, citing R. S. Shankland, et al., *Review of Modern Physics*, 27, 167 (1955), p. 171, p. 175. Consoli and Costanzo compute the second harmonic component of the Michelson-Morley experiment to be: July 8, noon: 0.010 ± 0.005; July 9, noon: 0.015 ± 0.005; July 11, noon: 0.025 ± 0.005; July 8, evening: 0.014 ± 0.005; July 9, evening: 0.011 ± 0.005; July 12, evening: 0.018 ± 0.005 (*op cit.*, p. 15).

[1035] Robert Shankland, "Conversations with Albert Einstein II," *American Journal of Physics*, 41:895-901, July 1973. Cited in DeMeo, p. 3. Recently, Nobel laureate Maurice Allais has done extensive study of Miller's results, and has concluded in his abstract: "It is utterly impossible to consider that the regularities displayed in

We can see in the words "a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted" precisely the same sentiment that Einstein voiced to Herbert Samuel a few years earlier: "If Michelson-Morley is wrong, then relativity is wrong."[1036] A "trivial positive effect" was just what Miller found, but as we have seen above, all the other interferometer experiments, including Michelson-Morley, showed the same trivial positive results. As noted in his quote above, Miller claimed nothing more than what Michelson-Morley's results already indicated.

Other evidence related to Shankland shows that Einstein was doing his best to ignore or even stifle experiments designed to show the same positive results as Michelson-Morley. In an interview Shankland arranged with Einstein in 1952, he asked Einstein about the recently published paper on Relativity by J. L. Synge who predicted a small positive effect in a Michelson-Morley-type experiment. Shankland reports:

> Einstein stated strongly that he felt Synge's approach could have no significance. He felt that even if Synge devised an experiment and found a positive result, this would be completely irrelevant….[Later] he again said that more experiments were not necessary, and results such as Synge might find would be 'irrelevant,' He told me not to do any experiments of this kind.[1037]

Miller's interferometric observations can be explained by temperature effects. As a result the light velocity is not invariant whatever its direction and consequently the principle of invariance of light velocity on which fundamentally does rest the special theory of relativity is invalidated by the observation data." Allais adds: "Shankland's and et al's conclusions on the temperature effects are based on shaky hypotheses and reasonings. They are totally unfounded" (L'origine des régularités constatés dans les observations interférométriques de Dayton C. Miller (1925-1926): variations de température ou anisotropie de l'espace," C. R. Academy of Science, Paris, t. 1, Sèrie IV, p. 1205-1210, 2000, translated from the French, p. 1205). In addition to Allais, Reginald T. Cahill points out that the non-interferometer coaxial cable experiments of DeWitte (1991) and Torr and Kolen (1984) show results of motion equal to Miller's 1925 data. In the midst of analyzing the results Cahill concludes: "So the effect is certainly cosmological and not associated with any daily thermal effects, which in any case would be very small as the cable is buried" (Novel Gravity Probe B Gravitational Wave Detection, Flinders University, August 21, 2004, pp. 16-17).

[1036] *Einstein: The Life and Times*, p. 107.

[1037] R. S. Shankland, "Conversations with Albert Einstein," *American Journal of Physics*, 31:47-57, 1963, pp. 53-54, cited in *Thematic Origins of Scientific Thought*, p. 366. Holton says that "an experiment along these lines was devised

The only thing Miller did was confirm the "trivial" results of Michelson-Morley by doing over 100,000 trials in contrast to the 36 trials by Michelson-Morley, and by showing from which direction the ether drift originated. The fact that Einstein thought Miller's results denied his Relativity theory but that Michelson-Morley's results supported it, tells us that something was seriously wrong with either the information being disseminated about the interferometer experiments, or, more likely, that scientists were so biased in interpreting those results in their presumed favor (*i.e.*, as "null" results), that the whole world was convinced by some strange pixie dust that what was actually black was now white. Men do such things when the evidence gets uncomfortably close to revealing the truth about the cosmos as it really is, and as the Bible itself predicts. The Psalmist tells us that "the heavens declare the glory of God, and the firmament shows his handiwork" but modern science systematically suppresses it. As St. Paul says, "…the unrighteousness of men *who suppress the truth*…because that which is known about God is evident among them, for God made it evident to them."[1038] It is the same kind of suppression we saw with Edwin Hubble and Stephen Hawking who, after seeing evidence that Earth was in the center of the universe, declared it "intolerable" and concocted other theories to explain it away, feigning humility in the process. At the least, the world should have been told that there was a significant possibility that the Earth wasn't moving. That would have been a fair and scientific way of handling the evidence. In fact, acquiescing to Miller would have allowed science to opt for a moving Earth against a stationary ether as at least one of the possible solutions of his experimental results, for that is what Miller himself surely proposed.[1039] But modern physics was so bent on protecting Einstein that

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later and gave a null result, as Einstein had predicted," but he gives no reference to any such experiment and thus we do not know what Holton understands as "null," considering that Synge claimed to predict "a small positive effect," which is precisely what Miller's experiments found, and what the original Michelson-Morley experiment found (5 km/sec, not 0).

[1038] First quote is from Psalm 19:1 [18:1], the second from Romans 1:18-19, author's translation.

[1039] As we noted earlier, however, Miller's results did not prove that the Earth was moving through ether, since the equally viable explanation is that the ether is moving against the motionless Earth due to the rotation of the universe, which carries the ether around Earth. Miller would have no way to prove which was correct. Miller claimed that, due to the combined movement of the sun and the Earth, the drifts accumulative effect was to make the Earth drift, in the final analysis, toward the southern hemisphere rather than equatorially. In the geocentric system, the precession or wobble of the universe's movement will likewise not allow a mere equatorial-based drift, at least during most of the year.

they couldn't see the forest for the trees. As a result, they perpetuated a misinterpretation of Michelson-Morley to save themselves, so they thought, from having to reveal the news that the Earth is not moving at all. That news, of course, would have been almost as devastating to mankind as the return of Christ himself at the end of the world, for surely it would have been the death-knell to the runaway train of pseudo-intellectualism that pervades the modern age.

Interestingly enough, Miller's evidence against Einstein was corroborated from an unlikely source, Albert Michelson himself. In 1926-1929, Michelson, with Francis Pease and Fred Pearson, made several attempts at repeating the 1887 Michelson-Morley experiment. Perhaps the results of the 1925 experiment that Michelson performed with Henry Gale a year earlier were too perplexing for him since, as we noted earlier, it produced the same positive results that Michelson should have recognized in 1887. Their 1929 paper, "Repetition of the Michelson-Morley Experiment," reported on three attempts to produce fringe shifts, using light-beam interferometry similar to that originally employed in the Michelson-Morley experiments. The first experiment, which used the same

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In fact, we can predict that the ether drift should change direction depending on where the universe is in its annual precession. Miller's data correlates with this. During the latter stages of his experimental career, 1925 gave him the most optimal equipment and conditions to make his tests. In that year, Miller made four tests at four different times of the year. Each instance showed a different angle of displacement: February 8 was 10 degrees west, April 1 was 40 degrees east, August 1 was 10 degrees east, and September 15 was 55 degrees east. Here we see, for example, that between the sixth month interval of February 8 and August 1, the angle of displacement was precisely opposite (*i.e.*, 10 degrees west versus 10 degrees east), showing the same difference as we see between the Earth's axis and Polaris in six-month intervals. In viewing Miller's hodographs of the ether drift, superimposing the universe on the hodograph, one can readily see how it oscillates back and forth twice per year. Hence it is no coincidence that the mean displacement of Miller's four months of figures is 23.75 degrees east of north which, in the geocentric system, equates with the precessional tilt of the universe, and in the heliocentric system with the tilt of the Earth's axis at 23.5 degrees. Bouw adds that "Miller's results were quite consistent but not at all what was expected from theory. For example, Miller consistently obtained a result of two km/sec for the interferometer's motion at Case Institute of Technology (Cleveland, Ohio), but he got a result of three km/sec in the hills surrounding Cleveland. On the other hand, he consistently obtained ten km/sec at Mount Wilson (Los Angeles, California). In each case the error or uncertainty in his observations amounted to about a half km/sec," referencing L. Silberstein, *Nature*, 115:798, 1925 and Dayton Miller, *Nature*, 116:499, 1925 (*Geocentricity*, pp. 248-49, 364).

22-meter light path as the original Michelson-Morley experiment, predicted a fringe shift of 0.017 but stated "no displacement of this order was observed." The second experiment in 1927 used a 32-meter light path and again stated: "no displacement of the order anticipated was obtained." Here we notice that, rather than report that he obtained a small positive result, Michelson obfuscates his results and claims only that they didn't produce what was "anticipated." On what he based his "anticipated" results is not stated, but perhaps it was what he learned from the Michelson-Gale experiment just a couple of years earlier.

A third experiment performed in 1928 was moved to a "well-sheltered basement room of the Mount Wilson laboratory," and this time the light path was increased to 52 meters, more than double the original 1887 experiment. This higher altitude and longer light-path came closer to Miller's specifications. Thus, it is no surprise that, in this third try, Michelson indeed found significant fringe shifting, obviously because he finally learned to use better equipment. The more accurate equipment, however, brought out Michelson's bias toward replicating the exact results of his 1887 experiment, since he makes a concerted effort to downplay the results of this third and final experiment. Perhaps Michelson, now that his name was a household word among physicists, realized how much the world depended on verifying his 1887 "null" results to save Relativity from the jaws of defeat. Even his daughter, Dorothy Michelson Livingston, knew what was at stake for the Albert Michelson legacy. Concerning Dayton Miller's positive interferometer results she adds this bit of misplaced sarcasm: "Miller might have been wiser to have concentrated on his valuable research in acoustics and the exquisite tone of his flutes."[1040]

Regarding his interpretation of the 1928 experiments, Michelson downplays them with these words:

> The results gave no displacement as great as one-fifteenth of that to be expected on the supposition of an effect due to a motion of the solar system of three hundred kilometers per second. These results are differences between the displacements observed at maximum and minimum at sidereal times, the directions corresponding to… calculations of the supposed velocity of the solar system. A supplementary series of observations made in directions half-way between gave similar results.[1041]

[1040] *The Master of Light: A Biography of Albert A. Michelson*, p. 315.
[1041] "Repetition of the Michelson-Morley Experiment," *Nature*, 123:88, 19 Jan. 1929; and in *Journal of the Optical Society of America*, 18:181, 1929, cited in DeMeo, p. 17.

We see that Michelson did the same thing with his results that we saw Kennedy and Thorndike do with their results: contrast them to the presumed high velocities of celestial bodies in order to make the interferometer results look smaller. In the case of Kennedy-Thorndike, the nebulae [the term for galaxies in those days] were the contrast, whereas with Michelson-Pease-Pearson it is the solar system. There is a certain irony in this, since it is the heliocentric system that these men held as a fact that led them to hypothesize the high velocities of the nebulae and solar system in the first place.[1042] In any case, Kennedy-Thorndike found a value of "10 ∀ 10 km per sec" for the ether's resistance against the Earth. Lo and behold, Michelson found the same thing since, if one multiplies his "three hundred kilometers per second" by "one-fifteenth," the result is 20 km/sec, which is precisely within Kennedy-Thorndike's margin of error.[1043]

Of course, none of this was a surprise to Miller. In commenting on Michelson's results, the unassuming Miller only wished his colleague had been a little more astute and not done his experiment in a basement. He writes:

> If the question of an entrained ether is involved in the investigation, it would seem that such massive and opaque shielding is not justifiable. The experiment is designed to detect a very minute effect on the velocity of light, to be impressed upon the light through the ether itself, and it would seem to be essential that there should be the least possible obstruction between the free ether and the light path in the interferometer.[1044]

Since Miller is not at all reluctant to point out precisely what Michelson-Pease-Pearson had demonstrated in their last ditch efforts to support Relativity theory, namely, that "The experiment is designed to detect a very minute effect on the velocity of light," this brings us back to the statement that Einstein made to Sir Herbert Samuel in Jerusalem: "If

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[1042] In the geocentric system, the celestial bodies are not traveling at high velocities since, as they are embedded in the universal ether, it is the ether that does the rotating around the Earth, with only slight independent movement of the celestial bodies within the ether. It is precisely the rotation of the ether every 24 hours that accounts for the small positive results of all the interferometer experiments at the surface of the Earth.

[1043] Some commentaries say the multiplier was one-fiftieth, not one-fifteenth, but the former appears to be in error.

[1044] "The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, vol. 5 (2), pp. 203-242, July 1933, DeMeo, p. 18.

Michelson-Morley is wrong, then relativity is wrong."[1045] The irony of the whole thing is that it was Albert Michelson himself who proved that Michelson-Morley was wrong. In fact, Michelson proved this in two ways. The first was by the Michelson-Gale experiment in 1925 that measured the same absolute motion that Sagnac discovered in 1913; the second, by the Michelson-Pease-Pearson experiment which showed an ether drift against the Earth, and that the speed of light was affected by it. But since he was too blinded by whatever was prohibiting him from telling the whole truth, Michelson went to his grave thinking he had been successful, and so did the rest of the world. Michelson's work was buried along with him.

Recent Ether-Drift Experiments Showing Positive Results

One of the most detailed and well-reasoned reports concerning ether-drift experiments comes from the Ukrainian scientist Yuri Galaev. In his work, *Ethereal Wind in Experience of Millimetric Radiowave Propagation*, he writes in his abstract (translation corrected):

The experimental hypothesis checks [for] the existence of such a material medium of a radiowave's propagation…as ether is propagated in [an] eight millimeter radiowave range. The ethereal wind speed and this speed's vertical gradient near the Earth's surface have been measured. The systematic measurement results do not contradict the initial hypothesis rules, and can be considered as experimental…confirmation about the ether's existence as a material medium in nature.[1046]

The body of the paper reports the following (translation corrected):

The great work of collecting and analysis, dedicated to the ethereal wind problem, was performed by Atsukovsky. The ether model is offered and the ether dynamic picture of the world was designed in his works. The ether is represented as a material medium, which fills in the global space and has the properties of viscous and compressible gas; it is the building stuff of all material formations. The element of ether is an amer. The physical fields represent different forms of ether motion, *i.e.*, the ether is [the] material medium for electromagnetic wave

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[1045] *Einstein: The Life and Times*, p. 107.
[1046] "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *Spacetime and Substance*, Vol. 2, No. 5 (10), 2001, p. 211.

propagation. The gradient boundary layer is formed at [the] mutual motion of the solar system and ether near the Earth's surface, in which the ether running speed (ethereal wind) increases with the altitude. The ethereal wind apex is northern." To account for previous "null" results of modern experimentation he adds: "It is shown that metals have larger etheric dynamic resistance and interfere with the ether flows. Therefore, metering devices arranged in metal chambers are inadmissible. The work authors consider that the experiments are authentic"[1047]

In other words, those who found a "null" result mistakenly thought their experiments were accurate, but they never considered how the metal casing was shielding the ether. Galaev faults Miller's experiments for a different reason. He writes (translation corrected):

…Miller's huge interferometer was disassembled [and] assembled again and adjusted while moving from Cleveland to Mt. Wilson observatory. Therefore, the technique, which Miller applied for speed-dependence measurement of the discovered motion from an altitude above the Earth's surface, was unacceptable to make a final conclusion for the benefit of ether's existence.[1048]

Galaev is probably right about the disassembling/assembling issue. Galaev's radiowave tests, which he outlines in excruciating mathematical and physical detail in his paper, were performed over five months, from September 1998 until January 1999. Measurements were taken round the clock, except on certain days, for a total of 1288 hours. In the final analysis, his findings confirm Miller's 1925 and Michelson's 1929 results. He writes:

The obtained value…8,490 m/sec…is close to the result of 9,000 m/sec [of Miller]. A bit smaller value…in comparison [with Miller] can be explained due to the…slightly cross terrain. Miller built a light wooden house…with windows made of white canvas on all its sides. In 1929 Michelson, Pease, Pearson conducted a similar experiment in a fundamental building of an

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[1047] *Ibid.*, pp. 212-213.
[1048] *Ibid.*, p. 213.

optical workshop…The ethereal wind measured speed was no more than 6,000 m/sec as a result.[1049]

He concludes (translation corrected):

> The executed analysis has shown that these results can be explained by radiowaves-propagation phenomenon in a space parentage-driving medium with a gradient layer speed in this medium flow near the Earth's surface. The gradient layer available testifies that this medium has the viscosity – the property of intrinsic material medium, *i.e.*, material consisting of separate particles. Thus the executed experimental results agree with the initial hypothesis positions about the ether material medium's existence in nature.[1050]

Galaev's remark that the ether has "viscosity" and "consists of separate particles" is precisely what we would expect for a medium to propagate waves. This is precisely what fellow Ukrainian, N. A. Zhuck found as well.[1051] Krasnoholovets agrees:

[1049] "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *Spacetime and Substance*, Vol. 2, No. 5 (10), 2001, p. 224. Galaev's 6,000 m/sec for Michelson is due to his using 1/50th instead of 1/15th of the 300 km/sec for the anticipated solar system movement.

[1050] *Ibid.*, p. 213. See also Yuri M. Galaev, "Ether-drift. Experiment in the band of radio wave," Petit, Zhukovsky, 2000 (Russian); "Ether-drift effects in the experiments on radio wave propagation," (*Radiophysics and Electronics*, Institute for Radiophysics and Electronics of the National Academy of Sciences of Ukraine, Vol. 5, No. 1, pp. 119-132, 2000 (in Ukrainian). See also "The Measuring of Ether-Drift Velocity and Kinematic Ether Viscosity Within Optical Waves Band," (*Spacetime and Substance*, Vol. 3, No. 5 (15), 2002, pp. 207-224).

[1051] "The equation $d^2 X/dt^2 + H\, dx/dt = 0$ shows that the ether has viscosity. Also, it was shown that the bearer, [in] both gravitational and electromagnetic interactions, is the medium (ether) consisting of particles (amer) μ by a mass about 10^{-69} kg…taking into account the polarizability of an ether, *i.e.*, the presence in it of elastic properties (that has been confirmed by [the] spread of a wavelike process as electromagnetic waves) in the obtained equation it is necessary to add one more item $\mu\omega_o^2 X$ named the recovery force (here w_o is the ether particles oscillations eigenfrequency). Zhuck, p. 208. See also N. A. Zhuck in "Cosmological Effects in Bulky Michelson-Morley Interferometers" (Ukrainian-Russian conference, Nov. 8-11, 2000, Abstracts, p. 73); and in *Spacetime and Substance* 1:5, 71-77 (2000), in Russian.

A new optical method of the first order was proposed and implemented by Galaev (2002) for measurements of the aether-drift velocity and kinematic viscosity of aether. Galaev's results correlate well with the results of other researchers [Miller, 1933; Essen, 1955; Azjukowski, 1993]."[1052]

Another prominent experimenter and interpreter of these issues is Nobel laureate Maurice Allais. Allais wrote four papers on the results of Dayton Miller's work, and although he agreed with the results of the work, he added a different interpretation, namely, there is an optical anisotropy in space; and the cosmic velocity is towards Hercules, not Draco.[1053] All in all, Reginald Cahill sums up the findings rather well: "…these very different experiments show…absolute motion is one of the most startling but suppressed discoveries of the twentieth century."[1054]

[1052] Volodymyr Krasnoholovets, "The Tessellattice of Mother-Space," in *Einstein and Poincaré*, 2006, p. 144. He adds: "Overall, this research strongly supports the idea that the aether is a substrate responsible for propagation of electromagnetic waves….Other researchers demonstrated direct interaction of matter with a subquantum medium. In particular, the influence of a new 'strange' physical field on test subjects has been shown by Baurov (2002), Benford (2002) and Urutskoev *et al*. (2002). Similar effects are described by Shipov (1997)….One more incomprehensible phenomenon is the Kozyrev effect (Kozyrev and Nasonov, 1978) whereby a bolometer centrally located in the focal point of a telescope records a signal from a star much earlier than the light signal hits the focal point" (*ibid*).

[1053] "The Experiments of Dayton C. Miller (1925-1926) And the Theory of Relativity" in 21st Century, Science and Technology, Spring 1998, p. 31; Maurice Allais, "Des régularités très significatives dans les observations interférométriques de Dayton C. Miller (1925-1926) C. R. Academy of Science, Paris, t. 327, Sèrie II b, p. 1405-1410, 1999; "Nouvelles régularités très significatives dans les observations interférométriques de Dayton C. Miller (1925-1926)" C. R. Academy of Science, Paris, t. 327, Sèrie II b, p. 1411-1419, 1999); L'origine des régularités constatés dans les observations interférométriques de Dayton C. Miller (1925-1926): variations de température ou anisotropie de l'espace," C. R. Academy of Science, Paris, t. 1, Sèrie IV, p. 1205-1210, 2000). Allais was also noted for showing evidence of displacements in pendulums during solar eclipses (Chris Duif, "A Review of Conventional Explanations of Anomalous Observations during Solar Eclipses," in *Journal of Scientific Explanation* by Peter A Sturrock, 19:327, 2005).

[1054] Reginald Cahill, "The Einstein Postulates: 1905-2005: A Critical Review of the Evidence," in *Einstein and Poincaré: The Physical Vacuum*, 2006, p. 131. Cahill's caption under Dewitte's coaxial cable graph adds: "Dewitte 1991…coaxial cable, measured with atomic clocks, over three days and plotted against sidereal time….This remarkable agreement with the Miller interferometer

The Results of Sapphire Oscillators

Finally, many experiments occurring today to test the constancy of the speed of light make the same mistake that Michelson and Morley made over one hundred years ago. In regard to the 1887 experiment, Robert Kunzig of *Discover* magazine writes:

> Because Earth orbits the sun at 18 miles per second, Michelson and Morley reasoned that they should be able to detect an ether wind blowing through their Cleveland basement… Several groups are looking for such variations with modern versions of the Michelson-Morley experiment. Peter Wolf, Sebastien Bize, and their colleagues at the Paris Observatory measure *c* with microwaves oscillating at 12 gigahertz inside a small sapphire crystal…If *c* were to change because the orientation of the crystal had changed with respect to some "preferred" direction of space [the movement of the Earth around the sun], then the resonant frequency of the sapphire oscillator would change as well…Over a period of months, as Earth spins on its axis and revolves around the sun, the Paris researchers monitor their oscillator, comparing it with the microwaves from a hydrogen maser (microwave laser), which shouldn't be affected by Earth's motion. "What we measure is that small frequency difference," says Bize. "We look for modulations that correlate with the motion of Earth."[1055]

This description is rather interesting for several reasons. First, it is obvious that Kunzig, Wolf and Bize are basing their observations on the same unproven premise which plagued Michelson-Morley – they assume the Earth is moving. As it stands, they are going to find the same "null" result as Michelson-Morley and conclude that the speed of light is the same in all directions, and therefore constant. After a hundred years, no one seems to have caught on to the idea that the "null" result was a product of a motionless Earth. Second, in the control experiment Wolf and Bize used a hydrogen maser that they claim "shouldn't be affected by Earth's motion." This begs the question as to how a hydrogen maser will not be

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experiment shows that the detection of absolute motion is one of the great suppressed discoveries of physics. At least six other interferometer or coaxial cable experiments are consistent with these observations" (*ibid*).

[1055] Robert Kunzig, *Discover* cont. editor, "Testing the Limits of Einstein's Theories," September 2004, pp. 56-57.

affected by the "Earth's motion," while every other light source *is* affected by such motion? Moreover, if it is true that a hydrogen maser is not affected by the "Earth's motion," then the hydrogen maser should be used in all future interferometers to test whether the speed of light is truly constant. Of course, the problem would be to prove that a hydrogen maser is not affected by motion. But how can one do so if he already assumes the Earth is moving? Any test done on a hydrogen maser has Earth as its laboratory.

Kunzig proceeds in the article to give a description of a similar experiment being performed at Humboldt University in Berlin. The results are not surprising:

> Another group…uses a slightly different setup, comparing the outputs of a pair of sapphire oscillators. Over the past several years the two groups have achieved broadly comparable null results. "The speed of light in any two directions is the same to about one part in a quadrillion," says Holger Müller…That's equivalent to knowing the U. S. gross national product to within a penny.[1056]

Müller, of course, is basing his "null" result on the same unproven premise adopted by Michelson-Morley and Wolf-Bize. If they assume the Earth is moving at 30 km/sec, and if they happen to include the supposed speed of the solar system around the Milky Way at 300 km/sec, and the Milky Way is revolving around or moving toward another group of galaxy clusters at a speed of 600 km/sec, naturally, if they produce only a negligible km/sec result in their sapphire oscillators they will certainly conclude that the speed of light is unaffected, just as Michelson-Morley did. In effect, these kinds of experiments tell us nothing, except perhaps that science still uses the same prejudices and unproven assumptions to make their tallies come out as expected.
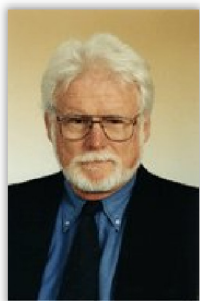
We can, however, see these same prejudices and assumptions in those who reject the results of sapphire oscillators. For example, **Reginald Cahill**, in his 2005 paper on the Michelson-Morley experiment, on the one hand, he recognizes that "only a Michelson interferometer in gas-mode can

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[1056] Robert Kunzig, *Discover* cont. editor, "Testing the Limits of Einstein's Theories," Sept. 2004, p. 57. Alan Kostelecký, "The Search for Relativity Violations," subtitle: "Ancient Light," *Scientific American*, Sept. 2004, p. 99.

detect absolute motion, as we now see. So as better and better vacuum interferometers were developed over the last 70 years the rotation-induced fringe shift signature of absolute motion became smaller and smaller….and in recent years they had finally perfected a totally dud instrument," on the other hand, he believes that "absolute motion is not inconsistent with the various well-established relativistic effects; indeed, the evidence is that absolute motion is the cause of these relativistic effects, a proposal that goes back to Lorentz in the 19th century," which leads him to conclude that although the "Einstein-Minkowski spacetime ontology is invalidated, and in particular that Einstein's postulates regarding the invariant speed of light have always been in disagreement with experiment from the beginning….Then of course one must use a relativistic theory for the operation of the Michelson interferometer."[1057]

That Cahill doesn't see it as odd to invoke a relativistic framework to understand the Michelson-Morley experiment when, in fact, relativity came after and was purposely invented as an answer to the Michelson-Morley experiment, shows that anti-Einstein physicists can be just as presumptuous as Einstein's physicists. This is a classic case of trying to use as proof the very thing one is trying to prove. Cahill, as most scientists, cannot accept that the Earth is not revolving around the sun, which then forces him to use the Lorentzian answer to Michelson-Morley, that is, that the arm of the experimental apparatus shrunk during the experiment due to pressure from the ether caused by the Earth moving at 30km/sec. However, the perennial problem remains – all the Michelson-type interferometer experiments Cahill cites give, at their very highest, only one-third of the 30km/sec speed. So Cahill, even though he has handily proven the existence of ether and nullified Einstein, is straddled with an ether that is too small to prove his case. So he must seek another way to apply the Michelson results in order to arrive at 30km/sec or above. This will keep the Copernican theory intact and allow the Earth to revolve around the sun through the ether.

To arrive at this position, Cahill claims, since all previous analysis of Michelson-Morley (including Dayton Miller) used "Newtonian physics to calibrate the interferometer," this was a big mistake, for it only provided 8 to 10 km/sec, far below the needed 30km/sec. If they had used the "relativistic theory for the calibration of gas-mode interferometers" they would have found a result of 300km/sec, which is far above 30km/sec. Cahill claims that this application was "first used in 2002" by none other

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[1057] "The Michelson and Morley 1887 Experiment and the Discovery of Absolute Motion," Reginald T. Cahill, School of Chemistry, Physics and Earth Sciences, Flinders University, Adelaide, Australia, August 24, 2005, pp. 1-2, at arXiv:physics/0508174v1.

than Reginald Cahill.[1058] He arrives at the 300+ number by adjusting the refractive index, n, of the gas in the interferometer, where $n(n^2 - 1) = k$. He then states that "Michelson and Morley implicitly assumed the Newtonian value $k = 1$" and that "the Einstein postulates have that absolute motion has no meaning, and so effectively demands that $k = 0$. Using $k = 1$ gives only a nominal value for v_p, being some 8km/s for the Michelson and Morley experiment, and some 10km/s from Miller; the difference arising from the different latitude of Cleveland and Mt. Wilson," adding "that n_{air} = 1.00029 gives $k^2 = 0.00058$ for air, which explains why the observed fringe shifts were so small."[1059] Cahill claims that in order to calculate the speed correctly we need a higher k value, but he doesn't specify what that value is except to say "The remaning fits give a speed in excess of 300km/s" and "To get the Michelson-Morley Newtonian based value of some 8km/s we must multiply the above speeds by $k = \sqrt{0.00058} = 0.0241$." Indeed, if we multiply 0.0241 by "v_p = 351 km/s" found in Cahill's Fig. 4, we get 8.45km/sec, close to Michelson's result.

As to how Cahill justifies using a higher k value (other than his claim that "Newtonian physics had failed"), we don't receive much of an explanation, except that "the new theory of gravity required a re-analysis of the data," which includes Cahill's reference to his paper "Quantum Foam, Gravity and Gravitational Waves," in *Relativity, Gravitation, Cosmology* written the year prior, 2004, and his paper "Process Physics: From Information Theory to Quantum Space and Matter," in 2005. Apparently, this means that Cahill allows himself to bump up the k value due to his "new theory of gravity," and at the same time contrast his results against Miller's when he says "While the orbital motion of the earth about the sun slightly affects the RA [right ascension] in each month, and Miller used this effect to determine the value of k, the new theory of gravity required a re-analysis of the data, revealing that the solar system has a large observed galactic velocity of some 420+30km/s in the direction (RA = 5.2hr, Dec = –67deg)."[1060] In other words, Cahill's new theory of gravity allows him to use relativity and quantum mechanics to increase the k value, which in turn gives him a galactic ether drift of 420km/sec, and just for good measure he throws in "+30km/s" to account for the presumed revolution of the earth around the sun! Thus Cahill is guilty of the same mathematical fudging that he accuses the Einsteinian relativists. Both groups are desperate to avoid a motionless Earth to explain Michelson-Morley, and thus both groups distort the data to fit their theories.

[1058] *Ibid.*, p. 5.

[1059] *Ibid.*, pp. 5-6.

[1060] *Ibid.*, p. 7.

Author	Year	Description	Δc/c
Wolf *et al.*[30]	2003	The frequency of a stationary cryogenic microwave oscillator, consisting of sapphire crystal operating in a whispering gallery mode, is compared to a hydrogen maser whose frequency was compared to caesium and rubidium atomic fountain clocks. Changes during Earth's rotation have been searched for. Data between 2001–2002 was analyzed.	$\lesssim 10^{-15}$
Müller *et al.*[28]	2003	Two optical resonators constructed from crystalline sapphire, controlling the frequencies of two Nd:YAG lasers, are set at right angles within a helium cryostat. A frequency comparator measures the beat frequency of the combined outputs of the two resonators.	
Wolf *et al.*[31]	2004	See Wolf *et al.* (2003). An active temperature control was implemented. Data between 2002–2003 was analyzed.	
Wolf *et al.*[32]	2004	See Wolf *et al.* (2003). Data between 2002–2004 was analyzed.	
Antonini *et al.*[33]	2005	Similar to Müller *et al.* (2003), though the apparatus itself was set into rotation. Data between 2002–2004 was analyzed.	$\lesssim 10^{-16}$
Stanwix *et al.*[34]	2005	Similar to Wolf *et al.* (2003). The frequency of two cryogenic oscillators was compared. In addition, the apparatus was set into rotation. Data between 2004–2005 was analyzed.	
Herrmann *et al.* [35]	2005	Similar to Müller *et al.* (2003). The frequencies of two optical Fabry–Pérot resonators cavities are compared – one cavity was continuously rotating while the other one was stationary oriented north–south. Data between 2004–2005 was analyzed.	
Stanwix *et al.*[36]	2006	See Stanwix *et al.* (2005). Data between 2004–2006 was analyzed.	
Müller *et al.*[37]	2007	See Herrmann *et al.* (2005) and Stanwix *et al.* (2006). Data of both groups collected between 2004–2006 are combined and further analyzed. Since the experiments are located at difference continents, at Berlin and Perth respectively, the effects of both the rotation of the devices themselves and the rotation of Earth could be studied.	
Eisele *et al.*[2]	2009	The frequencies of a pair of orthogonal oriented optical standing wave cavities are compared. The cavities were interrogated by a Nd:YAG laser. Data between 2007–2008 was analyzed.	$\lesssim 10^{-17}$
Herrmann *et al.*[3]	2009	Similar to Herrmann *et al.* (2005). The frequencies of a pair of rotating, orthogonal optical Fabry–Pérot resonators are compared. The frequencies of two Nd:YAG lasers are stabilized to resonances of these resonators.	
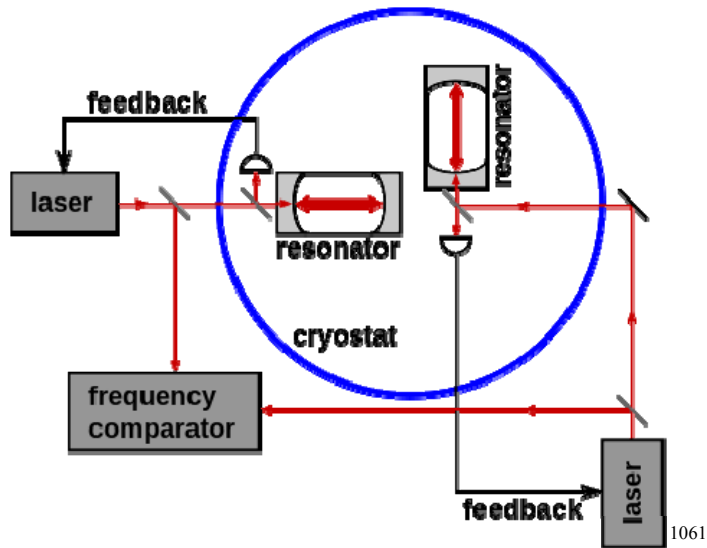
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1061 http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment. See also "Laboratory Test of the Isotropy of Light Propagation at the 10^{-17} Level" by Ch. Eisele, A. Yu. Nevsky and S. Schiller, *Physical Review Letters* 103, 090401 (2009).

The real problem with oscillators or resonators is precisely the very attempt they make to help the Michelson-Morley type apparatus do their job of determining the anisotropy of space. That is, a vacuum removes all of the traceable ether in the atomic scale (*e.g.*, electron-positron pairings) and leaves only the untraceable ether in the Planck scale (*e.g.*, quantum foam). Removing all the traceable ether means that a resonator would need to reach a $\Delta c/c$ level of 10^{-33} to detect the Planck ether – a virtual impossibility.

Chapter 6

What is Space in the Geocentric Universe?

Perhaps the main question that has occupied science since the time of Descartes (who understood space as filled with whirlpools of force he called "vortices") is whether space is composed of a substance, and, if so, what is it? One of the reasons the question of ether keeps coming to the forefront stems from our basic knowledge that, in order for something to be transferred from one place to another, it must travel through the space between the two places. Whether it is light, electricity, magnetism, gravity, sound, or material objects, it seems that all physical things must travel through a medium. At least everyone thought so up until the time of Einstein's Special Relativity theory. Logically, if there is nothing between points separated by a distance, what difference should the distance make? More of nothing is still nothing. Einstein said light always traveled at a constant speed in a vacuum, but if light travels a certain distance of "nothing" between source and receiver, where was the light before it reached the receiver? Does space know place?

The issue of what constitutes space is not only a science question but also a philosophical question. If, for example, we employ the services of a strong vacuum pump and eliminate all the air out of a container, do we now conclude there is "nothing" in the container? Philosophically speaking, how can "nothing" exist? Since the container hasn't collapsed, our intuition tells us that the container is still taking up space, even though there is, presumably, "nothing" inside of it. Incidentally, one cannot argue that, due to the inefficiency of vacuum pumps, there may be at least some molecules of air left in the container. Even if that were the case, the molecules, sparse as they would be, would be separated by vast spaces between them, so the question remains: what constitutes the space between the few remaining molecules in the container? As one modern physicist answered the question: "But what we've learned is…if you take everything away, there's still something there."[1062] Or as another physicist put it:

[1062] Lawrence M. Krauss, "Questions That Plague Physics," *Scientific American*, Sept. 2004, p. 83. Krauss, formerly chairmen of the physics department at Case Western Reserve University and now professor at Arizona State University, is, however, an outspoken critic of String Theory and Quantum Loop Gravity, as outlined in his books: *Hiding in the Mirror: The Mysterious Allure of Extra Dimensions*. He is also an advocate of keeping Creation science out of the public

> We can no longer sustain the simple idea that a vacuum is just an empty box. If we could say that there were no particles in a box, that it was completely empty of all mass and energy, then we would have to violate the Uncertainty Principle because we would require perfect information about motion at every point and about the energy of the system at a given instant of time…[1063]

True enough. Science is at a loss to tell us what a vacuum really is. We see this in other phenomena as well. Ever since the time of Ernest Rutherford (1871-1937), science has settled upon the idea that the atom itself is composed of mostly empty space between the electrons whizzing around the protons and neutrons. Under current theory, only a quadrillionth of the atom is occupied by the atom's particles. But isn't the "empty space" of the atom the same as the "nothing" left in the container by the vacuum pump?

For the sake of argument, let's posit that there is a substance much smaller than the electrons and protons that fits compactly between them. The grains of this substance must then be smaller than any of the numerous subatomic particles man has discovered, including neutrinos, muons, gluons, mesons, kaons, *etc*. Let's say that this infinitesimally small substance also fills the space of the "nothing" left in our vacuum container, so that we can now say that there is "something" still in the container, although we can neither see it nor possess instruments capable of detecting it. This was precisely the thinking of scientists from Descartes to Lorentz. They knew instinctively that some kind of medium had to exist, at least on a theoretical basis, even if they couldn't detect it. While Newton resolved in his 1687 book *Principia Mathematica* that "I design only to give mathematical notions of these forces, without consideration of their physical causes and seats," which led to his concept of "action-at-a-distance" whereby gravity was mysteriously transported over vast distances by some mysterious yet unexplained means, nevertheless, he believed that space was filled with something. He writes:

> May not planets and comets, and all gross bodies, perform their motions more freely, and with less resistance in this aethereal medium than in any fluid, which fills all space adequately without leaving any pores, and by consequence is much denser

schools. See video at *New Scientist* that gives a popular view of the issue: http://bcove.me/d3c6fmrh

[1063] John D. Barrow, *The Book of Nothing: Vacuums, Voids, and the Latest Ideas about the Origins of the Universe*, 2000; Vintage Press, 2002, pp. 204-205.

than quick-silver and gold? And may not its resistance be so small, as to be inconsiderable? For instance; if this aether (for so I will call it) should be supposed 700,000 times more elastick than our air, and above 700,000 times more rare; its resistance would be above 600,000,000 times less than that of water. And so small a resistance would scarce make any sensible alteration in the motions of the planets in ten thousand years.[1064]

Others after him held closely to this conviction, since it explained so many other phenomena in nature. As Robert Hooke understood it:

The mass of æther is all æther, but the mass of gold, which we conceive, is not all gold; but there is an intermixture, and that vastly more than is commonly supposed, of æther with it; so that vacuity, as it is commonly thought, or erroneously supposed, is a more dense body than the gold as gold. But if we consider the whole content of the one with that of the other, within the same or equal quantity of expatiation, then they are both equally containing the material or body.[1065]

James Clerk Maxwell
(1831 – 1879)

James Clerk Maxwell's entire electromagnetic theory was built on the foundation of ether, and he held the same idea as Newton regarding the constitution of interplanetary space. He writes:

Ether or Æther (αἰθήρ probably from αἴθω, I burn) a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty…. Whatever difficulties we may have in forming a consistent idea of the constitution of the aether, there can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of

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[1064] Isaac Newton, *Opticks*, Fourth edition, 1730, Question 22. Newton addresses the issue of ether from Questions 18-31, mostly in reference to the travel of light through ether.
[1065] *From the Posthumous Works of Robert Hooke*, 1705, pp. 171-172, cited in O. Lodge, *The Ether of Space*, p. 98.

which we have any knowledge. Whether this vast homogeneous expanse of isotropic matter is fitted not only to be a medium of physical interaction between distant bodies, and to fulfill other physical functions of which, perhaps, we have as yet no conception, but also...to constitute the material organism of beings exercising functions of life and mind as high or higher than ours are at present - is a question far transcending the limits of physical speculation.[1066]

The vast interplanetary and interstellar regions will no longer be regarded as waste places in the universe, which the Creator has not seen fit to fill with the symbols of the manifold order of His kingdom. We shall find them to be already full of this wonderful medium; so full, that no human power can remove it from the smallest portion of space, or produce the slightest flaw in its infinite continuity. It extends unbroken from star to star; and when a molecule of hydrogen vibrates in the dog-star, the medium receives the impulses of these vibrations, and after carrying them in its immense bosom for several years, delivers them, in due course, regular order, and full tale, into the spectroscope of Mr. Huggins, at Tulse Hill.[1067]

As we have noted in previous chapters, the scientists of this day found at least something resembling a medium in space in all their interferometer experiments of the late 1800s and into the 1900s. Regardless of how small,

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[1066] *Encyclopedia Britannica*, 9th edition, Edinburgh: Adam and Charles Black, 1875, under the title "Ether," republished by Cambridge University Press, 1890. Expanding on Maxwell's Greek, the word αἰθήρ commonly referred to the upper, purer air, as opposed to ἀήρ, the lower air or atmosphere. This distinction would make the ether the rarified interplanetary medium in distinction to the air near the Earth. Although αἴθω may be the closest derivative, it was a separate word found only in the present and imperfect tense, ἦθον, meaning "to light or kindle," and rarely "to burn or blaze." Another significant derivative is αἴθων, the participle of αἴθω, which either means "fiery burning" or "flashing or glittering metal" (Liddell and Scott, *Greek-English Lexicon*, Oxford University Press, 1871, 1977, pp. 18-19). The "metal" aspect of ether has some representation in the Hebrew word רקיע translated as "firmament" in Genesis 1:6-9, since the Hebrew refers, among other meanings, to a beaten down metal, denoting the firmness of its constitution.
[1067] *Encyclopedia Britannica*, 9th edition, Edinburgh: Adam and Charles Black, 1875, under the title "Ether," republished by Cambridge University Press, 1890, as cited in Sir Oliver Lodge, *The Ether of Space*, 1909, p. 114.

they measured some resistance to light traveling in a specific direction on the surface of the Earth. As we also noted, since that resistance was smaller than what they expected for an Earth supposedly revolving around the sun at 30 km/sec, the experimenters invariably produced erroneous interpretations, which resulted in Einstein's hasty rejection of ether, and with that, the missed opportunity of finding a proper explanation for the small positive results afforded by actual experimental evidence.

But if space has substance, what is it? We know that even though it is not seen, nevertheless, it impedes the light circling an interferometer. If it is smaller than an atom's components, how small can it be? Will it ever reach a point of being "indivisible"? This question introduces us to another philosophical problem – the problem of extension and divisibility. The fact that matter exists means that it extends into space. Descartes developed the Cartesian coordinates to help determine the exact "point" in space an object occupies.[1068] Although, on the one hand, the concept of occupying space is very simple, on the other hand, the fact that something is extended means that it is divisible. A twelve-inch rod can be cut into two pieces of six inches, and a six-inch rod is divisible into two three-inch pieces, and so on and so on. Theoretically, we could divide the rod in half for an infinite number of times. We can divide the rod manually as well, but we may reach a point where, at least on a physical basis (not theoretical), we cannot divide the rod any longer.[1069] In other words, matter might reach a point where it is physically indivisible. The Greeks called this stage of indivisibility the "atom." But just how small can nature be before it reaches its limit of physical divisibility? We may never know for certain, but we do have some parameters with which to work, which we will investigate momentarily.

[1068] Descartes formulated the Cartesian coordinates by observing a fly flying in his room. He reasoned that the exact location of the fly in flight could be calculated at any one instant by measuring the distance the fly was from the floor and two adjacent sides of the room.

[1069] This brings up the thorny issue concerning theoretical postulates formed from "thought experiments" as opposed to those formed from physical evidence found by experiment. Theoretical thought experiments may require causes and effects that are physically impossible to attain, and thus leave the hypotheses issuing from them as either false or unprovable. Conversely, although experimental evidence is the best means of physically verifying the truth, we may not possess the mechanical apparatus to determine whether a theoretical concept is true or false, as is demonstrated by the Heisenberg Uncertainty Principle. A variation of this is Zeno's Paradox, which says that if the distance to an end point is halved successively, one will never reach the end point since there will always be a space to halve.

Einstein Goes Back to Ether

Perhaps the best place to begin in discovering what constitutes space is to investigate the turn of events that took place in Albert Einstein's theorizing on the subject. This is an important starting point for the simple reason that, whereas from the years 1905-1915 Einstein had rejected the notion of ether filling the constitution of space, it was in the year 1916 that he re-adopted ether as a constituent part of his theory of General Relativity, although with extensive modifications to Lorentzian ether. As his biographer Abraham Pais put it: "The aether of the general theory of relativity is a medium without mechanical and kinematic properties, but which codetermines mechanical and electromagnetic events."[1070] In 1916 Einstein wrote:

> …in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, *i.e.*, no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity….Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together.[1071]
> It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the

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[1070] *Subtle is the Lord*, Oxford, 1982, 2005, p. 313.

[1071] Albert Einstein, "Grundgedanken und Methoden der Relativitätstheorie in ihrer Entwicklung dargestellt," *Morgan Manuscript*, EA 2070, as cited in Ludwik Kostro, *Einstein and the Ether*, Aperion, 2000, p. 2. For a good summation of Einstein's reasoning in regard to reviving the ether concept, see Galina Granek's "Einstein's Ether: Why Did Einstein Come Back to the Ether?" *Apeiron*, vol. 8, no. 3, July 2001; "Einstein's Ether: Rotational Motion of the Earth," *Apeiron*, vol. 8, no. 2, April 2001; Ludwik Kostro, "Einstein and the Ether," *Electronics and Wireless World*, 94:238-239 (1988). Kostro writes: "the notion of ether was not destroyed by Einstein, as the general public believes" (*ibid.*, p. 239); "Lorentz wrote a letter to Einstein in which he maintained that the general theory of relativity admits of a stationary ether hypothesis. In reply, Einstein introduced his new non-stationary ether hypothesis" (*ibid.*, p. 238).

ether, for I can see that with the word *ether* we say nothing else than that space has to be viewed as a carrier of physical qualities.[1072]

Prior to this shift, Einstein had made the following statements, five years apart, the first from his famous 1905 paper:

The introduction of a 'light ether' will prove to be superfluous, because the view here to be developed will introduce neither a 'space at absolute rest' provided with special properties, nor assign a velocity vector to a point of empty space in which electro-magnetic processes take place.[1073]

The second, in 1910, stated: "The first step to be made…is to renounce the ether."[1074] So there we have it. What Special Relativity taketh away with the left hand, General Relativity giveth back with the right hand. Few are aware of this dramatic shift in Einstein's thinking, and of those, many are embarrassed to admit that the ether concept had to be reintroduced and coincided with the very leg of the Relativity theory that had vociferously denied it. The reason? Prior to 1916, Einstein wanted to divest physics entirely of the notion of absolute rest. The concept of an immobile Earth or immobile ether was, for some odd reason, repugnant to him. Having already accepted Copernican cosmology,[1075] the ether was the last thing standing in his way. As he understood it, if ether existed, it necessitated that there be absolute space. If there is absolute space, then there is absolute rest. Obviously, Relativity cannot exist with anything being at absolute rest, for, by definition, the theory would be nullified.

The task of putting the nails into ether's coffin was not so easy, however. Henri Poincaré left some unfinished business that Einstein still had to address. Poincaré continued to insist upon the existence of ether for three main reasons: (1) stellar aberration (which we covered previously in

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[1072] Albert Einstein, "Letter to H. A. Lorentz, November 15, 1919," EA 16, 494, as cited in Ludwik Kostro, *Einstein and the Ether*, *Aperion*, 2000, p. 2.
[1073] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905.
[1074] "Le Principe de relativité et ses consequences dans la physique moderne," *Archives de sciences physiques et naturalles*, 29, pp. 18-19.
[1075] In 1938 Einstein wrote: "Since the time of Copernicus we have known that the Earth rotates on its axis and moves around the sun. Even this simple idea, so clear to everyone, was not left untouched by the advance of science. But let us leave this question for the time being and accept Copernicus' point of view" (Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154-155).

the study of the Arago and Airy experiments); (2) "action-at-a-distance" whereby gravity and electromagnetism could be transmitted over vast distances; (3) rotational motions (of which we saw an example in Sagnac's 1913 experiment). Although Einstein felt that he had answered the phenomenon of stellar aberration (but, as we noted earlier, in reality he had not), he did not have a quick answer for rotation and action-at-a-distance.

In addition, Dayton Miller, as we have detailed earlier, was hot on Einstein's trail between 1921 and 1933. With Miller's new and improved interferometer experiments, Einstein could run but not hide from the mounting evidence for the existence of ether. Along these same lines, in 1923 Ernst Gehrcke published the article "The Contradictions between the Ether Theory and Relativity Theory and Experimental Tests"[1076] in which he reexamined the Michelson-Morley, Michelson-Miller, and Georges Sagnac experiments, concluding that Relativity theory simply did not have a good explanation for the results.

In the late 1920s, Paul R. Heyl posed a different yet related question to Einstein:

> …Einstein pointed out that there might be no such thing as gravitational force any more than there is a centrifugal force; that both may be considered as manifestations of inertia aided in the case of gravitation by curved space acting much like a mechanical surface of constraint. For this reason it is sometimes said that the theory of relativity has done away with the ether. I hardly think that is a fair statement…[I]f relativity ignores the ether, does it not introduce what is to all intents and purposes its equivalent? The ether was supposed to be a medium filling all space that otherwise would be empty. Einstein supposes space itself to be enough of an entity to have a curvature, and to be "empty" only where and when it is flat. But if space can be bent and can straighten out again, why can it not repeat this process with sufficient rapidity to be called a vibration? And what difference does it make whether it is space itself that vibrates, or something that fills space? Back in every one of our heads is the idea that there is something which philosophers call a "thing-in-itself" which is responsible for our sensations of light and

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[1076] German title: "Die Gegensätze zwischen der Äthertheorie und Relativitätstheorie und ihre experimentale Prüfung," *ZftP*, 4, 1923, Nr. 9, pp. 292-299, Kostro, p. 135.

electricity; and whether we spell it ETHER or SPACE, what does it matter?[1077]

As 1993 Nobel Prize winner, **Robert Laughlin,** puts it:

It is ironic that Einstein's most creative work, the general theory of relativity, should boil down to conceptualizing space as a medium when his original premise was that no such medium existed…. Einstein… utterly rejected the idea of ether and inferred from its nonexistence that the equations of electromagnetism had to be relative. But this same thought process led in the end to the very ether he had first rejected, albeit one with some special properties that ordinary elastic matter does not have. The word "ether" has extremely negative connotations in theoretical physics because of its past association with opposition to relativity. This is unfortunate because, stripped of these connotations, it rather nicely captures the way most physicists actually think about the vacuum.

In the early days of relativity the conviction that light must be waves of something ran so strong that Einstein was widely dismissed. Even when Michelson and Morley demonstrated that the earth's orbital motion through the ether could not be detected, opponents argued that the earth must be dragging an envelope of ether along with it because relativity was lunacy and could not possibly be right…. Relativity actually says nothing about the existence or nonexistence of matter pervading the universe, only that such matter must have relativistic symmetry.

And he concludes with this important paragraph:

[1077] Paul R. Heyl, "The History and Present Status of the Physicist's Concept of Light," in "Proceedings of the Michelson Meeting of the Optical Society of America," *Journal of the Optical Society of America*, vol. XVIII, March 1929, p. 191.

It turns out that such matter exists. About the time relativity was becoming accepted, studies of radioactivity began showing that the empty vacuum of space had spectroscopic structure similar to that of ordinary quantum solids and fluids. Subsequent studies with large particle accelerators have now led us to understand that space is more like a piece of window glass than ideal Newtonian emptiness. It is filled with "stuff" that is normally transparent but can be made visible by hitting it sufficiently hard to knock out a part. The modern concept of the vacuum of space, confirmed every day by experiment, is a relativistic ether. But we do not call it this because it is taboo.[1078]

Einstein was thus forced back to at least some concept of ether, but here is where he wanted it both ways. He needed ether to account for the physical effects of action-at-a-distance and rotational motion, but he did not want to give ether any physical attributes, for if he did, that would nullify Relativity theory. As he puts it:

The special theory of relativity forbids us to assume the ether to consist of particles observable through time, but the hypothesis of ether is itself not in conflict with the special theory of relativity. Only we must be on our guard against ascribing a state of motion to the ether.[1079]

So, according to Einstein's wishes, we can have the "concept" of ether but we cannot have "particles" or "motion" of ether. His followers were parroting the same reasoning. In 1923, Arthur Eddington had caught on to Einstein's rationale, stating:

[1078] Robert B. Laughlin, *A Different Universe: Reinventing Physics from the Bottom Down*, 2005, pp. 120-121. The two chapters of Laughlin's book that deal with these issues are: "The Nuclear Family," (pp. 99-116 and "The Fabric of Space-Time" (pp. 117-126). Laughlin can speak so boldly about ether and not be afraid of suffering chastisement because, as one author notes: "…the impression of suggesting an ether theory is carefully avoided, because such can still be career suicide. Only physicists who were established beyond reproach could discuss ether-like aspects openly, like George Chapline, Gerd 't Hooft, Robert Laughlin, or Frank Wilczek, just to alphabetically list a few who did. Today, we finally witness the dams breaking and ever more people dare to 'come out.'" Sascha Vongehr, "Supporting Abstract Relational Space-Time as Fundamental without Doctrinism Against Emergence," Nanjing University, China, Dec. 2009, p. 2.
[1079] May, 1920 Leyden address, para. 16.

If a substantial aether analogous to a material ocean exists, it must rigidify, as it were, a definite space; and whether the observer or whether nature pays any attention to that space or not, a fundamental separation of space and time must be there. Some would cut the knot by denying the aether altogether. We do not consider that desirable, or, so far as we can see, possible; but we do deny that the aether need have such properties as to separate space and time in the way supposed.[1080]

In this way, Einstein allows himself to maintain the key to his Relativity theory (the denial of absolute space and rest), yet have at least a conceptual basis for understanding action-at-a-distance and rotational motion. Although he says this "conceptual" ether has no "particles" or "motion," we are then told in the next paragraph that it, nevertheless, has at least some physical qualities. He writes:

But on the other hand there is a weighty argument to be adduced in favor of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatsoever. The fundamental facts of mechanics do not harmonize with this view. For the mechanical behavior of a corporeal system hovering freely in empty space depends not only on relative position (distances) and relative velocities, but also on its state of rotation, which physically may be taken as a characteristic not appertaining to the system in itself. In order to be able to look upon the rotation of the system, at least formally, as something real, Newton objectivizes space. Since he classes his absolute space together with real things, for him rotation relative to an absolute space is also something real. Newton might no less well have called his absolute space "ether"; what is essential is merely that besides observable objects, another thing, which is not perceptible, must be looked upon as real, to enable acceleration or rotation to be looked upon as something real.[1081]

Here Einstein is preparing us for his concept of ether by citing Newton's notion of space. Since Newton made no absolute claims to knowing the constitution of space or the cause of gravity, Einstein feels safe in appealing to Newton. Einstein needs to "objectivize" space in order to explain movement within it (*e.g.*, rotation and action-at-a-distance), but

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[1080] Arthur Eddinton, *Space, Time and Gravitation*, p. 39.
[1081] *Ibid.*, para. 18.

other than his metrical tensor fields developed from the geometry of Minkowski and Riemann, he does not reveal what "physical qualities" he will eventually attribute to space.

Ludwik Kostro has done the most work in retracing Einstein's steps toward reviving the ether. In fact, Kostro reveals that up to our day no one had made a thorough report of Einstein's concept of the ether, stating that his is "the first comprehensive history of Einstein's concept of the ether."[1082] Kostro points out, however, like many other innovations of science attributed to Einstein, this, too, was the product of someone prior to Einstein that he had read but to whom he had not given any credit. The German physicist Paul Drude had written about the concept in 1900 in his work *Handbook of Optics*. Drude allows ether "…if one understands by ether not a substance, but only space endowed with certain physical characteristics."[1083] Kostro comments:

> We know for sure…that Einstein read the…*Handbook of Optics*, because upon reading it he wrote a letter to the author in which he offered his comments on the book….Einstein must also have read Drude's *Physics of the Ether Based on Electro-magnetism*, which appeared in 1894…. Similarities between expressions, and even identical ways they were used, offer proof that Einstein studied these works thoroughly. In his subsequent works Einstein would define the ether as "physical space endowed with physical attributes."[1084]

All in all, Einstein envisioned three different kinds of ether: one for the Special theory; one for the General theory; and one for his hoped-for Unified theory. The ether for the Special theory originated from Lorentz, but Einstein rejected it because Lorentz understood it as an immobile ether, identical to the concept held by the 1905 Nobel Prize winner Philipp

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[1082] Ludwik Kostro, *Einstein and the Ether*, 2000, p. 7. Kostro adds: "There do exist a number of articles outlining the history of this subject by the author of the present work [Kostro]. In works by other historians of physics which the author had been able to obtain, Einstein's ether and its features are given a mere mention. Many documents presented or quoted in this work have never been published. The documentation I have drawn upon here has been collected by the library of the Museum of Science and Technology in Munich (Deutsches Museum) and in the Bayerische Staatsbibliothek in Munich" (*ibid*).

[1083] Kostro, *Einstein and the Ether*, p. 18.

[1084] *Ibid*., pp. 19-20.

Lenard,[1085] and reminiscent of the "absolute space" of Isaac Newton. The ether of General Relativity only had to incorporate gravity, thus Einstein had to develop another type of ether in order to unify gravity with electromagnetism, which led to embellishing Riemann's geometry with what was known as "tele-parallelism" and six more tensor fields in addition to the ten already being used by General Relativity. Of course, this attempt brought Einstein to the end of his rope, and he began to see that the whole endeavor might be seriously flawed, as we noted previously in his private letters to Maurice Solovine and others. Despite his valiant attempts, Einstein simply could not find singularity-free equations to his General or Unified Field theory.[1086]

The details of Einstein's thought process are of interest here. In 1916, Einstein was distancing himself from Ernst Mach's philosophy, although he would keep Mach's concept of the "distant masses" (stars) as providing the inertial frame of the universe and the inertial force of local phenomena. (Mach maintained his belief in ether in order to have a medium to transport the force from the stars). By the time Einstein gave his University of Leyden address on May 5, 1920, he had been sufficiently influenced by Henrick Lorentz's ether-based electromagnetic and cosmological views, and thus he admitted publically for the first time that the concept of ether was vital to physics, and, in fact, physics could not exist without it. First, Einstein reviews the various ether theories of the past. In the first half of the nineteenth century, Einstein understands that in the era of Fizeau and Fresnel:

> …It appeared beyond question that light must be interpreted as a vibratory process in an elastic medium filling up universal space. It also seemed to be a necessary consequence of the fact that light is capable of polarization, that this medium, the ether, must be of the nature of a solid body, because transverse waves are not possible in a fluid, but only in a solid. Thus the physicists were bound to arrive at the theory of the "quasi-rigid"

[1085] Philipp Lenard, *Über Äther und Materie, Zweite, ausführlichere und mit Zusätzen versehene Auflage*, Heidelberg, C. Winters Universitätsbuchhandlung, 1911, cited in Kostro, p. 42.

[1086] Kostro says that at one time Einstein arrived at a singularity-free theory by "removing the denominator from the equations." Quoting Einstein: "If one modifies the equations in an unessential manner so as to make them free from denominators, regular solutions can be obtained, provided one treats the physical space as consisting of two congruent sheets." Kostro also reveals that Einstein would eventually abandon this solution, however (*Einstein and the Ether*, pp. 138-140).

luminiferous ether, the parts of which can carry out no movements relative to one another except the small movements of deformation which correspond to light-waves.[1087]

As for Maxwell and Hertz, Einstein said:

> …the ether indeed still had properties which were purely mechanical, although of a much more complicated kind than the mechanical properties of tangible solid bodies. But neither Maxwell nor his followers succeeded in elaborating a mechanical model for the ether which might furnish a satisfactory mechanical interpretation of Maxwell's laws of the electro-magnetic field….Thus the purely mechanical view of nature was gradually abandoned. But this change led to a fundamental dualism which in the long-run was insupportable…. This dualism still confronts us in unextenuated form in the theory of Hertz, where matter appears not only as the bearer of velocities, kinetic energy and mechanical pressures, but also as the bearer of electromagnetic fields…. The ether appears indistinguishable in its functions from ordinary matter. Within matter it takes part in the motion of matter and in empty space it has everywhere a velocity…[1088]

This then leads to the theory of Lorentz. Einstein describes it as follows:

> Such was the state of things when H. A. Lorentz entered upon the scene….He [took] from ether its mechanical, and from matter its electromagnetic, qualities. As in empty space, so too in the interior of material dies, the ether, and not matter viewed atomistically, was exclusively the seat of electro-magnetic field. According to Lorentz the elementary particles of matter alone are capable of carrying out movements; their electromagnetic activity is entirely confined to the carrying of electrical charges. Thus Lorentz succeeded in reducing all electromagnetic happenings to Maxwell's equations for free space. As to the mechanical nature of the Lorentzian ether, it may be said of it, in a somewhat playful spirit, that immobility is the only mechanical

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[1087] Einstein's Lecture at the University of Leyden, Germany, May 5, 1920.

[1088] *Ibid*. See also Arthur Miller's *Albert Einstein's Special Theory of Relativity* for an in-depth explanation of Hertz's contribution to the electromagnetic/ether issue, pp. 11-14.

property of which it has not been deprived by H. A. Lorentz. It may be added that the whole change in the conception of the ether which the special theory of relativity brought about, consisted in taking away from the ether its last mechanical quality, namely, its immobility.

Next Einstein explains by means of his famous K and K' models what led him, initially, to dispense with ether.

The space-time and the kinematics of the special theory of relativity were modelled on the Maxwell-Lorentz theory of the electromagnetic field. This theory therefore satisfies the conditions of the special theory of relativity, but when viewed from the latter it acquires a novel aspect. For if K be a system of coordinates relative to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations without any change of meaning also hold in relation to any new system of coordinates K' which is moving in uniform translation relative to K. Now comes the anxious question: Why must I in the theory distinguish the K system above all K' systems, which are physically equivalent to it in all respects, by assuming that the ether is at rest relative to the K system? For the theoretician such an asymmetry in the theoretical structure, with no corresponding asymmetry in the system of experience, is intolerable. If we assume the ether to be at rest relative to K, but in motion relative to K', the physical equivalence of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless unacceptable.

What Einstein is trying to say is that, by accepting Special Relativity as a fact (which he believes has been proven by the Michelson-Morley experiment), then it must also be accepted that the "space-time and the kinematics of the Special Theory of Relativity" must hold for all objects and locations, whether at rest or in motion. Hence, it would be incorrect to make a distinction between one object and another by saying that one object is *at rest in ether* and the other is *moving in ether*, since, if both objects experience the same "space-time" effects regardless of their relationship to the ether, then the ether had nothing to do with what they experienced. For Einstein, ether not only becomes superfluous, it actually gets in the way of logic. Logic requires that if a substance such as ether exists, then it must produce different effects on an object at rest as opposed

to an object in motion. Since there is no difference, in Einstein's logic one can then dispense with ether. Thus Einstein concludes:

> The next position which it was possible to take up in face of this state of things appeared to be the following. The ether does not exist at all. The electromagnetic fields are not states of a medium, and are not bound down to any bearer, but they are independent realities which are not reducible to anything else, exactly like the atoms of ponderable matter.

Now, let us recall from previous analysis what led Einstein to this kind of thinking. The 1887 Michelson-Morley experiment, including its Fizeau-Fresnel precursors and its post-1887 confirmations, led Einstein and the rest of the world to believe that ether had no effect on objects because, as the experiments apparently proved, a light beam traveling with the Earth's velocity of 30 km/sec against the ether experienced no reduction in its speed when compared to a light beam that was not traveling against the ether. Rather than entertain the idea that the Earth was immobile, Einstein had two other alternatives: (a) that ether traveled with the Earth in its revolution around the sun; or (b) that there is no ether, and thus light itself is an absolute. Thus, the theory of Special Relativity was born, for if there is no ether, and all the heavenly bodies are in motion, then there is no absolute state of rest and no central point in the universe. Every object can act as its own inertial point. Each object will be subject to the same laws, and we, the observers, can understand how one object relates to the next only by means of the equations of Relativity theory. Thus, if Special Relativity can explain the mathematical relationships of these various objects, then there is no need for an ether, or, for that matter, there is no need for any fixed absolute, including a fixed Earth. Relativity makes the need for all absolutes superfluous. Accordingly, the confusing array of length contractions, time dilations, mass increases and gravitational warping seem much better ways of explaining the universe to the sophisticates of modern science than the simplified notion of a fixed Earth in a revolving sphere of stars.

Philipp Lenard was one of Einstein's most vocal opponents at this time. In a 1917 speech titled "Relativity Principle, Ether, Gravitation" he remarked that Einstein merely renamed ether as "space," and concluded that General Relativity theory could not exist without ether.[1089] Einstein

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[1089] "*Über Relativitätsprinzip, Äther, Gravitation,*" Leipzig, S. Hirzel, 1918, cited in Kostro.

responded with "Dialogue Concerning Accusations against Relativity Theory" in 1918.[1090]

In it we find Einstein basing his ideas on the aforementioned misinterpretation of the Michelson-Morley experiment, saying such things as: "According to the special theory of relativity a privileged state of motion did not exist anymore; this meant the negation of ether in the sense of earlier theories," but he agreed with Lenard that the space of General Relativity had "physical properties." Ernst Gehrcke had already introduced a critique of Einstein with the article "On Critics and History of the New Theories of Gravitation" in 1916,[1091] and Paul Weyland followed with a 1920 paper titled "Einstein's Theory of Relativity as Scientific

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(1862 - 1947**

Mass Suggestion," concluding that "Einstein eliminated the ether by decree, [but] he re-introduced it *via* a different concept with the same functions."[1092]

After Einstein's Leyden address in 1920 came the 1924 article titled *Über den Äther*. Einstein was on a quest to eliminate Lorentz's immobile ether and replace it with a pliable ether. He needed ether, at least in some form, to answer Newton's biggest problem: "action-at-a-distance." As he says in *Über den Äether*: "We are going to call this physical reality, which enters into Newton's law of motion alongside the observable ponderable bodies, the 'ether of mechanics.'"[1093] Einstein knew that there could be no such "action" unless there existed a continuous medium to carry it from one place to another. As he says in the same work: "But every contiguous action theory presumes continuous fields, and therefore also the existence of an 'ether.'"[1094] Since Einstein was convinced he could not have any

[1090] "Dialog über Einwande gegen die Relativitätstheorie," *Die Naturwissenschaften* 6, 1918, cited in Kostro.

[1091] "Zur Kritik und Geschichte der neueren Gravitationstheorien," *AdP*, 50, 1916, pp. 119-124, cited in Kostro. Gehrcke had also proved that Einstein plagiarized some of his work, specifically the 1898 mathematical work of Paul Gerber concerning the perihelion of Mercury (Kostro, *Einstein and the Ether*, p. 79).

[1092] "Einsteins Relativitätstheorie – eine wissenschaftliche Massensuggestion," *Tägliche Rundschau*, August 6, 1920, as cited in Kostro.

[1093] *Über den Äether*, p. 85, as cited in Kostro, *Einstein and the Ether*, p. 103.

[1094] *Über den Äether*, p. 93, as cited in Kostro, *Einstein and the Ether*, p. 106. Also appearing in and translated from *Schweizerische naturforschende Gesellschaft,*

object or place in the universe serve as an immobile point, this medium had to move. In Einstein's theory, it would move because matter moved it, yet it would be continuous because matter permeates the universe. As he describes it:

> No space and no portion of space [can be conceived of] without gravitational potentials; for these give it its metrical properties without which it is not thinkable at all….According to the general theory of relativity, space without ether is unthinkable; for in such space, not only would there be no propagation of light, but also no possibility of existence for standards of space and time (measuring rods and clocks), nor therefore any space-time intervals in the physical sense.[1095]

One can easily see the strain under which Einstein had put himself. He desperately wanted the ether because it would give him "standards of space and time," but he had not, and would never, as it develops, explain how he can possess such standards if both the matter and the ether it bends are constantly moving. Of course, we need only interject once again that, had Einstein properly interpreted the Michelson-Morley experiment, he would have had his "standard of space and time" in an immobile Earth.

**Louis de Broglie
(1892 – 1987)**

Even among Einstein's supporters the understanding that space is filled with substance was never relinquished. Louis de Broglie (d. 1987), the Nobel laureate famous for his discovery of the electron's wave in the 1920s, wrote in 1971 that the concept of ether, or as he calls it "the hidden medium," needed to be revived. Critiquing the model of space proposed by Erwin Schrödinger in 1926, de Broglie longs for the days of fixed points reminiscent of Descartes' Cartesian axes and Newton's absolute space:

Verhand-lungen, 105, 1924, pp. 92-93, and also appearing in Einstein's book, *The World as I See It*, 1934, "Relativity and the Ether," 1920, pp. 121-137, cited from *The Einstein Myth*, Part 1, p. 100. Einstein would write many other papers on the ether, such as "The New Field Theory" in 1929; "The Problem of Space, Ether and Field as a Problem of Physics" in 1934.

[1095] *Äther und Relativitätstheorie*, Berlin, J. Springer, 1920, pp. 13-14, Kostro, *Einstein and the Ether*, pp. 97-98.

Everything becomes clear if the idea that particles always have a position in space through time is brought back…. According to my current thinking, the particle is always located within a physical wave….The movement of the particle is assumed to be the superposition of a regular movement…and of a Brownian movement due to random energy exchanges which take place between the wave and a hidden medium, which acts as a subquantum thermostat. The point of prime importance in this model is that at each moment the particle occupies a well-defined position in space, and this re-establishes the clear meaning which the configuration space had in classical mechanics.[1096]

Ludwik Kostro's book, *Einstein and the Ether*, has revealed the heretofore undisclosed history of ether science in the twentieth century. He states the following candid conclusion:

Modern science has its roots in ancient Greek philosophy. This philosophy, as we know, used the word "ether" to designate the particular kind of matter that filled the universe. This term was used throughout the history of philosophy and science, and it

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[1096] Louis de Broglie, "Waves and Particles," *Physics Bulletin*, 22, February 1971, single page. In the same article he adds: "…whereas in my original concept I assumed that the coexistence of waves and particles, perceived by Einstein in 1905 in respect of light in his theory of light quanta, should be extended to all types of particle[s] in the form of the coexistence of a physical wave with a particle incorporated in it. Moreover, Schrödinger's ψ wave was soon to lose the nature of a physical wave on the day when Max Born put forward the hypothesis that it was a probability, and for that reason should be normalized, which is equivalent to assigning to it an arbitrary amplitude selected by the theorist. Thus, starting from a synthetic idea of the coexistence in physical space of waves and particles, a theory in which there was no longer any wave or particle was arrived at!….But as soon as Schrödinger's works were published I was struck by the paradox involved, as indeed I had already emphasized in an article which appeared in 1928 [Selected Papers on Wave Mechanics, London: Blackie, p. 130]. For since Schrödinger gave up the idea that particles existed in physical space, they no longer have well defined coordinates and it is difficult to imagine how the configuration space can be constructed with nonexistent coordinates….It may assist in clarifying this point to recall that in classical mechanics particles are treated as a first approximation as material points which have well defined coordinates in physical space at every moment….But this representation, clear and logical though it is, loses all its meaning in a theory in which particles have no spatial position as in current quantum mechanics" (*ibid*).

was also current at the beginning of this century. A resumption of its use at the dawn of this new century is now a fact. Since, according to the General Theory of Relativity and other modern branches of physics, the space and time of the universe do not constitute a vacuum, but a structured material plenum characterized by different physical quantities, the historical and traditional word "ether" is the most appropriate to express these features of the universe.[1097]

Galine Granek adds:

Einstein's new kind of ether was the metrical tensor field. He thus started to adhere to this new ether. He named it "Mach's ether" or simply "ether," and supplied the same reasons that Poincaré had provided in his writings as to why we should adhere to the ether (we need the ether in order to remove absolute rotation and action-at-a-distance: see my papers "Poincaré's ether"). Einstein thus returned to the 19th century concept of the ether, but stripped of it its most important characteristic: a medium being in absolute rest. One could still pose the perplexing question: Was Einstein's ether endowed with any properties independent of the masses in it? For if it did possess such properties then there was actually no difference between Einstein and Poincaré's ether. Einstein did not give a definitive answer to the above question in his (1920) lecture.[1098]

Astrophysicist Toivo Jaakkola extends Kostro's evidence:

A few words about the gravitational ether, and the ether concept in general may be in place here. The ether hypothesis was thought to be buried by the Michelson-Morley experiment, but today it is more alive than ever, in the form of the CBR [Cosmic Background Radiation]: experiments capable of finding the ether were not possible in the 1880s, but were possible in the 1960s. In a sense, the electromagnetic ether has always been observed – as the heat of the Sun (since as pointed out, CBR is reprocessed photons)…. All the main cosmological, astrophysical and

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[1097] Ludwik Kostro, *Einstein and the Ether*, 2000, pp. 186-187.
[1098] "Einstein's Ether: D. Rotational Motion of the Earth," Galina Granek, Department of Philosophy, Haifa University, Mount Carmel, Haifa 31905, Israel, *Apeiron*, Vol. 8, No. 2, April 2001, p. 64.

physical facts: the gravity and Olbers paradoxes, redshift effects and CBR, gravitation and radiation, and the existence of particles can be conceived in the framework of this ether concept.[1099]

Everyone is seeing it. No more disparaging remarks about ether will be made from the science community today. As these authors put it: "Today the vacuum is recognized as a rich physical medium….A general theory of the vacuum is thus a theory of everything, a universal theory. It would be appropriate to call the vacuum "ether" once again."[1100]

In the end Einstein seems on the verge of resigning himself to failure. He even questions whether his Relativity theory is necessary, and, similar to Lorentz's letter written to Einstein in 1915 seeking a

> …'world spirit,' who would permeate the whole system under consideration without being tied to a particular place or 'in whom' the system would consist, and for whom it would be possible to 'feel' all events directly would obviously immediately single out one of the frames of reference over all others.[1101]

Einstein surprisingly refers to God and His alternate choices in a 1926 letter to Sommerfield:

> It is also necessary to criticize the fact that he [Eddington] often describes the theory of relativity as *logically* necessary. God could also have decided to create an absolute static ether instead of the relativistic ether. This would hold especially, if he were to adapt the ether to the (substantial) independence from matter, as in de Sitter, an opinion toward which Eddington obviously leans; because in such a case an "absolute" function should also be attributed to the ether.[1102]

[1099] "Action-at-a-Distance and Local Action in Gravitation," in *Pushing Gravity*, ed., Matthew Edwards, pp. 157-159.

[1100] S. Saunders, H. R. Brown, editors, *The Philosophy of Vacuum*, 1991, p. 251.

[1101] Henrick Lorentz to Albert Einstein, January 1915, Robert Schulmann, A. J. Kox, Michael Janssen and József Illy, editors, *The Collected Papers of Albert Einstein, Correspondence 1914-1918*. Princeton: Princeton University Press, 1998, Document 43.

[1102] Albert Einstein, "Letter to A. Sommerfield, 28/11/1926," in *A. Einstein, A. Sommerfield Briefwechsel*, Basel-Stuttgart: Schwabe u. Co. Verlag, 1968, p. 109, as cited in Kostro, *Einstein and the Ether*, p. 99.

Candidates for Material Ether: Carl Anderson's Positron

What science has found since the time of Einstein is a virtual sea of particles, both in the micro-levels and macro-levels of the cosmos, many of which are suitable candidates for the "ponderable" ether that Einstein dismissed because of his philosophical and scientific presuppositions. As noted above, the primary presupposition of which Einstein and all Copernican scientists were guilty is that they left no room to explain the interferometer experiments by means of a motionless Earth. Had they done so, it would have shown that something physical was there, even though they could not see, touch, hear, smell or taste it. That this kind of presupposition would lead to either a misinterpretation of the evidence, or even a downright denial of it, was brought out quite clearly in Einstein's interpretation of Carl Anderson's experiment in 1932. Anderson (1905-1991) was an American physicist who, with Victor Francis Hess of Austria, won the Nobel Prize for physics in 1936 for his discovery of the positron, the first known particle of "antimatter." In 1927, Anderson had begun studying X-ray photoelectrons (electrons ejected from atoms by interaction with high-energy photons). In 1930 he began research on gamma rays and cosmic rays. While studying photographs of cosmic rays in cloud-chambers, Anderson discovered a number of tracks whose orientation indicated they were caused by positively charged particles, but particles too small to be protons. In 1932 he announced that the particles were "positrons," particles with the same mass as electrons but positively charged. Paul Dirac had predicted their existence in 1928. Anderson's claim was controversial until it was verified the next year by the British physicist Patrick M. S. Blackett.

Prior to Anderson, the electron was discovered in 1897 by J. J. Thomson; the proton in 1911 by Rutherford, Wein, et al., and the neutron in 1932 by James Chadwick. In 1937, Anderson would also discover the short-lived meson. Later came the discovery, although much of it theoretical, of about two hundred more nuclear particles, but most, like the meson, were unstable. The implications of Anderson's work, however, went far beyond the finding of just another subatomic particle. His discovery was another crossroads for science, perhaps equal to the 1887 Michelson-Morley experiment. As in 1887, everything depended on the

**Carl David Anderson
(1905 – 1991)**

interpretation given to the experiment. The wrong interpretation, which is inevitably based on the wrong presuppositions, would put all of science on the wrong track, and it could be decades, even centuries, before it would get back on the right track. As in the Michelson-Morley experiment, if science bases its interpretation on an unproven presupposition (*e.g.*, that the Earth is moving at 30 km/sec), then every subsequent experiment, whether on the micro- or macro-level, will be adversely affected, which has been the case with physics for quite a long time.

Carl Anderson's experiment was another example of such an occasion. In his discovery of the positron, Anderson found that when gamma radiation of no less than 1.022 million electron volts (MeV) was discharged in any point of space, an electron and positron emerged from that point.[1103] He also found the converse, that is, when an electron collides with a positron, the two particles disappear, as it were, and produce two gamma-ray quanta which disperse in opposite directions, but with a combined energy of 1.022 MeV. As one set of authors describe his discovery:

> On August 2, 1932, Anderson obtained a stunningly clear photo-graph that shocked both men. Despite Millikan's protestations, a particle had indeed shot up like a Roman candle from the floor of the chamber, slipped through the plate, and fallen off to the left. From the size of the track, the degree of the curvature, and the amount of momentum lost, the particle's mass was obviously near to that of an electron. But the track curved the wrong way. The particle was positive. Neither electron, proton, or neutron, the track came from something that had never been discovered before. It was, in fact, a "hole," although Anderson did not realize it for a while. Anderson called the new particle a "positive electron," but positron was the name that stuck. Positrons were the new type of matter – antimatter – Dirac had been forced to predict by his theory. (The equation, he said later, had been smarter than he was.)"[1104]

After the excitement of the discovery, of course, comes the interpretation. Often there is a vast gulf that separates the two. A viable interpretation of Anderson's discovery is that space is composed of a lattice of very stable electron-positron pairs which, when the proper quanta

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[1103] 1.022 MeV equals 3.9×10^{-19} calories.
[1104] Robert Crease and Charles Mann, "Uncertainty and Complimentarity," *World Treasury of Physics, Astronomy and Mathematics*, ed., T. Ferris, 1991, p. 78.

of radiation are administered, will either temporarily deform the lattice or jolt the electrons and positrons out of alignment and release them into the view of our bubble chambers. But there is one caveat for modern science: this particular interpretation contradicts both Einstein's theory of Relativity, which was well in vogue by 1932, and the Quantum Mechanical model of the atom known as the Standard Model. Since science almost invariably depends on the reigning paradigm to interpret new evidence (especially paradigms as strong as Relativity and Quantum Mechanics), a suitable counter-interpretation had to be created – one eliminating the possibility that space contained a material substance.

There were two men bold enough to apply this interpretation, Albert Einstein (to save Relativity) and Werner Heisenberg (to save Quantum Mechanics). Relativity theory holds that there is a physical relationship between energy and matter, as well as necessitating that space is a vacuum containing no "ponderable" ether. Thus Einstein had no choice but to conclude that the appearance and disappearance of the electron-positron pair was an example, as he called it, "of the creation and annihilation of matter." Moreover, with the ability to create and destroy electrons and positrons, the formula $E = mc^2$ now had its first "proof." Not only was there a mathematical relationship between matter and energy, but now there could be a relationship wherein energy could become mass, and mass could become energy. This became the standard interpretation of not only electrons and positrons, but of all subatomic particles that met their antimatter counterpart. Although this was pure speculation, these new interpretations did not seem to bother its authors. Let's revisit one of our earlier authors, Jonathan Katz, as he explains the electron-positron "creation" in regard to gamma-ray bursts:

> Einstein's equation $E = mc^2$ gives the amount of energy E that can be obtained if a mass m is completely turned into energy. This relation can be turned around: if two gamma rays with total energy E collide, they may produce a mass m. However, this is only possible if particles whose masses are m or less can be *created* (visible light cannot turn into matter because there are no particles with small enough masses). The least massive known particles are electrons (negatively charged) and positrons (positively charged), each with a mass corresponding to 0.511 MeV of energy. Because electric charge is never created or destroyed, electrons and positrons can only be *created* in pairs, one of each, with zero total charge. Two gamma rays, each of energy 0.511 MeV or more, colliding head-on, can therefore *produce* an electron-positron pair. If the collision is not head-on,

then the necessary energy is greater. If the gamma rays have more energy than the minimum required, the extra appears as kinetic energy of the *newborn* matter – the electron and positron are *born* in motion.[1105]

As one can sense from reading Katz's description, the science establishment has given this explanation so often, and believed it for so many years, they have not the slightest doubt or embarrassment in saying that matter is created out of thin air. As if hypnotized, they entertain no other possibilities. This is a perfect example of how the evidence from experiment will invariably be interpreted by the scientific paradigm reigning at the time, in this case, the theories of Relativity and the Quantum Model of the atom.[1106] As Paul Dirac said in his 1933 Nobel Prize speech:

**Paul Dirac
(1902 – 1984)**

To get an interpretation of some modern experimental results one must suppose that particles can be created and annihilated. Thus if a particle is observed to come out from another particle, one can no longer be sure that the latter is composite. The former may have been created. The distinction between elementary particles and composite particles now becomes a matter of convenience. This reason alone is sufficient to compel one to give up the attractive philosophical idea that all matter is made up of one kind, or perhaps two kinds, of bricks.[1107]

Actually, Dirac was being critical of the "creation" interpretation, but interpretations of this variety are still very popular today. Often, the more

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[1105] Jonathan Katz, *The Biggest Bangs*, p. 46, emphasis added.

[1106] Besides the ignoring of the First Law of Thermodynamics, a rather glaring anomaly in the "creation/annihilation" theory is that the resulting electron and positron both have angular momentums equal to $\hbar/2$ (h = Planck's constant). But this would necessarily mean that the electron or positron, respectively, would have 16 times (or 1,600%) more energy than the gamma photon that supposedly "created" it. Modern physics simply ignores the problem and refers to it as an "inherent property" of the process.

[1107] *World Treasury of Physics, Astronomy and Mathematics*, ed., T. Ferris, 1991, pp. 80-81.

bizarre the theory, the better it sells to the media and the public at large. Various physicists have made a cottage industry out of such speculations. Stephen Hawking, for example, theorizes that in order to have higher than zero temperatures in black holes (a requirement to keep them stable), there must exist "virtual particles." According to Hawking, these are particles that "pop in and out of the vacuum of space spontaneously." Interestingly enough, Hawking holds that these "virtual particles" are mostly electron-positron pairs, and perhaps some proton-antiproton pairs. He writes:

> Quantum mechanics implies that the whole of space is filled with pairs of "virtual" particles and antiparticles that are constantly materializing in pairs, separating, and then coming together again and annihilating each other. These particles are called virtual because, unlike "real" particles, they cannot be observed directly with a particle detector. Their indirect effects can nonetheless be measured, and their existence has been confirmed by a small shift (the "Lamb shift") they produce in the spectrum of light from excited hydrogen atoms.[1108]

He explains their origin in another paragraph:

> When the universe was a single point, like the North Pole, it contained nothing. Yet there are now at least ten-to-the-eightieth particles in the part of the universe we can observe. Where did all these particles come from? The answer is that relativity and quantum mechanics allow matter to be created out of energy in the form of particle/antiparticle pairs. And where did the energy come from to create this matter? The answer is that it was borrowed from the gravitational energy of the universe.[1109]

Again, the more logical and less mystifying interpretation is that the electron-positron pairs are not created through force but were already present, and the radiation of the "black hole" is enough to jar them loose (that is, if black holes actually exist). This solution, of course, would be the death knell of the Big Bang theory, as well as Relativity and Quantum Mechanics.

[1108] *Black Holes and Baby Universes*, pp. 107-108.
[1109] *Black Holes and Baby Universes*, p. 97. In another place Hawking says that black holes "would be able to create electron-positron pairs and particles of zero mass" (*ibid*., p. 109). We notice, however, that Hawking doesn't tell us from where the gravitational energy originates if, according the General Relativity theory he is employing, there was no matter to warp space-time.

There is quite an intriguing story behind the "creation/annihilation" interpretation of Anderson's positron discovery. As noted, physicist Paul Dirac had predicted the discovery of the positron in 1928. In fact, his famous equation predicted that the entire universe is made up of electron-positron pairs (we will call them electropons, henceforth).[1110] The most unique aspect of Dirac's analysis was that his equation required two sets of electropon pairs, positive pairs and negative pairs.[1111] It was known as Dirac's "sea." For the Relativists who followed Einstein, Dirac's model, although everyone knew it was very workable, merely raised the stakes in the ongoing "ether-war," whose shots were first fired over forty years prior in the Michelson-Morley experiment (1887). In fact, in the same year that Dirac came out with his equation and through it predicted the positron's existence, Michelson was doing his final interferometer experiment to detect the ether that Dayton Miller had found four years earlier. Dirac's equation would be one more proof that Einstein incorrectly interpreted Michelson-Morley, the very experiment that hung Relativity in the balance.

This smell of ether was a stench in the nostrils of Relativists, but the budding science of Quantum Mechanics didn't much like the odor either. Werner Heisenberg did everything but hire an assassin to foil Dirac's work. He once referred to Dirac's work as "learned trash which no one can take seriously."[1112] Heisenberg got into the act because the stakes were raised high when Carl Anderson experimentally verified Dirac's 1928 prediction of the positron just four years later (1932). Something had to be done, and done quickly, to destroy Dirac's ether-based universe. For six years Heisenberg and his colleagues tried to find an error in Dirac's equation, but to no avail. Finally, they decided to create their own fudge factor.

**Werner Heisenberg
(1901 – 1976)**

[1110] Paul A. M. Dirac, *Proceedings of the Royal Society A*, 117, 610 (1928a); 118, 351 (1928b). P. A. M. Dirac, *Scientific American*, May 1963, p. 86. The equation took the form: $\sum_\beta [\sum_\mu (\gamma_\mu)_{\alpha\beta} \theta/\theta x^\mu + mc/\hbar \theta_{\alpha\beta}] \psi_\beta = 0$.

[1111] This is because the energy-momentum-mass relation of $E^2 = c^2p^2 + m^2c^4$ requires both a positive and negative energy, such that $\pm E = (c^2p^2 + m^2c^4)^{1/2}$. Some hypothesize that the 2.7° Kelvin radiation is the interface between the negative and positive energy.

[1112] Werner Heisenberg, Letter to Wolfgang Pauli, February 8, 1934.

Although Dirac's equation required the negative energy electropon pairs to be raised to positive energy pairs, Heisenberg circumvented this process by claiming that the positive energy pairs were merely "created" and had no origin from negative energy. Similarly, as Dirac's equation required the positive energy pairs to go back intermittently to the negative energy state, Heisenberg reinterpreted this to mean that the positive pairs were "annihilated." If there was any inadvertent crossover between the negative and positive, Heisenberg's quantum mechanics coined the words "vacuum fluctuation" or "Zero-Point fluctuation" to take care of that problem. Thus we have the dubious origin of the "creation/annihilation" interpretation of Carl Anderson's 1932 experiment and a case in which the politics and intrigue of the science establishment is revealed.

The significance of the electropon phenomenon is noted in how it reflects on the essence of the Big Bang theory, and the inevitable problems it creates. The standard theory is told to the popular enthusiast in the science magazine, *Discover*:

> Whenever a normal particle and an antiparticle meet, they annihilate each other, converting all their mass into energy in a pyrotechnic demonstration of Einstein's famous law, $E = mc^2$. And therein lies the source of one of the greatest dilemmas of science. Physicists believe that by the time the universe was just 10^{-33} of a second old…the temperature had dropped from unimaginably hot to a mere 18 million billion billion degrees. That was cool enough for the first particles of matter and antimatter to condense from pure energy. But to balance the cosmic energy books – and to avoid violating the most fundamental laws of physics – matter and antimatter should have been created in exactly equal amounts. And then they should have promptly wiped each other out. Yet here we are. Somehow a bit of matter managed to survive.[1113]

The article proceeds to report that the scientists working on this problem have no clue how to solve it. One team of scientists, although admitting that this theory is "extremely speculative" and has "no experimental evidence" to support it, proposes that the universe started with neutrinos that turned into electrons, positrons, protons and

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[1113] Tim Folger, "Antimatter," *Discover*, August 2004, p. 67-68. *Discover* notes that "Andrei Sakharov was the first to understand that the Big Bang actually created a crisis for physicists: How could they explain the absence of antimatter and the presence of matter in a cosmos where both should have almost instantaneously vanished?" (p. 69).

antiprotons, but finds that this solution "would have yielded more protons and antiprotons, leading to a fateful imbalance between matter and antimatter at the dawn of time," to which his partner offers the consolation: "In the end there is irrefutable evidence that we are here."[1114] Thank God for that.

Every time modern science tries to explain the present universe by relying on a process, the process fails to produce the universe they presently see. This is the perennial problem with the Big Bang theory: every twist and turn concocted to answer the anomalies it invariably confronts, invariably "violates the most fundamental laws of physics." So either the new theories are wrong, or the "fundamental laws of physics" are wrong, or quite likely both are wrong. We can safely say, however, that when a theory is based on the idea that matter and energy are created out of thin air, then Middle Age alchemists and blood-letters are not as odd in comparison. Until men accept the fact that it was all brought into being simultaneously by an *ex nihilo* divine fiat, they will continue to go down the path of no return.

The Anderson discovery was also important for another reason. It revealed that space consists of very dense yet very stable electropon pairings, perhaps in some type of lattice or crystalline structure. Someone in the physics community should have surmised that light traveling through this dense medium would be directly affected. Physics had already been prompted to think in this vein with Einstein's Nobel Prize-winning discovery in 1905 of the photoelectric effect (the process by which a photon of the right frequency releases an electron from metal), as well as Arthur Compton's discovery in 1923 of the process by which a photon gives momentum to an electron,

Arthur Compton (1892 – 1962)

appropriately called the "Compton effect." With the knowledge that light can be affected by, and produce, physical effects when it interacts with atomic particles, then observing consistent interferometer results of 1-4 km/sec over the course of more than 60 years (*i.e.*, 1867-1932) should have suggested to them that light was being physically affected by some kind of substance in space. Unfortunately, as we know all too well, strong but unproven presuppositions (*i.e.*, that the Earth was revolving around the sun at 30 km/sec) prohibited them from making that crucial link.

[1114] "Antimatter," *Discover*, August 2004, p. 71.

Another possible reason for modern science's reluctance to accept that electropon pairs already exist and are not "created" is that it would force a wholly different explanation to such formulas as $E = mc^2$, explanations that are not dependent on Lorentz's complex transformation equations or Einstein's canons of tensor calculus. In other words, the alternative explanations would be physical, mechanical, and anti-Relativistic. That is, energy (E) is absorbed into open space resulting in the release of a mass of electrons and positrons (or various other possible particles), which can then be multiplied by the square of the speed of light to calculate the total amount of energy absorbed. In fact, accepting the electropon lattice model, one can arrive at $E = mc^2$ by a simple algebraic proportion.[1115]

That an electropon lattice may pervade all of open space and thus constitute the salient part of the "ponderable" ether has been postulated for quite some time. Plasma physics, for example, has demonstrated that electropon pairs play an important role in almost every phenomenon in the cosmos, including stars, neutron-stars, pulsars, quasars and gamma-ray bursters.[1116] Based on much physical evidence, several physicists have shown that an electropon lattice provides one of the most logical, lucid, and thoroughly physical explanations for nuclear and cosmological phenomena. Despite the unfortunate theoretical detour to which science drove itself after the 1887 Michelson-Morley experiment, there are a few modern scientists who haven't succumbed to the *hocus pocus* of spatial warps, time dilations, and quantum uncertainties. All the mystery and confusion created by Relativity and Quantum Mechanics is suddenly evaporated once one understands the *physical* reasons (as opposed to the

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[1115] If the product 300,000 km/sec is caused by the velocity (v) of the wave motion of the electropon lattice, then $v = (E/m)^{1/2}$ where m equals the mass of the electron or positron (9.1×10^{-31} kg), and E is the binding energy per particle (511,000 eV or 8.2×10^{-14} joules), the equation is: $v = (8.2 \times 10^{-14}$ joules$/ 9.1 \times 10^{-31}$ kg$)^{1/2} = (9 \times 10^{16}$ m^2/s$^2)^{1/2} = 3 \times 10^8$ m/s = 300,000 km/s = c, the accepted "speed" of light. Since $c = v$ in $v = (E/m)^{1/2}$, then $E = mc^2$. (See M. Simhony, *An Invitation to the Natural Physics of Matter, Space, Radiation*, Singapore, New Jersey: World Scientific, 1994, pp. 172-175).

[1116] *Electron-Positron Physics at the Z*, "Series in High Energy Physics, Cosmology and Gravitation," M. G. Green, Royal Holloway and Bedford College, UK, January 1998. Plasma experimenters spend most of their time colliding electrons and positrons at just below luminal speeds producing an array of other strange particles. In fact, different particles are produced depending on how fast the electrons and positrons collide. Whether these are true particles or merely different bubble-chamber paths of the same particle remains on the debating table.

merely mathematical or theoretical) why things occur as they do.[1117] For example, the origin of inertia could be simply explained, since around every micro and macro object there are billions of electropon pairs, which vibrate at a frequency proportional to the velocity of the object. If the object remains in uniform motion, so does the vibration energy of the electropon pairs. If there is any change in motion, the electropon pairs act accordingly, changing their frequency and energy. The energy required to change the values for the electropon pairs is equivalent to the inertial energy of the object. The same principle could hold for gravity. Any two bodies will disturb the equilibrium of the electropon pairs, and will do so based on their masses and the inverse square of the distance between them. Since the disturbance occurs between the bodies, the force will be felt there, and nowhere else.[1118] In fact, because the electropons are in a lattice formation, they function very similar to crystalline structures. In light of this comparison, Robert Laughlin sheds some light as to how such crystalline structures transmit their energy:

> The ability of electrons and holes to move ballistically through the lattice is not obvious at all….The resolution of this problem is that the entanglement is rendered irrelevant by emergence. It

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[1117] Among the many contributors, Menahem Simhony has developed one of the most comprehensive explanations of matter, space, and energy. From the results of the 1932 discovery of the positron, Simhony's model is based on the concept of an electron-positron cubical lattice comprising all of open space. Simhony holds that the density of the electron-positron pairs in space is 6×10^{30} cm^3. This is precisely the same value found by another researcher in the field, Allen Rothwarf, although the two scientists worked independently (Allen Rothwarf, "Cosmological Implications of the Electron-Positron Ether," *Physics Essays*, 11, 1998). John Kierein finds a similar density to the electron-positron model, and by it shows that redshift is due to the Compton effect (John Kierein, "Implications of the Compton Effect Interpretation of the Redshift," *IEEE Trans. Plasma Science* 18, 61 (1990). Simhony puts forth physical answers to gravity (p. 129), electromagnetism (p. 92), inertia (pp. 124, 212, 222), momentum (p. 162), the wave-particle duality (p. 163), the speed of light and superluminal speeds (p. 209), redshift (pp. 223, 249, 252), why atoms do not collapse (p. 193), evidence against the Big Bang and expanding universe (pp. 241, 245-247, 254), black holes (p. 244), etc. Simhony, however, misinterprets the Michelson-Morley experiment, and therefore fails to equate the electron-positron pairs as a constituent part of the ether detected by the interferometer experiments (See M. Simhony, *An Invitation to the Natural Physics of Matter, Space, Radiation*, 1994).
[1118] Coulomb's law says the attractive force between the electron and positron is 42 orders (10^{42}) higher than the gravitational force, so these are very stable pairings.

turns out to be exactly and universally the case that crystalline insulators have specific collective motions of isolated electrons that look and act as though they were motions of isolated electrons….The important thing is that the particle-like nature of the collective motion is exact and reliable.[1119]

As for magnetism, a free moving electron will simply attract the positron end of an electropon pair. Thus, as Maxwell wrote in 1873:

From the hypothesis that electric action is not a direct action between bodies at a distance, but is exerted by means of the medium between the bodies, we have deduced that this medium must be in a state of stress.[1120]
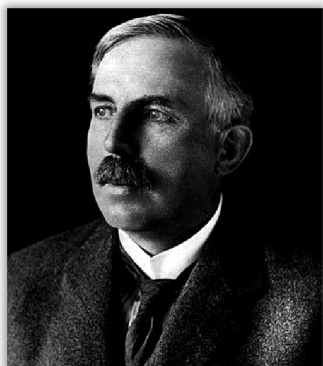
Ernest Rutherford
(1871 – 1937)

At the least, there are viable, physical, solutions at our disposal. Unfortunately, most physicists still think that the particles appearing in electropon collisions are created out of thin air, rather than being released from it, since opting for the latter would mean that space is substantive and that science has to go back to the drawing board.

In line with these insights is the discovery in 1911 by Ernest Rutherford when he bombarded very thin sheets of gold with alpha particles. He found that, even though alpha particles are 8,000 times larger than the electron, and the metal foil was 400-atoms-thick, nevertheless, most of the particles penetrated the foil with little problem. Only a few, perhaps 1 in 1,000, were scattered, some deflected 90 degrees, others 180 degrees. A viable interpretation of this phenomenon is that the alpha particles move through the atom as if it were almost completely empty. The few alpha particles that were deflected had done so because they hit the nucleus of the atom, which means that most of the mass and electric charge of the atom are concentrated at that central point. As it turns out,

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[1119] Robert B. Laughlin, *A Different Universe*, p. 66.
[1120] James Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 142, 670, 1873. Maxwell also said: "There can be no doubt that the interplanetary and interstellar spaces are not empty but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge."

only a quadrillionth of the atom has mass. The rest is "empty space," whatever one conceives that to be.

Naturally, Rutherford's results bring up some intriguing questions that are not often given the proper spotlight. If only 0.000,000,000,01% of the typical atom is occupied by particles, what constitutes the other 99.999,999,999,99%? For lack of a better term, modern science calls it "empty space," but what is empty space? We are back to our philosophical question introduced at the beginning of this chapter: Can "nothing" exist? It will do no good for the Relativist to appeal to General Relativity, for the fact remains that Rutherford's alpha particles did not go through a time warp or a spatial curvature but through the "absolute" space between the nucleus and the swirling electrons of the atom.

Since the time of Rutherford, science has penetrated even farther into the atom. By the time we get down to quarks and leptons (the theoretical components of protons and neutrons), we are at dimensions of 10^{-18} centimeters in length, as opposed to 10^{-12} cm for the atom itself.[1121] But we are still left with the "empty space." Could this "empty space" be filled with particles even smaller than a length of 10^{-18} cm? Perhaps the electropon pairings constitute much of open space, but even then it looks like we need some help in packing the rest of the space with something even smaller.

The Ether of Quantum Mechanics and String Theory

Ever since the dawn of quantum mechanics (a theory to which Einstein was bitterly opposed because any assignment of ponderable substance to space would explicitly contradict General Relativity), most of today's physical theorists hold that inner and outer space hold a dizzying array of particles and/or fields. One scientist, Josef Tsau, believes that the universe is bathed in a primary ether particle, the neutrino. Although they have mass, neutrinos are extremely small entities. They can apparently travel through the empty space of the atom and do so at the speed of light. Having no charge, they can only affect other masses by their high kinetic energy. Fifty trillion of them are said to pass through our human body every second. Tsau has developed a whole science of physics based on

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[1121] Some accelerators have produced evidence of "pentaquarks," a collection of five different quarks, but the same evidence leads to the theory that there may be a dozen or more species of pentaquarks (J. R. Minkel, "The Power of Five," *New Scientist*, July 3, 2004, p. 32).

how the neutrino interacts with atomic particles, explaining everything from gravity to how light travels to how planets revolve around the sun.[1122]

Even smaller particles are discussed by other scientists. Different names are given to these entities (*e.g.*, gravitons, maximons, machions, etherons, axions, newtonites, higgsionos, fermions, bosons, zero-point energy field, material vacuum, cosmic false vacuum). Popular String theorist, Brian Greene, speaks of them as "modern echoes…of a space-filling ether." He writes:

> We then encounter subsequent discoveries that transformed the question once again by redefining the meaning of "empty," envisioning that space is unavoidably suffused with what are called quantum fields and possibly a diffuse uniform energy called a cosmological constant – modern echoes of the old and discredited notion of a space-filling ether.[1123]

It has been known in modern science for quite some time that there exists a world permeating all of space that consists, perhaps, of the smallest functional dimensions known to man. As one author puts it:

> Classically, a vacuum is simply the absence of matter. In quantum mechanics, however, the [Heisenberg] uncertainty principle leads us to view the vacuum as a very complex system. A particle-antiparticle pair can pop into existence in empty space, provided that the two annihilate each other in a time so short that the violation of energy conservation implicit in this process cannot be detected. The vacuum, then, is more like a pan of popcorn than a featureless, empty sea. Particle-antiparticle pairs pop into existence here and there, but disappear quickly.[1124]

[1122] Josef Tsau, *Discovery of Aether and its Science*, 2005. It is Tsau's belief that a neutrino wind generated by the sun pushes the planets in their orbital paths, thereby answering the mysterious phenomenon of inertia. He writes: "The high energy neutrino particles produced by the dense-matter object of the Sun affected by its rapid rotation and the strong force fields created by the rotation may form a constant spiral neutrino-particle wind that provides a directional pushing effect only, which may cause the outer layer of the Sun to rotate and is utilized by all planets to stay in orbit. If a planet is orbiting in the right direction, such a spiral wind at equilibrium would constantly give it a push in both its orbiting and anti-gravity directions to keep it in orbit" (p. 22).

[1123] Brian Greene, *The Fabric of the Cosmos*, 2004, Preface, p. x. Brian Greene has also written the popular book, *The Elegant Universe*.

[1124] James Trefil, "The Accidental Universe," *Science Digest*, June 1984, p. 100.

Nobel laureate Robert Laughlin shows us a little more of the history behind this discovery:

> The existence and properties of antimatter are profoundly important clues to the nature of the universe….The simplest solution – and the one that turned out to be experimentally correct – was to describe space as a system of many particles similar to an ordinary rock. This is not a precisely correct statement, since Paul Dirac formulated the relativistic theory of the electron…but in hindsight it is clear that they are exactly the same idea…. This…has the fascinating implication that real light involves motion of something occupying the vacuum of space….The properties of empty space relevant to our lives show all the signs of being emergent phenomena characteristic of a phase of matter.[1125]
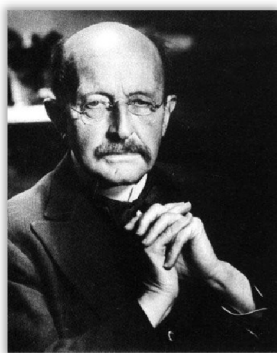
**Max Planck
(1858 – 1947)**

As we see, there is a whole other realm of particle-antiparticle pairs besides those of electropons. Quantum mechanics can only measure the effects of the particles. It does not know what the particles are, nor can it accurately predict what these particles will do in every case (as opposed to being able to predict what atoms will do). As noted above, quantum scientists refer to them as particles that "pop in and out of existence."[1126] The only thing they know for sure about them is that the First Law of Thermodynamics cannot be violated, and thus, in one zepto-second the particle is here, and in the next it must be gone, but to where no one knows.

Most of this strange, unseen world comes in what science knows as "Planck" dimensions, named after the physicist Max Planck due to his formulation of the quantum $\hbar$, the smallest unit of energy.

[1125] Robert B. Laughlin, *A Different Universe*, pp. 103-105.

[1126] As one popular magazine put it: "…according to quantum mechanics, empty space is not empty. Rather, the vacuum is filled with fields and particles that constantly pop in and out of existence. The problem is that when physicists estimate how much energy is contained within those fields and particles, they come up with a number…that is insanely large, 10^{120} times greater than what we observe" (*Discover*, October 2005, p. 56).

It is in this world that lengths come as small as 10^{-33} cm; mass as ethereal as 10^{-5} grams; and time as short as 10^{-44} seconds. Comparing the Planck length to the size of an atom (10^{-13} cm) or an electron (10^{-20} cm), a Planck particle (which we call "plancktons," henceforth) is 100,000,000,000,000,000,000 times smaller than the former and 1,000,000,000,000 times smaller than the latter. You can visualize its smallness by this analogy: if a drop of water were the size of Earth, an atom would be the size of a basketball, and a planckton would be about the size of the electrons in the basketball.[1127]

How does modern science know plancktons exist? The logic of quantum physics leads them there. As Stephen Hawking puts it:

> [T]he uncertainty principle means that even "empty" space is filled with pairs of virtual particles and antiparticles…(unlike real particles, they cannot be observed directly with a particle detector)….If it weren't – if "empty" space were really completely empty – that would mean that all the fields, such as the gravitational and electromagnetic fields, would have to be exactly zero. However, the value of a field and its rate of change with time are like position and velocity of a particle: the uncertainty principle implies that the more accurately one knows one of these quantities, the less accurately one can know the other. So if a field in empty space were fixed at exactly zero, then it would have both a precise value (zero) and a precise rate of change (also zero), in violation of that principle. Thus there must be a certain minimum amount of uncertainty, or quantum fluctuations, in the value of the field.[1128]

As we noted earlier, these particles are said to be continually "popping in and out" of space. In fact, as modern science interprets the appearance and disappearance of electropon pairs to be an example of the creation and annihilation of matter, they make a similar interpretation in explaining why plancktons appear and disappear in 10^{-44} seconds. To explain their appearance some physicists have gone to the extreme of saying that these particles come from other universes or dimensions,

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[1127] The Planck length is derived from the formula $\sqrt{(G\hbar/c^3)}$, where G is the gravitational constant, $\hbar$ is Planck's constant of angular momentum, and c is the speed of light. This may be the fundamental length that would prohibit further division on an actual, not potential, basis. For further study, see V. L. Ginzburg, *Key Problems of Physics and Astronomy*, Moscow, Mir Publishers, 1976.
[1128] Hawking, *A Briefer History of Time*, pp. 122-123.

visiting us for very brief "Planck" periods.[1129] In that sense also they are understood as "virtual" particles, not real particles.

In 1957, Princeton professor John Wheeler was the first to describe this phenomenon as "space-time foam" – a universe of virtual particles appearing and disappearing in Planck time through blackholes.[1130] Ironically, Wheeler was also quoted as saying that blackholes were "the greatest crisis ever faced by physics."[1131]

Stephen Hawking supports Wheeler's theory, stating that, on extremely small scales in the Planck dimensions, space is alive with "turbid random activity and gargantuan masses," while "wormholes" provide passage to other universes.[1132] Others, such as Ian Redmount and Wai-Mo Suen speak of "quantum space-time foam" or "Lorentizian space-time foam,"[1133] as does S. J. Prokhovnik.[1134] F. Selleri understands the CMB as the fundamental reference frame, pointing out that any object that travels through it is

John A. Wheeler
(1911 – 2008)

[1129] MIT physicist, Alan Guth, and Russian physicist, Andrei Linde.

[1130] John A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology?" *The Encyclopedia of Ignorance*, editors: Ronald Duncan and Miranda Weston-Smith, *Pocket Books*, 1978, pp. 19-35.

[1131] "Those Baffling Black Holes," *Time*, Sept. 4, 1978. In another venue, Wheeler commented: "To me, the formation of a naked singularity is equivalent to jumping across the Gulf of Mexico. I would be willing to bet a million dollars that it can't be done. But I can't prove that it can't be done" (*Computer Defies Einstein's Theory*, by John Wilford, New York Times, March 10, 1991).

[1132] *Black Holes and Baby Universes and Other Essays*, Bantam, 1994; *A Briefer History of Time*, pp. 104-123.

[1133] *Physical Review D*, 3rd series, vol. 47, No. 6, March 1993; I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163 (1993); "De Broglie Waves on Dirac Ether," *Lettere Al Nuovo Cimento*, vol. 29, No. 14, Dec. 1980; W.-M. Suen, "Minkowski Spacetime is Unstable in Semi-Classical Gravity," *Physical Review Letters*, 62, 2217 (1989).

[1134] S. J. Prokhovnik, "Light in Einstein's Universe," Dordrecht, Reidel, 1985; "A Cosmological Basis for Bell's View on Quantum and Relativistic Physics," in *Bell's Theorem and the Foundation of Modern Physics*, eds., A. Van der Merwe, F. Selleri, G. Tarozzi, New Jersey, World Scientific, 1990, pp. 508-514.

affected by radiation pressure.[1135] Jean-Pierre Vigier refers to it as a "non-empty vacuum" and outlines the phenomenon of superluminal interactions in an "underlying deterministic substructure."[1136] Vigier points to the experiments by Alain Aspect, which confirm the results.[1137] Robert Moon, professor emeritus in physics at University of Chicago, adds:

> According to accepted theory, free space is a vacuum. If this is so, how can it exhibit impedance? But it does. The answer, of course, is that there is no such thing as a vacuum, and what we call free space has structure. The impedance equals 376+ ohms."[1138]

Many theorists appeal to ultra small particles to explain the phenomenon of gravity, which has hitherto defied the efforts of modern science to uncover its physical mechanism. In trying to explain gravity as a process of interacting particles, the "empty space" of the cosmos is said to be filled with particles going by such names as "gravitons," "machions," "messenger particles," or "force-carrier particles." Included among these particles are electropon pairs, which are said to have a time-scale existence of 10^{-21} seconds. Another explanation, going by the name of String Theory, holds that, rather than space being filled with point particles, it consists of one-dimensional "strings" that are 10^{-33} cm in length. The particles we are detecting are merely oscillations of the strings. This theory requires the existence of 10 or more dimensions to make everything fit, which are given various exotic names such as "Calabi-Yau manifolds."[1139]

Other discoveries have also added to the mystery. In 1948 Hendrik Casimir discovered that two mirrors facing each other in a perfect vacuum have a mysterious force acting upon them that draws them together, which is appropriately called "the Casimir effect."[1140] This is a force that seems

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[1135] F. Selleri, "Space-time Transformations in Ether Theories," *Z. Naturforsch*, 46a, 1990, pp. 419-425.

[1136] J. P. Vigier, "Causal Superluminal Interpretation of the Einstein-Podolsky-Rosen Paradox," and "New non-zero photon mass interpretation of Sagnac effect as direct experimental justification of the Langevin paradox," *Physics Letters A*, 234, 1997, pp. 75-85; *Physics Letters A* 175, 1993, p. 269.

[1137] *Physical Review Letters*, vol. 49, No. 2, July 12, 1982.

[1138] "Space Must Be Quantizied," *21st Century*, May-June, 1988, p. 26ff.

[1139] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, New York: Alfred A. Knopf, 2004, p. 369.

[1140] Hendrik B. G. Casimir, Proc. Kon. Ned. Akad. Wetensch. B51, 793, 1948; S. Lamoreaux, *Physical Review Letters*, 78, 5, 1996; M. Bordag, U. Mohideen and V. M. Mostepanenko, "New developments in the Casimir effect," *Phys. Rep.* 353

to appear out of nowhere, since in a vacuum there would be no obvious forces or material substances carrying them, yet a force it was. Current science tries to explain the appearance of this force as a "vacuum fluctuation" wherein the aforementioned "virtual particles" do their magic, but this is merely theoretical phraseology for something they really don't understand. One interesting theory held by the editor of the *Astrophysical Journal*, Bernard Haisch, is that the Casimir effect shows the existence of a "zero-point field" and is the scientific fulfillment of the opening verses of Genesis 1:3, "Let there be light."[1141] Although Haisch's exuberance may

1, 2001; H. B. Chan, et al., "Nonlinear micromechanical Casimir oscillator," *Physical Review Letters* 87, 211801, 2001; F. Chen and U. Mohideen, "Demonstration of the lateral Casimir force," *Physical Review Letters* 88, 101801, 2002; C. Genet, A. Lambrecht and S. Reynaud, "Temperature dependence of the Casimir force between metallic mirrors," *Physical Review* A 62 012110, 2000; K. Lamoreaux, "Demonstration of the Casimir force in the 0.6 to 6 micrometer range," *Physical Review Letters* 78 5, 1997; K. A. Milton, *The Casimir Effect: Physical Manifestations of Zero-point Energy*, World Scientific, Singapore, 2001. The Casimir Effect also causes one to wonder whether the Gravitational constant *G* in Newton's force equation [$F = Gm_1m_2/r^2$] is, indeed, caused by gravity or some other force, since its value was determined in 1798 based on the attraction of metallic spheres in close proximity to one another. Stephen Mooney holds that the Cavendish Torsion Balance measures electrostatic attraction, not gravitational attraction. He points out that when Cavendish conducted the test, he found perplexing the fact that the attraction between the two spheres increased when he heated the larger of the two. Mooney believes the reason is that Cavendish was measuring the radiation density at the Earth's surface (which is not a constant value), not gravitational attraction (Stephen Mooney, "From the Cause of Gravity to the Revolution of Science," *Apeiron*, vol. 6, no. 1-2, pp. 138-141, 1999). Science is not agreed on the value of G in any case. Most disagree on its value after only three decimal places, and some disagree even after one decimal.

[1141] Bernard Haisch, scientific editor of *The Astrophysical Journal* and editor-in-chief of the *Journal of Scientific Exploration*, has postulated that the Casimir Effect is due to the exclusion of the zero-point field from the gap between the plates, which was worthy enough to be published by *Physical Review*, (B. Haisch, A. Rueda, and H.E. Puthoff, Physical Review A, 49, 678, 1994. In an article in *Science and Spirit Magazine* titled "Brilliant Disguise: Light, Matter and the Zero-Point Field," Haisch coincides his findings with Genesis 1:3's "Let there be light." Haisch holds that the zero-point energy field results when, due to the Heisenberg Uncertainty Principle which says that there will be continual random movement in electromagnetic waves, if all the energy in those random movements are added up, it will produce the "background sea of light whose total energy is enormous: the zero-point field. The 'zero-point' refers to the fact that even though this energy is huge, it is the lowest possible energy state." Other articles include: "BEYOND E=mc^2: A First Glimpse of a Post-modern Physics in Which Mass, Inertia and

be somewhat misplaced, it is obvious that he knows *something* is there, and it is far smaller than the dimensions we see on the atomic level. Accordingly, other physicists recognize that it is high-time Einstein's theories about gravity be replaced.[1142] All these discoveries spell a certain doom for the theories of Einstein because, try as they may, no one has been able to bridge the huge gap between Relativity and the Quantum world in which these particles are created and catalogued. In fact, Roger Penrose, who has coined the word "twistors" for his particles of choice, has stated that the concept of "space-time" may be eliminated from the basis of physical theory altogether.[1143] Abhay Ashtekar holds that at the Planck scale the concept of space-time is replaced by a network of what he calls "loops and knots" of energy. This theory is being further developed by Carlo Rovelli and Lee Smolin.[1144]

Gravity Arise from Underlying Electromagnetic Processes," B. Haisch, A. Rueda and H. E. Puthoff, *The Sciences*, November/December, Vol. 34, No. 6, pp. 26-31, 1994; B. Haisch, A. Rueda and H. E. Putoff, "Inertia as a Zero Point Field Lorentz Force," *Physical Review* A, Vol. 49, No. 2, 1994; B Haisch and A. Rueda, "Electromagnetic Zero-Point Field as Active Energy Source in the Intergalactic Medium," presented at 35th Jet Propulsion Conference, June 1999. "Vacuum Zero-Point Field Pressure Instability in Astrophysical Plasmas and the Formation of Cosmic Voids," A. Rueda, B. Haisch and D. C. Cole, *Astrophysical Journal*, 445, 7, 1995; Puthoff, H.E., "Gravity as a Zero Point Fluctuation Force", *Physical Review* A, Vol. 39, No. 5, 1989; R. Matthews, "Inertia: Does Empty Space Put Up the Resistance?" *Science*, Vol. 263, 1994.

[1142] H. Yilmaz, "Towards a Field Theory of Gravitation," *Il Nuovo Cimento*, Vol. 107B, no. 8, 1991; I. Peterson, "A New Gravity? Challenging Einstein's General Theory of Relativity," *Science News*, Vol. 146, 1994; J. P. Siepmann, "The Laws of Space and Observation," *Journal of Theoretics*, Vol. 1, No. 1, 1999.

[1143] Roger Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe*, New York, Alfred Knoph, 2005, pp. 968-1002.

[1144] Lee Smolin, "Atoms of Space and Time," *Scientific American*, Sept. 2004; A. Ashtekar, V. Husain, J. Samuel, C. Rovelli, L. Smolin: "2+1 quantum gravity as a toy model for the 3+1 theory," *Classical and Quantum Gravity* 6, L185, 1989; C. Rovelli: "Loop space representation In: New perspectives in canonical gravity," A. Ashtekar Bibliopolis, Naples 1988; C. Rovelli and L. Smolin: "Knot theory and quantum gravity," *Physical Review Letters* 61, 1155, 1988; C. Rovelli, L. Smolin: "Loop space representation for quantum general relativity," *Nuclear Physics* B331, 80, 1990; A. Ashtekar, C. Rovelli, L. Smolin: "Gravitons and loops," *Physical Review* D44, 1740, 1991; A. Ashtekar, C. Rovelli: "Connections, loops and quantum general relativity," *Classical and Quantum Gravity* 9, 3, 1992; J. Iwasaki, C. Rovelli: "Gravitons from loops: non-perturbative loop-space quantum gravity contains the graviton-physics approximation," *Classical and Quantum Gravity* 11, 1653, 1994; H. Morales-Tecotl and C. Rovelli: "Loop space representation of quantum fermions and gravity," *Nuclear Physics* B 451, 325,

The seeming inevitable position to which science is being led is that there is a world of activity occurring at Planck dimensions that underlies everything that happens in the universe. Obtaining the right understanding of this Planck universe will ultimately set aside both Relativity and Quantum Mechanics. Even staunch Relativists admit this eventuality. As Alan Kostelecký writes in *Scientific American*: "The observable effects of Planck-scale Relativity violations are likely to lie in the range of 10^{-34} to 10^{-17}."[1145] Kostelecký more or less admits that, even though the ultimate theory of nature lies in these tiny dimensions, current science is at a loss to investigate them:

> Whatever the eventual form of the ultimate theory, quantum physics and gravity are expected to become inextricably intertwined at a fundamental length scale of about 10^{-35} meters, which is called the Planck length, after the 19th century German physicist Max Planck. The Planck length is far too small to be within the direct reach of either conventional microscopes or less conventional ones such as high-energy particle colliders (which probe "merely" down to about 10^{-19} meter).[1146]

The magazine itself adds:

> In quantum physics, short distance and short times correspond to high momenta and high energies. Thus, at sufficiently high energy – the so-called Planck energy – a particle should "see" the graininess of spacetime. That violates relativity, which depends on spacetime being smooth down to the tiniest size scales.[1147]

1995; C. Rovelli and L. Smolin: "Spin Networks and Quantum Gravity," *Physical Review* D 53, 5743, 1995; gr-qc/9505006. Lee Smolin argues that space is proportional to the area of its boundary in Planck units establishes a fundamental limitation on the nature of physical systems, called the "Bekenstein" bound. The power of this principle lies in its universality—any viable theory of quantum gravity must explain why it holds ("Three Roads to Quantum Gravity," Basic Books, 2001).

[1145] Alan Kostelecký, "The Search for Relativity Violations, " *Scientific American*, September 2004, p. 96.

[1146] *Ibid*.

[1147] Graham P. Collins, staff writer, *Scientific American*, Sept. 2004, p. 99. NB: We are not here supporting the concept of "space-time," but merely using the same terminology of modern science as they discover the contradictions and anomalies in their own theories.

It predicts the same doom, however, for Quantum Mechanics itself:

> Still, something is rotten in the state of quantumland, too. As Einstein was among the first to realize, quantum mechanics, too, is incomplete. It offers no reason for why individual physical events happen, provides no way to get at objects' intrinsic properties and has no compelling conceptual foundations.[1148]

In Quantum Land, virtual particles can do just about anything the theorist desires they do, including traveling faster than the speed of light or escaping from a black hole. There is one catch, though. The math of Quantum Mechanics maintains that, if they travel faster than the speed of light, they better "pop out of existence" prior to any violation of the Heisenberg Uncertainty Principle, otherwise, they cannot exist.

In the end, those who depend on "virtual" particles with word pictures such as "space-time foam" or "non-empty vacuum" have admitted, however, that the whole system of "virtual" particles is doomed from the start. Redmount and Suen have shown that if plancktons are left in the "pop in and pop out" category it creates numerous anomalies in the structure of the quantum field, including but not limited to "wormholes" on an intolerable scale.[1149] This leads one to posit that the plancktons should be understood as real particles, the underlying substance of the Genesis firmament itself. We will cover this possibility momentarily.

String Theory: Seeking to Bridge Relativity and Quantum Mechanics

As we noted, some have even entertained the idea that other universes exist in different dimensions, universes that sometimes interact with our universe by sharing virtual particles with us. In a rather amusing assessment of current theories, *Popular Science* editor Michael Moyer describes his trip through the maze of quantum mechanics:

> Things happen in more than three dimensions of space; to see them in only three is to succumb to a trick that the universe is constantly playing on us….Type of possible space #1: A 10-dimensional universe made up of the normal three dimensions of space, plus one of time, plus six-dimensional Calabi-Yau

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[1148] George Musser, "Was Einstein Right," *Scientific American*, Sept. 2004, p. 89.

[1149] I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163, 1993.

manifolds…I'm not making this up. I am only attempting to report to you, dear reader, what I have heard smart people say….When scientists talk about extra dimensions, they actively avoid the use of English….So they use the language of math, whose concepts and terms are easily generalized into any number of dimensions or spaces or inconceivable, unphysical situations …string theory carries with it great hope for both particle physics…and cosmology. Both are beset with problems, "problems" here meaning deep chasms of ignorance in our understanding of the physical world…

Type of possible space #2: The universe as we know it is merely a three-dimensional brane suspended in a four-dimensional bulk. What the %$#& is a brane?…You live on a brane. A brane is like a membrane. Imagine the skin that forms on your soup when it gets cold. A brane is like that….Like so much congealed fat, we are prevented from escaping the brane and going into the higher dimensional soup. Only gravity is allowed to do that. The problem that had been confounding all of these smart people for so long (and continues to confound them; did I mention that none of what I'm describing has yet been supported by a shred of experimental evidence?) was this: Gravity is weak…. Everything else works fine; gravity is the oddball of the particle family….OK, so where does gravity fit into all this? Just treat it like any other force – gravity is caused by massive particles throwing "gravitons," attractive particles, at each other….You may have caught wind of another theory of gravity called general relativity. A fellow named Einstein came up with it almost 100 years ago. Conceptually, it could not be any more different from the standard model. General relativity explains gravity by invoking the warping of space-time; the standard model explains it and everything else by invoking the exchange of subatomic particles. Problems happen when we try to put the two theories together…. Problems like mathematical inconsistencies, zeroes in denominators, nonsensical results…. Yet, as we have seen, gravity is much weaker than every other force…. According to brane theory, we lose gravitons out into the fourth dimension. The result: gravity is weak….Gravitons, like photons, do not possess the property known as mass. They weigh nothing…there is another, mirror brane located as little as a millimeter or so

away from us at all times, but which we can never reach, because we are not gravitons…[1150]

Gravity has been the fly in the ointment of every theory concocted by modern science. A theory may be able to explain (at least within its own framework) about 75% of nature, but if it fails to explain the 25% due to gravity, then the whole theory is brought to naught. String Theory is the invention of a handful of scientists seeking for some solution to the intractable problem created when one attempts to combine General Relativity's explanation of gravity with Quantum Mechanics' explanation of the nuclear forces holding the atom together. General Relativity could explain things (at least mathematically) on the macroscale (*e.g.*, planets, stars), and Quantum Mechanics could do the same on the microscale (*e.g.*, atoms, quarks), but in instances when the macro met the micro, as is the case, for example, when a star of great mass is said to collapse into an infinitesimal point particle (*e.g.*, a "blackhole"), then both theories break down, producing nonsense, both physically and mathematically.

The refusal of Relativity to marry Quantum Mechanics also means that no children will be produced from that non-union. Science is stymied, and they will continue to be stymied. Not willing to admit that their mathematical inventions of General Relativity and Quantum Mechanics do not represent physical reality, and desperately seeking a solution other than constituting the universe with 95% make-believe matter (*i.e.*, Dark Matter), a group of these puzzled scientists invented another mathematical model hoping to combine the two disciplines into one unified formula, or what was dubbed as a "theory of everything."[1151] Three of the pioneers in this search were Leonard Susskind, Michael Green and John Schwarz. To get the ball rolling, Susskind borrowed a formula from mathematician Leonhard Euler (d. 1783) and applied it to the strong force between atoms. Then Green and Schwarz were successful in 1984 in working out a mathematical formula that at least balanced both sides of the equal sign. Their formula translated into a model of one-dimensional vibrating strings of energy that were said to compose the quarks and leptons of atoms. These vibrating strings were said to be moveable and pliable, as opposed to the rigidness of point particles. They also came in many sizes and shapes, which were defined by the amount of vibration each string possessed, which in turn determined their function.

[1150] Michael Moyer, "Journey to the 10th Dimension," *Popular Science*, March 2004.

[1151] See Brian Greene, *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory*, 1999; Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004.

It was discovered in the late 1980s, however, that the mathematics of String Theory produced five different, yet valid, theories. Some theories were radically different from the others. Some had closed strings, others had open strings, and some even required at least 26 dimensions in order to function. The acknowledged "Einstein" of Quantum Mechanics, Edward Witten, supposedly found a solution, proposing that each was simply a different way of looking at the results. The new perspective was called "M-theory" (for reasons no one is quite sure). Still, the bad news was that these strings needed six extra dimensions (other than the three we have already) in order to do their specific jobs. In brief, the extra dimensions were the means to overcome the barriers of Relativity theory that limits anything from traveling faster than the speed of light. The multiple dimensions of String Theory allowed matter to take a "short cut," as it were, through dimensions that Relativity did not possess. To help justify the six dimensions, String Theory advocates borrowed from the theory of Theodore Kaluza and Oskar Klein who had proposed in the early 1920s that a fifth dimension existed that carried electromagnetic waves. Hermann Minkowski had already added time as a fourth dimension in order to make the mysterious entity "space-time."[1152] String theorists reasoned that if there can be four or five dimensions, why not ten or eleven? As we noted above, "branes" or membranes were invented to help solve this problem.

Still, the mathematics of String Theory eventually led the extra dimensions to the same absurd infinities that hampered General Relativity. Yet, for reasons that String theorists can only rationalize by appealing to the "anthropic principle" (*i.e.*, things are the way they are because we wouldn't be here if they were any other way), somehow we are magically left with only three spatial dimensions (length, height and width) that aren't absorbed into infinity. Alas, String Theory doesn't really explain anything. It is merely a mathematical model, and a desperate one at that, with no physical proof, and none in sight. It reaches a virtual dead end, and science is left without a solution to the problem of how to combine General Relativity with Quantum Mechanics.[1153]

[1152] Charles Lane Poor divests Minkowski's "fourth dimension" of its mystique quite easily. He writes: "To most people, the very words, four dimensions, are enough; everything at once becomes incomprehensible and absurd. Yet there is no reason for this too prevalent idea: in the broad sense of the words, there is nothing new or startling in the four dimensional idea. It is a matter of common, every-day knowledge that, in order to describe fully an event, we must tell not only where the event took place, but when" (*Gravitation versus Relativity*, p. 37).

[1153] Imaginations certainly run wild in the "objective" world of modern science. Leonard Susskind has recently advocated that String Theory predicts as many as 10^{500} different universes, each with its own set of physical properties. Out of the

The real solution, of course, is that both Relativity and Quantum Mechanics are failed theories of reality in themselves, and this inadequacy shows up very clearly when schemes to combine the theories must be aborted. But since modern science has wedded itself to the Big Bang process, it will be forever trapped in theories that simply don't work. The only possible explanation is that the universe was created by divine fiat, *ex nihilo*, but it is precisely that solution which modern man is unwilling to accept. It is not "branes" that collide to make universes, it is God who creates, and the first thing with which He started was Earth, in the center of it all, as Genesis 1:2 clearly states. Until science realizes this simple fact, it will be dreaming up theories that produce dead ends. As physicist Michael Duff was wise enough to admit:

> Well, the question we often ask ourselves as we work through our equations is: 'Is this just fancy mathematics, or is it describing the real world?'.…Oh yes, it's certainly a logical possibility that we've all been wasting our time for the last twenty years and that the theory is completely wrong.[1154]

Can Modern Man Live in the Universe He has Fashioned?
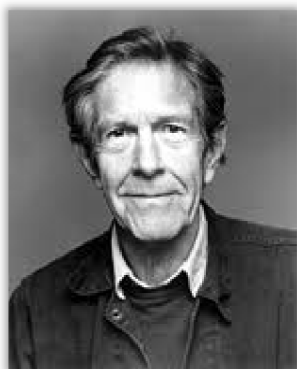
John M. Cage
1912 – 1992

As we often discover among famous scientists and philosophers who develop their unique theories, although their thoughts are logical according to their own premises, those same ruminations will not allow the inventor to live in the system he has created. The existentialist says everything is absurd, but he can't live in an absurd world. The nihilist says everything leads to anarchy, but he can't live in a world of anarchy. The atheist denies the existence of God, but foxholes have a way of persuading him otherwise. The evolutionist says everything is by chance, but he is very careful to avoid walking in front of moving

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10^{500} possible universes, Susskind admits he has no reason why our single universe, with its unique biological life, came into existence, but he insists, nevertheless, "that it cannot be due to Intelligent Design" (Leonard Susskind, *The Cosmic Landscape: String Theory and the Illusion of Intelligent Design*, 2005).

[1154] "A Conversation with Brian Greene," Nova television series, Public Broadcasting Service, October 2004.

traffic and choosing food that is non-poisonous.

John Cage, the famous composer of the mid-twentieth century, is a perfect example of the dichotomy in which modern man finds himself. Cage made a name for himself by performing concerts based on *musique concrète*. To impress upon his audience that we lived in a universe of chance where all is relative, Cage used mechanical musical conductors that operated by random action, leading the orchestra members to play their instruments haphazardly. The "music," of course, became a mere collection of noises with no meter or melody. At the end of the concert the orchestra would often hiss at Cage while he took his bow to the audience in order to register its discontent. Yet there was an obvious contradiction between Cage's philosophy and his practical life. In addition to being a famous conductor, John Cage was also a world famous mycologist (one who specializes in the study of mushrooms). He had one of the most extensive private libraries ever compiled on the subject. Since some mushrooms are poisonous, Cage had to be very careful which ones he consumed. As he said himself: "I became aware that if I approached mushrooms in the spirit of my chance operations, I would die shortly….So I decided that I would not approach them in this way!" [1155] Obviously, he could not live in the "chance" world he created for himself.

**Erwin Schrödinger
(1887 – 1961)**

Austrian physicist Erwin Schrödinger (d. 1961) one of the world's premier scientists and the inventor of Quantum Mechanics, found himself in the same dilemma. At one point he stated: "I do not like it [quantum mechanics], and I am sorry I ever had anything to do with it." In his 1945 book *What is Life* he admitted that discovering the true laws of nature may be beyond human understanding. Since physics had not, and to this day has still not, settled on whether the electron is a particle, a wave or some combination of the two; or how the electron can seem to be in two places at the same time (otherwise known as "superposition of states" or "entanglement"), Schrödinger wanted to demonstrate the unlivable absurdities to which his theories often led. He thus introduced the world to

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[1155] Calvin Thomas in *The New Yorker*, November 28, 1964, as cited in Francis Schaeffer's *The God Who is There*, Crossway Books, 1990, p. 79.

his famous feline, otherwise known as "Schrödinger's Cat." As one author puts it:

> A cat is in a box with a lid that is shut. Within the box is a radioactive atom that has a 50-50 chance of decaying in an hour. If the atom decays this triggers a mechanism that breaks a vial of poison gas which kills the cat. The cat has two states: alive or dead. Schrödinger argued that if we take seriously the idea of the superposition of states [of atomic particles] then we must write for the cat's state: cat > = a/alive > + b/dead >, that is, the cat apparently is in a superposed state of life and death! Then we open the box. According to the measurement hypothesis (discussed next) when we open the box, we are performing a measurement of the cat's state; this is said to cause the cat's superposed state to collapse into one base state or the other. The cat is found either pushing up the daisies, or purring for its milk. Schrödinger found this so totally absurd that (like Einstein) he could not bring himself to embrace fully the new mechanics he helped create.[1156]

As noted, the same kinds of dichotomies began to penetrate the soul of Albert Einstein. Here is how his biographer describes the series of events:

> They had solved individual problems, but they had done nothing to replace the all-embracing pattern of classical physics which they had first questioned, then shattered. Planck's quantum theory, Einstein's photons, Rutherford's first ground plan of the nuclear atom and Bohr's disturbing explanation of it – had each provided isolated answers to isolated problems. Yet in the

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[1156] www.physics.fsu.edu/users/ProsperH/AST3033/quan tumworld.htm. In 1957, Princeton University scientist, Hugh Everett, explained the "superposition of states" as evidence of a parallel universe, claiming that the cat is both dead and alive, that is, dead in one universe and alive in another. Before Schrödinger's box is opened, the parallel universes exist simultaneously, but when the box is opened this causes the universes to separate and the superposition is terminated. Still, one cannot predict whether he will find a dead cat or a living car before the box is opened. Two opposing philosophical/scientific interpretations flow from this unpredictability: (a) the Copenhagen interpretation led by Niels Bohr, which states that subatomic particles, by nature, *do not have* defined properties; and (b) Einstein's theory that subatomic particles, by nature, *do have* defined properties, but our instruments are woefully inadequate to determine them with any accuracy.

process they seemed to have produced more riddles than they had solved. 'By the spring of 1925,' writes Martin Klein, 'the theoretical picture had been elaborated by the work of many physicists into a tantalizingly incomplete and confused tangle of successes and failures, so that Wolfgang Pauli, one of the most acute, and most outspoken, of the young theorists could write to a friend: 'Physics is very muddled again at the moment; it is much too hard for me anyway, and I wish I were a movie comedian or something like that and had never heard anything about physics.'[1157]

The Copenhagen Perspective

Einstein biographer Ronald Clark also traces the steps that led to the absurd conclusions of quantum mechanics, especially those of the Copenhagen variety.

A fundamental premise of classical physics was that events followed each other in succession on a basis which could be predicted if only one understood the laws of nature and had sufficient facts….Certain factors in the quantum theory had first cast a ray of doubt upon this comfortable assumption: the electron in the Bohr atom, jumping from one orbit to another without obvious cause, tended to increase this doubt. Was there, perhaps, no real 'cause' for such movements?…Might not the whole conception of causality in the universe be merely an illusion? This possibility had already gravely disturbed Einstein…and as early as January, 1920, he had voiced his doubts to Max Born. "The question of causality worries me also a lot."[1158]

After the contributions of Louis de Broglie and Erwin Schrödinger, things began to move rapidly:

What had thus occurred within a very few years was a steady merging of the particle and wave concept. The electron…appeared that it was both at the same time. Here it

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[1157] *Einstein: The Life and Times*, pp. 405-406. His teacher once told Max Planck: "Physics is finished, young man. It's a dead-end street," then advised Planck to become a concert pianist (Nick Herbert, *Quantum Reality*, p. 31).
[1158] *Einstein: The Life and Times*, pp. 406-407.

seemed that science had run up not only against 'common sense,' which was already suspect when it began to deal with events in the subatomic world, but against rational logic. For could anything really be one thing and its opposite at one and the same time?[1159]

Which then led to the inevitable climax:

> Schrödinger's wave mechanics…was thus credible on the grounds that reality is what you make it. This was disturbing enough to those who believed that all ignorance in science could be removed by an addition of knowledge. But more was to follow…a totally different approach was being made by Werner Heisenberg….Thus by 1927 the de Broglie-Schrödinger picture of the electron was being matched by a purely mathematical explanation of the atom….The suggestion that a satisfactory picture of the physical world could consist not of a description of events but of their probabilities had already been made in Heisenberg's famous 'uncertainty principle.'[1160]

The significant outcome of these events was, as de Broglie put it many years later, quantum physics now appeared to be "…governed by statistical laws and not by any casual mechanisms, hidden or otherwise. The 'wave' of wave mechanics ceased to be a physical reality….The corpuscle, too, was turned into a mere phantom…"[1161] The Copenhagen interpretation of Quantum Mechanics, and virtually all of modern physics

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[1159] *Einstein: The Life and Times*, p. 410.

[1160] *Einstein: The Life and Times*, pp. 410-411. Schrödinger further complicated the picture since his energy-momentum relationship ($E = \rho^2/2m$) was thoroughly anti-Relativistic. Paul Dirac tried to bridge this gap with his alternative to $E = mc^2$, namely, $E^2 = m^2c^4$. Schrödinger writes: "Surely you realize the whole idea of quantum jumps is bound to end in nonsense…if the jump is sudden, Einstein's idea of light quanta will admittedly lead us to the right wave number, but then we must ask ourselves how precisely the electron behaves during the jump. Why does it not emit a continuous spectrum, as electromagnetic theory demands? And what law governs its motion during the jump? In other words, the whole idea of quantum jumps is sheer fantasy." Niels Bohr retorts: "What you say is absolutely correct. But it does not prove that there are no quantum jumps. It only proves that we cannot describe them, that the representational concepts with which we describe events in daily life and experiments in classical physics are inadequate when it comes to describing quantum jumps" (as recorded by Werner Heisenberg in *Physics and Beyond*, 1971, pp. 73-74).

[1161] *Einstein: The Life and Times*, p. 412.

today, holds that matter does not exist until an observer looks at it, or that matter does not exist independently of the observer. It is the observer's previous knowledge of the matter that creates its physical reality. More technically, all of matter is understood as a "wave function," a surreal explanation of the universe that expresses itself only in mathematical equations. When the observer looks in any direction, his mere glance is said to "collapse the wave function," and thus he sees the material object before him. This "collapse" is the main reason that science can think of light both as a particle and a wave, simultaneously. In effect, the "wave" of light "collapses" when one observes it and thus one can then "see" the particle.

If one tends to think these ideas are absurd, he is in good company. Richard Feynman, one of the premier physicists in the world during his day, admits: "The theory of quantum electrodynamics describes Nature as absurd from the point of view of common sense. And it agrees fully with experiments. So I hope you can accept Nature as she is – absurd."[1162] Or as Werner Heisenberg puts it: "The law of causality is no longer applied in quantum mechanics."[1163]

Rather than question whether their own theories about Nature are absurd (which implies that they know very little about Nature), proud scientists like Feynman and Heisenberg would rather put the blame on Nature. As long as they remain in this quagmire, the men of Feynman's generation will never be able to come to the truth. They will only disguise their ignorance in mathematical equations. As Heisenberg himself admitted: "The paradoxes of the dualism between wave picture and particle picture were not solved; they were hidden somehow in the mathematical scheme."[1164] In essence, the only difference between medieval superstition and modern physics is that the latter has the privilege of hiding its superstitions in complex equations that no one understands.

At this point Einstein had much trouble living in the universe that his Relativity theory helped create:

> While Born, Heisenberg, and Bohr accepted it without qualification, Einstein and Planck accepted it only with the strongest qualifications. Yet these two were the very men who a quarter of a century earlier had pulled into physics the very ideas which they now thought of as its Trojan horse.

[1162] Richard P. Feynman, *The Strange Theory of Light and Matter*, 1988, p. 10.

[1163] Werner Heisenberg, *Physics and Philosophy: The Revolution in Modern Science*, 1966, p. 88.

[1164] *Ibid.*, p. 40.

The break with the old world which this new concept epitomizes can be illustrated by two statements. One is by Sir Basil Schonland, who describes the new world in *The Atomist*. 'It appeared experimentally proven,' he says, 'that at the bottom of all phenomena there were to be discerned laws of chance which made it impossible to think of an ordered deterministic world; the basic laws of nature appeared to be fundamentally statistical and indeterminate, governed by the purest chance.'[1165]

Werner Heisenberg received fame in the physics world for what has become known as the *Uncertainty Principle* – a further blow to the pride of science. As noted earlier, this is a principle, accepted reluctantly by the entire scientific world (because they have no other choice), which states that there is no accurate way to measure size, distance and location in the sub-atomic world. As science had long been debating whether light and matter were made up of particles or waves,[1166] Heisenberg sealed the door shut by saying that the mere act of trying to figure it out influences the result, and thus it will always be "uncertain."[1167] To use a crude analogy,

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[1165] *Einstein: The Life and Times*, pp. 412-413.

[1166] The perplexity of the issue was brought out no better than the summation voiced in 1927 by Sir William Bragg, director of the Royal Institution: "On Mondays, Wednesdays, and Fridays we teach the wave theory and on Tuesdays, Thursdays, and Saturdays the corpuscular theory" (*Einstein: The Life and Times*, p. 420). Forty years later, when one would assume that science had a better grasp on the quantum world, Richard Feynman, one of its more prominent spokesman, wrote: "I think I can safely say that nobody understands quantum mechanics" (1967 paper: "The Character of Physical Laws"). Niels Bohr once quipped: "But, but, but…if anybody says he can think about quantum theory without getting giddy it merely shows that he hasn't understood the first thing about it" (Otto Frisch, citing Bohr, in *Niels Bohr, A Centenary Volume*, editors, A. P. French and P. J. Kennedy, 1985, p. 136). Heisenberg adds: "Let us consider an atom moving in a closed box which is divided by a wall into two equal parts. The wall may have a very small hole so that the atom can go through. Then the atom can, according to classical logic, be either in the left half of the box or in the right half. There is no third possibility: *tertium non datur*. In quantum theory, however, we have to admit – if we use the word 'atom' and 'box' at all – that there are other possibilities which are in a strange way mixtures of the two former possibilities. This is necessary for explaining the results of our experiments" (Werner Heisenberg, *Physics and Philosophy*: *The Revolution in Modern Science*, 1966, pp. 181-182).

[1167] In seeking to determine the position and velocity of a subatomic particle, one must shine light on the particle, but light has a limited capability due to its wavelength (the length between the crests of its wave) and its size (one quantum). If one wants to measure the position of one particle in relation to another particle, he would employ light of a very short wavelength in order to penetrate between

Heisenberg revealed that our ability to penetrate the atom was as limited as trying to dissect an ant with a telephone pole. The only other option for science was to bombard the ant with other ants at very high speeds and wait to see what came out. In any case, Heisenberg demonstrated that man's technology is woefully inadequate to discover precisely what makes up our world. He reduced physical science to good guesses rather than precise facts, yet science camouflages its inadequacies by appeal to such things as "statistics" and "the wave/particle" theory, and "multiple histories of space-time." Where Einstein threw the macroscopic world upside down by saying that everything was in motion and therefore all measurements were "relative," so Heisenberg did the same with the microscopic world by saying that the atom was just as "relative" as the universe, and nobody was quite sure about anything anymore, big or small. We might say there was both an Atomic Uncertainty Principle and a Cosmological Uncertainty Principle hampering the advancement of science.

The Demise of Relativity Theory

Einstein publicly criticized Heisenberg's *Uncertainty Principle* and Quantum Mechanics. But Quantum Mechanics, by depending on nothing more than statistical analysis, was having reasonable success in analyzing and predicting the effects of the subatomic world, and thus Einstein's opposition was more or less a losing battle. Einstein spent the rest of his career trying to meld General Relativity and Quantum Mechanics, without any success (and no success has come to anyone else). In fact, his post-Relativity career was virtually fruitless. This failure suggests (and Einstein

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the particles. But in choosing a short wavelength, one quantum of that wavelength will disturb the particle and change its velocity to a proportionate degree. Thus, the more accurately one tries to measure the position of the particle the more the particle's velocity will be altered from its original movement. According to Heisenberg's equation ($\Delta p \Delta x \geq \hbar$, where Δp is the difference in, or uncertainty about, momentum; while Δx is the difference in, or uncertainty about, location. Thus, the product of the uncertainty in the position of a particle and the uncertainty in the momentum of the particle is greater than or equal to Planck's constant) if in determining the position of a particle one can cut the margin of error in half, he will inevitably double the uncertainty of the particle's velocity, and vice-versa. To get an idea of the magnitude of the "uncertainty" left to us by Heisenberg, if a car were traveling 64.9999999999999999999999999999 mph, and another car traveling beside it was moving precisely at 65 mph, if the two vehicles represented electrons whose positions were known but whose speed needed to be measured, the difference in speed between the two would be on the order of 100,000. In the atomic world, that is quite an "uncertainty."

was quite cognizant of it) that one or both of the theories were wrong. Hence, we can understand why he worked so feverishly to unify the two theories since, if he could show that the two worked together, he would save his own theory from being obliterated.

For Einstein, one of the chief threats of Quantum Mechanics was that it would eventually nullify one of his most famous conceptions, "space-time," thereby completely overthrowing Relativity. As *Scientific American* describes it:

> After all, relativity is riddled with holes – black holes. It predicts that stars can collapse to infinitesimal points but fails to explain what happens then. Clearly the theory is incomplete…. Moreover, quantum theory turns the clock back to a pre-Einsteinian conception of space and time. It says, for example, that an eight-liter bucket can hold eight times as much as a one-liter bucket. That is true in everyday life, but relativity cautions that the eight-liter bucket can ultimately hold only four times as much – that is, the true capacity of buckets goes up in proportion to their surface area rather than their volume. This restriction is known as the holographic limit. When the contents of the buckets are dense enough, exceeding the limit triggers a collapse to a black hole. Black holes may thus signal the breakdown not only of relativity but also of quantum theory (not to mention buckets).[1168]

With revelations like the above, most physicists are quietly burying Einstein's theories in private ceremonies, but the public is not yet invited since it would burst – just a little too soon – the 100-year-old aura the scientific community created around him. Even his admirers are quite candid about the demise of Einstein's theories. Brian Greene writes:

> Bell's reasoning and Aspect's experiments show that the kind of universe Einstein envisioned may exist in the mind, but not in reality. Einstein's was a universe in which what you do right here has immediate relevance only for things that are also right here. Physics, in his view, was purely local. But we now see that the data rule out this kind of thinking; the data rule out this kind of universe.[1169]

[1168] George Musser, "Was Einstein Right," *Scientific American*, Sept. 2004, p. 89.
[1169] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004, pp. 120-121.

What the public knows of Einstein's inner turmoil, however, is merely his famous quote: "God does not play dice with the world," heard in every quarter of the civilized world. As Clark writes:

> His feelings went deep, and were epitomized in the famous phrase…which he used in a letter to Max Born on December 12, 1926. 'Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the Old One. I, at any rate, am convinced that He does not throw dice….As Einstein put it years later to James Franck: "I can, if the worst comes to the worst, still realize that the Good Lord may have created a world in which there are no natural laws. In short a chaos. But that there should be statistical laws with definite solutions, *i.e.*, laws which compel the Good Lord to throw dice in each individual case, I find highly disagreeable."'[1170]

Here again we see that Einstein cannot live in the world to which his theories inevitably lead. He now appeals to "the Old One," and more specifically "the Good Lord," as the preferred reference frame, as it were, for his critique of modern physics. Something deep inside forced him to become quasi-religious as the world he helped create got a little too crazy for even his sensibilities. In any case, Heisenberg, for one, was not moved by Einstein's appeals to "the Good Lord." He knew that Einstein was the very one who had opened Pandora's box. In one particular conversation, Heisenberg let him know just how hypocritical Einstein's position was:

[1170] *Einstein: The Life and Times*, p. 414. At the **Fifth Solvay Congress in 1927**, Niels Bohr further comments: "On his side, Einstein mockingly asked us whether we could really believe that the providential authorities took recourse to dice playing […ob der liebe Gott würfelt]…I remember, also, how at the peak of the discussion Ehrenfest, in his affectionate manner of teasing his friends, jokingly hinted at the apparent similarity between Einstein's attitude and that of the opponents of relativity theory…" (*ibid.*, p. 418). At the same congress, Ehrenfest had another opportunity to put all the confusion into perspective. As Clark reports: "…Lorentz did his best to give the floor to only one speaker at a time. But everyone felt strongly. Everyone wanted to put his own view. There was the nearest thing to an uproar that could occur in such distinguished company, and in the near confusion Ehrenfest moved up to the blackboard which successive speakers had used and wrote on it: 'The Lord did there confound the language of all the Earth" (*ibid.*, p. 417).
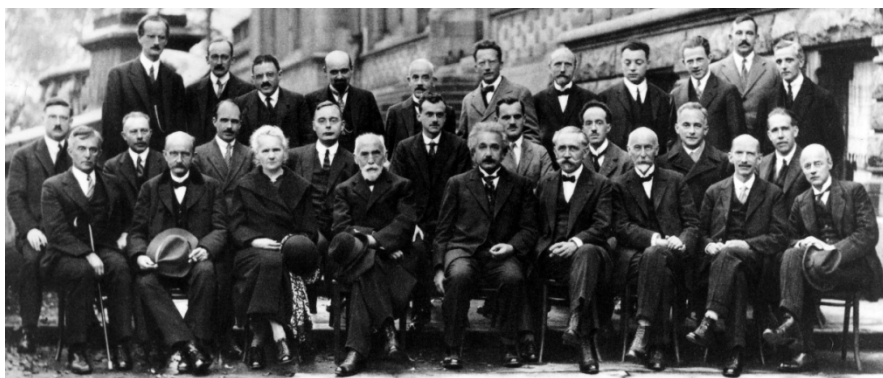
The Fifth Solvay Conference, 1927

From back to front and from left to right: Auguste Piccard, Émile Henriot, **Paul Ehrenfest**, Édouard Herzen, Théophile de Donder, **Erwin Schrödinger**, Jules-Émile Verschaffelt, **Wolfgang Pauli**, **Werner Heisenberg**, Ralph Howard Fowler, **Léon Brillouin**, Peter Debye, Martin Knudsen, William Lawrence Bragg, Hendrik Anthony Kramers, **Paul Dirac**, **Arthur Compton**, **Louis de Broglie**, **Max Born**, **Niels Bohr**, Irving Langmuir, **Max Planck**, Marie Skłodowska Curie, **Hendrik Lorentz**, **Albert Einstein**, **Paul Langevin**, Charles Eugène Guye, Charles Thomson Rees Wilson, Owen Willans Richardson

Heisenberg: "We cannot observe electron orbits inside the atom.…Since a good theory must be based on observable magnitudes, I thought it more fitting to restrict myself to these, treating them, as it were, as representatives of the electron orbits."

Einstein: "But you don't seriously believe that none but observable magnitudes must go into physical theory?"

Heisenberg: "Isn't that precisely what you have done with relativity?"

Einstein: "Possibly I did use this kind of reasoning, but it is nonsense all the same.…In reality the very opposite happens. It is the theory which decides what we can observe." [1171]

[1171] *Physics and Beyond*, translated by Arnold J. Pemerans, 1971, p. 63. Original in German is titled *Der Teil und das Ganze*, München: Piper, 1969, S. 79-80. Einstein's quote ("It is the theory which decides what we can observe") seems to be well known, since it was quoted in *Discover's* April 2004 issue, page 14, although without a reference. Heisenberg also writes of Einstein: "Bohr and Einstein were in the thick of it all. Einstein was quite unwilling to accept the

With that interesting peek into the methodology of Einstein, the saga continues:

> The distressing position in which Einstein now found himself was not unique. J. Robert Oppenheimer has pointed out how 'many of the men who have contributed to the great changes in science have really been very unhappy over what they have been forced to do, and cites not only Planck and Einstein but Kepler and de Broglie. The process is not restricted to physics. Lord Conway…has pointed out that "each generation makes of the world more or less the kind of place they dream it should be, and each when its day is done is often in a mood to regret the work of its own hands and to praise the conditions that obtained when it was young."'[1172]

> So with Einstein. At times he was wryly humorous about his inability to accept the new world which his colleagues had created. Philipp Frank visited him in Berlin, apparently in 1932, and they began to talk of the new physics. Then, says Frank, 'Einstein said, partly as a joke, something like this: "A new fashion has now arisen in physics. By means of ingeniously formulated theoretical experiments it is proved that certain physical magnitudes cannot be measured, or, to put it more precisely, that according to accepted natural laws the investigated bodies behave in such a way as to baffle all attempts at measurement. From this the conclusion is drawn that it is completely meaningless to retain these magnitudes in the language of physics. To speak about them is pure metaphysics."'[1173]

And then Einstein was hit with the proverbial mirror to see his own reflection:

> And when Frank pointed out to Einstein that he had invented the fashion in 1905, Einstein answered: 'A good joke should not be repeated too often.' More cogently, he explained to Infeld – the Pole who had visited him in Berlin and who was later to join him in the United States – 'Yes, I may have started it, but I regarded

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fundamentally statistical character of the new quantum theory" (Werner Heisenberg, *Physics and Beyond*, 1971, p. 79).

[1172] *Ibid*., pp. 413-414.

[1173] *Ibid*. , p. 414.

these ideas as temporary, I never thought that others would take them so much more seriously than I did.'[1174]

Einstein's facile attempt at deflecting the blame away from himself is certainly disturbing. Perhaps he is trying to pass off his theory of Relativity as just an exercise in free-thinking, as is the case with his famous "thought experiments." Or perhaps, when his theories are found to lead to absurdities, he would have us pull the plug and call it all a joke. What kind of man would pardon himself by suggesting that men subsequent to him shouldn't have taken the implications of his theories so seriously?

The Indian astrophysicist, **Subrahmanyan Chandrasekhar** was said to have a "deep anger" at Einstein for not sufficiently developing his theories and consequently leaving the struggle to others.[1175] Perhaps in line with his above comment to Heisenberg ("It is the theory which decides what we can observe"), Einstein's following comment makes more sense:
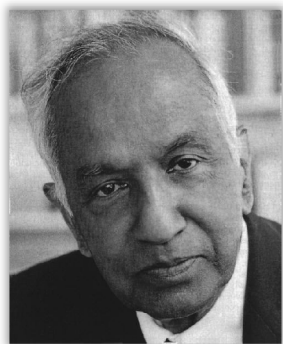
"When I examine myself and my methods of thought I come to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge."[1176] Unfortunately, it is precisely these "fantasies" that have turned the world upside down. To those who are looking to get out from the quagmire into which Einstein and modern physics have put the world, his words are indeed no "joke," especially for those of us who realize that Einstein's *Trojan Horse* was created in 1905 precisely to escape the clear and numerous experimental results showing that ether existed and that the Earth was standing still in it. Almost all the absurdities of modern physics have their root in the "fantastic" interpretations Einstein gave to those crucial experiments.

Thus, we see that Einstein, like many before him whose perspective was limited, was forced to question the validity of their own theories. This was inevitable, for Relativity makes all understanding just that – relative – with no certainty and no absolutes. Einstein could not live with his own theory, and, as we have documented, at many points he found himself retracing his steps and reviving the very concepts that he had originally denied.

[1174] *Ibid*., p. 414.
[1175] Interview of Dr. Chandrasekhar by Lee Smolin, cited in *Discover*, September 2004, p. 39.
[1176] *Einstein: Life and Times*, p. 87 in 1971 edition.

Newton's Absolute Space and the Spinning Water Bucket

As we noted earlier, Einstein felt compelled to come closer to Newton's idea of "absolute space," and thus he returned to the concept of ether. Einstein's appeal to Newton stems from the problem Newton discovered concerning the "**spinning bucket of water**." Although Newton did not make any definitive claims as to the constitution of space, nevertheless, as opposed to Einstein, he believed it was absolute, that is, space had an existence separate from the matter contained within it and independent of the arbitrary perceptions of Einstein's "observer." As he states it: "Absolute space, in its own nature, without regard to anything external, remains always similar and immovable."[1177] Space never changed, no matter what event occurred in it or who observed that event. We know this postulate in modern terms as "the inertial frame of reference."

Newton was led to his particular understanding, and attempted to prove it, by the experiment of the spinning bucket of water. Here is how the 1689 experiment was conducted: Newton hung a bucket of water by a rope. He turned the bucket so the rope was wound up very tightly, and then he allowed the rope to unwind. As the bucket spun, the water level, which was previously flat, gradually started to curve up the sides of the bucket. In all such experiments, as the water begins to rotate the surface of the water becomes concave. Here Newton had a keen insight. When the bucket started to move against the water, the water level was flat. It was only when water was rotating that the surface of the water began to curve upwards. As Newton puts it:

> …the surface of the water will at first be plain [flat], as before the vessel began to move; but the vessel, by gradually communicating its motion to the water, will make it begin sensibly to revolve, and recede little by little from the center, and ascend up the sides of the vessel, forming itself into a concave figure (as I have experienced), and the swifter the motion becomes, the higher will the water rise, till at last, performing its revolutions in the same time with the vessel, it becomes relatively at rest in it.[1178]

[1177] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689); translated by Andrew Motte (1729), revised by Florian Cajori, Berkeley: University of California Press, 1934, Definition VIII.
[1178] *Ibid*., Definition XII.

1 Rope, Bucket and Water are Stationary

2 Rope and Bucket Spinning. Water Slowly Forming a Concave Surface

3 Rope and Bucket Cease Spinning. Water Continues with Concave Surface Until it Stops Spinning
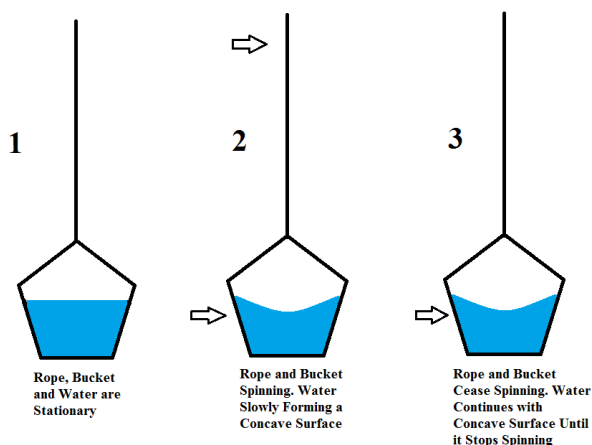
Newton correctly reasoned that it was not the bucket that changed the shape of the water's surface, that is, it was not the inside of the bucket that was attracting the water. Once the surface of the water curved upward, the bucket's only function was to contain the water in a confined space. If one suddenly stops the spinning bucket, the surface of the water will remain concave as long as the water's velocity continues. Or, one can replace the water and the bucket with a disc of putty and observe how the putty expands radially as it is rotated. Newton reasoned that it was something about the nature of rotation itself that causes this phenomenon.

Although this experiment seems simple and ordinary, it has spawned some of the most perplexing scientific and philosophical questions man has ever faced. Using a little personification to help understand the perplexity of this phenomenon, we would ask: how does the water know that it is rotating and that it should form a concave surface? If the sides of the bucket are not creating the phenomenon except to confine the water to one place, then against what is the water spinning and curving? Of course, being in the wake of Copernicus, Newton considered it unimaginable that a rotating universe against a fixed Earth or even the stars within it could be responsible for causing the water to curve upward, and thus he concluded that the water must be reacting to a fixed space surrounding it, and in that sense the water's motion was not relative but absolute. But in Newton's view, absolute space is more of a concept than a real entity with physical locus points. As such, the water's curve upward could not be caused by rotation in relation to absolute space. Hence Newton admitted he did not know why a rotating object should react in this way with absolute space. Instead, the label "centrifugal force" was employed to describe the phenomenon, but neither Newton nor anyone else could explain its origin because there existed no physical body that produced the force.

Newton tried a variation of the experiment, but this time it was a thought experiment. He envisioned two balls tied together with a rope. On Earth, if the balls are rotated around a common center, the rope will become taut as the balls recede from one another. But what would happen if the balls were rotated in an empty universe? As Newton puts it:

> For instance, if two globes, kept at a given distance one from the other by means of a cord that connects them, were revolved about their common center of gravity, we might, from the tension of the cord, discover the endeavour of the globes to recede from the axis of their motion, and from thence we might compute the quantity of their circular motions…. And thus we might find both the quantity and the determination of this circular motion, even in an immense vacuum, where there was nothing external or sensible with which the globes could be compared. But now, if in that space some remote bodies were placed that kept always a given position one to another, as the fixed stars do in our regions, we could not indeed determine from the relative translation of the globes among those bodies, whether the motion did belong to the globes or to the bodies…[1179]

Newton, of course, would have the same problem concerning the bulge of the Earth at the equator, since the same "centrifugal" force he invented for the water bucket and globes would necessarily be responsible for equatorial expansion. He writes:

> The equal gravitation of the parts on all sides would give a spherical figure to the planets, if it was not for their diurnal revolution in a circle. By that circular motion…by its ascent towards the equator it will enlarge the diameters there, and by its descent towards the poles it will shorten the axis….and therefore the diameter of the earth at the equator is to its diameter from pole to pole as 230 to 229.[1180]

Although Newton's ratio of 230:229 is very close to correct, he says he will provide us the reason for these "centrifugal" phenomena (he writes: "it shall be explained more at large in the following tract"), except for his reasoning that rotational motion created a force when it moved against

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[1179] *Ibid*., Definition XIV.
[1180] *Ibid*., Definition XVIII, Theorem XVI and Definition XIX, Problem III.

absolute space, he did not provide a physical answer to the phenomena, but merely mathematical equations that calculated the amount of the forces involved. Thus, as he had earlier admitted:

> It is indeed a matter of great difficulty to discover, and effectually to distinguish, the true motions of particular bodies from the apparent; because the parts of that immovable space, in which those motions are performed, do by no means come under the observation of our senses.[1181]

The problems were not over. Although unbeknownst to Newton, about two hundred years later Jean Foucault would demonstrate his famous pendulum. It would rotate like clockwork totally independent of the Earth beneath it. What was the force that rotated the pendulum? It could not be attributed to "centrifugal" force because the pendulum was rotating, not expanding outwards. Hence, another cause had to be invented to account for this apparently strange phenomenon. It was dubbed the "Coriolis" force, after the man, Gaspard-Gustave Coriolis, who discovered its effect. But this force, too, was invented, and thus had to be added in by hand to Newton's force equations, since there existed no physical body to account for its origin.

Foucault didn't know the origin either. As Assis notes:

> It is curious to note Foucault's description of his experiment. Sometimes he speaks of the rotation of the earth relative to space and other times relative to the fixed stars (heavenly sphere). He does not distinguish these two rotations or these two concepts….For instance, he begins by stating that his experiment showing the rotation of the plane of oscillation "gives a sensible proof of the diurnal motion of the terrestrial globe." To justify this interpretation of the experimental result he imagines a pendulum placed exactly at the North pole oscillating to and fro in a fixed plane, while the earth rotates below the pendulum. He then says: "Thus a movement of oscillation is excited in an arc of a circle whose plane is clearly determined, to which the inertia of the mass gives <u>an invariable position in space</u>. If then these oscillations continue for a certain time, the motion of the earth, which does not cease turning from west to east, will become sensible by contrast with the immobility of the plane of oscillation, whose trace upon the ground will appear to have a

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[1181] Ibid., Definition XIV.

motion conformable to the <u>apparent motion of the heavenly spheres</u>…[1182]

As we will see when we cover the subsequent history, these slips of the pen, as it were, from Newton onwards betrays the common thread running through all the attempts to explain the water bucket and other such phenomena in regards to the difference between absolute and relative motion – the unproven presumption they inherited from Copernicus, the man who took away the one absolute they possessed – an immobile Earth. In time this ambiguous system became deeply problematic. At first the new theoreticians were somewhat inebriated by the sense of freedom Copernicus brought to them, for in their view he had unshackled the world from the grip of medieval philosophy and theology. Like the teenager who has his taste of freedom running away from home but soon discovers how lost and desperate he is as he tries to figure out life on his own, so the sons of the Enlightenment found themselves in the same predicament when they tore themselves away from the arms of their holy mother. There was simply no place to put an anchor any longer. Copernicus had cut the umbilical cord and men were now floating in space. From then onward, science and philosophy become little more than one attempt after another to restore Earth's moorings, but they tried to do so without giving up the Copernican theory – a formidable task, indeed.

The "Space" of Diggs, Bruno and Descartes

Thomas Digges (d. 1595) made it even more difficult. Two decades after Copernicus, Diggs observed a "new star" in the cosmos and wrote about it in his work *Alae seu scalae mathematicae*. This "star" was the same supernova that Tycho Brahe had discovered in 1572. From this discovery, Diggs proposed a modified Copernican universe, suggesting that the expanse of space was not closed but infinite, and that the sun and

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[1182] L. Foucault, "Physical demonstration of the rotation of the earth by means of the pendulum," *Journal of the Franklin Institute*, 21:350-353, 1851, as cited in *Relational Mechanics* by Andre K.T. Assis, 1999, p. 78-79. Assis shows the fallacy in Foucault's thinking: "Experimentally it is found that this ω_d [angular rotation of the earth] has the same value (in direction and order of magnitude) as the kinematical rotation of the earth relative to the fixed stars…But there is no explanation of this fact in Newtonian mechanics….According to the Newtonian mechanics, these dynamical effects (deformation of the spherical form of the earth or rotation of the plane of oscillation of the pendulum can only be explained by a rotation of the earth relative to absolute space or to an inertial frame of reference" (*ibid*., pp. 79, 81).

planets were located in a remote and isolated part of the cosmos. Although his father, Leonard Digges, held to the Ptolemaic model, Thomas Digges was a staunch leader of the Copernicans in England. In 1576 he added an appendix to his father's 1556 almanac, *A Prognostication Everlasting*, which supported the Copernican theory under the title: *A Perfit Description of the Caelestiall Orbes according to the most aunciente doctrine of the Pythagoreans, latelye revived by Copernicus and by Geometricall Demonstrations approved*. This was the first English publication supporting the Copernican theory, comprised mainly of an English translation of the main chapters of Copernicus' book, *De revolutionibus*.

Right on the heels of Digges was **Giordano Bruno** (d. 1600). Most scholars have come to agree that it was Bruno as the person whom the Inquisition is alleged to have executed both for his heretical ideas and his insistence that the Church should not dictate truth.[1183] It is Bruno

who must be regarded as the principal representative of the doctrine of the decentralized, infinite and infinitely populous universe; for he not only preached it throughout western Europe with the fervor of an evangelist, but also first gave a thorough statement of the grounds on which it was to gain acceptance from the general public.[1184]
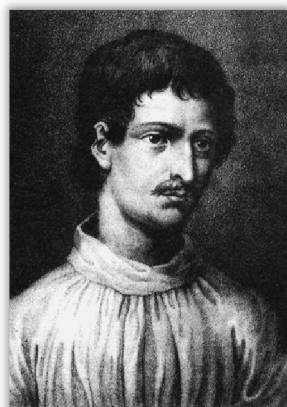
Bruno defended Copernican cosmology in the 1584 book *La Cena de la Ceneri*,[1185] and developed his concept of an infinite universe in *De l'infinito e mondi* ("On the Infinite Universe and Worlds") and *De immenso et innumerabilis* ("On the Immense and the Innumerable").[1186] Whereas Copernicus' universe was much bigger than Ptolemy's and Aristotle's, it was finite, since it was enclosed within the sphere of fixed

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[1183] See Chapter 14 of Volume II of this book for more information on Bruno.

[1184] A. O. Lovejoy's, *The Great Chain of Being*, p. 116, cited in Koyré, *From the Closed World to the Infinite Universe*, p. 39. Koyré concludes: "Bruno's world-view is vitalistic, magical; his planets are animated beings that move freely through space of their own accord like those of Plato or or Pattrizzi. Bruno's is not a modern mind by any means" (*ibid.*, p. 54).

[1185] *La Cena de le Ceneri* in *Opere Italiano*, ed., Gentile, Bari 1907.

[1186] *De Immense et Innumerablilis*, in *Opera Latina Conscripta*, ed., Fiorentino, Naples, 1884, Libero III, cap. 9, vol. 1, pt. 1. 380-386, cited in Stimson, p. 51.

stars. Yet Copernicus' model would inevitably lead to an infinite universe, mainly because it had no center, but also because, as Koestler says, "once the apparent daily round of the firmament was explained by the Earth's rotation, the stars could recede to any distance,"[1187] and the more difficult it would be for the geocentrists to explain how an immense universe could rotate. With this implication, Bruno declared that Earth was merely a planet, and, sounding a bit like a modern String theorist or a forerunner of the "omega-searching" Teilhard de Chardin influenced by the "noosphere," Bruno held that:

> …this world itself was merely one of an infinite number of particular worlds similar to this, and that all the planets and other stars are infinite worlds without number composing an infinite universe, so that there is a double infinitude, that of the greatness of the universe, and that of the multitude of worlds.[1188]

And by logical extension:

> To a body of infinite size there can be ascribed neither center nor boundary….there are in this space countless bodies such as our earth and other earths, our sun and other suns, which all revolve within this infinite space, through finite and determined spaces or around their own centers. Thus we on the earth say that the earth is in the center….Just as we say that we are at the center of that [universally] equidistant circle…so doubtless the inhabitants of the moon believe themselves at the center [of a great horizon] that embraces the earth….Thus the earth no more than any other world is at the center….From various points of view these may all be regarded either as centers, or as points on the circumference…Thus the earth is not in the center of the Universe; it is central only to our surrounding space.[1189]

These ideas were part of Bruno's "astro-theology," which greatly alarmed Church officials, who eventually had him extradited to Rome to face this and other incidents of heretical teaching.

[1187] *The Sleepwalkers*, p. 220.

[1188] William Roscoe Thayer, *Throne Makers*, New York, 1899, p. 268, *Giordano Bruno: His Trial, Opinions and Death*, pp. 252-308, cited in Stimson, p. 51.

[1189] *De l'infinito e mondi* p. 309, cited in Koyré, *From the Closed World to the Infinite Universe*, pp. 41-42.

Since science was isolating Earth in the faraway corners of space, **René Descartes** (d. 1650) attempted to at least apply a leash to the remaining cosmos by introducing his famous saying *Cogito ergo sum* ("I think therefore I am"). Once one forsakes his home, he will need a new start in life, an identity of his own, and what better identity could there be than the human cognition that caused the separation? Having picked himself up by his own bootstraps, he also needed a new home, an anchor to secure himself. This Descartes provided by inventing the "Cartesian coordinates." Instead of a sphere the universe was now partitioned into x, y, z coordinates, just as if one were to measure the length, width and height of a room from one of its corners. If one wants to locate a certain position within the room, he simply finds the place where the three coordinates intersect. The problem with this approach was, of course, that without an immobile Earth, Descartes was at a loss to tell us where the universe's "corner" is located. Thus Descartes came to believe that empty space did not exist but is made up of bodies themselves and their extensions. What we see as empty space is actually filled with bodies, small or large, and there is no place in the universe where a body does not exist. As such, when one measures "space" he is measuring the bodies which are compacted together, and out of which the Cartesian coordinates possess their intrinsic dimensions.[1190]

The Space of Leibniz, Euler & Kant

Gottfried Leibniz (d. 1716) came after Descartes and told a different story. His idea was that the space between the bodies sufficed for a definition of space. But since he also did not possess a central and immobile Earth, Leibniz was forced to say that no location of any object in space is in distinction to any other location. As such, there is no reason to speak of objects being located in certain places, and thus he also rejected Newton's concept of absolute space, since

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[1190] René Descartes, *Die Prinzipien der Philosophie*, ed. A. Buchenau, Philosophische Bibliothek, Vol. 28 (F. Meiner, Hamburg, Germany, 1992).

"absolute" implies that two or more locations can be distinguished. Newton's water bucket experiment did, however, present a problem to Leibniz. In his correspondence with Samuel Clarke, Leibniz admitted he had no answer to it:

> I find nothing in the Eighth Definition of the *Mathematical Principles of Nature*, nor in the Scholium belonging to it, that proved, or can prove, the reality of space in itself. However, I grant there is a difference between an absolute true motion of a body, and a mere relative change of its situation with respect to another body. For when the immediate cause of the change is in the body, that body is truly in motion; and then the situation of other bodies, with respect to it, will be changed consequently, though the cause of the change be not in them. 'Tis true that, exactly speaking, there is not any one body, that is perfectly and entirely at rest; but we frame an abstract notion of rest, by considering the thing mathematically. Thus have I left nothing unanswered, of what has been alleged for the absolute reality of space. And I have demonstrated the falsehood of that reality, by a fundamental principle, one of the most certain both in reason and experience; against which, no exception or instance can be alleged. Upon the whole, one may judge from what has been said that I ought not to admit a moveable universe; nor any place out of the material universe.[1191]

Here we note Leibniz's comment: "'Tis true that, exactly speaking, there is not any one body, that is perfectly and entirely at rest; but we frame an abstract notion of rest, by considering the thing mathematically." This, in precise terms, is the great problem that Copernicus left the world after his insistence that the Earth was moving in space.

Newton, as we have noted, used the water bucket experiment to attempt to prove the existence of absolute space, but he could neither explain the specific property space possessed that would allow it to pull up water, nor did he demonstrate how absolute space could be directly observed. Newton may have hinted at an answer by referring to "as the fixed stars do in our region."[1192] The precise contribution the stars made to the matter, however, would not be suggested until about two hundred years


[1191] Leibniz-Clarke Correspondence, 5th paper, Manchester University Press, England, 1956.

[1192] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689); translated by Andrew Motte (1729), revised by Florian Cajori, Berkeley: University of California Press, 1934, Definition XIV.

later in the work of Ernst Mach, and then immediately thereafter by Albert Einstein. Prior to that, George Berkeley had suggested that the water in the bucket was rotating not with respect to absolute space but to the stars, but at that time no one was apt to listen to challenges to Newton's view of the universe.

Next on the scene was **Leonhard Euler** (d. 1783). He insisted that absolute space and absolute time are beyond much doubt, since these two components are compatible with observation, and therefore they are real, not imaginary. To Euler it made sense that merely imagining absolutes cannot serve as the basis for celestial mechanics, or for that matter, any mechanics. As such, Euler neither accepted Berkeley's suggestion that the stars are the absolute frame of reference nor the source that controlled the laws of inertia, since such star-power was considered "metaphysical," not mechanical.[1193]
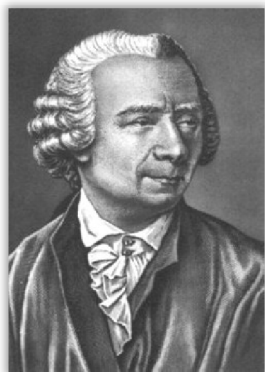
Immanuel Kant (d. 1804) succeeded Euler. Using a bit of metaphysics, he concluded that space and time are *a-priori* elements of existence since, if we measure things in space and time, without them we would have no experience. Space and time thus become pristine forms of human intuition and, therefore, cannot be altered by experience. But this particular version of space and time is absolute, and must be distinguished from empirical space and time, the latter of which is a matter of perception, yet constitutes all the objects we experience. This formulation, of course, goes hand-in-hand with Kant's philosophical separation of the noumenal world (*i.e.*, "the thing in itself") from the phenomenal world (*i.e.*, the world known through experience), a philosophy that marked the beginning of the end for the Enlightenment, for man could no longer be certain that the things he experienced were real since they could just as well be a figment of his imagination.

Kant admitted, however, that circular motion, as opposed to uniform linear motion, is real motion in itself, since it presupposes the existence of an external force that prohibits the body from moving in a straight line. (This coincides with Newton's First Law of motion concerning inertia, which, as opposed to Aristotle's view, did not require a force to keep the body moving in a linear direction). From this reasoning, Kant makes his defense of Copernicanism. For him, it is not merely an "experiential"

[1193] Leonhard Euler, "Réflexions sur l'espace et le temps," *Memoir de l'academie des sciences de Berlin* 4, 324, 1748.

matter that the Earth rotates among fixed stars as opposed to the stars revolving around a fixed Earth, since according to Kant real motion can be demonstrated empirically by the presence of inertial forces.[1194] Kant, of course, was never exposed to the ideas of Ernst Mach, otherwise he would have known that inertial forces in space are just as relative as everything, assuming, of course, that there is no fixed Earth to decide the issue.

It is significant that Kant concludes his analysis of the problem of motion by asserting that the Copernican theory was correct. It shows that upholding Copernicanism was at the forefront of the debate, although it was somewhat camouflaged by all the discussion concerning "absolute" versus "relative." The truth is that the sons of the Enlightenment were in quite a predicament trying to make sense of a universe in which everything was moving, thus causing the relations between objects to become very confusing. They were caught, on the one hand, trying to avoid the "unthinkable" (the immobile Earth the ancients had bequeathed to them) and, on the other hand, trying to salvage from this confusion their own "absolutes." Rejecting the Earth as the absolute, Descartes postulated his "Cartesian coordinates," Leibniz his "defined" space, Berkeley his "stars," Euler his "absolute space and time," Newton his "absolute space," and Kant his "circular motion," in order to fill the gapping hole left by Copernicus. None of these worked, however, and, in fact, the whole affair eventually produced the philosophical and mechanical schizophrenia latent in Kantianism.[1195]

Immanuel Kant
1724 -- 1804

[1194] Immanuel Kant, "Metaphysische Anfangsgründe der Naturwissenschaft," *Schriften zur Naturphilosophie*, Werkausgabe Band IX, ed., W. Weischedel, Suhrkamp, Frankfurt, 1968.

[1195] Interestingly enough, Kant didn't think too highly of Newton's view of the universe. He writes: "Newton's dynamics goes essentially beyond all observations. It is universal, exact and abstract; it arose historically out of myths; and we can show by purely logical means that it is not derivable from observation-statements" (cited in Karl Popper's, *Conjectures and Refutations*, p. 190). Popper adds: "Kant also showed that what holds for Newtonian theory must hold for everyday experience…that everyday experience, too, goes far beyond all observation. Everyday experience too must interpret observation; for without theoretical interpretation, observation remains blind – uninformative. Everyday

After Kant's wrecking ball, the world has never been quite the same. Men wandered around as philosophical zombies not knowing what was real and what was fantasy. It was just a matter of time before the relativistic world of Albert Einstein would serve as the nuclear bomb, as it were, to obliterate any attempt to revive an immobile Earth. But as the saying goes: 'what goes around, comes around,' for, inadvertently, it was the very theory of Relativity that breathed life back into the corpse of geocentrism since, by the very tenets of Relativity, Einstein proved there was no way to discount geocentrism. In other words, the very wall that they all sought to avoid was precisely the one into which they all ran!

Ernst Mach, Albert Einstein and Modern Philosophy

Before we analyze Mach's and Einstein's solutions to Newton's bucket problem, it would be beneficial to investigate their relationship. Of all scientists, **Ernst Mach** probably had the greatest influence on Einstein. Even though they would eventually diverge on several key points, according to Holton, "until Mach's death, and for several years after, Einstein declared himself a disciple of Mach." Mach was an Austrian physicist, physiologist and psychologist, who tried to understand reality through a synthesis of these disciplines. Moritz Schlick was one of his closest adherents and describes Mach's methodology in these words:

> Since all our testimony concerning the so-called external world relies only on sensations, Mach held that we can and must take these sensations and complexes of sensations to be the sole contents [Gegenstände] of those testimonies, and, therefore, that there is no need to assume in addition an unknown reality hidden behind the sensations…there exists in this world nothing whatever other than sensations and their connections… scientific knowledge of the world consists, according to Mach, in nothing

experience constantly operates with abstract ideas, such as that of cause and effect, and so it cannot be derived from observations" (*ibid*.).

else than the simplest possible description of the connection between the elements [sensations]…[1196]

One who is familiar with philosophy will see definitive elements of both Kant and Hume in Mach's approach. Kant more or less limited our understanding of reality to the categories of the mind obtained by *a priori* intuition, as opposed to the objectiveness of the thing in itself; and Hume believed that nothing could be known except by sense experience.

Michele Besso, Einstein's oldest and closest friend, had introduced him to the work of Mach. Interestingly enough, although a victim of the Copernicanism and Newtonianism he inherited, Mach was on a continual search for at least some kind of absolute. He knew instinctively, as most physicists do, that this void had to be filled. It's quite unfortunate that they all turned their back on the fixed-Earth given to them by Christianity. Instead,

> Mach suggested referring all motion to the fixed stars (as in his well-known analysis of Newton's bucket experiment), or perhaps to a "medium" filling all of space (*i.e.*, ether), or to a mean velocity with respect to all the masses in the universe.[1197]

Mach's books (*Science of Mechanics*, *The Principles of Physical Optics* and *Analysis of Sensations*) had the greatest initial effect on Einstein.[1198] In the first book were two ideas that helped mold Einstein's thinking. The first is reflected clearly in…

> Einstein's insistence from the beginning of his relativity paper that the fundamental problems of physics cannot be understood until an epistemological analysis is carried out, particularly so with respect to the meaning of the conceptions of space and time; and second, by Einstein's identification of reality with

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[1196] Moritz Schlick, *Ernst Mach, der Philosoph*, in a special supplement on Ernst Mach in the *Neue Freie Presse*, Vienna, June 12, 1926, as cited in Holton, *Thematic Origins of Scientific Thought*, p. 240.

[1197] *Albert Einstein's Special Theory of Relativity*, p. 121.

[1198] As Einstein stated in his *Autobiographical Notes* of 1946: "This book exercised a profound influence upon me….I see Mach's greatness in his incorruptible skepticism and independence; in my younger years, however, Mach's epistemological position also influenced me very greatly….As far as the history of science is concerned, it appears to me that Mach stands at the center of the development of the last 50 or 70 years" (p. 21).

what is given by sensations, the "events," rather than putting reality on a plane beyond or behind sense experience.[1199]

Since Kant had created a deep chasm between our subjective thinking and the objective nature of reality, gone forever were the absolutes of Greek and Medieval thought. Whereas a balance existed in pre-Kantian times between nature and grace, after Kant, grace had all but been obliterated from man's thought process. The phenomenal world of particulars was likewise separated from the noumenal world of universals. From this, a movement toward determinism soon became prominent, first in physics and then in human disciplines, such as psychology, sociology and biology. As Arthur Miller states:

> Einstein no doubt found this book provocative….All of this discussion was based upon a framework whose dynamics were explained more clearly than by Hertz or von Helmholtz – that is, the neo-Kantian framework emphasizing the role of those organizing principles for thinking which admit of the validity, for example, of non-Euclidean geometrics.[1200]

As **Karl Popper** summed it up so well:

Karl Popper (1902 – 1994)

In Kant's own striking formulation of this view, 'Our intellect does not draw its laws from nature, but imposes its laws on nature.' This formula sums up an idea which Kant himself proudly calls his 'Copernican Revolution.' As Kant puts it, Copernicus, finding that no progress was being made with the theory of the revolving heavens, broke the deadlock by turning the tables, as it were: he assumed that it is not the heavens which revolve while we the observers stand still, but that we the observers revolve while the heavens stand still. In a similar way, Kant says, the problem of scientific knowledge is to be solved – the problem how an exact science, such as Newtonian theory, is

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[1199] Holton, *Thematic Origins of Scientific Thought*, p. 242.
[1200] *Albert Einstein's Special Theory of Relativity*, p. 121.

possible, and how it could ever have been found. We must give up the view that we are passive observers, waiting for nature to impress its regularity upon us. Instead we must adopt the view that in digesting our sense-data we actively impress the order and the laws of our intellect upon them. Our cosmos bears the imprint of our minds.

By emphasizing the role played by the observer, the investigator, the theorist, Kant made an indelible impression not only upon philosophy but also upon physics and cosmology. There is a Kantian climate of thought without which Einstein's theories or Bohr's are hardly conceivable; and Eddington might be said to be more of a Kantian, in some respects, than Kant himself.[1201]

Popper then posits that the Kantian methodology applied the salve to the wound caused by Copernicanism:

There is a second and even more interesting meaning inherent in Kant's version of the Copernican Revolution, a meaning which may perhaps indicate an ambivalence in his attitude towards it. For Kant's Copernican Revolution solves a human problem to which Copernicus' own revolution gave rise. Copernicus deprived man of his central position in the physical universe. Kant's Copernican Revolution takes the sting out of this. He shows us not only that our location in the physical universe is irrelevant, but also that in a sense our universe may well be said to turn about us; for it is we who produce, at least in part, the order we find in it; it is we who create our knowledge of it. We are discoverers: and discovery is a creative art.[1202]

By the time Einstein came on the scene, a "creative art" is precisely what the scientific endeavor became. Man now visualized himself riding on moonbeams, growing older than his twin brother, and seeing matter shrink when it moved. Once Kant opened the floodgates, man could, in an almost god-like fashion, impose his thoughts on the universe and mold it anyway he saw fit, backed up, of course, with mathematical equations that gave it a veneer of credibility.

[1201] *Conjectures and Refutations: The Growth of Scientific Knowledge*, pp. 180-181.

[1202] *Ibid*., p. 181.

Under the influence of Kant and later philosophers such as Hegel, Heidegger, and a few other German and French philosophers, scientific thinkers of Ernst Mach's breed became commonplace in Europe. In fact, the whole concept of "relativity" sprung out of this crucible. Einstein's 1905 paper, which converged on many fronts with Mach's philosophical ideas was, according to Holton,

> …enthusiastically embraced by the groups who saw themselves as philosophical heirs of Mach, the Vienna Circle of neopositivists and its predecessors and related followers, [relativity] providing a tremendous boost for the philosophy that had initially helped to nurture it. A typical response welcoming the relativity theory as "the victory over the metaphysics of absolutes in the conceptions of space and time…a mighty impulse for the development of the philosophical point of view of our time," was extended by Joseph Petzoldt in the inaugural session…in Berlin, 11 November 1912.[1203]

Hence, we see that this was a philosophical war. The "victory over the metaphysics of absolutes" was the battle cry against the Aristotelian and Platonic ideals that had permeated classical thought and helped give philosophical structure to Christian thought in the work of Augustine and Aquinas. This is precisely why the issue of whether the Earth is the immobile center of the universe is so vitally important, something that these "neopositivists" understood all too well. Once Copernicus, Kepler, Newton, and now Einstein, had removed that universal absolute, no one could stand in the way of the philosophical juggernaut that would issue from it. When the results from Arago, Airy, Fizeau, and Michelson-Morley threatened to pop the bubble of "victory over absolutes" (since they demonstrated physical evidence of the likelihood that Earth was fixed in space), we can understand why Einstein became such a revered icon of modern man. With or without Mach, he saved them from a fate worse than death. With Einstein's magic, the Earth would remain moving.[1204]

[1203] *Thematic Origins of Scientific Thought*, p. 243.

[1204] Ironically, Mach rejected the Special Theory of Relativity based on the fact that it was not founded on empirical evidence. Mach writes in 1913: "I gather from the publications which have reached me, and especially from my correspondence, that I am gradually becoming regarded as the forerunner of relativity….I must, however, as assuredly disclaim to be a forerunner of the relativists as I personally reject the atomistic doctrine of the present-day school, or church" (*ibid*., p. 248). Einstein laments: "The theory was, for him, inadmissibly speculative. He did not know that this speculative character belongs also to

Mach's Interpretation of Newton's Bucket

Now we are ready for Mach's interpretation of the "bucket" experiment. Since Mach held that all knowledge was derived from sensation, he refused to accept any postulate of natural science that was not verified empirically. This prompted him to deny Newton's concept of absolute space. He writes:

> The one experiment [Newton's bucket] lies before us, and our business is, to bring it into accord with the other facts known to us, and not with the arbitrary fictions of our imagination."[1205]

He argued, rather, that as the water curved upwards inside the bucket it was reacting to all the mass and gravitysurrounding it, including the Earth but mostly the stars. Whereas Newton said the water was rising relative to absolute space and that the observer witnessed the event with absolute space as his foundation, Mach said the water was rising relative to absolute gravity and that the observer viewed the event with the external mass as his foundation. In doing so, Mach obviously rejected absolute space as the foundation. He writes:

> Newton's experiment with the rotating water bucket teaches us only that the rotation of water relative to the bucket walls does not stir any noticeable centrifugal forces; these are prompted, however, by its rotation relative to the mass of the Earth and the other celestial bodies.[1206]

Mach's general point is that, since Newton fixated on absolute space, he did not take into account relative motion, that is, the water was rotating relative to all the matter in the universe such that if there were no other matter, the water surface would not become concave. Mach also discounted Newton's thought experiment concerning the two globes,

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Newton's mechanics, and to every theory [of] which thought is capable. There exists only a gradual difference between theories, insofar as the chains of thought from fundamental concepts to empirically verifiable conclusions are of different lengths and complications" (From *Zur Enthüllung von Ernst Machs Denkmal*, n. 13, as cited in *Thematic Origins of Scientific Thought*, p. 250).

[1205] Ernst Mach, *The Science of Mechanics: A Critical and Historical Account of its Development*, published 1883, trans., T. J. McCormack, 1960, p. 284.

[1206] *Ibid*. Mach further pointed out that if the water in the bucket was "several leagues thick" and thus of great mass itself, we could not predict how it would respond to the mass outside of it.

stating that if there were no universe against which the globes would rotate, we would not know that the globes were rotating.

In another work relating to Newton's bucket experiment, Mach says something that reflects deeply on the geocentric issue:

> Obviously, it doesn't matter if we think of the Earth as turning round on its axis, or at rest while the fixed stars revolve round it. Geometrically these are exactly the same case of a relative rotation of the Earth and the fixed stars with respect to one another. But if we think [as in Newton's view] of the Earth at rest and the fixed stars revolving round it, there is no flattening of the Earth, no Foucault's experiment, and so on – at least according to our usual conception of the law of inertia. Now one can solve the difficulty in two ways. Either all motion is absolute, or our law of inertia is wrongly expressed. I prefer the second way. The law of inertia must be so conceived that exactly the same thing results from the second supposition as from the first. But in this it will be evident that in its expression, regard must be paid to the masses of the universe.[1207]

Geocentrism, of course, opts for a hybrid of Newton's and Mach's views, which holds the Earth is at rest and the stars rotate, but the gravity of the stars influence the forces we experience on Earth. Additionally, since the Earth is fixed, all motion is, indeed, absolute, since motion can be measured against one, and only one, absolute point. In any case, Einstein recognized Mach's view in his 1920 paper, stating:

> Mach tried to avoid having to accept as real something which is not observable [absolute space] endeavoring to substitute in mechanics a mean acceleration with reference to the totality of the masses in the universe in place of an acceleration with reference to absolute space. But inertial resistance opposed to relative acceleration of distance masses presupposes action-at-a-distance; and as the modern physicist does not believe that he may accept this action-at-a-distance, he comes back once more, if he follows Mach, to the ether, which has to serve as the medium for the effects of inertia.[1208]

[1207] As cited in William G. V. Rosser's, *An Introduction to the Theory of Relativity*, 1964, p. 454, from Dennis Sciama's, *The Unity of the Universe*, 1959.
[1208] 1920 Leyden address, para. 19.

The geocentrist explains the above problem very simply: all the matter in the universe is more or less equally distributed around the Earth, and thus its mutual gravitational attraction is canceled at the neutral point, Earth, the center of mass, as required by Newtonian physics. We, however, experience the effect of the universe's collective gravitational force in the form of the phenomenon we know as "inertia." Inertia is the property in which an object remains at rest, or remains in motion if it is already in motion, unless acted upon by a net external force. The rotating universe creates a ubiquitous and balanced force around the Earth whose primary responsibility is to keep the Earth in place so that it cannot be moved (as the barycenter of a spinning gyroscope remains in place). Since the force is balanced, we do not feel it, unless we move against it (as when we try to turn the gyroscope or suddenly put on the brakes in a moving car). Moreover, the rotation of the universe around the Earth creates the additional forces we understand as centrifugal, Coriolis and Euler forces. These gravitational forces are transmitted (*i.e.*, "action-at-a-distance") through the universal ether, and we see its differing effects in the various forces we experience (*e.g.*, inertia, centrifugal, *etc*.). Since the ether is dense and supergranular, it can transmit the forces very rapidly.

Einstein's View of Newton's Bucket

As noted previously, the pre-1916 Einstein wanted to dismiss the concept of a "medium" because he thought the Michelson-Morley and similar experiments demonstrated that ether did not exist. As Einstein saw it, if we allow Mach's view, that is, there is inertial resistance between the Earth and the distant stars, then something must carry that resistance, even as air carries sound. For the record, Mach never explained how the stars transmitted their forces to the Earth.[1209] Since in Einstein's view there was no difference between inertial resistance and gravitation (which he claimed to have proven by his elevator analogies), he simply replaced Mach's inertial resistance with gravitation. Hence, the Earth was not in inertial resistance against the stars; rather, the Earth was affected, at least partially,

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[1209] As Assis notes: "Mach proposed that the distant matter (such as the fixed stars) establishes a very good inertial system. But he did not explain how this connection between the distant stars and the locally determined inertial frames might arise. He stimulated thinking in the right direction, although he did not supply the key to unlock the mystery. Another point is that he did not show how the spinning set of stars can generate centrifugal forces. The same can be said of Leibniz, Berkeley and all the others. Mach suggested that nature should behave like this, but he did not propose a specific force law that possessed this property" (Andre K. T. Assis, *Relational Mechanics*, pp. 122-123).

by the gravity from the stars. Of course, one might object that Einstein's gravity also needs a "medium" to travel from the stars to the Earth, and thus he does not escape the need for ether. As we noted, Einstein had his particular ways of dealing with this issue. He writes:

> According to this theory the metrical qualities of the continuum of space-time differ in the environment of different points of space-time, and are partly conditioned by the matter existing outside the territory under consideration. This space-time variability of the reciprocal relations of the standards of space and time, or, perhaps, the recognition of the fact that "empty space" in its physical relation is neither homogeneous nor isotropic, compelling us to describe its state by ten functions (the gravitational potentials *g*), has, I think, finally disposed of the view that space is physically empty.[1210]

Thus, to replace Mach's continuous stream of inertial communication between the stars and the Earth, Einstein proposes that there are pockets of varying gravitational effects all over the universe which are caused both by the objects in the vicinity of the "territory under consideration" (*e.g.*, Earth and the water bucket) and "matter existing outside" (*e.g.*, the distant stars). To what degree the "matter existing outside" affects the "territory under consideration" Einstein does not specify, nor does he explain how such distant matter transmits its affects to Earth, other than to say that there are "ten functions of gravitational potentials,"[1211] which means he will resort to mathematics to explain their existence, not physical evidence.

In any case, Einstein has given us enough information to understand how he will explain Newton's spinning bucket of water. These distant stars, which can be considered as one massive body, form a universal enclosure around the "territory under consideration," and, according to General Relativity, they will create space-time dimensions on the bodies within that "territory." In the case of the bucket, the water climbs the inside walls because, as the water rotates against the masses near it (*e.g.*, Earth, moon, sun, planets) and far from it (*e.g.*, stars, galaxies, black holes), its inertial movement will create a different space-time environment or "gravitational potential" as opposed to what the water had at rest. In a crude sort of way, Einstein posits that the water curves because

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[1210] 1920 Leyden lecture, para. 20.

[1211] These are Einstein's famous "metric tensor fields" or "dimensions of curvature," a mathematical composite of 20 components (10 of which are independent and 10 of which are zero) that characterize the fabric of space-time in General Relativity.

the space surrounding it curves. Hence, to avoid Mach's position, Einstein can say that the stars are not *directly* affecting the water, and thus there is no need for a mechanical ether to transmit their force to the water; rather, the stars are only *indirectly* affecting the water by helping to change the space-time dimensions surrounding the water. Since these space-time dimensions do not travel from the stars to the water in the bucket but continually affect space-time dimensions throughout the universe by their ubiquitous existence, then there is no need for what Einstein calls, an "undulating ether" to carry their effects. Thus he concludes:

> But therewith the conception of the ether has again acquired an intelligible content, although this content differs widely from that of the ether of the mechanical undulatory theory of light. The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events.[1212]

[1212] 1920 Leyden lecture, para. 20. As noted earlier, Einstein candidly admits, however, that his concept of gravitational ether cannot account for electromagnetic activity, since if space is created by gravity, then there is no place for electromagnetic activity to operate independently. This is further complicated by the fact that to Einstein, matter and the electromagnetic field are intimately related, such that matter is "nothing else than condensations of the electromagnetic field" (*ibid*, para. 24). He then says "it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation," but this wish, which he attempted to forge in the Unified Field Theory, never materialized. This failure, of course, suggests that the basic premises of Relativity theory are wrong. In another light, John Wheeler, et al., state: "A model universe that is closed, that obeys Einstein's geometrodynamic law, and that contains a nowhere negative density of mass-energy, inevitably develops a singularity. No one sees any escape from the density of mass-energy rising without limit. A computing machine calculating ahead step by step the dynamical evolution of the geometry comes to the point where it cannot go on. Smoke, figuratively speaking, starts to pour out of the computer…" (Charles W. Misner, Kips S. Thorne, and John A. Wheeler, *Gravitation*, 1973, p. 1196). Barbour and Bertotti add: "In 1908, Newton's absolute space and time were replaced by the equally absolute Minkowskian space-time. It is important to note that the local validity of special relativity, however well tested, can no more prove the existence of Minkowskian space-time than the bucket did Newton's space." In regard to General Relativity, they state: "To the extent that general relativity, which conceptually is a completely local theory…it is perhaps understandable that it is able to predict other local phenomena with great accuracy. However, the only real tests of general relativity are those that have been carried out in the solar system, under nearly stationary conditions, and for X values smaller than 10^{-6}" (J. B. Barbour and B. Bertotti,

Although Einstein tried his best to present a non-mechanical and non-kinematical ether to the world, not everyone was buying into it. As noted previously, Dayton Miller's experiments had come into full bloom a few years after Einstein's 1920 Leyden lecture, and thus the possibility of a mechanical ether simply would not go away, which is quite remarkable, since Miller was a heliocentrist who interpreted his interferometer experiments from the perspective that the Earth was moving at 30 km/sec. Yet even from that difficult perspective there were strong indications that a material ether existed. In 1923 Ernst Gehrcke reexamined the Michelson-Morley, Michelson-Miller and Georges Sagnac experiments, not to mention Michelson-Gale, and demonstrated how Relativity theory fell far short of explaining them.

These indications were strong enough that Einstein decided to address the issue in a book with Leopold Infeld in 1938 titled *The Evolution of Physics*. Einstein writes:

> Is the ether carried with a room as the air was? Since we have no mechanical picture of the ether it is extremely difficult to answer this question. If the room is closed, the air inside is forced to move with it. There is obviously no sense in thinking of ether in this way, since all matter is immersed in it and it penetrates everywhere. No doors are closed to ether. The "moving room," now means only a moving CS [coordinate system] to which the source of light is rigidly connected. It is, however, not beyond us to imagine that the room moving with its light source carries the ether along with it just as the sound source and air is carried along in the closed room. But we can equally well imagine the opposite: that the room travels through the ether as a ship through a perfectly smooth sea, not carrying any part of the medium along but moving through it. In our first picture, the room moving with its light source carries the ether. An analogy with a sound wave is possible and quite similar conclusions can be drawn. In the second, the room moving with its light source does not carry the ether. No analogy with a sound wave is possible and the conclusions drawn in the case of a sound wave do not hold for a light wave. These are the two limiting possibilities. We could imagine the still more complicated possibility that the ether is only partially carried by the room

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"Gravity and Inertia in a Machian Framework," *Il Nuovo Cimento*, 32B(1), March 11, 1977, pp. 26-27). As we will see in Appendices 5, 6, 7, and 8, even Einstein's "solar system" tests never proved General Relativity.

moving with its light source. But there is no reason to discuss the more complicated assumptions before finding out which of the two simpler limiting cases experiment favors.[1213]

Einstein explains why he cannot accept either of these possibilities:

Every attempt to explain the electromagnetic phenomena in moving CS [coordinate systems] with the help of the motion of the ether, motion through the ether, or both these motions, proved unsuccessful….Thus arose one of the most dramatic situations in the history of science. All assumptions concerning ether led nowhere! The experimental verdict was always negative. Looking back over the development of physics we see that the ether, soon after its birth, became the "*enfant terrible*" of the family of physical substances. First, the construction of a simple mechanical picture of the ether proved to be impossible and was discarded. This caused, to a great extent, the breakdown of the mechanical point of view. Second, we had to give up hope that through the presence of the ether-sea one CS [coordinate system] would be distinguished and lead to the recognition of absolute, and not only relative, motion. This would have been the only way, besides carrying the waves, in which ether could mark and justify its existence. All our attempts to make ether real failed. It revealed neither its mechanical construction nor absolute motion. Nothing remained of all the properties of the ether except that for which it was invented, *i.e.*, its ability to transmit electromagnetic waves. Our attempts to discover the properties of the ether led to difficulties and contradictions. After such bad experiences, this is the moment to forget the ether completely and to try never to mention its name. We shall say: our space has the physical property of transmitting waves, and so omit the use of a word we have decided to avoid. The omission of a word from our vocabulary is, of course, no remedy. Our troubles are indeed much too profound to be solved in this way![1214]

Of course, to today's Relativist, all this sounds so inviting. Here we have a theory that apparently solves the problem of having to find the

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[1213] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 167-168.
[1214] *Ibid*., pp. 175-176.

elusive ether; dispenses with the metaphysics of absolutes; makes a plausible connection between the distant stars and Earth; and, most of all, saves mankind from having to admit the possibility of a motionless Earth. As we have noted previously, however, the theory of Relativity was created under the misinterpretations of stellar aberration, interferometer, and other similar experiments. Since it was assumed in each case that the Earth was moving at 30 km/sec, invariably each experiment was interpreted as giving a null result for the existence of a mechanical ether. If Einstein and modern science had stopped for one brief moment to analyze those experiments from the perspective of a motionless Earth, they would have had positive proof of the ether's existence. The so-called "difficulties and contradictions" would have disappeared, for each experiment invariably showed a small positive result, a result consistent with a universe rotating in a sea of ether around the Earth as its immovable center. Having failed to grasp this truth, Einstein was forced into the fantastic contortions of time and space that we witness above, which, in the end, leave no room for the very thing that began his trek – electromagnetic activity. In fact, the effects of electromagnetic activity in the Sagnac and similar experiments demonstrate that absolute motion exists, and not even the mighty equations of General Relativity could dismiss that incontrovertible fact. (See Chapter 9 for continuing discussion of the origin and nature of centrifugal and Coriolis forces).

The Inherent Problems of Newton's and Einstein's Physics

In the end, the Newtonian and Einsteinian systems are mere mathematical representations of physical forces for which neither system provides real physical answers. Newton developed a physics that interpreted, in mathematical terms, the force of interaction between two bodies, but which was totally independent of the reference frame in which those bodies were contained. The formulas $F = ma$ and $F = Gm_1m_2/r^2$ work only in unaccelerated reference frames. When Newton's formulas are applied to accelerating frames of reference, they do not work unless compensations are added. In an accelerated frame, the two bodies begin to accelerate without a force being applied to them. Hence, Newton's math must be adjusted to compensate for acceleration, and this is accomplished by adding in fictitious components, otherwise known as centrifugal, Coriolis, and other forces. But centrifugal and Coriolis forces, even though measurable, are not products of matter or energy in the Newtonian system. Newton could not explain from whence they originated. Consequently, they are mere inventions of the human mind so as to allow Newton's math

equations to balance. Evidently, something is missing. As C. Møller writes:

> For example, if we consider a purely mechanical system consisting of a number of material particles acted upon by given forces…Newton's fundamental equations of mechanics may be applied with good approximation….On the other hand, if we wish to describe the system in an accelerated system of reference, we must introduce, as is well known, so-called fictitious forces (centrifugal forces, Coriolis forces, etc.) which have no connexion whatever with the physical properties of the mechanical system itself….It was just for this reason that Newton introduced the concept of absolute space which should represent the system of reference where the laws of nature assume the simplest and most natural form. However…the notion of absolute space lost its physical meaning as soon as the special principle of relativity was generally accepted, for as a consequence of this principle it became impossible by any experiment to decide which system of inertia had to be regarded as the absolute system.[1215]

Since Newton was a Copernican and thus did not have a fixed Earth from which to formulate his laws of motion, he ran into several difficulties, if not contradictions, in his formulas. As Dennis Sciama explains it:

> Newton's second law can be expressed in the familiar form: force is mass times acceleration. When we look carefully at this law we find a curious difficulty. For, while the force acting on a body is objectively determined by whatever is exerting the force, the value of the acceleration depends on how it is measured, that is, on which body is taken as providing a standard of rest….A similar example of this difficulty is provided by the motion of artificial satellites. The ones which have been launched so far have circled the earth in an hour or two. But the farther out a satellite is, the longer it takes to complete its orbit. At a certain height it will take just twenty-four hours. If a satellite at this height were to move parallel to the equator and in the same direction as the earth rotates, it would always be above the same point of the earth's surface. Someone looking up would see a

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[1215] C. Møller, *The Theory of Relativity*, 1958, pp. 218-219.

body at rest above his head, hovering with no visible means of support! These examples show that Newton's second law applies only if the accelerations of bodies are measured in a special way. Since Newton believed his law to be fundamental, he supposed that accelerations measured in such a way that his law applies are of particular significance, and he called them *absolute*. Newton's second law should now be amended to read: force is mass times absolute acceleration. Those bodies on which no forces act will then have no absolute acceleration. Such bodies are said to constitute an *inertial frame of reference* or simply an inertial frame, because accelerations measured relative to them will be absolute accelerations. Consequently for Newton's second law to be satisfied accelerations must be measured relative to an inertial frame of reference.

Inertial frames naturally play a fundamental role in Newton's theory. Nevertheless, he often found it convenient to use a *non-inertial* frame of reference – that is, to measure accelerations relative to some body whose absolute acceleration is not zero…This procedure leads, of course, to anomalies, in particular that a force may produce no acceleration at all. Nevertheless, Newton was able to adapt his law of motion to fit this situation by postulating the existence of some *additional* forces, which do not have a physical origin in material objects. These additional forces, commonly called inertial forces, are needed to compensate for measuring accelerations relative to a non-inertial frame of reference.[1216]

So we see that Newton needed to measure motion by means of a fixed frame, but having none (because Copernicus removed the possibility of a fixed Earth), he created his own fixed frame, which he called "absolute space." For Newton, the Earth was moving, but absolute space was immobile (a picture which is the exact opposite of what Scripture reveals to us). Thus Newton determined that all motion would be measured against this unseen yet ubiquitous spatial fortress. In order to provide evidence that absolute space existed, Newton introduced his water bucket experiment noted above. He held that, the degree to which the water curved upward would reveal the amount of absolute rotation the water possessed as measured against the immobile space surrounding it. Of course, as others pointed out, this didn't prove the existence of absolute space; rather, it

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[1216] Dennis Sciama, *The Unity of the Universe*, pp. 85-89.

only proved that the water was curving upward against *something*, but its exact identity remained a mystery. In reality, Newton was forced to answer the water bucket problem by appealing to absolute space because he had no other choice, namely, he did not believe it could be cause by the stars, the Earth, or the bucket.[1217]

Einstein thought of another way to solve these problems. To answer Newton's dilemma of having to add centrifugal and Coriolis forces, in the theory of General Relativity Einstein invented "curved space" so as to give matter itself the ability to obey Newton's laws without an external force being applied to the matter. The "force," as it were, came from the curved space which, when a body followed its curved path, made it appear as if it was accelerating. Einstein didn't have an explanation as to why the body followed the curved path (especially with no force pushing it), or how gravity could curve the vacuum of space, or even why an object would follow the so-called "geodesic" path. Moreover, since acceleration and gravity are locally equivalent in General Relativity, then the gravity caused by "curved space" becomes, in essence, another fictitious force similar to Newton's that allows the math equations to balance.[1218] The major problem for Einstein, of course, is that the mathematics cannot reveal whether the phenomenon is a fictitious force caused by curvature or a genuine force caused by something else. In fact, Einstein produced his

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[1217] Newton's system has the same problem with explaining the atomic world. As Robert Laughlin puts it: "Early in the twentieth century it was discovered that atoms, molecules, and subatomic particles are described by the laws of quantum mechanics – rules so different from Newton's that scientists struggled to find proper words to describe them. Newton's laws make profoundly false predictions at this scale, such as atoms having zero size and solids having huge heat capacities at zero temperatures that they do not, in fact, have. A beam of helium atoms projected onto an atomically perfect solid surface does not bounce off in all directions, as Newton's laws predict, but diffracts into rainbows as a beam of light would do. Atoms are not billiard balls at all but waves, as are their constituents, which bind together to form atoms the way waves of water bind to make a surge. Thus Newton's legendary laws have turned out to be emergent. They are not fundamental at all but a consequence of the aggregation of quantum matter into macroscopic fluids and solids" (*A Different Universe*, p. 31).

[1218] As Assis quips: "…the theoretical concepts of length contraction, time dilation, Lorentz invariance, Lorentz's transformations, covariant and invariant laws, Minkowski metric, four-dimensional space-time, energy-momentum tensor, Riemannian geometry applied to physics, Schwarzschild line element, tensorial algebras in four-dimensional spaces, quadrivectors, metric tensor $g_{\mu\nu}$, proper time, contravariant four vectors and tensors, geodetic lines, Christoffel symbols, super strings, curvature of space, etc. have the same role as the epicycles in the Ptolemaic theory" (Andre K. T. Assis, *Relational Mechanics*, p. 159).

General Relativity field tensors by finding a math equation that he could work backward into Newton's force equations,[1219] and because of that fateful step, his theory will be tied to the fate of the Newtonian theory. In the end, without physical proof of its existence, Einstein's curved space is just as fictitious as Newton's additional inertial forces (*e.g.*, centrifugal and Coriolis forces).[1220]

Einstein, however, has an even deeper problem explaining Newton's bucket. When the relativistic mathematics is applied to the bucket, it shows both an additional force that has no analogue to the Newtonian centrifugal force, as well as a Coriolis force that is five times the strength as the Newtonian Coriolis. These mathematical results occur when, using General Relativity's own principle of equivalence, the stellar frame is rotated around the bucket rather than kept fixed. As Assis explains it:

> But in Einstein's general theory of relativity a strange things happens. Although the fixed stars and distant galaxies exerted no force on the water in frame O in which the stars and distant galaxies were seen at rest, the same does not happen in this

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[1219] The 8π component in Einstein's field equation, $G = 8\pi T$ (in which G is the Einstein tensor and T is the stress or energy-momentum tensor), was added by determining what factor was necessary in order to make Einstein's equation equal to Newton's equation. This is why General Relativists, such as Misner, Thorne and Wheeler, can say: "The field equation [$G = 8\pi T$] even contains within itself the equations of motion ("Force = mass x acceleration") for the matter whose stress-energy generates the curvature." Consequently, they have no qualms in saying that $G = 8\pi T$ "…is elegant and rich. No equation of physics can be written more simply, and none contains such a treasure of applications and consequences. The field equation shows how the stress-energy of matter generates an average curvature (G) in its neighborhood…The field equation [$G = 8\pi T$] governs the motion of the planets in the solar system; it governs the deflection of light by the sun; it governs the collapse of a star to form a blackhole; it governs the evolution of spacetime singularities at the end point of collapse; it governs the expansion and recontraction of the universe. And more; much more" (*Gravitation*, pp. 42-43). The expanded Einstein field equation is $R_{ab} - \frac{1}{2}Rg_{ab} = -8\pi GT$, where g is the metric tensor, R_a is the Ricci tensor, R is the scalar curvature and T is the energy-momentum tensor. Einstein's original equation included the infamous cosmological constant Λ, and was written as $R_{ab} - \frac{1}{2}Rg_{ab} + \Lambda g_{ab} = -8\pi GT$.

[1220] As Reginald Cahill concludes: "…Newtonian gravity is known to be seriously flawed, and so ipso facto, by using this postulate ["In the limit of low speeds the gravity formalism should agree with Newtonian gravity"] Einstein and Hilbert inadvertently developed a flawed theory of gravity….Newtonian gravity failed because it was expressed in the limited formalism of the gravitational acceleration field g" ("The Einstein Postulates: 1905-2005: A Critical Review of the Evidence," in *Einstein and Poincaré*, pp. 131, 135).

frame O' of the bucket in which the stars and galaxies are seen rotating with…the angular rotation of the bucket and water relative to O. Now, due to the Thirring's force, there will appear a real gravitational force exerted by the spinning distant matter on the water. This force did not exist in the frame of reference O. The problem is that this new force is not exactly the Newtonian fictitious centrifugal force. In it appears the new axial term…which has no analogue in the Newtonian theory….In Newtonian mechanics the situation was much better and more coherent…Neither the centrifugal force nor *ma* [from *F = ma*] had any relation to the distant galaxies. But in general relativity we have a gravitational frame-dependent force….according to Thirring's expression, there will be a real gravitational influence of the distant galaxies on the water.[1221]

We will cover "Thirring's expression" more deeply in Volume II under "Thirring's Geocentrism." For now, we will also note the even greater effect that Thirring's mathematics has on Einstein's Coriolis force. Assis notes:

It might be thought that this is a negligible effect, but this is not the case. When we integrate Thirring's force over the whole known universe we obtain forces of classical mechanics. The equation[1222] gives the gravitational force exerted by the spinning universe on any body, according to general relativity. It has the same order of magnitude as the classical Coriolis and centrifugal forces. But the form and numerical values of Thirring's force are different from the classical ones. This means that Foucault's pendulum or the flattening of the earth, when analyzed from the earth's frame of reference in which the distant galaxies are seen as rotating, should, according to general relativity, have values different from those observed experimentally. This is one of the main quantitative flaws of general relativity….the analogous to Coriolis force is 5 times larger than the analogous to the centrifugal one….[This] shows that general relativity cannot

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[1221] Andre K. T. Assis, *Relational Mechanics*, p. 154.

[1222] From Thirring's 1921 equation [and also Peizoto, Rosa and Pfister] as $\vec{F} = \frac{4GM}{15Rc^2}[m\vec{\omega} \times (\vec{\omega} \times \vec{r}) + 10m\vec{u} \times \vec{\omega} + 2m(\vec{\omega} \cdot \vec{r})\vec{\omega}]$ and replacing M by $dM = 4\pi R^2 \rho dR$ and integrating from zero to Hubble's radius such that $R_o = c/H_o$ yields: $\vec{F} = -\frac{8G\rho}{15H_o^2}[m\vec{\omega} \times (\vec{\omega} \times \vec{r}) + 10m\vec{u} \times \vec{\omega} + 2m(\vec{\omega} \cdot \vec{r})\vec{\omega}]$, and where $\rho \approx 10^{-27}$ kg/m^3 universe density.

cope with Newton's bucket or two globes experiments in all frames of reference.[1223]

Are There Universal Connections in Space?

As Mach and Einstein struggled with the connection between the stars and the water bucket, this dilemma brings us back to the question of how the universe communicates with itself. If space is not a vacuum and is filled with something, it is probably no surprise that several experiments appear to indicate that particles are mysteriously connected, appearing to communicate with each other even when separated by great distances. What one photon does will be replicated by a twin photon across space, even though there is nothing immediately detectable connecting the two photons. It is as if some mysterious force and communication were making each photon perform the same movement.

These strange happenings were just beginning to be noticed back in the early 1800s when Thomas Young demonstrated that light passing through two adjacent slits produces interference patterns.[1224] In 1909 Goeffrey Taylor discovered that photons from sources as feeble as a candle produce interference lines. The basic question was: with what are the photons interfering in order to make interference patterns?[1225] At one point Paul Dirac was led to postulate that "…each photon then interferes only with itself."[1226]

In 1923, Clinton Davisson and Charles Kunsman reported a similar phenomenon with electron diffraction. In the same year Louis de Broglie found that all objects have properties of waves.[1227] The lighter the object,

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[1223] Assis, *Relational Mechanics*, pp. 154-157.

[1224] Thomas Young, "Experiments and Calculations Relative to Physical Optics," Bakerian Lecture, 1803, Philosophical Transactions of the Royal Society of London 94, 1-16.

[1225] Geoffrey I. Taylor, "Interference with Feeble Light," (Proceedings of the Cambridge Philosophical Society, 15, 114-115, 1909.

[1226] Paul Dirac, *The Principles of Quantum Mechanics*, 4th ed., p. 9.

[1227] In 1923, A. H. Compton performed an experiment shooting high frequency X-rays at various materials. He found that, after the X-ray bounced off the object, it had a slightly longer wavelength than the incident X-ray, which means it had lower energy. It also meant that the energy of the X-ray was partially being transferred to the material it hit (usually graphite). This exchange between the X-ray and the graphite followed the known laws of conservation of momentum and energy. The whole process is known as the Compton Effect, and it supported the idea that energy traveled in very tiny but independent packets. The packets were called photons and they were considered particles. Later in 1923, Louis de Broglie

proposed that the aforementioned particles also consisted of, and traveled in, waves. He was not sure himself precisely what this meant, since it was the result of the mathematical calculations he derived from experiments left to him by previous scientists studying the nature of the atom, especially Niels Bohr, who published his work about ten years earlier. Bohr understood the atom as consisting of electrons orbiting a nucleus of protons and neutrons. Bohr said that the electrons could orbit only at defined energy levels but at no place in between those levels. As the electrons orbit the nucleus, they naturally possess angular momentum (the phenomenon responsible for the behavior of an ice skater who spins faster as she brings her arms in close to her body). Knowing the angular momentum, one could then calculate the electron's speed, orbital radius, and kinetic and potential energy for each specific orbit. The electrons are free to move from one level to another. If they move to a lower energy orbit, they will release energy; if they move to a higher energy orbit, they will absorb energy. The amount of energy will equal the energy difference between the orbits. Hence, for illustration purposes only, if the energy of orbit level 1 is 10, and that of orbit level 2 is 20, the photon that is released or absorbed will possess an energy of 10. About two decades earlier, Max Planck determined that energy comes in precise amounts. For example, molecules (groups of atoms) vibrate at certain frequencies but cannot vibrate at intermediate frequencies. Planck stumbled onto the smallest numerical difference between the various frequencies, and it was assigned a value of 6.626×10^{-34} joule-seconds, which is represented by the symbol h. (A joule is the standard unit of energy which is attained by measuring the angular momentum, or spin energy, of a rotating or vibrating object.) The energy of the molecule is thus determined by its frequency of vibration multiplied by h. This value became known as *Planck's constant*. Einstein, after the famous photoelectric experiments of 1905 (wherein he directed light beams onto metal surfaces and found that a certain amount of light caused a specific number of the metal's electrons to be released), then proposed that the energy in light can only exist in certain values. The smallest unit of light-energy was called a photon. As one photon of light hit the metal plate, one electron would be released from the metal plate. The energy value of a photon would be its frequency (vibrational energy) multiplied by Planck's constant, h. In this model, photons are understood as particles. In other experiments, however, light behaves also as a wave. A wave has no substance of its own, but is merely a periodic motion of the medium in which it travels. (For example, one creates a wave by applying an up-and-down motion to a whip. The wave of the whip has energy, for unless one holds onto the handle of the whip, it will be forcefully dislodged from one's hand.) However, a question left unresolved is: if light is a wave what is its medium? To this day, modern science does not know for certain whether light is a particle or a wave, a combination of the two, or perhaps neither and thus something altogether undiscovered. Because of this uncertainty, light is sometimes referred to as an "electromagnetic wave" and at other times as "photons." Enter Louis de Broglie. Intrigued with the fact that electrons possess angular momentum and that they discharge or absorb energy as they jump into different orbits, he wanted to find

the reason for this behavior. Thus he proposed that electrons, and all matter, were not merely particles but also consisted of waves. Theoretically, everything from electrons to baseballs and beyond had a "wavelength" (λ), which could be measured by using Planck's constant, (h), divided by the object's momentum (p) in the equation $\lambda = h/p$. A big object, such as a pitched baseball, does not show a wavelength since its momentum multiplied by Planck's constant (6.626×10^{-34}) would yield a wavelength of less than 10^{-25} nanometers in size. That is twenty-four orders smaller than the diameter of an atom. But if electrons are or possess waves, then the idea of a particle whizzing around the nucleus had to be modified. The electron's relation to the nucleus was now understood as a wave filling the sphere of the atom. As waves, they won't discharge or absorb photons unless they change their energy level, which means they will change their wavelength, not their orbit. As in light waves, increasing the wavelength causes the frequency of the wave to decrease, and thus lowers the energy level of the electron, which in turn releases a photon. The opposite occurs when the wavelength is shortened. Erwin Schrödinger developed this model by employing more advanced equations. He concluded that electrons do not revolve around the nucleus at all; rather, the waves are stationary. Schrödinger's atom, like Bohr's, was electrical in nature, but the electric charge, rather than being contained in rotating electrons, is distributed throughout the entire atom. The electric charge may fluctuate and thus emit photons, or it may emit electrons, which in this case are considered as little bunches or "quanta" of electric charge split off from the main body of the atom, similar to flames coming off a burning log. To calculate the electrical energy, electrons were considered in terms of energy levels of stationary waves rather than particles circling the nucleus. The wavelengths for these atoms and electrons could be determined by the use of a mathematical system called "matrix mechanics" or Quantum Mechanics, but this was a purely mathematical explanation of the atom that had little if any pictorial description available. Interestingly enough, in light of the DeBroglie-Schrödinger theory, G. Bouw has proposed the following: "If the quantum law holds for the universe as a whole, we can imagine the universe to be a standing wave of wavelength (diameter) $\lambda = 4 \times 10^{28}$ cm (36 billion light years). Using Compton's formula $\lambda = h/mc$ where λ is the wavelength, h is Planck's constant, m is the effective mass of the particle, and c is the speed of light, we derive the effective mass of the universe as 5.5×10^{-66} gm, much much lighter than any known particle, photon or neutrino. That mass is only perceived at the edge of the universe. Any place else, even at the dynamic center which is, of course, the position of the Earth, perceived the mass of the universe to be 5.68×10^{56} gm" (*The Biblical Astronomer*, vol. 12, no. 99, 2002, pp. 15-16). Moreover, the Schrödinger atom requires a universal medium, since the atom itself has no definite boundary but theoretically extends into infinity, and thus all atoms are mysteriously united. As such, Schrödinger's model advanced the idea of a universal electric plenum, which would then be enhanced by the work of Paul Dirac. After some development of the model, in 1951 Dirac concluded: "We have now the velocity at all points of space-time, playing a fundamental part in electrodynamics. It is natural to regard it as the velocity of some real physical

the more pronounced the wave effect. An object as small as the electron would thus act very much like a wave. In 1927 Davisson repeated the electron diffraction experiment with Lester Germer. They shot electrons through a piece of nickel crystal. Thinking that the electrons were like little bullets, the two scientists expected to see the electrons react accordingly. Instead, the electrons produced an interference pattern and thus reacted as if they were in wave motion, not particle or ballistic motion.[1228]

Other strange effects were also being catalogued. As one physicist describes them:

> …a fast-moving point mass passing a spherically-symmetric body causes the latter to rotate; a mass moving with rapidly-decreasing velocity exerts both an attractive and a repulsive force on neighboring bodies; a fast-moving mass passing a stationary mass exerts an explosion-like force on the latter; a rotating mass that is suddenly stopped causes neighboring bodies to rotate; the period of revolution of a planet or satellite is affected by the rotation of the central body.[1229]

Niels Bohr (1885 – 1962)

As time went on, variations of the Davisson-Germer experiment were performed, evolving into the famous "double-slit" experiments.[1230] Eventually, a point was reached in which only one electron, about every ten seconds, was discharged towards the two slits. An amazing thing

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thing. Thus with the new theory of electrodynamics we are rather forced to have an ether" (*Nature* (London): 168: 906-907 (1951), as cited in *The Einstein Myth*, p. 102. Along with Dirac, in 1959 Louis de Broglie also began to reconsider the ether hypothesis. Later, Stark, Arrhenius, Lenard, Yukawa and Soddy began similar investigations).

[1228] Nickel has an atomic plane spacing of 0.0909 nanometers. If a beam of wavelength 1.17 nanometers is shot at it, the reflection will be at 40 degrees. This depends on the formula $n^{\lambda} = 2d \sin (\theta/2)$ where θ is the angle between the atomic planes; d is the incident beam; and n is a positive integer. George Thompson found the same results, sharing the Nobel Prize with Davisson in 1937.

[1229] Oleg D. Jefimenko, *Gravitation and Cogravitation*, 2006, p. vi.

[1230] In 1956 G. Möllenstedt and H. Düker split an electron beam and obtained an interference pattern (Zeitschrift für Physik 145, 377-397); in 1961 Claus Jönsson performed the first "double-slit" experiment with electrons, demonstrating interference patterns with up to five slits.

occurred: interference patterns were still being produced on the photographic plates. Apparently, the electron was "interfering" with something. In fact, the singly discharged electrons seemed to go through the slits alternately so that, as their markings were gradually observed building up on the collecting plate, they produced the same interference pattern as when thousands of electrons were shot at once at the two slits.[1231]

Prior to this, a huge theoretical war broke out between the followers of Albert Einstein and the followers of Niels Bohr.[1232] The former said the electrons were merely following already-programmed instructions built into them (*viz.*, "hidden variables"), whereas the latter claimed that the electrons randomly chose where they would hit, but also that there was some mysterious connection between them so that each electron knew what the other was doing and would act accordingly.

In 1932, John von Neumann gave a purported mathematical proof that the two theories could not be reconciled, but in 1952 David Bohm suggested that they could be reconciled, at least theoretically. In the double-slit experiment he held that a quantum wave was guiding each particle as it went through the slit. As the particle passes through the slit, so does its wave, and it is the wave that is causing the interference line on the screen. When both slits are open, a particle will pass through one slit or the other, but its wave travels through both slits, again causing the interference lines on the screen.

In 1964 **John Bell** had shown that the Einstein group was continuing to lose the battle. Using the fact that electrons have various spin orientations[1233] (*e.g.*, clockwise or counter-clockwise) Bell showed that if two electrons were placed back-to-back and sent to their respective

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[1231] Theoretically, this phenomenon was known to exist by the results of Davisson's experiments, but the theory could not be tested, at least completely, until the 1960s, and then not conclusively until the 1970s and 1980s. Experimental evidence was produced by P. G. Merli et al., "On the Statistical Aspect of Electron Interference Phenomena," *American Journal of Physics* 44, 306-307 (1976); Akira Tonomura et al, "Demonstration of Single-Electron Build-up of an Interference Pattern," *American Journal of Physics* 57, 117-120, (1989).

[1232] Einstein's supporters were Boris Podolsky and Nathan Rosen, who together wrote a paper in 1935 titled "Can Quantum-Mechanical Description of Physical Reality be Considered Complete?" versus the Copenhagen group headed by Bohr (Erwin Schrödinger, Max Born, Werner Heisenberg, et al.).

[1233] The fact that electrons spin and have a magnetic field was discovered in 1925 by S. Goudsmit and G. E. Uhlenbeck. Later it was also discovered that each atomic particle (proton, neutron, etc.) spins and possesses a magnetic field, but since neutrons have no electrical charge, the magnetic field cannot be due to the spin of the particle.

detectors an equal distance away, the electrons will invariably produce opposite spins. Moreover, it doesn't matter how far away the detectors are placed from each other, the results are always the same.[1234] This seems to indicate that one electron somehow knows what the other one is doing even when separated by a substantial distance.

In order for the Einstein group to explain this phenomenon, they would have to invoke a long-range physical force that connected the electrons, but this, of course, would immediately obliterate the theory of Relativity. Yet if Einstein employed short-range or "local" solutions (which is the essence of Relativity theory), he still could not produce the accurate answers provided by Quantum Mechanics, and this resulted in an "inequality" between Relativity and Quantum Mechanics, which is why the critique is called "Bell's Inequality" (but sometimes cited as "Bell's Theorem"). Following Bell's work, a whole host of physicists performed a series of experiments that confirmed Bell's critique of Einstein.[1235]

[1234] Further, if the electrons are tested for spin in two perpendicular directions, one particle goes left or right just as when the other one spins up or down. If they are tested for spin in the same direction, the proportion of times when the spins don't correlate increases as the square of the angle between the two directions, which is to be expected.

[1235] Beginning in 1968, several physicists confirmed "Bell's Inequality" using photons and protons (1968: Abner Shimony; 1972: Stuart Freedman and John Clauser; 1976: Edward Fry and Randall Thompson; 1982: Alain Aspect; 1986: Michael Horne; 1997: Nicolas Gisin; others include Anton Zeilinger, Richard Holt, M. Lamehi-Rachti, W. Mittig). In every case (except one which was later found to have experimental errors) quantum mechanics provided the correct answers and maintained its superiority over Einstein's "hidden variables" theory. For example, in 1972, Stuart Freedman and John Clauser state: "We have measured the linear polarization correlation of the photons emitted in an atomic cascade of calcium. It has been shown by a generalization of Bell's inequality that the existence of local hidden variables imposes restrictions on this correlation in conflict with the predictions of quantum mechanics. Our data, in agreement with quantum mechanics, violate these restrictions to high statistical accuracy, thus providing strong evidence against local hidden-variable theories" (*Physical Review Letters* 28, 938, 1972). See Amir D. Aczel's *Entanglement*, New York, Four Walls Eight Windows, 2001, and Nadeau and Kafatos' *The Non-Local Universe* (Oxford, 2001) for a comprehensive and entertaining history of this phenomenon.

Obviously, some profound phenomenon was occurring that neither Einstein nor Quantum Mechanics had the ability to answer. Einstein was limited by his wish to avoid a physical medium in space, and Quantum Mechanics was limited by the Heisenberg Uncertainty Principle. Since Einstein gave a fallacious interpretation to the Michelson-Morley experiment and fudged Maxwell's equations, he had already obliterated the concept of a material medium pervading all space; and since Quantum Mechanics did not know the origin of the wave that is attached to particles, everyone was at a loss to …explain the double-slit experiment. Weird and spooky interpretations inevitably followed (which these scientists often enjoyed because it elevated physics to a popular status). One such fantastic explanation comes from physicist John Gribbin:
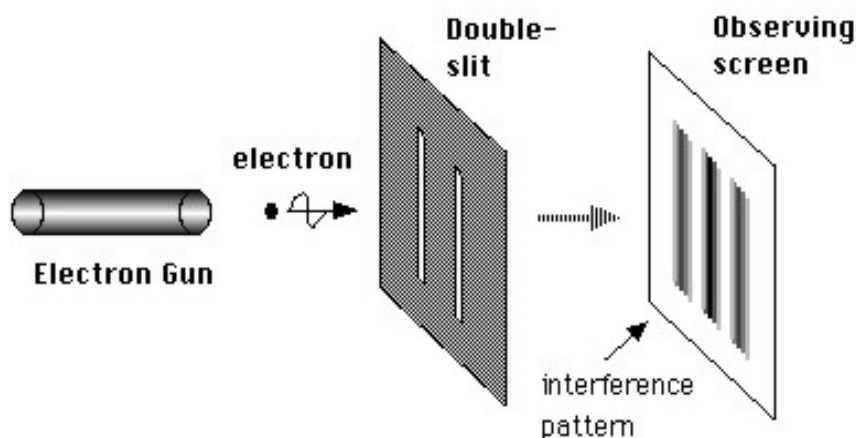
The electrons not only know whether or not both holes are open, they know whether or not we are watching them, and they adjust their behavior accordingly. There is no clearer example of the interaction of the observer with the experiment. When we try to look at the spread-out electron wave, it collapses into a definite particle, but when we are not looking it keeps its options open. In terms of Born's probabilities, the electron is being forced by our measurement to choose one course of action out of an array of possibilities. There is a certain probability that it could go through one hole, and an equivalent probability that it may go through the other; probability interference produces the diffraction pattern at our detector. When we detect the electron, though, it can only be in one place, and that changes the probability pattern for its future behavior – for that electron, it is

now certain which hole it went through. But unless someone looks, nature herself does not know which hole the electron is going through.[1236]

This kind of reasoning has led to some of modern science's most preposterous ideas, such as: electrons have a mind of their own and are purposely trying to deceive us; that everything in the subatomic world is a product of chance; that an object only exists when someone looks at it, or that the observer has some telepathic power to make the electron perform on cue. These fantasy-like interpretations are the result of scientists being locked into a paradigm, and that paradigm started when they incorrectly interpreted the Michelson-Morley experiment. Unfortunately, academicians are under the false impression that scientific progress is inevitable; that no grand detours from truth and correct thinking have been made or will be made; that what is done is done and that there is no point in going back and starting all over again. Besides, that would not only be a gut-wrenching embarrassment, but it would put millions of careers and salaries in dire jeopardy. No one is willing to pay that price.

The experiments elicit one obvious conclusion: both parties must admit to a physical and superluminal connection between particles. Apparently, there is an underlying mechanism of cause and effect in nature that has eluded their discovery, at least up until now. There appears to be a whole world of forms and forces to investigate that is far deeper than the threshold available in Quantum Mechanics and the singularities of General Relativity. Current instruments simply cannot probe into this mysterious and infinitesimally small universe, which is the reason theoreticians are forced into hypotheses such as the Heisenberg *Uncertainty Principle*. As Van Flandern notes:

> Of course, nothing about nature requires that the individual agents conveying an action be observably large or otherwise suitable for detection by any human-built apparatus. At one time, single air molecules were unknown to science…. Likewise, the photon…was once unknown, although humankind was able to perceive bulk light long before forming cogent ideas about its true nature."[1237]

Since the infinitesimal dimensions of plancktons defy detection, absolute measurements of their position and velocity will be

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[1236] John Gribbin, *In Search of Schrödinger's Cat*, 1984, p. 171.
[1237] "Gravity," in *Pushing Gravity*, p. 93.

indeterminable. Once we understand this relationship, the "spookiness" of Quantum Mechanics is minimized. According to *Scientific American*:

> Particles…appear to behave in funky quantum ways simply because we don't, or can't, see this underlying order….The equations of quantum mechanics have an uncanny resemblance to those of the kinetic theory of molecules and, more generally, statistical mechanics. In some formulations, Planck's constant, the basic parameter of quantum theory, plays the mathematical role of temperature. It is as though quantum mechanics describes some kind of gas or ensemble of 'molecules' – a chaotic soup of more primitive entities. [1238]

As noted earlier, the density of the plancktons in the universe may be absolutely mind-boggling. **M. A. Markov** of the Academy of Science of the former USSR writes of infinitesimal particles he calls "maximons" possessing a 10^{94} gr/cm^3 density. According to him and many other physicists, this is the fundamental limit of mass density.[1239] V. Krasnoholovets speaks of it even more graphically, using his "cells" and "tessellattice" nomenclature:

> Predictable orders of size…are clusters/universes whose objects range from 1 (the Planck scale, *i.e.* the size of an elementary cell of the tessellattice), to ~10^{10} elementary cells (roughly quark-like size), to about 10^{17} cells (atomic size), to 10^{21} cells (molecular

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[1238] George Musser, "Was Einstein Right?" *Scientific American*, Sept. 2004, p. 89. Musser also quotes Massimo Blasone of the University of Salerno, Italy, stating: "You'd have quantum mechanics as a low-energy limit of some fundamental theory" (*ibid*., p. 90).

[1239] Markov put forward his hypothesis in 1965 (Supplement of the Progress of Theoretical Physics, 1965, p. 85, as cited in "Spontaneous Breaking of Symmetry and Fundamental Mass" by Umida Ibadova, Dept. of Theoretical Physics, Samarkand, Uzbekistan). In a later work, Markov stated "the limiting matter density….is assumed to be a stable particle (maximon) of Planck mass and dimensions" or "a maximon is an elementary black hole of mass $(\hbar c/\kappa)^{\frac{1}{2}}$" where κ is the gravitational constant ("Some Remarks on the Problem of Very Early Universe," in *The Very Early Universe*, G. W. Gibbons, S. W. Hawking, *et al*., 1983, pp. 353, 361). The value 10^{94} gr/cm^3 was understood as a new universal constant for fundamental mass. Markov also refers to Planck time as 10^{-43} sec and Planck length as 10^{-33} cm.

size), to 10^{28} (human size) to 10^{40} cells (solar system size) up to 10^{56} cells (largest structures).

Speaking of the Planck particles as filling all of space, Krasnoholovets adds:

> This space can be fully associated with the tessellattice of densely packed balls, or superparticles. And this is the degenerate space (one may associate it with an abstract physical vacuum). Superparticles constitute founding cells of the tessellattice and are stacked without any unfilled place between them….Thus, the real space exists in the form of the tessellattice…that densely pack the universe….A particle cannot move without rubbing against superparticles of the tessellattice, and hence a packet of lattice deformations goes forward accompanying the particle. Elementary excitations migrating from cell to cell in fact represent a resistance, *i.e.*, inertia, of the space constructed as the tessellattice…. Furthermore, solutions to the equations of motion show that motion of the particle in the tessellattice is characterized by two de Broglie relationships for the particle: $E = h\nu$ and $\lambda = h/(m\upsilon)$ where $\nu = 1/(2T)$, and these allow the derivation of the Schrödinger equation.[1240]

As noted previously, to understand how dense this really is, one could fit the baryonic mass of approximately 10^{39} universes into a single cubic centimeter. In comparison, we've already noted that only a quadrillionth of the atom is occupied by mass, the rest is "empty space." If this empty space were removed, the atom would be a very dense object. It would be so dense that a teaspoon of it would weigh trillions of tons. Plancktons are even denser, and in fact, they would necessarily constitute the rest of the quadrillion parts of "empty space" between the nucleus and its electrons.

As noted earlier, some have hypothesized fantastic notions that plancktons "pop in and out of existence" from other universes. But any hypothesis of this type inevitably transgresses conservation laws. Every so-called "emission" of a virtual particle amounts to the sudden appearance of additional energy in our universe, while every "absorption" into the adjacent universe amounts to a sudden disappearance of energy

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[1240] Volodymyr Krasnoholovets, "The Tessellattice of Mother-Space as a Source and Generator of Matter and Physical Laws, in *Einstein and Poincaré: The Physical Vacuum*, 2006, pp. 144, 149-152.

from our universe. Thus, we would have violations of the conservation of energy on a grand scale.

The reality is that plancktons do not "pop in and out" but are here to stay, and, in fact, they provide the best model for understanding the "action-at-a-distance" phenomenon, since their extreme density will allow instantaneous wave-transmission over long distances. Einstein was forced by his own theoretical postulates to limit the speed of gravity to a velocity equal to or less than light, since his mathematics wouldn't let it travel any faster. As Martin Gardner explains it to the novice:

> Imagine a gigantic pair of scissors, the blades as long as from here to the planet Neptune. The scissors begin to close with uniform speed. As this happens, the point where the cutting edges intersect will move toward the points of the scissors with greater and greater velocity. Imagine yourself sitting on the motionless pin that joins the blades. Relative to your inertial frame, the point of intersection of the blades will soon be moving away….Suppose that the handles of the scissors are on Earth and the point of intersection of the blades is at Neptune. As you wiggle the handles slightly, the intersection point jiggles back and forth. Could you not, then, transmit signals almost instantaneously to Neptune? No, because the impulse that moves the blades has to pass from molecule to molecule, and this transmission must be slower than light. There are no absolutely rigid bodies in general relativity.[1241]

So here we have the quintessential distinction between non-ether space and ether space. Since Einstein was forced (so he thought) to dispense with ether because of the Michelson-Morley experiment, there can be no "rigid body" filling in the space between the planets and stars. It is a vacuum, according to Einstein. Consequently, gravity doesn't "travel"; rather, it is created in a certain locale because the mass of a star or planet distorts or 'pulls in' the space around it. Of course the logical question is: what is inherent in "space" that a star or planet can affect it, if space, being a vacuum, is filled with nothing? How can nothing be molded to form a certain shape? The alternative answer is that space is, indeed, filled with something. Not only is it "something," but because its dimensions are in infinitesimally small scales, it fulfills the definition of a "rigid body" and therefore allows for instantaneous transmission of any force between 'Earth and Neptune,' or any body in the universe. It was precisely

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[1241] *Relativity Explosion*, pp. 65-66.

Einstein's misinterpretation of the interferometer experiments, and thus his failure to consider the possibility of a "rigid body," that led him down the wrong path to Relativity. As Einstein wrote in one of his last essays:

> The concept of space was enhanced by the discovery that there exist no completely rigid bodies. All bodies are elastically deformable and alter in volume with change in temperature.[1242]

The Geocentric Connection

What Einstein could not find, the biblical geocentric universe possesses. The "rigid body" is its foundation. The *firmament* of Genesis

1:6-9, by the very definition of the Hebrew word, is "rigid." Its rigidity is necessary to form and maintain anything as large as our universe, and that is precisely why it was created as early as the Second Day. All of the above discoveries of modern science concerning the infinitesimal world of Planck particles and its attending phenomena can be synthesized into an ingenious and fascinating model of geocentrism. In fact, this model shows that the Planck dimensions of physics not only constitute the fundamental fabric of space, they are the ingredients essential to make a universe function. **Gerardus Bouw**, probably the premier geocentric scientist today, has engineered such a model. Basically Bouw argues that the "fundamental constants" of physics (*e.g.*, gravity, electric charges, position, time, temperature, entropy) can only be joined together in a limited number of ways in order that no one constant conflicts with the others. Since there is a plurality of fundamental constants, a least common denominator is needed to join them all together. The melding of these constants is accomplished in two ways: on the one hand, at the extreme ends of the physical spectrum, by reducing the mixing crucible to scales much smaller than atomic particles so that all the necessary constants are represented in their irreducible form; and, on the other hand, to test how these constants react in sizes as big as the universe, which, of course, is the ultimate large scale environment. The most crucial constants that need to be joined

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[1242] Albert Einstein, "Relativity and the Problem of Space," cited in Albert Einstein, *Ideas and Opinions*, 1954, p. 365.

together are: Planck's constant, Boltzmann's constant, the speed of light, and the gravitational constant.[1243] As Bouw puts it:

> As we proceed to smaller and smaller scales nothing interesting seems to be happening until we get to a scale of about 10^{-33} cm. At that size called a *Planck length*, fascinating things happen…we find that the warp and woof of heaven comes into focus. Physics attempts to derive relationships between the different properties of objects. Such relationships typically involve certain constants: values which are generally assumed not to change over time. The speed of light is such a constant. So is the gravitational constant. It turns out that there are relationships among these constants themselves, and those relationships all express themselves to specifics at the Planck length. For example, the Planck length itself, L, relates Planck's constant (a unit of angular momentum or spin energy), h, the speed of light c, and the gravitational constant G to give a length of 1.616×10^{-33} cm.[1244]

> Modern science is not certain as to the meaning of these numbers, but the most popular explanation at present is that they signify particles which pop into existence, exist for about 10^{-44} seconds, and then pop out of existence again. These particles, called Planck particles, form the basis for various cosmological theories such as strings, superstrings, 10-dimensional space, and so on.[1245] So it seems that we are engulfed in a sea of Planck

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[1243] We hasten to add, however, that the gravitational constant has shown some inconsistency over the years. In 1986, for example, the value assigned to G was $6.67259 \pm 0.00085 \times 10^{-11}$, while in 1998 it was given a value of $6.673 \pm 0.010 \times 10^{-11}$, a factor of ten in just twelve years (Pari Spolter, "Problems with the Gravitational Constant," *Infinite Energy*, 10:39, no. 59, 2005).

[1244] Gerardus D. Bouw, *Geocentricity*, Association for Biblical Astronomy, Cleveland, OH, pp. 324-325. Bouw continues: "By the same token, the constants give us a fundamental unit of mass M, called the *Planck Mass*, which is 2.177×10^{-5} gm. The corresponding basic unit of time, the *Planck time*, t, is 5.391×10^{-44} sec. [NB: The *Planck length* is the distance light travels (10^{-33} cm) in one Planck time interval (10^{-44} sec)]. Lastly, the fundamental unit of temperature T can be derived by introducing Boltzman's constant, k, and it gives a temperature for the firmament of 1.417×10^{32} °K; a most fervent heat not observed anywhere in the universe."

[1245] Bouw, *Geocentricity*, p. 325. In Superstring theory the "strings" have dimensions as those in the Planck world. The "strings" are said to have a length of 10^{-33} cm and a mass of 10^{-6} g. Rather than calling them "Planck particles," String

particles. The particles can be viewed as constituting a pervasive medium which acts like an ideal fluid (meaning that there is no friction). The density, P, of that fluid is an astounding 3.6×10^{93} g/cm^3…If this doesn't qualify for the name "firmament," then what does?[1246]

A substance of such a high density as the firmament has some interesting properties. One would think, for example, that it would be impossible to move in such a medium, just as one could not move if encased in iron. Normally this is true, but the deBroglie wavelengths of nuclear particles are so long compared to that of the Planck particles that the firmament is transparent to them. This is similar to why light can travel through a "dense" medium such as glass instead of being stopped cold on impact. Bouw concludes:

> The advantage of the firmamental model is that it can easily account for a number of experimental observations which are harder to explain heliocentrically. These include the Sagnac effect, Faraday disk-generator paradox, Earth's night-time

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theorists have designated them as "strings" in order to provide a mental picture of their function. For example, a closed string produces gravity, hence the popular theory known as "Quantum Loop Gravity." Mathematically, String theory has succeeded in uniting all known particles, including the Higgs boson and fermions, within one spatial superstructure, yet this superstructure must possess 10 or more dimensions in order to do so. An even more accommodating concept is Massive Superstring theory, which is the closest modern science seems to have come in understanding the universe's underlying superstructure. In this theory, the string takes on the complete Planck dimensions of time (10^{-44} sec), length (10^{-33} cm), temperature (10^{32} K) and mass (10^{-5} gm).

[1246] *Geocentricity*, p. 326. Bouw is referring to the "firmament" mentioned in Genesis 1:6-9, 14-20 as filling the entire space between the Earth's surface and the edge of the universe, and into which the stars and other heavenly bodies are placed. To understand the tremendous density of the Planck "firmament," Bouw adds: "Let us try to envision such a cube made up of Planck particles. The numbers are incomprehensible. For example, the mass of the entire universe is estimated to be about 2×10^{54} g. Packing everything in the universe into the cube would only give us a density of 2×10^{54} g/cm^3, far short of the Planck medium's 3.6×10^{93} g/cm^3. That means that one would have to pack 2×10^{39} universes into the cube to arrive at the appropriate density!" (*ibid*.). In this way, it can be said that the Planck particles are so small that it is as if to us they do not exist, and thus movement through them is as natural as walking through air. For the biblical support of the firmament being composed of such a super dense material substance, see Chapter 12, Volume II of this book under Job 37:18.

electric field, and ball lightning. And so both heliocentrically-based quantum mechanics and geocentrically-based firmamental mechanics explain the same phenomena at the Planck scale, albeit with different philosophical assumptions: one assumes that space is filled, the other that space is empty.[1247]

As Markov has suggested, these infinitesimal particles would also act as a frictionless fluid. As Martin Selbrede notes:

> Markov poses that the Planck particles behave like sub-microscopic black holes. He is basically describing the property of this material. If you create a liquid out of maximons, how does it behave? He says it really behaves like space. In other words, you can move through it freely. So the objection again that this ultra-rigid ether or plenum – whatever words you want to use; firmament has been proposed as a term for it – that you can't move though it, because I can't move through lead and I certainly can't move through something that is a hundred thousand times thicker than lead, Markov says that is not true. There is nothing heavier than a black hole, assuming you believe in them in the first place, and consequently a liquid made of these microscopic black holes behaves like a space does. It behaves a lot like what we would call a space-time quantum foam. It is quasi-isotropic, which means it behaves generally the same in all directions. I would put some qualification on it, but it means that in the literature, again, you see all the foundational pieces of the geocentric model are there, either overtly or covertly present.[1248]

Someone might argue, however, that if plancktons are particles with spherical shape, what constitutes the space between the spheres? Is there an even smaller particle? The answer to this may be that at a 10^{-33}cm

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[1247] Gerardus Bouw, *Bulletin of the Tychonian Society*, No. 46, 1988, p. 33.

[1248] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012. Selbrede notes that "A maximon is not necessarily a black hole, according to Markov, but 'may be a particle of the same Planck dimensions, but with a structure essentially different from a black hole. Their gravitational radius coincides with their Compton length,' *ibid*, pg. 365. This is pointed out here to cut short any critique that the firmament model clearly leans on general relativity by relying on the existence of microscopic black holes" ("Rebuttal of North and Nieto," by Martin Selbrede, 1994, Chalcedon Foundation).

diameter mass has reached a point where individual units of mass are no longer spherical. In other words, the unit of mass is so small that it has reached the point in which there is no more space between the individual particles. This state, of course, is hard for us to imagine, but if we begin, for example, with a jar of marbles and pour water into the jar, the water will take up the remaining space left by the ajoining marbles. If we imagine the marbles getting smaller and smaller yet increasing in number to fill respective jars, less and less water will be required to fill in the empty space. If we keep reduce the size of the marbles we will eventually reach a point in which there is no more space for the water to fill. This is the point at which matter has reached its ultimate density and it can go no further and still remain mass. This is the state of supergranularity and this is what gives the plancktons their absolute rigidity yet, at the same time, the supergranularity gives the plancktons their absolute flexibility so that no friction occurs between it and atomic matter that is twenty orders of magnitude larger.

To get an idea of how small a planckton is, we can start by imagining a drop of water being as big as the earth. At that size, an electron would be the size of a softball. Now, imagine the electron to be the size of the earth. At that size, the planckton would be the size of a softball. Eventually, we reach a point where the matter cannot be broken down any farther and still remain matter. It would constitute a physical law of nature. That point is 10^{-33}cm.

Because of the flexibility of the plancktons, objects from the size of electrons to those of giant superclusters of stars can move through them with no resistance, and they will move as all matter does – by wave motion. This is precisely why quantum mechanics finds that the proton, neutron and electron are wave/particle dualities. The wave dimension of matter is needed to move through the dense Planck medium, while the particle nature moves through the vacuum of space (*e.g.*, a planet revolving around the sun moves through the vacuum of space). The leading wave of matter moving through the ether is the essence of the de Broglie wave. As light can move through a solid block of transparent material, analogously, solid objects can move through the plancktons that permeate the universe. Great pressure does not necessarily inhibit movement or cause friction, but will actually help an object to move, since the pressure helps eliminate molecular action against the moving body and allows energy losses only through turbulence and wave action, provided the pressure is equally distributed. We see this in everyday life, for example, when a submarine experiences less drag and can move more freely the deeper it is submerged into the ocean. In the laboratory, it has been shown that super-cooled helium allows motion of objects through it

without any detectable friction. This substance acts so peculiarly at 0.25 degrees above absolute zero that it is understood as a "new phase of matter, a 'supersolid' form of helium-4 with the extraordinary frictionless-flow properties of a superfluid."[1249] As Robert Laughlin notes:

> The similarities between the vacuum of space and low-temperature phases of matter are legendary in physics. Not only are phases static, uniform quantum states, but their most subtle internal motions are physically indistinguishable from elementary particles very generally. This is one of the most astonishing facts in science, and something students always find upsetting and difficult to believe. But they eventually become convinced after looking at enough experiments, for the evidence is plentiful and consistent. In fact, the more one studies the mathematical descriptions of cold phases, the more accustomed one gets to using the parallel terminologies of matter and space interchangeably. Thus instead of a phase of matter we speak of a vacuum. Instead of particles we speak of excitations. Instead of collective motions we speak of quasiparticles. The prefix "quasi" turns out to be a vestige of the historical battles over the physical meaning of these objects and conveys no meaning. In private conversations one drops the pretense and refers to the objects as particles.[1250]

[1249] Barbara Kennedy, "Strong New Evidence of a New, Supersolid Phase of Matter," *Science Journal*, Penn State University, Summer 2005, p. 8. Kennedy continues: "Solid helium-4 appears to behave like a superfluid when it is so cold that the laws of quantum mechanics govern its behavior.... 'We used to think that a solid could not flow, but now we have discovered that when you cool solid helium to a sufficiently low temperature it can not only flow, but it actually flows without friction....The implication of our research is that we now have to rethink what we mean by a solid'" (*ibid*., p. 9). Additionally, at 2.2 Kelvin the helium will have no viscous drag with its rotating container; at certain speeds it will spin twice as fast as its container; and it will mysteriously penetrate through its container. Mercury has been found to have zero resistance to electrical current at 4.1 Kelvin. Sodium atoms at 435×10^{-9} Kelvin stopped the travel of light for a few milliseconds. The discovery of these reactions is based in part on the Planck, Einstein and Bose theory of heat capacity. It theorizes that near 0° Kelvin, atoms may group together under the same wavefunction to act as a single 'superatom' and is known as a Bose-Einstein condensate. See *Einstein's Other Theory: The Planck-Bose-Einstein Theory of Heat Capacity*, Donald W. Rogers, 2005, pp. 165-175.

[1250] Robert B. Laughlin, *A Different Universe*, p. 105.

One can imagine what the extent of frictionless qualities would be for a super-fluid at 10^{93} g/cm^3. As Bouw views it:

> The firmament is like a huge solid block, somewhat analogous to a crystal. At the same time, its granularity is so superfine that it also behaves like a superfluid…All solids are fluid to some extent…Any grouping of lattice frames (such as would constitute a photon, neutrino, proton, atom, molecule, star, galaxy or universe) is not attached to any fixed (determined) position in the firmament's matrix and so can – indeed, must – move, rotate, or both move and rotate relative to the firmament. As such, the entire lattice, which is the stellar universe, can be treated as an entity independent of the firmament.[1251]

As Bouw describes it in modern terms:

> In short, this means that the firmament is an underlying medium. The atoms and galaxies of our universe are merely tiny, insignificant disturbances in the firmament. Because of the Heisenberg Uncertainty Principle matter is totally unaware of the firmament's existence. If it were not for Scripture, we would be equally unaware of it. Only on extremely small scales, distances of the order of a Planck length, does the firmament show through the warp and woof of space….The firmament which God created on the second day is thus an extremely massive structure. Its properties are manifold and in a very literal sense, it determines the very physics of the universe….From the perspective of modern science, the firmament…is a very viable scientific option. It is a super-dense, created medium which mimics a plenum. It does so by both keeping absolute position and time

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[1251] Gerardus Bouw, *Bulletin of the Tychonian Society*, No. 47, 1988, p. 13. Bouw also notes that Nobel laureate, Steven Weinberg has a similar view for modern physics. Weinberg estimates the energy density of the universal medium to be 10^{113} GeV, which equals a mass density of 10^{89} g/cm^3, which is only four orders of magnitude less than Bouw's estimate (Steven Weinberg, *Reviews of Modern Physics*, January, 1989, as cited in *Bulletin of the Tychonian Society*, No. 53, p. 34). Bouw adds that the firmament is larger than the universe, and it is the universe that is expanding, not the firmament. The firmament would thus have to be larger in radius than the universe, equal to the amount of time the universe has and will expand. In biblical proportions this would equal approximately 10,000 light-years or less. The "independence" of the firmament from the universe is the reason for the Heisenberg Uncertainty Principle.

indeterminate within it (Heisenberg Uncertainty Principle), as well as allowing only wave motions and disallowing absolutely straight line motion….It reacts instantly to any changes within it (in about 10^{-78} seconds). Material objects can only become vaguely aware of its existence on extremely large scales (of the order of the size of the universe) and on extremely small scales (of the order of sub-nuclear particles). *None of these phenomena are new, all have been noted before in the scientific literature.*[1252]

Noted above is a reference to the reaction time within the firmament. Expanding on this concept, Bouw presents an ingenious system that demonstrate the speeds at which waves traverse the universe. Each calculation follows the known laws of physics. The first calculation is the speed of sound as a function of tension (T), otherwise known as "transverse waves," which is how light beams travel through space. The equation for a transverse wave is: $v_t = \sqrt{T/\mu}$ where μ is the mass per unit length. In the Planck dimensions, the mass of the firmament is 2.2×10^{-5} grams over a length of 1.6×10^{-33} centimeters, yielding a value for μ at 1.89×10^{56} gm/cm. Since the tension is the gravitational attraction between plancktons, the force is: $T = G\mu^2 = 1.27 \times 10^{49}$. Substituting these values in the original formula [$v_t = \sqrt{T/\mu v_t}$] yields $v_t = 3.04 \times 10^{10}$ cm/sec (within the margin of error for the speed of light), and thus, as Bouw concludes: "the transverse-wave speed of a disturbance in the firmament is the observed speed of light."[1253]

A second calculation of speed can be based on temperature. In Planck dimensions, the firmament has a temperature of 1.42×10^{32} Kelvin. The quantum speed, v_q, is related to Boltzmann's constant, k, while the particle mass, m, in the equation: $v_q = \sqrt{(3kTmx^{-1}}$ yields a value for v_q as 5.17×10^{10} cm/sec.[1254]

The third calculation is the most significant since it measures the speed of the pressure wave (compressional or longitudinal) through the firmament. This calculation depends on the compressibility of the universe in the firmament. The speed of the pressure wave, v_b, is derived by its relation to the density, ρ, in the equation: $v_b = \sqrt{(B_m/\rho)}$. A bulk modulus

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[1252] *Geocentricity*, p. 329, emphasis added.
[1253] Gerardus Bouw, *The Biblical Astronomer*, vol. 12, no. 99, 2002, pp. 17-18.
[1254] In this case Bouw notes: "This is roughly twice the speed of light and may well be equal to the speed of light given that the coefficient of 3 assumes three degrees of freedom for the particle. If there's only one, then the speed becomes 2.98×10^{10} cm/sec which is the speed of light" (*ibid.*, 18).

relates pressure to volume by the formula $B_m = (P - P_o) V_o/V_o - V$, where P and V are the compressed pressure and volume and P_o and V_o are the original values. Assuming a difference in compression between space and the firmament, $P_o = 0$ while $P = 10^{49}$ (the pressure between two plancktons). $V_o = 10^{85}$ cm^3, the volume of the universe. The final volume is 10^{-39} cm^3. The density is the critical density of the universe set at 10^{-29} gm/cm^3. Applying these estimates in the formula: $v_b = \sqrt{(B_m/\rho)}$, then $v_b = 3 \times 10^{39}$ cm/sec as the speed of the compression waves. At this rapid speed the compression wave crosses the universe in 10^{-11} seconds, virtually instantaneously. Depending on adjustments to the above figures, the upper limit for the speed of the compression wave is the Planck time of 10^{-44} seconds as opposed to 10^{-11} seconds.[1255]

Finally, whatever we will discover in the future regarding the balance between the Planck world, the electropon net, electromagnetic radiation, the Cosmic Microwave Background radiation,[1256] long wavelength photons,[1257] or the neutrino sea, the point is made that there are many viable ingredients as to the constituents of ether, as well as understanding why Michelson-Morley and every other interferometer experiment for the next 50 years all measured a resistance to the ether. Since, as these experiments indicate, Earth is motionless at the center of a universe filled with infinitesimally small particles that are revolving around it, we would expect only a slight resistance to register in the interferometers located at the Earth's surface. It is a fact of science that we did, indeed, obtain that slight resistance, and which resistance has heretofore been dismissed by modern science. In fact, the wave/particle duality of light, the mysterious results of the "double-slit" experiment, the de Broglie wave or the Schrödinger wave, may be nothing more than the effect of particles (*e.g.*, photons, electrons, etc.) reacting to the infinitesimal medium through

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[1255] *Ibid*., p. 19. Bouw is using a formula common in physics. C. L. Andrews writes: "For longitudinal waves in a liquid $v = \sqrt{B/\rho}$ where B is the bulk modulus of elasticity and ρ is the mass per volume or 'volume density'…For transverse waves in a solid $v = \sqrt{n/\rho}$ where n is the shear modulus of elasticity and ρ the density. By definition of a solid, only solid media may transmit transverse waves. Thus the historical 'ether' is a solid which, if it has a shear modulus of elasticity no less than steel, must have a density less less than that of our best vacuum in order to transmit transverse waves with the speed of light" (*Optics of the Electromagnetic Spectrum*, 1960, p. 53).

[1256] "Induction of Gravitation in Moving Bodies," Matthew R. Edwards in *Pushing Gravity*, p. 139; "Action-at-a-Distance and Local Action in Gravitation," Toivo Jaakkola in *Pushing Gravity*, p. 158.

[1257] "Gravitation as a Compton Effect Redshift" John Kierien, *Pushing Gravity*, pp. 131-132

which they travel. A particulate medium many times smaller than atomic particles and photons must be very dense, and thus it can allow movement only through wave motion. Thus, any particle moving through the medium, including photons, will create waves proportional to the speed that the entity is able to travel through the medium. The undulation of the wave itself, however, can travel at superluminal speeds, due to the extreme density of its substance. In this way, the issue of "causality" is undisturbed, since there is direct contact between physical entities that will cause eventualities.

The Center of Mass for the Firmament and Earth

Bouw also gives us the unique relation between the Planck firmament and the Earth in regards to the center of mass of both. He writes:

> Moreover, because the firmament is some 10^{123} times as massive as the universe, the universe follows the firmament-induced Coriolis and Centrifugal forces' dictates….Since the earth is located at the gravitational center of the firmament and on its axis of rotation, it will not feel the gravitational wave….There is one other phenomenon predicted by this model. If the earth is at the gravitational center of the firmament, earth's gravitational field, as opposed to any other body's gravitational field, coincides with the firmament's. As such, any force applied to either move the earth out of its central position or to change the length of the day, will be opposed by the firmament, which will perceive said imposed force as an attempt to change its position or rotation rate. By Newton's first law—for every action there is an equal and opposite reaction—the responding force, coming from an immovable object, will transfer the action of the force onto the universe….the universe does the moving in the opposite direction of what the earth would have moved had it not been at the core of the firmament's gravitational field.

Bouw then shows the connection of the dual center of mass with the orientation of the Cosmic Microwave Background Radiation (CMB):

> It is, therefore, a small wonder that the three poles [dipole, quadrupole and octupole of the CMB] should line up with the ecliptic. The Axis of Evil may be dismissed as an unfortunate coincidence and the quadrupole and octupole may be regarded as 'local' (although no realistic explanation has yet surfaced), but

the fact remains that these follow logically from all experimentally-based, geocentric results.

The evidence suggests that the cosmic phenomena that reveals the Axis of Evil are a consequence of the yearly Coriolis force exerted by the effective daily rotation of the firmament. We examined the effect of that rotation on the sun from a geocentric perspective—that the entire universe will follow the solar motion as long as the center of gravity of the earth exactly coincides with the center of gravity of the firmament.[1258]

[1258] *The Biblical Astronomer*, Vol. 21, No. 137, pp. 73-74.