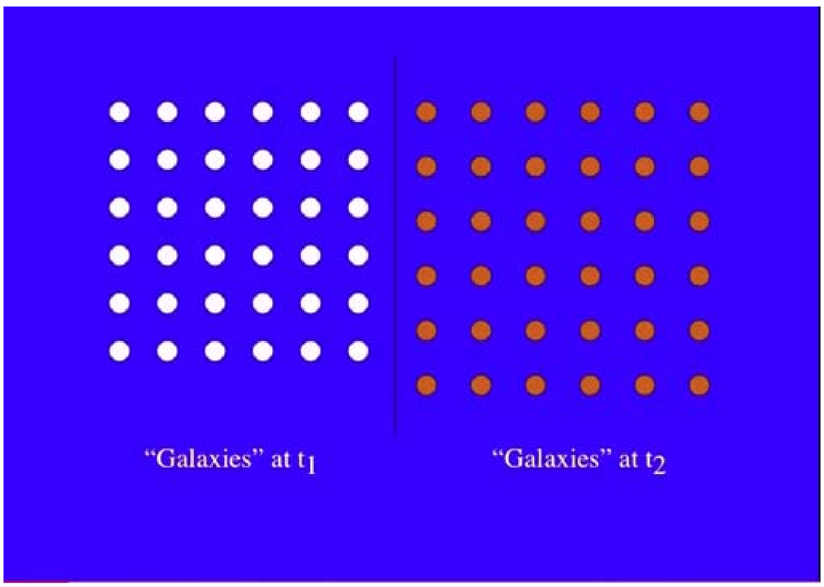
Answer to Dr. Lawrence Krauss' YouTube Cosmology

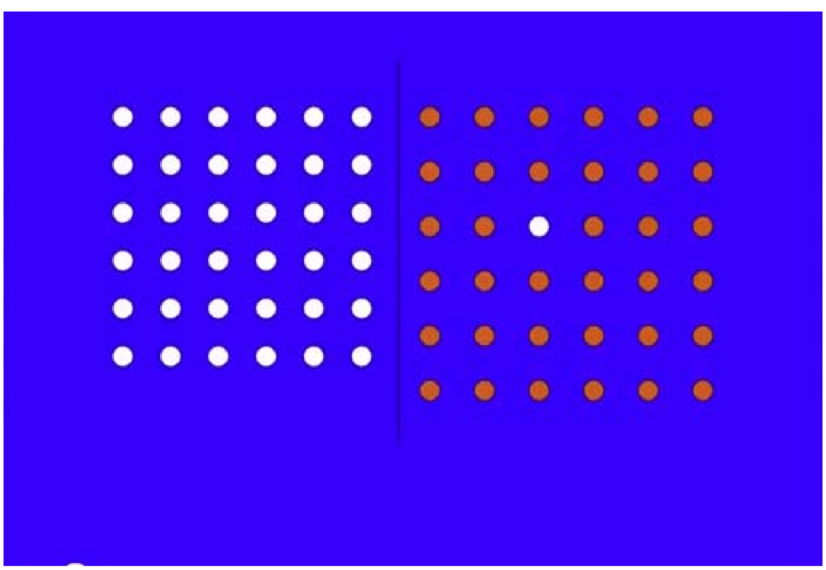
By Robert Sungenis, Ph.D.

http://www.youtube.com/watch?v=7ImvlS8PLIo

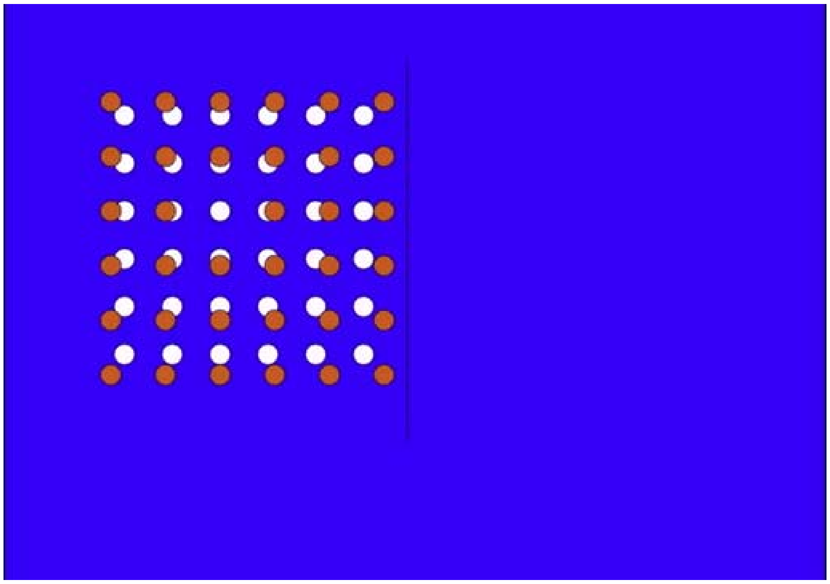
Krauss: "All other galaxies are moving away from us, on average….Now, what does this tell you? It obviously tells you we are the center of the universe. And, in fact, it does, and my wife reminds me of that on a daily basis. It really means the universe is expanding uniformly in all directions."



"Then pick a galaxy to live on":

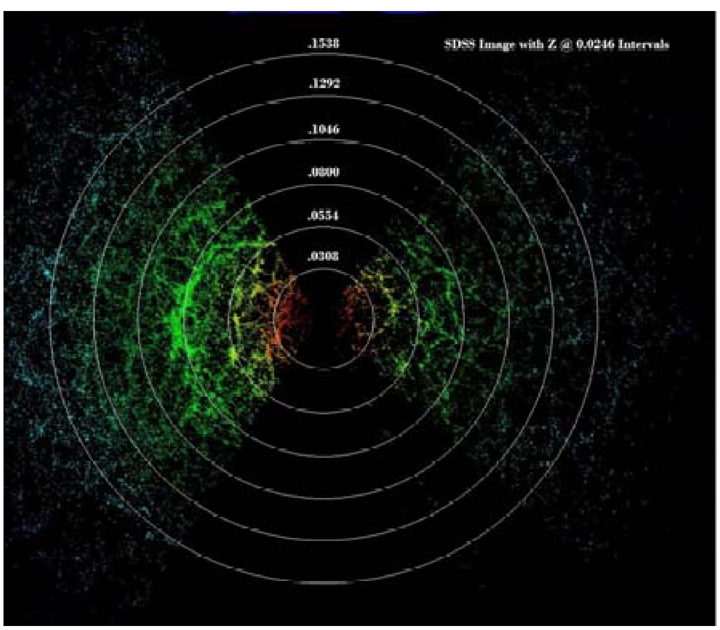


"What would you see? Superimpose the expanding galaxy on the beginning galaxy":



“So, depending on your mood at the time, every place is the center of the universe, or no place is the center of the universe. It doesn’t matter. The universe is expanding.”

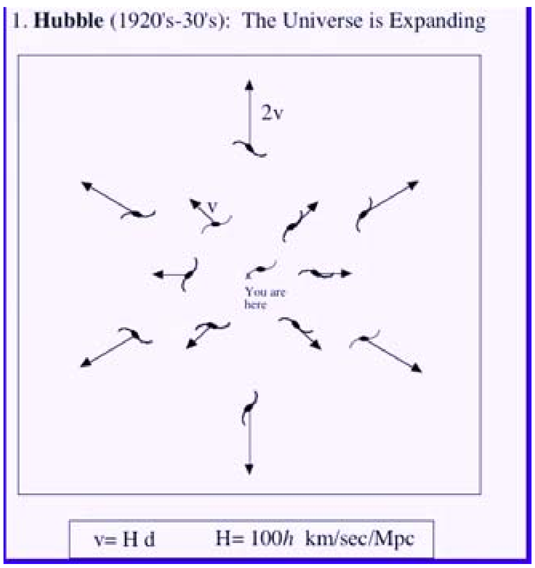
R. Sungenis: First, Krauss doesn’t know the universe is expanding, since there are about three or four other scientifically viable explanations to redshift that do not depend on expansion. Krauss needs the universe to expand because he insists on using Einstein’s general relativity to explain the universe. One of the best geocentric explanations is that the redshift is caused by the centrifugal force on light in a rotating and yet non-expanding universe. Second, it is not true that in an expanding universe one would see himself in the center in any location he stood. The reasons are twofold: one, because the Sloan Digital Sky Survey shows there are concentric circles or periodicities of galaxies with specific redshift values in the range of z = 0.0246 and these values only show up when viewed from Earth. In any other place the circles would disappear, and that means that no other place can be the center of galaxy distribution. (See SDSS image left). Two, as recent as 2008, it was discovered that Lorentzian- and Hubble- related mathematics disqualifies Krauss’ “center in every place” alternative. Yukio Tomazawa of the Michigan Center for Theoretical Physics demonstrated that the 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 CMB dipole excludes such an interpretation of the coordinates for the



Friedman universe" ("The CMB dipole and existence of a center for expansion of the universe," Yukio Tomazawa, University of Michigan, February 2, 2008, p. 2, see Galileo Was Wrong, p. 65, fn 218).

Krauss: "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."

R. Sungenis: Even though Krauss tries to pass this comment off as one of his many attempts at comic relief, in the real world it is typical of the agenda Krauss and his like-minded colleagues have when the approach science. They are avowed atheists and they make a concerted effort to remove God, and in this case Jesus, from people's minds. Science is their religion and the stars are their gods.

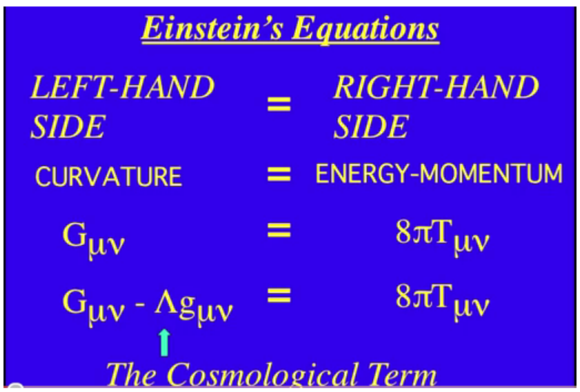


This observation caused Hubble to conclude: "…Such a condition would imply that we occupy a unique position in the universe, analogous, in a sense, to the ancient conception of a central Earth….This hypothesis cannot be disproved, but it is unwelcome and would only be accepted as a last resort in order 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" (The Observational Approach to Cosmology, 1937, pp. 50, 51, 58-59.)

We notice that Hubble tries to counter the geocentric evidence by injecting "spatial curvature" into the universe. Why? Because, as Krauss tried to say above, spatial curvature would allow one to say that he was expanding on the surface of a big ball which would then make it appear as if every point could be considered a center. This attempt at injecting spatial curvature as the solution against geocentrism was clever but it could not explain the concentric circles of galaxies around the earth, as noted above. It also cannot explain the distribution of gamma ray bursts, X-ray bursts, quasars or BL Lacertae.

In the video, Krauss claims that Hubble's 1929 expansion rate "had to be off by a factor of ten" simply because it would only allow the universe to be 1.5 billion years old, but paleontology said the Earth was 4.5 billion years old, so Hubble's expansion rate had to be modified to fit evolution, "otherwise the universe would come into existence before the earth." This is a good example of how modern science fudges the data when it is forced to do so to save its theory. Hubble based his figures on observation. Krauss is basing his on the theory of evolution.

Krauss then shows the following charts of Einstein's theory of general relativity:

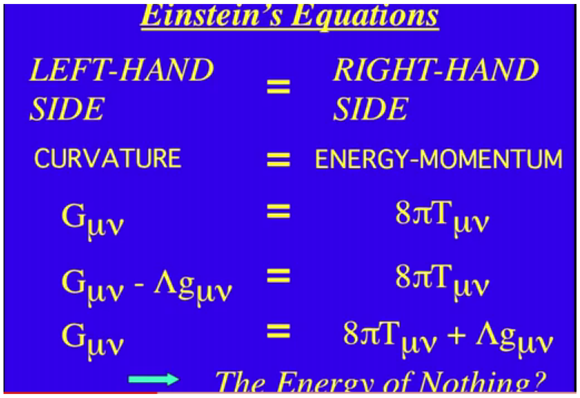


Krauss gives a history of Einstein's general relativity formula as applied to the cosmos. In Einstein's theory, gravity causes space to curve in on itself.[1] The result of gravity's pull on space is the tensor $G_{\mu\nu}$ on the left side of the equation. This will cause the universe to contract since gravity causes all mass to congeal together. The $T_{\mu\nu}$ is the stress or energy-momentum tensor which causes the gravity. The 8π 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."

But Einstein had a big problem. If there was nothing to retard the curvature, the universe would eventually curve into itself and disappear. So Einstein invented a counterforce to make the universe expand instead of contract. This is represented by the Lambda ($\Lambda g_{\mu\nu}$) on the left side of the equation. Einstein, of course, could give any value he wanted for Lambda in order to make his theory work. Later he decided not to use it, since he figured the universe would somehow expand on its own, which was later dubbed the Big Bang.

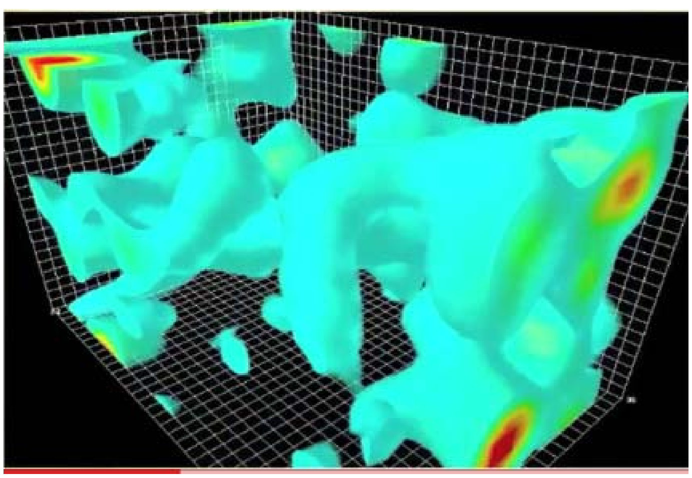
Krauss then suggests that, because of the development of Quantum Mechanics, Einstein's Lambda figure is needful, but on the other side of the tensor equation.

[1] This in itself is a dubious idea, since neither Einstein nor anyone else has explained what space is curving against or even what space is in order to have existence so that it can curve. According to Einstein, space is a total vacuum, so what is curving? Moreover, in order to know it is "curved" one has to have a straight edge with which to contrast it, but Einstein gave us none. But we will address the point for the sake of argument.



Here Krauss puts Lambda on the other side of Einstein's equation (and in doing so he must change it from a minus to a plus) and says it is "energy." He also says "it is nothing, but in physics nothing isn't nothing anymore. It weighs something." We need to understand that Krauss is being equivocal about the meaning of "nothing" in order to set the audience up for his next hypothesis. He doesn't mean that nothing exists (an oxymoron) but only that we cannot see it, feel it, taste it, touch it, or hear it, so to us it is "nothing" but in reality it is something very real, and so real that it takes up about 99.99999% of the universe.

Krauss elaborates on this idea and says that this "nothing" has substance because its minute particles pop in and out of existence in so fast a time that you can't see them, and thus it looks like nothing is there. Because of these "quantum fluctuations" in and out of our universe they are called "virtual" particles. He admits this may sound like philosophy or religion, "like counting the number of angels on the head of a pin."



As an example of how these "virtual" particles interact with our universe, Krauss says the above animation shows the "empty space" of a proton (not the quarks, but the empty space between the quarks), is filled with these virtual particles and take up about 90% of the volume of the proton (represented by the green area). (NB: Krauss will later tell us that since the virtual particles in this proton can "pop in and out of existence" so can anything, and thus the universe can come from nothing).

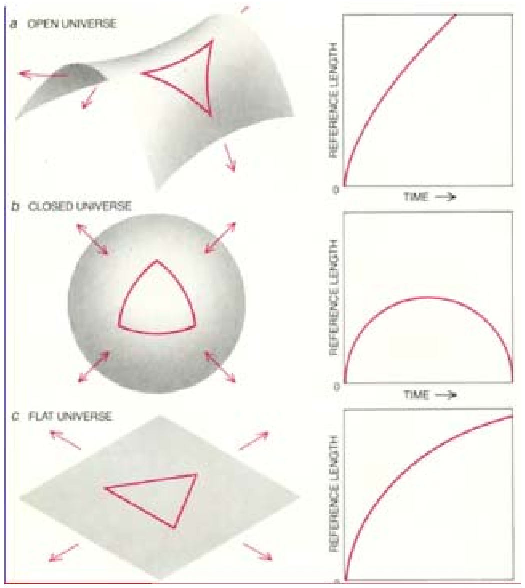
Why does Krauss insist that these minute particles are “virtual” and “pop in and out of existence”? The reason is that he needs this virtual matter to support his cosmology. Krauss’ cosmology is based on General Relativity (since Einstein’s theories have dominated physics for the last 100 years and it is presently locked into his paradigm). General Relativity believes the universe is expanding based on its interpretation of the red shift it sees in galaxies. But in order to have the universe expanding at the rate they need it to expand (and the rate they need it to expand is based on how long they need the universe to exist to make enough room for the billions of years needed for evolution of species to take place) they need a lot more matter in the universe than they presently find, to the tune of needing 96% more matter and energy than they see in stars and galaxies. Since Einstein’s tensor equation ($G_{\mu\nu} = 8\pi T_{\mu\nu}$) is merely a more sophisticated form of Newton’s basic force law (F = ma), Einstein’s formula cannot escape the “m” (mass) requirement of Newton’s formula if it believes the “a” (acceleration) is occurring as the universe presently expands and thus accelerates outwards. But the big problem for the Big Bang is that their most sophisticated instruments have not been able to detect any of this needed matter (including Krauss’ “Germanium” detector he speaks about in the lecture).[2] So the next best thing is for them to say the matter “is there and not there” at “virtually” the same time.

[NB: this is where Krauss and his colleagues also invent the “parallel universe” idea, since if the “virtual” particles are such that they “pop in and out of existence,” then they must be in another place we can’t see (i.e., in another universe or two universes or three or ad infinitum universes) while they are not with us].

In the end, the concept of “virtual” particles popping in and out of existence as the source for the needed matter to make the Big Bang/Evolution model work is merely a desperate, last-ditch effort to save face for modern man. It’s like the street corner magician playing Three-Card Monty with you – now you see it now you don’t.

[2] Krauss claims that germanium at slightly above -273 K can detect DM when a particle of DM hits it, since it will cause heat. He never explains how he knows it is DM that is hitting the germanium or even what DM is. Or he says that they will discover the DM when the Hadron collider breaks apart the proton and “creates” the DM. It’s a “race” he says.

Krauss: Types of universes:



Krauss: Since GTR says space is curved, then the universe can be one of three different geometries: Open, Closed or Flat. A Closed universe will expand, stop and collapse. An Open universe will expand forever. A Flat universe will expand, slow down, but never stop.

Krauss says: If we "weigh" the universe we can tell what kind of the three we have.

The energy of empty space, however, turned out to be 10^{120} more than all the observable material in the universe. But they had to have zero as an answer in order to make everything balance out, since we could not live in a universe with 10^{120} energy. But they didn't know how to get zero.

Vacuum Energy =

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000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,
000,000,000,000,000,000,000,000,000

x ***Energy of All Matter in the Universe***

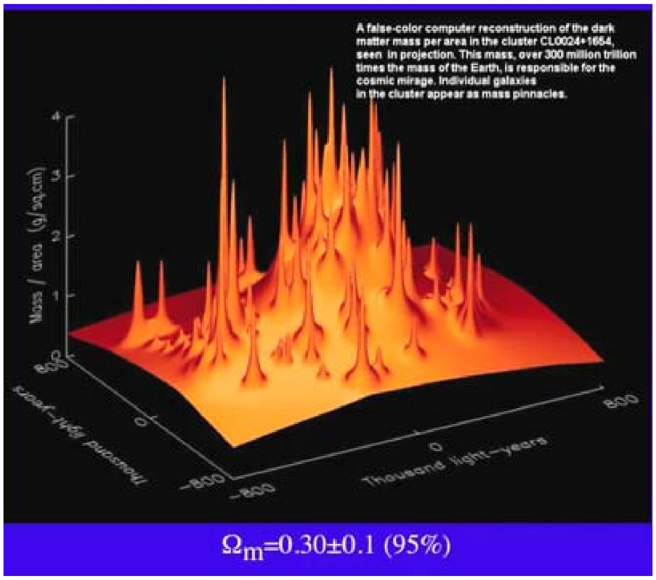
THE WORST PREDICTION IN ALL OF PHYSICS!!

Their answer is apparently Dark Matter and Dark Energy, for they will make the balance. But it is only theoretical, since they have never found either Dark Matter or Dark Energyh.

Krauss said that, working backwards from how much they know General Relativity Theory (GRT) pulls mass, they use GRT to weigh the universe. The "weighing" process takes place as follows. For example, they believe that a galaxy will produce many images of galaxies because of gravitational lensing (see below), that is, they believe galaxies pull light around them and magnify the image or produce many images (like looking through a faceted piece of glass). In order to calculate how much galaxy mass would be needed to see what we see, GRT "weighs" the mass and finds that it needs a huge amount, thus DM and DE are created by GRT.

Example of gravitational lensing:

The blue objects are supposed to be the result of gravitational lensing. The truth is, gravitational lensing is a fiction of General Relativity, and the fiction stems from Einstein's prediction in 1916 that light bends around the sun because of gravity. It doesn't. Light bends only when it goes through the outer plasma of the sun, and it does so at 1.75 arc sec due to the specific thickness of the plasma, otherwise known as refraction. But light does not bend outside the sun's plasma, yet General Relativity predicted that it would because the sun's gravity extends beyond the plasma. This is one of those inconvenient facts that Relativists don't want anyone to know. Light does not bend around the sun the way General Relativity predicted. Even the 1.75 arc sec was fudged by Einstein. We cover this story in my book Galileo Was Wrong: The Church Was Right.



This is Krauss' chart showing the galaxies at the needles, but most mass is between the needles. Krauss says Ω_m (Omega) is Dark Matter plus normal matter divided by what you need to make a flat universe. Krauss needs a "flat" universe because, as noted above, of the three universes (Open, Closed or Flat) only the flat universe has zero energy, that is, where the negative energy of gravity balances out the positive energy of matter. But the above W_m value (which is what our universe contains of Dark Matter and normal matter) gives only 30% of what is needed to make a flat universe.

Why does Krauss want a universe with a total energy of zero? Because, he says, **only a universe with zero energy could come from nothing (or zero)**. They need certain values to make the Big Bang work so they insist upon those values and tweak the numbers until they get what they want. In order to give credence to the Big Bang they must show that something can come from nothing. But this is a shell game. As noted earlier, it is not really nothing. It is very high energy substance that acts in unpredictable ways (like exploding into a Big Bang and producing our universe), or it could act very differently at another time and produce a completely different universe or perhaps one very similar to ours.

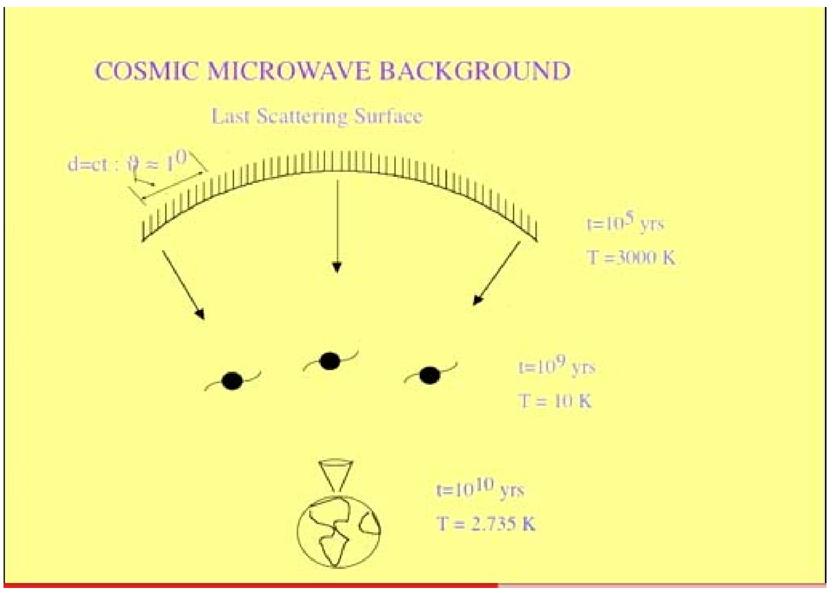
But all this talk of "parallel universes" and "quantum fluctuations" and "virtual particles that pop in and out of existence" has one overriding agenda behind it. Krauss told us what that agenda is:

> **"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."**

But lo and behold, Krauss says they ran into a big problem, since the "observers" did not find the energy at the very beginning of the Big Bang to be zero (although Krauss doesn't explain what these "observers" were observing). So, like a good scientist, did they abandon the theory of the Big Bang and start over again? No, they merely tried another means to get to zero energy. This one required them to measure the "curvature" or "energy-momentum" by hand (from $G_{\mu\nu} = 8\pi T_{\mu\nu}$). In order to do so they need a large triangle (since one can circumscribe a triangle in a circle)

Krauss arrives at his “triangle” by the following reasoning: if the universe is 13.78 billion years old, we should be able to look out and see the beginning of the Big Bang (looking backwards into time, as it were). But according to Krauss we can’t see all the way to the Big Bang because there is a wall. At the Big Bang, the temperature was hot enough (3000K) to break apart Hydrogen atoms to produce protons and electrons, which is a “charged plasma” and such is opaque to radiation. So we cannot see past this part of the universe since it is opaque at this point. But the light that bounces off the surface of the opaque wall is reradiated back to earth. It is at 3K, not 3000K, so the protons have captured the electrons and made space transparent instead of opaque, and thus we can see it from earth. Moreover, the radiation should be coming to us from all directions since the wall surrounds us like a sphere.

Krauss then says if one takes an arc of 1 degree on the wall of the CMB (where it is opaque), this represents 100k light years in distance. This surface (of 1 degree = 100K light years) existed when the universe was only 100,00 years old.

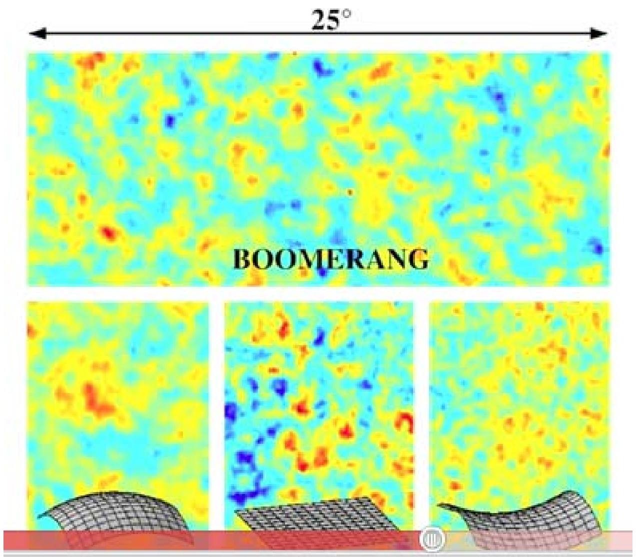


Krauss continues: Since Einstein said no information can be transferred faster than light, this means that nothing that happened on one side of the CMB could affect anything on the other side of the CMB. Thus, big lumps of matter “don’t know they are matter because gravity could not go across them.” Thus, very large lumps won’t collapse.

Krauss says the biggest lumps that would collapse are those that are 100K miles or less in size. Since 100K miles equals one degree for the base of the “triangle,” and the distance to the “wall” gives us 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), Krauss has his “triangle” to measure the curvature or energy-momentum of Einstein’s universe.

Krauss measure it as follows: -in an Open universe Krauss says light rays will diverge as you look back into time, so the distance across the "lump" (the "ruler") will look smaller, perhaps a half degree. In a Closed universe the light rays look bigger as you look back into time so the distance across the lump would be bigger than 1 degree.

So we then measure the lumps and see if they are a half degree, one degree or 1.5 degrees.



-Krauss says the Boomerang took a picture of the opaque wall and found the separation of the lumps was about 1 degree, which matches the bottom-middle picture showing a "flat" universe. Using a computer generated lump picture in which the lump is less than 1 degree produces a "Closed" universe (picture on the bottom-left). If the lumps are larger than one degree we get an "Open" universe (picture on bottom-right).

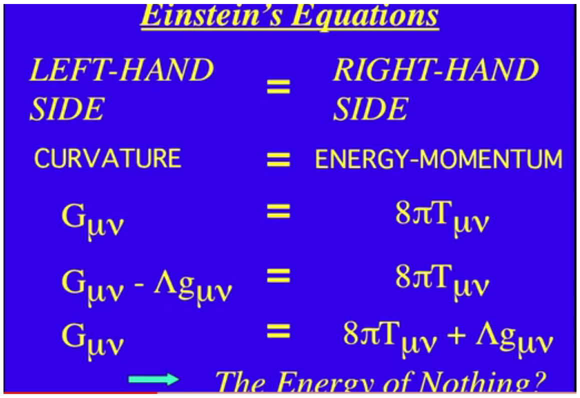
Since a "flat" universe (the middle picture) matches the Boomerang image, and thus Krauss says the universe is flat.

He then reinforces his previous point that, because "the universe is flat, it has zero total energy, and it could have come from nothing."

Krauss admits that he said earlier that the "flat" universe only has 30% of the mass it needs to function as a flat universe (even if one includes Dark Matter and normal matter). So where is the other 70%?

Answer: You put it in by hand, because you must have it to make the Big Bang work.

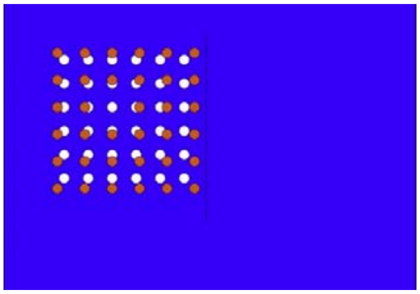
Krauss said they put in "energy" (Dark Energy) between the spaces of the Dark Matter and normal matter. If you do, he says, you are giving it Einstein's "cosmological constant" in reverse, that is, you are putting Lamda on the other side of the equation. So it is now $G_{\mu\nu} = 8\pi T_{\mu\nu}$ (Dark Matter & Normal Matter) + $\Lambda g_{\mu\nu}$ (Dark Energy). See his chart below.



Krauss admits, however, this would cause the expansion of the universe to accelerate over time.[3] So he needs a way to confirm this acceleration. Krauss says that in 1998 astronomers used supernovas as measuring sticks and found that they were showing an accelerating universe (but he never shows in this video how supernovas can serve as rulers). Krauss then reminds us that if we figure out how much energy is needed to make the universe accelerate according to the chart, it is 70% more than we presently have.

Krauss concludes with: "this completes the **ultimate Copernican principle**. We constitute a 1% bit of pollution in a universe that is 30% Dark Matter and 70% Dark Energy. We are completely irrelevant. Why we are in a universe in which we are so irrelevant is beyond me."

R. Sungenis: This, of course, is absurd, but it shows that scientists will do anything they can to stop us from being special in the universe. Krauss and company are caught in a dilemma. They see the redshift of light from galaxies increasing as the radius from us increases. They insist on interpreting this as an expansion of galaxies away from us because this will give them the only alternative answer to the fact that the galaxies and their redshift are all equidistant from us. Instead of interpreting the equidistant redshift as a sign that the earth is in the center of it all, they adopt the Friedmann-Lamaitre-Walker-Robertson metric of an expanding universe and propose that in an expanding universe everywhere seems to be the center and nowhere is the center, since that is what it would produce if it were expanding. See his original pictorial:



[3] Krauss says "eventually the galaxies will move away from us faster than the speed of light. It's allowed in General Relativity."

But in order to have this expansion and "no center" they must have something that causes the expansion, but they don't have anything, so they have to invent Dark Energy to propel the expansion, and that is why Krauss put the Lambda ($\Lambda g_{\mu\nu}$) figure on the right side of the equation (since that represents Dark Energy):

$G_{\mu\nu} = 8\pi T_{\mu\nu}$ (Dark Matter & Normal Matter) + $\Lambda g_{\mu\nu}$ (Dark Energy)

It's all a bunch of hocus pocus, made-to-order cosmology that preserves their world view. But as we saw above, the CMB dipole and the concentric circles of galaxies that arc around our earth simply will not allow their cosmology. The simple explanation is, as we say in Galileo Was Wrong:

"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. In this model, the universe has been expanding since the proposed Big Bang occurred 13.5 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,[4] but the expansion is only possible, as Clifton, *et al*, say,

> ...if a fraction of r 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, dark energy has been incorporated into the standard cosmological model, known as LCDM [NB: "LCDM" is another way of saying $G_{\mu\nu} = 8\pi T_{\mu\nu}$ (Dark Matter & Normal Matter) + $\Lambda g_{\mu\nu}$ (Dark Energy)]

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.[5] 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

[4] $H^2 = 8\pi G\rho/3 - k/a^2$, 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: $H_O D_L \cong cz + ½(1 - q_O)cz^2$, where *q* is the deceleration rate and subscript O denotes the value of a quantity today (*ibid*).

[5] 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).

> 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.
>
> 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.[6] 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...[7]

New Scientist wasted no time in laying out the cosmological and historical implications of this study:

> 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 the data – a geocentric universe. As one commentator put it:

> 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."[8]

New Scientist shows why even the sugar-coated phase gives astronomers a queasy feeling in their stomachs:

> 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

[6] Here Clifton, *et al*. cite A. D. Linde, D. A. Linde and A. Mezhlumian in *Physical Letters* B345, 203 (1995).

[7] "Living in a Void: Testing the Copernican Principle with Distant Supernovae," *Physical Review Letters*, 101, 131302 (2008) DOI: 10.1103/PhysRevLett.101.131302.

[8] "Dark Energy and the Bitterest Pill," July 14, 2008 at the Physics arXiv blog.

> 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 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 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.[9]

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."[10] 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.

Robert Sungenis

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[9] Marcus Chown, "Is the Earth at the Heart of a Giant Cosmic Void?*New Scientist*, Nov. 12, 2008, pp. 32-35.
[10] *Ibid*., p. 33.