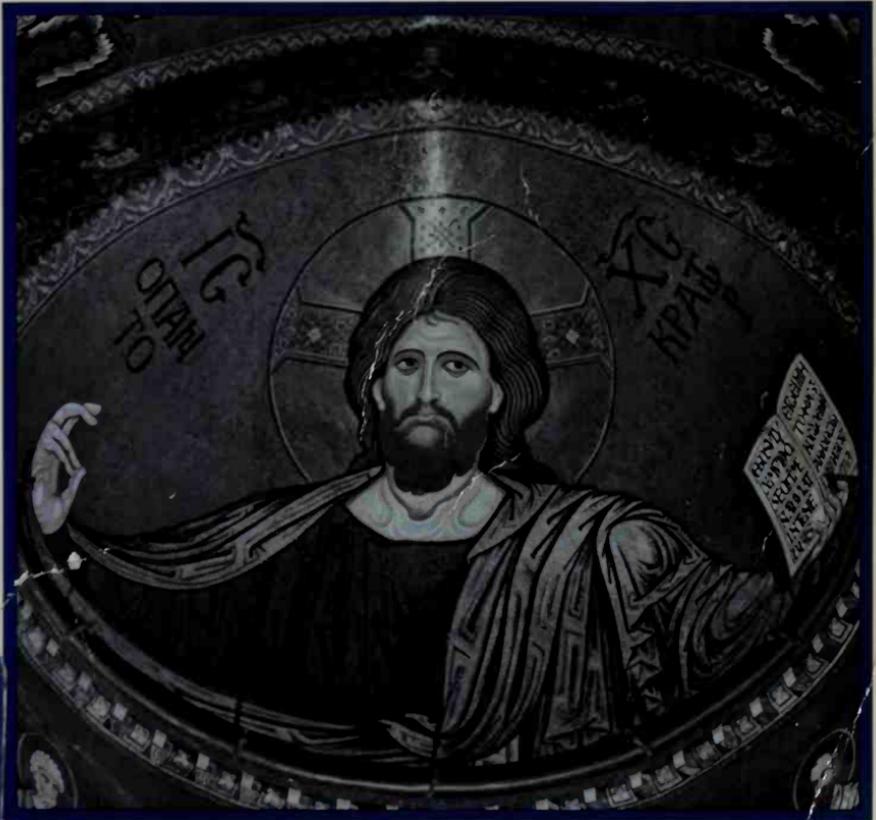
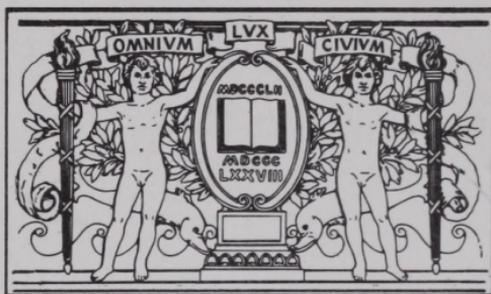


Stanley L. Jaki

The Savior of Science



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THE
SAVIOR
OF
SCIENCE

Stanley L. Jaki



REGNERY GATEWAY
Washington, D.C.

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FOREWORD

The present volume contains the lectures that formed the basis of discussions at the Third Annual Wethersfield Institute Conference in Troutbeck, Amenia, N.Y., on August 29-31, 1987. They are followed by the text of the lecture delivered on November 5, 1987, at Columbia University under the joint sponsorship of its Heyman Center for the Humanities and the Wethersfield Institute.

In its format the Third Conference markedly differed from the first two, held respectively on the restoration of the Sistine Chapel and the cultural importance of the use of Latin. At both those conferences a dozen or so scholars gave lectures that were open to the public. At Troutbeck, the thirty or so participants from the USA, Canada, and Europe, resembled a seminar.

The seminar-type character of the conference and the vicinity of Troutbeck to Wethersfield House gave ample opportunity to Mr. Chauncey D. Stillman, President of Wethersfield Institute, to establish close rapport with participants. They all were the beneficiaries of his engaging kindness that added a special glow to his dedication to the highest Christian perspectives. As a modest acknowledgment of our debt, this book is dedicated to him.

THE SAVIOR OF SCIENCE

INTRODUCTION

To speak of Christ, the Savior, also as a Savior of Science, may sound a jarring note in this world ever more saturated with science. To be sure, the claim that science alone can save mankind is less voluble today than a generation, let alone a century, ago. A sobering reappraisal of science has been going on in the measure in which public opinion has been awakening to the ecological crisis and the irrationality of the arms race. It is increasingly conceded that moral strength to cope with these and many lesser though still great problems cannot come from science, which was and still is instrumental in creating them.

Insofar as science is not a mere tool but intellectual creativity it is intertwined with presuppositions that have distinctly ideological character. Here too more is conceded nowadays than a generation or two ago when science and positivism (be it in the guise of pragmatism, empiricism, or operationism) were fairly synonymous. That science is not even irreconcilable with the ideology par excellence, or Christianity, can be heard in circles where not too long ago a perennial warfare between the two was the standard perspective. That science did not suddenly start with Galileo's inclined plane is a point that can be found in more recent better-grade college texts on early modern intellectual history. The reason for this is that even some prominent scientists have taken note of extensive historical findings about some medieval predecessors of Galileo.¹

To say medieval is almost to say Christian and in a rather dogmatic sense. The medievals certainly took it for a dogmatic verity that the universe was created freely and rationally throughout, the only kind of universe that lends itself to scientific investigation. They certainly did not endorse

the idea of a necessarily existing universe which invites an *a priori* approach to nature and nips empirical research in the bud. But what is distinctly Christian in the idea of a contingent universe? Did not Whitehead tie the Scholastics' insistence on nature's rationality, as a factor crucial for the future of science, to their belief in the absolute Lordship of Jehovah?² The Scholastics would have been the last to claim that Jehovah, or Yahweh (He Who Is) was a divine name first invoked by Christians, although they were the first to sense the inexhaustible philosophical significance of that name so unique in the history of religions.³

But was the name Jehovah as much of Hebrew make as it is often assumed? Jewish and especially those Christian theologians who plead the cause for natural theology, can hardly answer with an unqualified yes. Clearly, if both Old Testament and New Testament authors could charge the pagans with moral responsibility for their failure to recognize the only author of nature, then the natural recognizability of that divine name is somehow conceded. Christians have the added problem when it comes to Christ. His miracles are the kind of empirical facts over which science claims exclusive competence. The exact measure to which the rise and growth of empirical method contributed to the de-Christianization of the Western world may never be settled but the measure was not negligible. De-Christianization means above all the taking of Christ for just another ordinary empirical fact.

Many cultivators of that empirical method would have expressed themselves in much the same way in which Darwin did in a context of which only a small glimpse has so far appeared in published form. The context is Darwin's only and very brief written reflection as to what to do with Christ. In 1879, more than forty years after he had turned his back on Christian faith, synonymous for him with a rigidly literal reading of the Bible, he most likely did not

think that, as he answered the agonizing question of a seventeen-year-old German student, he was giving his own reply to Christ's historic question, "And you, who do you say I am?"

The first communication of W. Mengden, the student in question, to Darwin⁴ was prompted by the awe which countless others, young and old, felt on reading *The Origin of Species*. Darwin asked his son to send in reply⁵ a brief note which did not settle matters for his correspondent, still to reach his 18th birthday. "I have," he wrote to Darwin on April 2, 1879, "read in your writings a few things which I as a 17-year-old could not of course understand. Because of Haeckel's words that 'evolution is the true road to knowledge', and because of his *Schöpfungsgeschichte* [History of Creation], and also because of the talk of many who certainly cannot really understand you, I became confused and seized by doubts. Therefore I make bold to ask you whether strong belief in your theory is compatible with belief in God, or whether one has only the choice between your theory and belief in God, or whether those who believe in your theory can and should also believe in God as well?" Behind those agonizing questions lay young Mengden's convictions—many other readers of the *Origin* had similar feelings—that only Darwin could answer those questions, that he alone held the key to truth. "Should you," the youth continued, "take my questions to be impertinent and should you prefer not to answer them, please, I beg you, forgive me. I wanted to have the truth and, only because I know no one apart from you who could be of help, did I dare to make this request."

If Darwin's brief answer, penned on his behalf by his son, Francis, his future biographer, offered any truth, it was hardly the truth the young student looked for. What Darwin's answer seemed to offer with one hand, was taken back with the other: "Mr. Darwin begs me to say that he con-

siders that the theory of evolution is quite compatible with belief in God; but that you must remember that different persons have different definitions of what they mean by God."

Possibly, because of the ambiguity of the answer, young Mengden contacted in person Haeckel in nearby Jena and posed him similar questions. As the youth reported in his third letter, dated June 2, 1879, to Darwin, Haeckel expressed agreement with Darwin on God, an agreement which, in view of Haeckel's monistic pantheism,⁶ could but make one doubt that Darwin himself endorsed belief in a personal God, the God Mengden obviously had in mind. Haeckel, however, was unambiguous with respect to Mengden's question about his and Darwin's belief in Christ: "He [Darwin]," so Mengden reported Haeckel's reply, "cannot believe in the supernatural." This brought things to a head: "I therefore come to you for the third time, asking and begging, so that your kind reply may provide a directive that tells me what I should believe. Please, in your great kindness, don't brush me aside, keenly as I realize that my requests are improper and impertinent, because I know not where, apart from you, I can get hold of the truth."

With this the letter reached the crucial point, or Christ. "Please tell me," the youth continued, "can one believe in Christ as described in the Bible? What should one, according to your opinion, grant to Mr Haeckel and what definition of God is appropriate to be held by one who accepts your theory?" All this had an existential backdrop: "If you, however, are kind enough to be generous with your answer, would you please tell me what one should think about life after death and whether one should expect to meet others in afterlife? This question has agitated me anew because, owing to the death of my best friend, I have been in the grip of most serious thoughts." Most accounts of spiritual crises set off by Darwin's theory have yet to match the plain but

incisive reflections of a youth not yet out of high school or *gymnasium*.

By 1879, Darwin confessed that his "theology was a muddle."⁷ But he never saw with any comparable accuracy the muddle of his thinking about the scientific method. Was it a method or a "road-guide" into a specific area, the mechanism of evolution, or was the scientific method a guide about everything under the sun and even above it? Was it a method about something specific, or about everything that ever exerted the human mind? Not having even a modest amount of clarity about the limits of the validity of the scientific method, Darwin once more asked his son Francis to pen, on his behalf, a short résumé of his views on the bearing of evolutionary theory on matters theological, Christ not excepted: "I am much engaged, an old man, and out of health, and I cannot spare time to answer your questions fully,—nor indeed can they be answered. Science has nothing to do with Christ, except insofar as the habit of scientific research makes a man cautious in admitting evidence. For myself, I do not believe that there ever has been any revelation. As for future life, every man must judge for himself between conflicting vague probabilities."

Darwin's reply is important partly because it is very typical of views prevailing in a secularist culture about Christ and afterlife, a culture that claims to be scientific. A further importance derives from the extent to which Darwin's theory advanced the secularization of the modern world. Last but not least, Darwin's reply gives a glimpse of the Achilles' heel of that culture boastful of its empiricism. Darwin most likely thought that the strongest point in his reply related to that caution which familiarity with scientific method should generate. He did not suspect the extent to which the same familiarity could also give rise to an unwarranted discrimination among various kinds of facts and to a shocking insensitivity about the countless facts of history

which, unlike "the facts" of science, do not repeat themselves.

Among those unrepeatable facts of human history—individual and social, obscure and famous—none created as much of a stir as the fact of the Prophet from Nazareth. Men of power, men of learning, men of violence, men of lust, men of political madness, all tried to dismiss that fact, time and again, as a mere myth of no consequence. Nobody in Domitian's entourage had the slightest second thought as the Emperor treated with contempt the simple relatives of "Christos" presented to him.⁸ Within two hundred years, the Empire had to fix on its standards the ignominious cross which that "Christos" alone turned into a token of victory.

The commodity of second thought has not been more plentiful in times that are known as the progressive de-Christianization of the Western world. All too often camouflaged in scientific garb, it is a process which effectively hides from view facts that are neither of the making of science, nor can science make anything of them. A "scientific" stance that stimulates insensitivity to those facts is a parody of science, worthy of being called plain antiscience. All the more so because among those facts belong also some facts of scientific history, facts so very different from the facts of nature. A close look at the "unscientific" facts of the history of science, which is offered in the subsequent pages, must have in its focus the fact of Christ if that fact is indeed the most significant fact of history.

The resulting view that Christ is the Savior of science in that full sense in which He is also its Creator in the first place, is not expected to gain quick and broad acceptance. The "received" view about the birth of science is too entrenched even among those who think they have rendered their due not only to science but to Christ as well. As to those who do not think that anything is to be rendered to Christ, they will remain glued to their positions to the end

of time. This was clearly foreseen by Christ, the Prophet who most explicitly predicted endless struggle on this earth. The work of Redemption was to go on because as long as there were men, they were to be redeemed from their captivity to dark forces, intellectual and other. This most scientific 20th century has yielded to those forces on more than one occasion and in enormously tragic ways because of the colossal role of science. Serious and lasting reduction of that role presupposes a new thinking about science, a thinking which must focus on the origin of its object if it is to go to the heart of the matter.

Chapter One

THE STILLBIRTHS OF SCIENCE

Wandering between two worlds, one dead, the
other powerless to be born.

Matthew Arnold

Science and belief in Progress

When Darwin counseled doubts about Christ in the name of the critical spirit fostered by science, doubts were certainly not allowed about Progress writ large. As the second half of the 19th century kept unfolding, celebrations of Progress became a literary cliché as well. One could rely on that cliché even for the purpose of filling in a half-empty line and without running the risk of appearing trite and trivial. Thus, in starting his celebrated travelogue through Russia, Théophile Gautier referred to “our marvelous nineteenth century” as he registered the “mere” forty or so hours he needed to travel by train from Paris to Berlin on his way to Moscow. Not a few details in that travelogue could suggest that no progress had been made for centuries, if not millennia. Suffice it to recall the most entertaining phase of Gautier’s return trip to Paris in the Spring of 1867. First he went by train about 150 miles from St Petersburg to Pskov which he might just as well have described as the last outpost of Progress. From there he traveled in a flat open carriage (*tialaga*) with seats consisting of ropes stretched

from one side to the other and covered by sheepskin. For three days and nights his coachman made five "fiery" horses "gallop" along a muddy path, hardly different from the surrounding fields, from Pskov to Königsberg, a distance of 300 miles.¹

To be sure, such relapses into primitive times were temporary. As a proof, Gautier could have referred to the Moscow-St Petersburg railroad, laid down, along an almost straight line, over far worse terrain a decade or two earlier. But no sooner had the "iron horse" been given its opportunity to race from sea to shining sea across America's wild West, than its future nemesis, the internal combustion engine, began to take shape. In fact, even more spectacular means of communication appeared on the scene. The first transatlantic cable was just being laid and telephones soon vied with telegraphs. The century was hardly over when Marconi sent the first radio signals across the Atlantic.

Caution soon proved to be the unwise stance in making prognostications about progress which, of course, was synonymous with technological or scientific advance. Simon Newcomb, the first notable American astronomer, insisted on the impossibility of mechanical flying only seven years before the Wright brothers took to the air. A generation later the same caution served poorly a Rutherford as he took talks about the industrial use of nuclear energy for "talking moonshine." Still another generation later, and only four months before Hiroshima, Vannevar Bush invoked his expertise in explosives to assure the newly sworn-in President Truman that the atomic bomb could never go off.² He followed up this fumbling in scientific prognostication by insisting, around 1950, on the impossibility of building the kind of rockets that shortly afterwards became unveiled as intercontinental ballistic missiles. Parallel to those missiles, intercontinental travel became a daily routine. Progress

soon implied the exploration of the moon and the planets, owing, in no small measure, to the advent of computers. Marshall McLuhan must have had them in mind when he wrote in 1965: "As electrically contracted, the globe is no more than a village."³

At any rate, as the 19th century hastened toward its final decade, trust in progress took on the character of religious conviction which received a graphic portrayal in Stefan Zweig's reminiscences about his youth:

This belief in an uninterrupted, inexorable 'progress' had for that era truly the force of a religion; indeed people believed in 'progress' even more than in the Bible, and this belief appeared justified by the daily wonders of mechanics and science. A general raising of standards became even more perceptible, more rapid, more widespread as this century of peace drew to a close . . . Comfort penetrated from the houses of nobility into the houses of the bourgeoisie; no longer was it necessary to fetch water from the well or from the corridor, to struggle to light fire in the hearth. Hygiene spread, dirt disappeared. People became more beautiful,¹ healthier, more robust, their bodies strengthened by sport; one saw fewer and fewer cripples, mutilated bodies, goitrous growths on the streets. And all these miracles had been brought about by science, that archangel of progress . . . What wonder, then if this century basked in its own achievements and regarded each new decade as the herald of a better order? The possibility of a relapse into a new barbarity, such as, for instance, war between the nations of Europe, seemed as remote as demons or witches; our forefathers were unshakable in their belief that the differences between nations and beliefs would gradually disappear, and thus would peace and security, those highest of benefits, be shared among the whole of Humanity.⁴

Such belief was a reinforced echo of Condorcet's famous claim that science had secured unlimited progress for the human race. A strangely argued claim it was. Its scientific basis consisted in a reference to Laplace's proof of the stability of the solar system, although the proof left ample room for geological catastrophes capable of snuffing out the human race. A vague cosmic security could easily distract from some down-to-earth realities. Around 1800, medicine was just taking its first halting steps toward a truly scientific future of which little could yet be guessed. Epidemics still could rise and rage unimpeded. Child mortality was just as high as it had been since times immemorial. Puerperal fever took its toll as freely as ever before. A rapid rise in food production was not expected by Malthus as he brooded over the problem of overpopulation. There were no technological panaceas on hand against the Irish potato famine. A few decades later the phalanxes of philoxeria marched devastatingly across Europe's vineyards. The need to fetch water from the corridor or courtyard was eliminated only for a part of the bourgeoisie. (As late as 1930, one third of Paris, to mention only one big city, was still without running water). Worse, millions continued to flee from the miseries of civilized Europe into uncivilized parts of America. There they could be trapped in milltowns and mining-towns that allowed less freedom than was available in feudal villages.

Then came a war which, contrary to rosy expectations on both sides, lasted not for a few months, but for four full years. The massive graveyards of World War I had not yet been covered with fresh grass when a flu, about which medicine could only establish the useless label "Spanish," provided further overwork for gravediggers. Suddenly Western civilization seemed to be destined for a slow but inevitable burial—executed by its boasted science. This was the gist of Oswald Spengler's *Decline of the West*, a colossal

contrast to Herbert Spencer's perorations, delivered half a century earlier, on a universal progress to be achieved with reliance on science and technology in all fields of endeavor, including plain family life.⁵ Concerning that life two developments have by now become undeniable: an alarming increase in the number of one-parent families and in the number of abandoned and illegitimate children. The symptom is particularly acute in the United States, chock-full as it may be with science-made conveniences. According to recent disclosures, no less acute is the problem of abandoned children in the Soviet Union, which from its inception has aimed to be a science-based society.⁶

Those unwilling to see a connection between these two problems, or social plagues, and a feverish preoccupation with science and technology, still have to face up to the fact that the century of Progress could not have been followed by a century of war had it not been for science. That the War of 1914-18 produced well over ten million dead was largely a contribution of scientific know-how. Poisonous gases produced far fewer victims, though far greater revulsion, than did machine guns. As they clattered merrily on, machine guns mowed down in a fair morning as many as were to perish in a split second in Hiroshima and Nagasaki. It is little remembered that early in this century the first truly automatic machine gun was marketed in that spirit for which ruthless competition stood for Progress writ large.⁷ Science and technology almost alone decided the outcome of an even vaster war only a generation later. The failure of German industry to produce low-freezing oil was more important than any other factor in preventing the fall of Moscow. Radar and atomic bombs were not only the latest in theoretical and applied science, but also chief tools of victory in moments of despair or disarming fatigue.

The more than two hundred "minor" wars that have been fought all over the globe in the forty years since World War

It is a proof of the technological ease with which backward places can obtain weapons far more sophisticated than automatic rifles—whose number was estimated to be well over a hundred million two decades ago. As to the next Big War, which may easily turn into the Ultimate War, it has been fought for over four decades with ever greater intensity in most advanced laboratories surrounded by as much secrecy as possible. The big moves on the geopolitical chessboard consist all too often in giving a glimpse of some “super-secret weapon” to impress the *other* side.⁸ Yet Spengler, who in the wake of World War I struck the note of despair about Science and Technology taken for Progress, remained a minority voice. In the early thirties none other than Winston Churchill, who had a sixth sense for the best scientific advice he needed to prepare his country for the great trial, spoke in a most optimistic vein about a scientific future to be on hand within fifty years.⁹ He was no more accurate than were scientists who ventured to predict developments in their own field. Churchill’s prognostications did not contain most of the startling advances to come within a short time and contained items that are still a pipe dream, such as the replacement of ordinary food with pills and the mass production of chicken legs and breasts without the production of entire chickens.

Doubts in progress and the new historiography of science

The first major and truly intellectual doubts that science does not necessarily mean progress did not arise from reflections on the pathetic ability of man to abuse, on a terrifying scale, his tool-making skills which science raised to spectacular heights. A disillusioned look at science is not part of the hopeless staring into the future that fills the last pages of *All Quiet on the Western Front* (still an unsurpassed portrayal of what modern war is about, though written before diving

bombers and flying fortresses laid carpets of death over cultural and industrial centers).¹⁰

Even now—as we live with the possibility of nuclear holocaust and catch glimpses of a perhaps irreversible ecological disequilibrium induced by technology—doubts about science as progress are largely of intellectual provenance. Their erstwhile appearance was first surveyed in the concluding pages of J. Bury's classic work on the idea of progress first published in 1932.¹¹ What he found (not surprisingly to those appreciative of the inner workings of logic) was that the subjectivism, a priorism, and relativism of philosophies prevailing around the turn of the century began to erode even that pedestal upon which Progress had been receiving unconditional encomiums for some time.

Additional to those corrosive forces was the sobering recognition of the true intellectual physiognomy of Darwinistic evolution by some of its most celebrated spokesmen. The "wonderful century"¹² was not yet over when none other than T. H. Huxley warned about the hollow character of efforts that tried to derive universally valid truths and values (love in particular) from Darwinian evolutionary processes.¹³ That the word "agnosticism" was coined by the same erstwhile and chief Darwinist was an advance sign of the futility of discerning Progress within Darwinian perspectives. The illogical identification of the two went on, of course, unabated for a while, especially on the part of pragmatists in academia. The most consummate scorn—"logic is the organized way of going wrong with confidence"—for the working of the inner logic of any proposition or system came from one of the self-made leaders of industry, Charles F. Kettering of General Motors fame.¹⁴ Many captains of banking and industry, such as Rockefeller and Carnegie, found in Darwinism the ultimate justification of a progress working through the relentless fight against all competition. That progress seemed to be

continuity itself, similar to the one from nondescript roses to one especially large and beautiful specimen. Was it also tacitly assumed that ultimately all roses would come up without thorns?

Such an eventuality could easily be assumed by those who, by looking at classical Darwinism through rose-colored glasses, saw in it an apotheosis of Progress. Darwinism seemed to assure continuity through an immensely extended sequence of most minute changes, surreptitiously "directed" toward some great goal. In that perspective all flowed easily into everything else. More realistically, the perspective was the art of resigning oneself to very large robberies provided they were taking place through an immense chain of insensibly petty thefts. Things became more problematic with the recognition, largely through the rediscovery of Mendel's work, of noticeable sudden changes. (Mendelism became in fact a fly in the Darwinist ointment through Muller's famous work on fruit flies.) As genetic mutation brought into focus the "saltation" which Nature displayed in the emergence of distinct species, the reaction was not a puzzled look at the metaphysical problems posed by any "emergence," slow or rapid, but a routine trust in the power of custom or habit. Living long with a problem often can result in the illusion of its having been satisfactorily resolved.

Such was the background of the major twist in the historiography of science in this century. Sparked by A. Koyré's Galilean studies, first published in 1939-40, it became the "received view" in the 1950s as a large number of historians and scientists turned to the historiography of science. What Koyré did—largely by borrowing from Bachelard the application of "genetic mutation" to intellectual history—was to claim that a "mutational" change separates medieval science (discovered by Duhem) from Galilean and modern science or physics.¹⁵ Koyré's possibly anti-Christian or anti-

Catholic motivation (of which more later) in writing his Galilean studies could hardly displease most of those newly emerging historians of science. Nor were they adversely tuned toward Koyré's casting at least one important phase of the history of science into a Darwinian framework. Such an approach to scientific history soon became a runaway fashion among them.

The fashion did not always parade under distinctly Darwinian labels. Darwin and professional Darwinists never spoke of revolutions and paradigm shifts that became the shibboleths of the new unwisdom about scientific progress. But before long the history of science came to be seen as the essentially blind field of competing ideas with different degrees of survival value. To the credit of such Darwinist historiographers of science, they spelled out a most important aspect of their perspectives: it was the explicit denial that there was a "directedness" in the accumulation of scientific truths, taken at best for Popperian "verisimilitudes," the only kind of verities still allowed.

This new insensitivity to directedness had no connection with a much earlier debate whether biological evolution was a coherent "unfolding" and not merely a sequence of random novelties. Rationalists who had invested so much in the notion of Progress should have sounded the alarm when that debate petered out in a facile dismissal of "unfolding" or continuity on the purely biological level. By then they had acquiesced into taking Darwinian evolution for a magic device of endlessly arising novel facets on a vast scale. It was too late when some rationalists¹⁶ rallied against paradigmist gurus and their rapidly multiplying disciples, all ready to cash in on academic opportunities. Rationality, which those rationalists rightly saw to be threatened by "intellectual mutations" replacing continuous growth, or coherence of truth across time, was no longer a precious commodity.

That commodity hardly existed for the younger genera-

tion of historians of science. They were mostly raised on operationism, pragmatism, and sociologism—philosophies not suggestive of coherence though certainly germane to the idea of an essentially relativist struggle for survival, intellectual or other. Within those philosophies, rationalist arguments could not even be recognized as having a universal validity. They could only be assigned some pragmatic efficiency. But if such was the case, there remained no common platform for universally shared paradigms, images, research programs, and kindred sophistications. The only universality that remained was the universal fragmentation into competing paradigms. Momentary ascendancy of one over the other became a matter of decibels measured in the number of best advertised publications by most “respectable” publishers and reviewed by colleagues belonging to the same mutual admiration clubs within academia. For a bitingly graphic portrayal of this phenomenon one must turn to the American astronomer-physicist S. P. Langley. What he said, a hundred years ago, about scientific progress as such would certainly fit the profession known as *the* interpreters of scientific progress. He mused about the onrush of a pack of hounds

which in the long run, perhaps, catches its game, but where, nevertheless, when at fault, each individual goes his own way, by scent, not by sight, some running back and some forward; where the louder-voiced bring many to follow them, nearly as often in the wrong path as in the right one; where the entire pack even has been known to move off bodily on a false scent.¹⁷

That Langley did not rather fall back on the linguistic fragmentation of the architects of the Tower of Babel may perhaps be explained by the discredit which Darwinism had brought to biblical archeo-history. There no detail became

so much the target of intellectual contempt as the story of a Fall casting a shadow on all future.

The Fall and a blind spot for stillbirths

In speaking about that Fall traditional theology used to define its primary consequence as a loss of supernatural grace for all progeny of the First Parents. The weakening of human intellect has been, for that theology, always the first of the secondary consequences of the Fall which had 'original sin' as its standard name until recently. The phenomenological description of its first secondary consequence always implied the registering of perplexingly paradoxical and often tragic aspects of the functioning of the human intellect. The present academic cacophony as to the intellectual status of science and its growth deserves to be described as tragic even if one abstains from seeing it as a manifestation of that secondary consequence of original sin. Academically "respectable" accounts of that status and growth must have been laden with something not only innocently erroneous but also sinfully misleading. Otherwise scientists would have reacted with less revulsion. "Should the History of Science be X-rated?"¹⁸ was not an altogether inappropriate title of an essay dealing with that reaction. All this will be haughtily dismissed by those who, protected by the comfort of well-endowed chairs, see a mere game in the intellectual pursuit. One could only wish that all of them were as frank as that luminary at Harvard who was recently quoted by his dean. On being asked about the reasons for his demand for further increase of his already large emoluments, he unabashedly told the dean that "flattery and money" were his sole targets.¹⁹

This chapter does not have for its purpose a detailed phenomenological portrayal of the virulent presence of at least the intellectual consequence of original sin in the aca-

demia in general and in its departments of the history and philosophy of science in particular. Such a portrayal would carry with it the ungrateful prospect of accusing persons while trying to analyze ideas, claims, and contentions. This is not to suggest that it would not be "scientific" to refer to actual academics as heedless advocates of conceptual contradictions and blind alleys. These are displayed no less in current accounts of a Darwinistically conceived intellectual evolution than they are widely conceded to be present in works of academics long in the grave.

Yet a special aspect of the paradoxical if not tragic perplexity of the present generation ought not to be left unnoticed. That aspect is not so much a blind spot, as a plain unwillingness to look into the more distant scientific past and ask some searching questions about it. Startling should seem the scarcity of studies about a most curious feature of the evolutionary tree of science. The vista of dead branches (to say nothing of the innumerable dead twigs) in the evolutionary tree does not fail to provoke an ongoing debate. Not so in the case of the evolutionary tree of science, although it comprises several major dead branches. The ones with readily traceable record represent the history of science in China, India, and Egypt. They also form a class all the more instructive because there is little evidence that in their respective measure of scientific creativity they had been greatly influenced by one another.²⁰ Therefore the fate and fortunes of science in those three cultures may be indicative of a pattern as plain as it is telling.

An Egypt to be buried in sand

Nothing is plainer in all three of them than the heading of impressive scientific discoveries and technological achievements into a definitive standstill. The technical prowess displayed by the construction of pyramids has been the

subject of many encomiums. Enough can be learned about that prowess through one visit into the central burial chamber of the great pyramid of Cheops, or, more conveniently, through a visit to the Egyptian wing of any major museum. Once there, one cannot help being struck with awe and crowded with questions to which, apparently, no answer may ever be given. It has now become a cliché in accounts of Egyptian hieroglyphics to say that they represent a highly developed form of phonetic writing which in itself is possibly the greatest intellectual feat of all recorded history. They represent in full the reflective symbol-making powers of the mind, which already made use of sensory phonemes for verbal communications. Yet the same Egyptians of old failed to achieve a similar breakthrough when it came to quantities, measurements, and calculations, which should have been more easily handled than the abstract symbolization of the spoken word. Egyptian mathematics and geometry remained a practical art. The few tantalizing steps toward generalized algebraic operations and geometrical formulas remained stunted offshoots from a branch or trunk that in itself is suggestive of far greater creativity.

To say that the Egyptians of old failed to develop more science because they did not feel the need for more is an all too transparent form of begging a most serious question. Furthermore, it is also a bad if not conceited psychology. Why should one suppose the Egyptians of old to be so insensitive to their own well-being as to settle meekly for a medical art that administered far more poison than cure? It is simply unrealistic to assume perfect resignation on the part of so many generations of Egyptians to that classic disease among them (shown by countless mummies, royal and other) that first ruined their teeth and then ate away part of their jawbones. Why should the best minds among them have opted for complacency after striking successes in exploiting the inundations of the Nile? After all, they were

not slow in adopting ever better weapons—chariots, for instance—from neighboring countries whenever opportunity arose. Nor were they unwilling to respond in large numbers to Akhenaton's call to throw away long-established and rigid artistic forms and turn toward warmly humane representations of life and nature.

The ferociousness of the reaction that tried to efface all traces of Akhenaton's reign will reveal its subtle message if we recall the earlier endurance, over centuries, of progressive times. Such was the period that stretched from the Third Dynasty through the Sixth, or about five hundred years beginning about 2570 B.C. It was then that the classic categories of Egyptian art and architecture emerged, implying enormous expenditures of wealth and a complex organization of human talent and manpower.

A memorable figure of the epoch was Imhotep, the chief official of Djoser, the second pharaoh of the Third Dynasty. A tantalizingly short remark of Manetho (the chronicler of ancient Egypt in early Ptolemaic times) about Imhotep that, among other things, he "improved writing," tells as much about Imhotep's genius as about Manetho's pedestrian recital. Manetho is not the kind of historian who would recall the astonishment his forebears must have felt on seeing for the first time the wheel, the block, the tackle, and the pulley. Nothing is recorded by Manetho about the impression made on his ancestors as they were told an apparently incredible tale by some of their ablest sailors away from home for more than a year. All that could be known directly about their cruise was that they started toward the south along the eastern shores of Africa and returned from the direction of Libya.²¹ One wonders how many of the home-folk believed their claims that for a while (as they went around what much later was called the Cape of Good Hope) they saw the sun shining on them from starboard.

This striking evidence that the earth is a sphere was

missed long before Greek sages began to argue the same point on other grounds. This will not appear a facile exercise in hindsight to anyone perplexed by the often slow penetration of the human mind into the realm of truth. Of course, that penetration should be extremely haphazard and doubtful from the Darwinian perspective, which provides no room for geniuses, big and small, or even for the existence of reason. Much less has it an answer to the simultaneous existence in the mind, individual and communal, of flashes of insight and of an apparently invincible blindness in the face of the obvious; and to the apparent equanimity the mind can display toward the choice between true or false. The latter prompted one Egyptologist to say this about the motley collection of views, often in brazen conflict with one another, that make up Egyptian religion: "The impression made on the modern mind is that of a people searching in the dark for a key to truth and, having found not one but many keys resembling the pattern of the lock, retaining all lest perchance the appropriate one should be discarded."²² This is also a perfect summary of their accumulation of a lore, out of which, here and there, a gem casts a spark that never produced flame.

Had the Egyptians of old been but an animal species they would have continued in a resigned way with whatever attainments they possessed in the first place. (Snails, it is well to recall, have built their shells with no variation from time immemorial, while spiders spin their webs and beavers build their dams with apparently no real innovations.) But there is plenty of evidence in the poetry sung by the Egyptians of old that they kept longing for something better, for a level of existence in which the mixture of light and darkness would be dominated by the former and not by the latter. Paradoxically, they turned to the animal kingdom for inspiration, as shown by their cavorting in strange combinations of human and animal bodies. Most of their carved effigies

became buried in sand as if to symbolize that there was no future in store for the Egypt of old.

Hindus, still old and lethargic

The Egyptians of old were not alone among great ancient peoples to see themselves a part of a wholly animate nature or universe. Among Hindus of old this animistic view of the totality of existence issued in several memorable images. One was a huge egg in the womb of a deity with bisexual powers. Another was the fathomless waters representing the body of Vishnu where, out of every hair-follicle, a universe bubbled forth and broke up before long. This image was just as inconducive to strict reasoning about the actual universe as was the breathing of Vishnu, supposedly regulating his body motions, including his perspiration that triggered the appearance of those bubble-worlds.

The biological perspective demanded the riveting of one's focus on the birth-life-death-rebirth cycle going on in nature with apparently no starting and end points. The only regularity that could be tied to that perspective evoked the workings of a treadmill. The sinister and stifling character of being trapped in a cosmic treadmill became fully evident when the Hindus replaced the short-scale computation of the four ages (or Yugas), constituting a full turn, with a long-scale version. According to the short-scale the Kaliyuga, the worst though shortest of the four ages, should have yielded around 300 B.C. or so to the new golden age (Kritayuga) lasting four times longer or about 4000 years. When markedly better times, signaling the onset of the golden age, failed to come even centuries later, a unique opportunity could have been seized to break the hold which the treadmill of Yugas had on thinking. Rather, belief in the Yugas was retained even at an enormous price. The length of the Yugas was greatly increased so that their credibility

might be saved. This meant that the actual Kaliyuga, that had already lasted for more than its allotted 1200 years, was to be multiplied by a divine year (360 ordinary years). This shift to the longer scale, measured in hundreds of thousands of years, meant a drastic resignation to the "never-ending" presence of the chief characteristics of Kaliyuga: ignorance, poverty, and disease. These characteristics are graphically portrayed in the *Vishnu Purana*, written in the early phase of the much extended new Kaliyuga, and in other pieces of the Purana literature.

Literature portrays life though not without exaggeration. The despondent pages of *Vishnu Purana* should not mean that there was no laughter, no venture, no insight, no hope among Hindus of old as some of their sages told them of a general ignorance to last to no end for all practical purposes. (Even in this age accustomed to terrestrial history measured in billions of years, the anticipation of sameness, however comfortable, for another four hundred thousand years, would create boredom if not plain revulsion). Nor should the advent of Buddhism among the inhabitants of the Indian subcontinent be taken for a universal fixation of their eyes on their navels. As King Ashoka spread non-violent Buddhism, he did so with the unabashedly violent means of a consummate warrior. The non-rusting iron pillars erected by him, or in his memory, witness a technological skill still unexplained today.

Yet even today the modern state of India (proud of its atomic reactors and bombs) can suggest that no progress has been made since the years of Ashoka. One example is the still stunningly large proportion of sacred cows to the population, one cow for every two humans. Another is provided by the roads that connect over a third of India's more than half a million villages to modernity. Those roads are good only for bullock carts (and better grade jeeps, and tanks, of course). It is only now that efforts are being made to

improve the strength of those bullock carts with appropriate metal parts.²³ Bullock-carts and non-rusting iron were not connected in times long past.

Not that talent was in short supply. Ancient India was the place where the decimal counting was born—including the positional value for multiples of ten and for zero, which is possibly the greatest scientific discovery ever made. One might expect that constant use of the mathematical zero would have increased awareness about the difference between being and non-being. It did, but only to strengthen the conviction that what is always had to be and could never fail to exist. This meant the continuous self-generation of being in an emanationist sense, which in turn implied a continuous deterioration of reality along the descending ladder and also a recurrence forever for all. Explicitly contained in this perception was the refusal to consider the possibility of a beginning so absolute as to be equivalent to being called forth out of nothing.

The ultimate consequences of that refusal for the fate and fortune of science in ancient India will be clear later. Meanwhile, things remained where they were. There was a standstill, a stillbirth, as far as science was concerned, as if nothing could come to its rescue. For the Hindu of old (a generalization for the wide variety of races and tongues filling the vast Indian subcontinent) there was in store a resignation coached in bitter complaint, however mooted, and an unquenchable groping for salvation. In the *Svetasvatara Upanishad* the celebration of the science of the cosmic wheel's eternal turns was coupled with the admission of no escape from it. Still, the words of King Brihadrata, "in the cycle of existence I am like a frog in a waterless well,"²⁴ contain a subtle ring of protest that can be heard in a desperate case only because the last sparks of human hope refuse to be extinguished.

These sparks could not catch flame even in modern times

as long as traditional Hindu thought, together with ancient village life, was idealized if not plainly romanticized. As late as 1938 Gandhi still sounded adamant on the absolute superiority of a life with no machinery, let alone technology:

I believe that the civilization that India evolved is not to be beaten in the world . . . India remains immovable and that is her glory . . . Our ancestors dissuaded us from luxuries and pleasure. We have managed with the same kind of plow as existed thousands of years ago . . . We have had no system of life-corroding competition . . . It was not that we did not know how to invent machinery, but our forefathers knew that, if we set our hearts after such things, we would become slaves and lose our moral fibre. They, therefore, after due deliberation decided that we should only do what we could with our hands and feet . . . They were, therefore, satisfied with small villages . . . They held the sovereigns of the earth to be inferior to the Rishis and the Fakirs. A nation with a constitution like this is fitter to teach others than to learn from others.²⁵

That Nehru was indeed a strange inheritor of Gandhi's mantle is amply revealed by his idealization of at least a relatively brief period of Hindu past. He spoke of the writings of a Golden or Classical Age of India in which "there is a quiet serenity, and a glow of pride at being privileged to be alive in that high noon of civilization, and with this there is the urge to use their great intellectual and artistic powers to the utmost."²⁶

At any rate, industrial and business leaders of modern India did not call for a return to the spirit of that Golden Age. Rather they insisted that a change of mind, a conversion, was needed if India was to absorb modernity as embodied in technology and science. The character of conversion always depends on the vague notion of salvation, and

of a savior. Call for such conversion will hardly be heeded as long as the voice of astrologers is not on the wane but on the rise (in spite of science and education) and carefully listened to by high government officials.²⁷ Conversion will remain a mere word as long as political leaders in India play the role of savior and invoke the "scientific" spirit in ancient India as rooted in the vigorous social consciousness (taken in a quasi-marxist sense) of ancient Hindu villages.

An ever-old new China

The case is similar, though with a violent twist, in modern China. Mao Tse-tung's cultural revolution and great technological forward leap drew heavily on ancient Confucian and Taoist aphorisms, as if they represented the spirit of modern science, whatever the official Communist denunciations of ancient Chinese sages. A generation or two earlier leading Chinese scholars saw in Confucian tradition the antidote against modern Western science, which they took for an exploitation of nature and for a dehumanization of man. The latter reaction to science was only in part due to the scientific spirit in which science was introduced around the turn of the century in the new Chinese universities.²⁸ A century earlier Chinese scholars denounced the microscope as an instrument that forced nature into a strait-jacket. They did so with much the same blindness that Goethe displayed in attacking Newtonian optics in particular and science in general.

Such an attitude to science may have been an advance dismissal of any merit in the question about the backwardness of China that should have appeared especially glaring with regard to science. The memorable claim of Yu-lan Fung, made in 1922 in the pages of the *International Journal of Ethics*, that there had been no science in China because Chinese culture was and would be better off without it,²⁹

may have aimed at nipping in the bud the need to face up to a painful facet of Chinese history. The birth and robust growth of science in the West could but make that facet appear all the more conspicuous.

Western minds were at that time hardly keen on that curious aspect of the long dormant but at long last waking giant of the Far East. Their artistic or literary kind seized on China as a contrasting background to the disillusion with science that flared up in the wake of World War I. In the focus of that background was the view—ascribed to traditional Chinese philosophers—about man who looked upon himself as “lord of the world,” though with deep roots in the humbler strata of nature:

He needed no discovery of science to enlighten him; that enlightenment was part of his philosophy, his religion. He understood the continuity of the universe; he recognized the kinship between his own life and the life of animals and birds and trees and plants. And so he approached all life with reverence, giving each existence its due value.³⁰

But was it not self-contradictory to say that the traditional Chinese sage granted each existence its proper value if the list of existent things did not include man's ability to pursue science? Could a civilization, that had not produced painters and musicians, deserve credit for never having been disillusioned with painting and music?

Contradiction of this sort was just as present in the dicta of those Western intellectuals who about the same time approached the problem of China and science with an esteem for science that knew no bounds. A classic case was *The Problem of China* by Bertrand Russell, who identified himself in the title page as “sometime professor of philosophy in the Government University of Peking.” According to him,

Although Chinese civilization has hitherto been deficient in science, it never contained anything hostile to science, and therefore the spread of scientific knowledge encounters no such obstacles as the Church put in its way in Europe. I have no doubt that if the Chinese could get a stable government and sufficient funds, they would, within the next thirty years, begin to produce remarkable work in science. It is quite likely that they might outstrip us, because they come with fresh zest and with the ardour of renaissance.³¹

But if, as Bertrand Russell claimed in the same context, this youthful vigor in the Chinese mind was in fact very old, why was it "often very difficult to interest even the most reforming Chinese in afforestation."? And if the answer was that the agriculturally crucial program of reforesting vast tracts of bare hillsides was "not an easy subject for ethical enthusiasm,"³² how could a Confucius, the avowed source of exclusive interest in ethical matters, be presented as a model of modern, reform-minded Chinese?³³ And was it true that the most modern Chinese mind, so ancient and yet so modern, needed only "new material"³⁴ from the West to start out on a scientific quest and soon overtake the West? Were not the Chinese the first, a thousand years ago, to have such new items as magnets and gunpowder? Was not China the birthplace of the basic type of printing?

Blockprinting is not such a far cry from printing with movable type as it appears to be. In a sense the puzzle is not so much that in the West blockprinting of entire pages, introduced in the late 1300s, was transformed into printing with movable type long before Gutenberg appeared on the scene with a highly perfected form of the art.³⁵ In view of the speed with which that transformation (so elementary and obvious, and yet so ingenious and revolutionary) had taken place in the late-medieval West, one should be puzzled by the inability of the Chinese to catch a glimpse of the

obvious during the many centuries they had spent in block-printing.

The puzzle should have exercised Western minds in the 1920s all the more because by then enough evidence turned up about the hollowness of a long-standing cultural cliché about what happened in the West. The cliché originated with Francis Bacon who took three inventions (printing, gunpowder, and magnets) for the decisive steps that made the rise of science possible in his own time. Without crediting the Chinese of old with at least the last two, he explicitly ascribed one (the gunpowder) to a Western man, a medieval monk to boot.

It tells something of the utter falsity of the "empiricist" approach to the rise of science that Joseph Needham, the chief modern expert on the history of science in China, found it wholly inadequate. Not that he, an avowed Marxist, did not look for some empirico-sociological cause for the failure of science to be born in China. To his own consternation and to the bafflement of many of his readers, he felt impelled to fall back on a theological consideration. Its essence is the parting of the pre-Confucian Chinese with their erstwhile belief in an only God (Creator) and Lawgiver. Once this belief (for whose existence Needham saw convincing evidence in early Chinese lore) was replaced by a quasi-panteistic identification of man and society with Nature writ large, the Chinese of old, so Needham argued, no longer felt confident that their limited mind could grasp and control the laws of Nature because Nature itself was not subject to a Mind and Lawgiver transcendent to it.³⁶

Right there and then Needham missed a great opportunity. It could, of course, hardly be seized by one who believed that one can be Marxist and Christian at the same time. Perhaps this was possible within Needham's brand of Anglicanism in which at least one traditional Christian dogma, the dogma about original sin, had for some time

been taken for an unesthetic relic, to be referred to with an air of amused condescension. As long as Christian divines took that sin seriously, they did not fail to face up in long treatises to the problem of why monotheism survived only in vague reminders in all ancient cultures. Closely attached to this problem, and also intensely discussed in those treatises, was the question of the possibility and viability of a purely natural monotheism, that is, a monotheism not connected with belief in a direct revelation of other supernatural truths. All those treatises, to take only their orthodox Catholic brand,³⁷ are so many witnesses to the teaching of Vatican I that whatever the full reasonability of the classic proofs of the existence of God, moral help in the form of salvation through revelation was needed for their steadfast espousal.

In theological treatises written on original sin a great opportunity is still to be recognized. That opportunity is in the seizing of the "scientific" light which in this age of science can illuminate that often vilified dogma about original sin. The latter keeps gathering ever new empirical evidences on its behalf and does so in the measure in which this age returns, partly because of the lure of science, to ways of thinking and behaving that are at times less characteristic of noble than of ignoble pagans. In that light, science visibly appears as an enterprise in need of salvation.

Readiness to ignore that need can turn into a shallow academic exercise even a graphic portrayal of the crudely anthropomorphic aspects of ancient Chinese cosmology. Reflected in those shallow waters they will not appear to be so many blind alleys for science in China of old. Much less will then emerge the reasons that lie in those depths of the human mind and heart where only the voice of theology finds resonance. Without the willingness to give hearing to that voice, even the most gripping account of the frustrations, perplexity, and intermittent agonies of the ancient Chinese vis-à-vis Nature may miss the point. The same

holds true of a similar portrayal of their resistance to Western science that was presented to them, however incompletely, by Jesuit missionaries.

A further reason for this is the veneer that has accrued on accounts of what really happened in China. The veneer, originally spread out in terms of Confucian estheticism, is now thickened by a historiography of science in which one is asked to proceed merrily from one phase of partial insights into scientific problems to the next phase and consider lightly, if at all, the mental agonies filling the gap between the two. This historiography of science has still to face up honestly to the problem of why three great ancient cultures display, independently of one another, a similar pattern vis-à-vis science. The pattern is the stillbirth of science in each of them in spite of the availability of talents, social organization, and long periods of peace—the standard explanatory devices furnished by all-knowing sociologies of science on which that historiography relies ever more heavily.

Babylon as 'babylon'

The same historiography has also to face up to another variant of the same problem or pattern. In the former case one could perhaps fall back on the inept argument that those three great cultures could not, in the absence of direct impact on one another, form a critical mass of knowledge resulting in a chain reaction, or rise to the intellectual temperature where self-ignition takes place. No such evasion of the problem is possible when one turns to the direct succession of great cultures that runs from the Sumerians through their successors (Babylonians, Assyrians, and Persians) to the Greeks and from them to the Arabs. Whatever the incompleteness of our knowledge of the manner in which Mesopotamian and Egyptian scientific, or rather proto-

scientific, lore was transmitted to the Greeks, the passing (dramatically quick) of the entire Greek scientific and philosophical corpus to the Arabs is known in detail. What is still to be mentally absorbed, although it is obvious, is the failure of that cumulative process to give science that viable birth which is followed by a continued and ever faster growth.

Science, which is the chief seal of modernity, requires hard studies in the measure in which it is to be appreciated. Little learning about the fine arts is needed to sense a striking modernity in the famous alabaster head of a woman (called the Warka Head after the locality where it was found),³⁸ although it is more than 4000 years old. Diggings in the same area, the lower Euphrates valley, yielded also palm-size clay tablets by the tens of thousands with scripts consisting of wedge-shaped letters. The deciphering which quickly followed electrified the world of scholars. Some of them were so overawed as to place the origin of all learning and art in Babylon of old. Exaggerated as was the enthusiasm of pan-Babylonists about a hundred years ago, some of the clay tablets did indeed contain extraordinary items of learning. Among them were mathematical puzzles equivalent to second-degree equations, lists of hundreds of plants and chemical compounds together with their astonishingly accurate medicinal properties, and even longer lists of planetary positions. The latter turned out to be the factual proof of the ancient report that Hipparchus relied on Babylonian astronomical data in reaching his conclusion about the precession of the equinoxes, one of the greatest scientific discoveries of all times.

Last but not least, there was the writing itself which, unlike the Egyptian hieroglyphics and their Phoenician and Greek derivatives, shows few traces of having been developed from images of various objects. Some uses of that extraordinary feat of abstraction tell a dispiriting story.

Countless are the tablets filled with crude superstitions, bizarre variations on the art of foretelling events, ordinary and extraordinary, from the motion, color, and deformities of animals, domestic and other. In those days of over-enthusiasm with ancient Babylon (a generalization of successive cultures, non-Semitic and Semitic, stretching over 2000 years) nothing was more tempting than to ignore the real significance of these prognostications. They were still to be recognized as evidences of a pervasive addiction to a most irrational weakness of the human mind. They were part of a view about the universe as a huge animal whose dangerous irrationality could be appeased if men and women engaged in wild rituals, such as the Akitu festival, a week-long orgy around New Year, that turned into a "babylon" the streets of Babylon. The festival was an "advanced" form of a belief, common among primitive tribes, that the ferociousness, if not apparent irrationality, of nature can be kept within bounds only by engaging periodically in rituals with the same characteristics.

It should not therefore be surprising that the famed Babylonian cosmogony, the *Enuma elish*, is a portrayal of personified forces of nature locked in bloody battles. Their crowning phase is the dismemberment of the body of Tiamat, the mother goddess, for the purpose of forming from its pieces the main parts of the world: the sky, the earth, the waters, and the air. Such a cosmogony was certainly not a pointer toward that kind of understanding of the cosmos which amounts to science. Almost to a man, the secularist academic world took and still takes that cosmogony for the model which the author of Genesis 1 closely followed in the wake of the Babylonian captivity of the Jews. The model provided at most a few verbal paraphernalia but not the message of Genesis 1 which, by comparison with the *Enuma elish*, should appear rationality incarnate. The academic world, forgetful of basic rules of

comparison, may indeed be in need of a mental cure, a salvation of the intellect, and probably more so than the ancient Babylonian sages. Those sages merely shut their eyes to a flame flickering in darkness, whereas modern academics time and again seem to choose to ignore broad daylight.

Greek tragedy with a scientific cast

The Greeks' borrowing from Babylonian intellectual treasures was not on the scale of their political interactions with the Persian rulers of Babylon. For long decades, Xenophon is the witness, as many Greek notables sold their services to their Eastern rivals as took a heroic stance against them. The Babylonian scientific data could not have benefited a Hipparchus if he had not already been the beneficiary of the science of geometry, the Greeks' greatest scientific feat, which is not a borrowing from the Babylonians, let alone from the Egyptians. Geometry as the Greeks had developed it was a system of generalized propositions about spatial configurations. They advanced that system to the point where modern geometers are still unable to reconstruct the steps of demonstrations behind some propositions, given without proofs, in the last of the Fourteen Books of Euclid. Geometry is still not science inasmuch as science is about the actual universe in which all is in motion. There, unlike in the world of geometry, nothing is ever at rest. That restless reality was never penetrated by the Greek mind, restless as it was to the point of being tragic. The tragic element in the Greek mind has often been noted. With respect to science nothing reveals that tragedy so much as the inability of the Greeks of old to make a breakthrough toward the true science of motion by formulating at least the first of Newton's three laws of motion. Actually, they settled for a law of motion which represented such mental shortsightedness as to cry out not so much for correction as for plain salvation.

The most specific form of that law is in Aristotle's *On the Heavens* which set the fate and fortunes of science, or rather its tragic misfortunes, for seventeen hundred years. According to that law, the rate at which falling bodies speed toward the center of the earth, or its surface for that matter, is determined by their weight. Thus, to paraphrase a specific example given by Aristotle, if two bodies are dropped from the same height at the same time, the one with twice the weight of the other would reach the ground twice faster than the lighter of the two.³⁹ Counter-evidences of that famous passage were on hand every day and at every spot where construction went on. Workers obviously dropped two tools or two stones of markedly different weights at the same time. During the long centuries of classical antiquity, any curious reader of that passage in *On the Heavens* could have climbed to the roof of a house or temple, or walked to the edge of the Acropolis, and performed well in advance a "crucial" experiment. According to a long-exploded though very reluctantly dying legend, Galileo was the first to perform it, and from the top of the tower of Pisa.⁴⁰ No ancient Greek scholar ever developed that modest measure of curiosity, and certainly not Aristotle's great commentators of Hellenistic times who weighed each and every syllable of his dicta.

One is here in the presence of a blindness of the human mind to the obvious which is worth exploring even if in the end the most appropriate commentary would be the falling back on a gripping story. It is the story of the man born blind whose salvation comes when he recovers his eyesight after he cries out "Lord that I may see" in reply to the question "What do you want of me?" The question could have come from Socrates had it been but a mere question and not a preamble to a saving miracle.

Undoubtedly, it was a novel or saving insight into the working of nature that Socrates wanted to impart to his friends as his great parting gift. Urged by his friends, who bribed the jailkeeper so that Socrates might escape from the

sentence to drink the hemlock, Socrates refused to seize the opportunity on the ground that he wanted to save his soul. He found all his friends mocking at the immortality of the soul with cleverly superficial references to a physics that recognizes (and rightly so) but matter and motion. Unfortunately, Socrates was unable to resort in this most crucial context to his famous method. It would have been possible for him to lead his opponents to the point where they would have admitted a contradiction in their argumentation. Did they not freely bribe the jailkeeper and for a purpose? Did they not freely and for a purpose argue against Socrates that there were only matter and motion? Why did Socrates fail to note that if his friends were right there could never be a free argument for any purpose whatsoever? There is more in *Phaedo* than meets the eye.

When even a Socrates misses so obvious a saving grace, only those beyond salvation would argue that the mind, a mind reaching for the best form of physics, is in no need of a savior. For the best form of physics, which Socrates proposed in order to save purpose, freedom, and soul (and justify his readiness to die for a supreme purpose), was its possibly worst form. The reason for this was that it was capable of taking on a systematic form which no previous ancient culture could provide for its erroneous rudiments in the science of physics.

Systems are the highest glory of the human mind but they can also turn into its darkest pitfalls. The system in question consisted in the fallacious generalization of the thesis that all seeks what is best for it. On the level of personal human acts (motions or moves) this was a promising starting point toward the recognition of absolute ideals which only immortal souls could appreciate. But equivocation alone could turn this thesis into the universal statement that all movement was propelled by a desire to fulfill a goal or purpose and that therefore the chief aim of physics was to ascertain the manner in which each piece of matter tended

toward its (value-loaded) best position. From there it was a short step to the claim that what was the best was also the most natural and therefore the intensity of motion was a function of the "magnitude" of a "striving" nature measured, in the case of sheer matter, by its size or weight. Once in the grip of so many equivocations or misplaced analogies, even a genius like Aristotle could readily be lured into formulating the grandly erroneous law: twice the weight, twice the speed of fall.

This law, as all other laws of Aristotelian physics, was taken to be necessarily true, whatever the evidence to the contrary. The sense of purpose, which is immediately evidenced through introspection, became, through its unwarranted generalization by Socrates, an invitation to reach truth through introspective mentation, the gist of apriorism and the worst pitfall offered by logic. Beneath the immediate though never to be underestimated lure of logic there was another, even more insidious lure for reaching a conclusion so fateful for the future of physics. That lure was the pantheistic, pan-emanationist, pan-biological perspective in which the Greeks, at no essential variance with all other great cultures, looked at the universe. Steeped in that perspective, which included a firm belief in eternal cycles of birth-life-death-rebirth for all, the Greeks of old could be but the victims of an intellectual state similar to what has come to be called later by physics the state of unstable equilibrium. It is the insecure position on the top where at the slightest impulse one can only start sliding, and irreversibly so, toward one or another extreme. In the case of the Greeks of old one such extreme was the conclusion (reached freely and for a purpose) that all was matter and motion resulting in rigid determinism. Another was that motion, even the motion of stones, was propelled by a purpose and toward the best.

That the Greeks of old could not muster intellectual strength for recognizing the respective and limited validity

of both perspectives as they tried to understand existence, physical and spiritual, may tell something of the superhuman aspect of an apparently elementary wisdom. It is contained in the famous reply to the question of which side of a tax coin was to be honored. The reply urged obeisance to both sides, whatever the apparent conflict between the two. As will be noted later, full trust in a rational Creator was needed to muster intellectual courage to live with quantities as well as qualities whatever the apparent irrationality of the fact that they are irreducible to one another.

When that famous reply beginning with "render to . . ." was given, Greek science had already for two or three centuries been coasting on a relatively high but barren plateau. A coasting it was also in the sense of being replete with a great deal of complacency. The source of the latter is best expressed in a little read work of Aristotle where he endorses in a matter-of-fact way the idea of eternal cycles with reference to cultural history. He explicitly states that inventions familiar to his contemporaries had been invented in innumerable times before. Then he adds that the comfort provided by the technical brand of those inventions available in his time represented the highest level they are capable of providing.⁴¹ Clearly, if one is consciously merged into the treadmill of eternal recurrences, only two choices remain. One is that of hopelessness, the feeling that one is at the bottom. The other is complacency, the illusion that one is and remains on top, at least in the sense that the irreversible decline will begin to be felt only by one's distant progeny. Both attitudes cry out for salvation, although the second may be the less receptive to it.

Muslim epilogue to an age-old tragedy

It was about that latter point that Muslim intellectuals were fatefully carried along as they absorbed with great earnest-

ness and meticulous scholarship the entire Greek philosophical and scientific corpus. The intellectuals in question were non-theologians in the sense that they had no interest in mysticism or in the promotion of religious practices. They, of course, had to comply externally at least with norms of discourse and behavior set by the Koran and the precursors of ayatullahs. The dispute between Avicenna and Averroes with al-Ashari and al-Ghazzali on the status of scientific laws in particular and on the relation of reason and revelation in general is too well known to be reviewed here in detail. In sum it was a clash between two irreconcilable positions, both utterly blind to a perception identical to the one tagged to the tax coin. Muslim mystics decried the notion of scientific law (as formulated by Aristotle) as blasphemous and irrational, depriving as it does the Creator of his freedom. The intellectuals (philosophers) glorified the *a priori*, necessary validity of those laws. Neither position was conducive to that progress which science was to represent. The improvements brought by Muslim scientists to the Greek scientific corpus were never substantial. A stunning proof of this is the ideal of civilization described by Ibn Khaldoun in his famous interpretation of cultural development from nomadic civilizations to ones centered on large towns written around 1370.⁴² The ideal as described there suggested that nothing essentially new had been achieved since Muslim crusaders first tried, a generation after Muhammad's "ascension into heaven," to decapitate Christendom with a naval siege laid to Constantinople.

That the real fulcrum of Christendom lay elsewhere could not be unknown to Ibn Khaldoun. Nor could he, who visited the last outposts of Islam in the Iberian peninsula, ignore a strange reversal of roles. Two hundred years earlier, some of the best minds of Western Europe flocked to the great Muslim centers of learning in Cordova to have access to the Greek philosophical and scientific corpus. Three hun-

dred years later not only did Paris and other medieval universities far surpass the best offerings Cordova could ever make, but the West was the scene of a burgeoning civilization compared with which the Muslim world was a mere stagnation.

Eager curiosity, however plentiful in Muslim realms, was not enough for a breakthrough toward viable science. Nor was that curiosity capable of maintaining its early vigor. As an already stagnating Muslim world found politico-religious vigor re-injected into it through the ascendancy of Ottoman Turks, the curiosity in question excelled in copying but not in originality. More than two hundred years after the construction of the famed Blue Mosque, W. Eton, for many years a resident in Turkey and Russia, found that Turkish architects still could not calculate the lateral pressures of arches. Nor could they understand why the catenary curve, so useful in building ships, could also be useful in drawing blueprints for cupolas.⁴³ The reign of Suleiman the Magnificent may be memorable for a wealth of gorgeously illustrated manuscripts and princely paraphernalia,⁴⁴ but for no items worth mentioning from the viewpoint of science and technology. At the Battle of Lepanto the Turkish navy lacked improvements long in use on French and Italian vessels. Two hundred years later, Turkish artillery was primitive by Western standards. Worse, while in Western Europe the dangers of the use of lead had for some time been clearly realized, lead was still a heavy ingredient in kitchenware used in Turkish lands.⁴⁵

Such were some of the many symptoms of a stagnation about which William James' *Principles of Psychology* contains a vivid and widely read reminder,⁴⁶ though no probing into its causes. As a zealous expounder of religious experience in which the object of worship is invariably the creation of the worshiping self, James could not be expected to see real differences in varieties. Students of ancient civilizations, who adopted his psychological account of religion, did so

therefore at their own peril. A case in point is Jacquetta Hawkes' much praised analysis of ancient Babylonian, Hindu, and Egyptian cultures. There religion is singled out as the chief propellant behind the greatest monuments, especially the pyramids, those cultures left behind. She certainly had no use for materialistic perspectives in which civilizations had to have an automatic birth and, most likely, an endless growth as well which most of them obviously did not have. According to her, with those interpretations, "like so many orderly economic and social constructions, we seem to be confronted with something like a motor car without an engine, or a suit of armor without a knight. The dynamic is missing."⁴⁷

In order to strengthen her point she referred to the medieval cathedrals as products of similarly religious aspirations.⁴⁸ But if religion in ancient Egypt and medieval Europe did not really differ, why were their respective expressions in vast monuments so different? One of those differences was the mechanical clock, a staple ornament of Gothic churches from the late 13th century on. The most significant progress those clocks represented was not embodied in their mechanical ingenuity: a double-feedback mechanism that harnessed for the first time in history the accelerating fall of weights into a motion with constant velocity.⁴⁹ Nor did the chief importance of that progress lie in the vastly increased regulation of daily life as some pundits of technological culture would have it.⁵⁰ Far more portentous was the theoretical insight achieved about motion. That insight, through which science achieved its first viable birth, proved to be its salvation. Had modern secularist culture not predisposed itself in the manner of Henry Adams to seeing an opposition between the Virgin and the Dynamo,⁵¹ it would not have ignored most scholarly news about the medieval birth of modern science. It will be the burden of the next chapter to unfold the ties of that birth with a Birth which forever remains identified with a Virgin.

Chapter Two

THE BIRTH THAT SAVED SCIENCE

I say, the acknowledgment of God in Christ
Accepted by thy reason, solves for thee
All questions on earth and out of it

Robert Browning

Copernicus' surprising naturalness

From the perspective of the late 20th century it should seem obvious that science is on hand only inasmuch as it is about things in motion. A proof of this on a grandiose scale is space travel which, like other great feats of science, opened up ominously new dimensions of tragic misuses. The construction of ever larger accelerators is no less a proof that the crucial business of science is about motion and that potential curses are latent in that business. All modern physical laboratories have for some time been intricate devices to trap moving things, however minute and arcane. Their chain stretches from scintillation screens, Geiger counters, and cloud chambers that made scientific history a little less than a century ago, through the cadmium rods of nuclear reactors of the mid-century, to the vast rows of tanks stacked in deep mines for the detection of neutrinos that stream in incredible quantities through everything at all times.

The successive unfolding of ever more stunning marvels of communication illustrates the same priority of motion for

physics. First it was the harnessing of the flow of electrons in metal wires, then the detection of waves triggered by their acceleration in antennas, after that the tracing of their "jumps" around the atomic nucleus, still later the moving of their arcane variety called "holes" in semiconductor devices with their historic impact on technology. A decade ago fiber optics, which is a new way of channeling photons at almost the speed of light, made technological history. Today, technology is on the threshold of another vast commercial venture after it was discovered in February 1987 that superconductivity, which is the practically unimpeded motion of electrons, can occur in certain compounds at temperatures slightly higher than the boiling point of liquid nitrogen.¹

All these ventures and marvels imply a continual reliance on Newton's three laws of motion: (1) the law of inertial motion at constant velocity that may be produced by a single impulse to a body at rest; 2) the law of the equality of any action to the reaction it produces; and (3) the equality of force to the product of mass with its acceleration. The significance of this order is that it implies the logical or conceptual dependence of one law on the other.

In this year that celebrates the 300th anniversary of Newton's *Principia* it may appear sacrilegious to think of any other source for those laws than Newton's genius. He certainly was a genius also in the sense in which genius means a hard to conceal consciousness of being a sort of superman. In his last twenty years Newton was not reluctant to appear as such. He did not mind that for distinguished visitors streaming into London he became one of the chief items on sightseeing agendas. Once surrounded by glory he was willing to indulge in a bit of contrived humility. His old-age utterance—"If I have seen further, it was only because I was sitting on the shoulder of giants"²—was at sharp variance with his attitude toward scientists in whom he saw potential rivals for fame. His dispute with Leibniz about priority

concerning the discovery of infinitesimal calculus hardly casts him in the best light. The same is true of his earlier altercation with Hooke about the inverse square law of gravitation, for which Hooke claimed priority. Although as an undergraduate Newton was raised on the Cartesian Rohault's famed physics textbook, in his older days he wasted precious time on erasing references to Descartes from his manuscripts lest posterity catch a glimpse of his debt to the great Frenchman. It was all the more a futile effort because the famed *Queries* of his *Optics* were bursting with Cartesian notions.

In all this Newton was a true child of a century which Whitehead memorably dubbed as the century of genius.³ Galileo started his career with a major plagiarism in technology as he presented the telescope to the Venetian Senate as his own invention. That he was quickly found out, mattered little. The principle that the winner takes all became a standard in scientific and technological races as well. No wonder that all glory for the discovery of the law of free fall has been customarily ascribed to Galileo, although he was first only in deriving the time-squared measure of space covered in such a fall. Many before him had taken that fall for a constantly accelerating motion. This must have been all too well known to Galileo who acquired his first introduction to non-Aristotelian concepts of inertial and accelerated motion through studies of textbooks introduced in Italy through the Jesuit Collegio Romano.⁴ Nor could he remain ignorant of the works of scholars, mostly Dominicans at the University of Salamanca, the chief cultivators of a still earlier physics teaching at the Sorbonne. Something similar will almost automatically be suspected of Descartes if one recalls that he was the product of the Jesuit college at La Flèche. While Galileo learned about an important new physics from second-hand sources, Descartes almost certainly delved into books printed in the early 1500s when publishers still

saw sales potential in printing medieval lecture notes penned a hundred or so years earlier.⁵

This takes us back to around 1400 when the in-thing for academics was to obtain copies (almost invariably written in quasi-shorthand) of Buridan's commentaries on Aristotle's *On the Heavens*. Even greater was the demand for similar commentaries by Oresme, Buridan's successor in the chair of philosophy at the Sorbonne. Oresme discussed in detail the advantages of assuming the daily rotation of the earth.⁶ A major physical difficulty within this assumption was why bodies not fixed to the earth—birds, clouds, and even stones dropped from a tower—do not fall behind on a fast rotating globe. Oresme's answer was that the earth's rotation was imparted even to such bodies and was kept undiminished by them. In stating this around 1370 Oresme simply gave a special application of the teaching of Buridan about the origin of the steady motion of celestial bodies.

But before rushing to Buridan's epoch-making statements anticipating Newton's first law, a word is to be said about Copernicus. In one aspect, however important for the future of physics, Copernicus was not an innovator at all when he put the sun in the center of the planets (and of the universe). His discourse was very matter-of-fact when he confronted the objections that, on a rotating earth, birds, clouds, and bodies dropped from a tower would fall behind.⁷ This simply proves that by Copernicus' times the solution given by Oresme to the problem had become widely known. The solution in question could not come to Copernicus from any of the three Greek sages—Herkleides, Ekphantus, and Hicetas—whom he quoted as early advocates of the rotation of the earth, nor from the one he did not quote, Aristarchus of Samos, the chief spokesman of heliocentrism in classical Antiquity.⁸

Even if Descartes had not heard of Buridan and Oresme, he as a champion of Copernicus could not fail to note in the

latter's masterwork the essence of what in his hands became a formal statement of the law of inertia, known today as Newton's first law. Had Descartes reflected on his debt to Copernicus, he would still not have informed his readers about it. The geniuses of the century of genius found uncongenial the intellectual honesty to acknowledge their indebtedness to others. Much less were they willing to credit medievals who at that time had already been relegated to the "Dark Ages," a libelous though very successful cultural label produced by Renaissance humanists, all too often virulently scornful of science.

The natural tone of Buridan

The reason for speaking explicitly of Buridan has far more to it than scholarly meticulousness, to say nothing of its kind practised by some historians of science ready to exhaust themselves in crossing the t's and dotting the i's. Probing into that record will explain why it was so easy for Copernicus, Descartes, Kepler, Galileo, and many lesser figures to accept that all bodies on earth shared the earth's motion, rotational as well as orbital. It will also explain why Buridan too evinced no mental agonies as he made his statements that may rightly be seen as the birth-register of Newtonian and modern science. The explanation is that all those in question believed in a saving Birth that once took place in a manger.

Buridan made those statements in his commentaries on Aristotle's *Physics* and *On the Heavens*. In the latter work, Aristotle, as befits a genuine Greek pagan, asserts the eternity of the universe as a self-evident truth.⁹ An immediate corollary of this was the motion, uninterrupted and unslackening since eternity, of the starry sphere and of the lower heavenly bodies. A Christian could only disagree, and many of them did in a most articulate way long before

Buridan. Christians could at most disagree among themselves as to the ground for their disagreement with Aristotle. Buridan must have often heard of the memorable dispute between Thomas and Bonaventure whether the temporality, that is, the strictly finite temporal past of the universe, was a truth that could only be known from revelation or also from reason.¹⁰ That theology or rather revelation asserted categorically the temporality of the universe was formally and solemnly declared a hundred years before Buridan. The year was 1214, the place was the Fourth Lateran Council. Its decree that all creation, spiritual and material, was created *ex nihilo* and *in tempore*¹¹ could only reinforce an already strong adherence to both points. Otherwise, subtle dissent would not have emerged in only one case, the writings of Siger of Brabant.¹²

What is universally shared, often appears uninteresting and almost inconsequential, although the very opposite may be true about it. Buridan's famous passages perfectly illustrate this point. He does not engage in lengthy refutations of Aristotle's claim about the eternity of the universe. Nor does he expand on the question whether the temporality of the universe is known only from revelation or from reason as well. In either case the temporality of the universe was a fact for Buridan, the Christian natural philosopher. In this respect he was but one of countless other Christian intellectuals, a single though precious drop in a vast culture or cultural consciousness.

That culture was not only vastly different in that respect from all other previous cultures, but precisely because of this it had a tremendous advantage over them. The advantage was that of one who in possession of a fact can naturally devote himself to the task of speculating about the *manner* in which that fact appears in reality. That naturalness reveals itself partly in Buridan's tone, partly in the breadth of his vista. In a sense, the most surprising aspect of both of his

famous statements about the physical manner in which all, especially celestial, motion began, is their being introduced by an analysis of the manner in which two earthly motions begin and continue. One was the putting into rotation of a smith's heavy wheel, the other was the manner in which the length of a jump could be increased.¹³

At this point, nothing would be more tempting than to yield to the wisdom of all-knowing hindsight. Armed with it one would emphasize that Buridan started from easily observable facts and then extrapolated them to the cosmos as a whole. Such an empiricist reconstruction of the genesis of Buridan's statements on inertial motion, terrestrial and cosmic, would hardly achieve its presumably de-theologizing aim. De-emphasis of the Christian theological matrix and propellant in Buridan's breakthrough would only increase the evidence about the ancient Greek mind as being in need of salvation. A "natural" genesis of Buridan's thinking would imply the ready availability of it for the Greeks of old and their baffling failure to seize on it. How widely they missed it should be clear from Aristotle's explanation of projectile motion in which the projectile experiences a push from the air closing in behind it in disregard of the resistance of the air in front of it.¹⁴ Buridan, however, emphasized the resistance of the air as he began by noting that the impetus theory explains why

one who wishes to jump a long distance drops back a way in order to run faster, so that by running he might acquire an impetus which would carry him a longer distance in the jump. Whence the person so running and jumping does not feel the air moving him, but rather feels the air in front strongly resisting him.

Such is the "preamble" to an epoch-making cosmological message.¹⁵ Its theological perspective will inconvenience

only those ready to forget for the sake of momentary convenience that all science is cosmology:

Also, since the Bible does not state that appropriate intelligences move the celestial bodies, it could be said that it does not appear necessary to posit intelligences of this kind, because it would be answered that God, when He created the world, moved each of the celestial orbs as He pleased, and in moving them He impressed in them impetuses which moved them without His having to move them any more except by the method of general influence whereby He concurs as a co-agent in all things which take place; "for thus on the seventh day He rested from all work which He had executed by committing to others the actions and the passions in turn." And these impetuses which He impressed in the celestial bodies were not decreased nor corrupted afterwards, because there was no inclination of the celestial bodies for other movements. Nor was there resistance which could be corruptive or repressive of that impetus. But this I do not say assertively, but rather tentatively so that I might seek from the theological masters what they might teach me in these matters as to how these things take place.¹⁶

The first thing to be noted in an age of science about these statements is that they anticipate Newton's first law of motion. Anticipation is taken in that sound evolutionary sense that suggests unfolding and not that cheap trick whereby full-grown rabbits are pulled out of a hat. The second thing to be noted is the vast cosmic matrix of that anticipation. Little or no problem should seem to be posed in this connection by that once hallowed empiricism according to which science proceeds by collecting small data. Tellingly, in the erstwhile Baconian form of that "inductive" empiricism, one did not even have to be "induced" to have some specific idea as to what to look for as the process of

collecting got under way and the investigator persisted in his blind and grim resolve.¹⁷ Contrary to Bacon's expectations, the history of modern science showed not only the crucial fruitfulness of guiding ideas, but also that it was proportional to their vastness. It should therefore seem very scientific that Buridan put a *cosmic* capstone on his formulation of inertial motion in terms of the impetus theory. He was not to suffer a fate similar to the fate of the Chinese of old who, let Needham be recalled once more, had lost intellectual courage about things on a small scale after having parted with their trust in rationality on the highest possible scale.

The universe in Genesis I

It is therefore imperative to unfold as completely as possible the cosmological matrix that fostered Buridan's statements, although at first sight they may seem uncondusive to such analysis. His phrase, "when God created the world," is not so clear a pointer as would have been the phrase, "In the beginning God made the heaven and the earth." Yet Buridan's explicit reference to the seventh day of creation is an all too clear proof that he was thinking in terms of a cosmological vista which subtly acted as part of the mind's salvation. Subtly, in more than one sense. First—it is enough to think of the so-called creationists today—that vista could all too often act as a blindfold, the very opposite to a saving process. This happened whenever the forest was not seen for the trees, that is, whenever attention was so fixed on particular details as to let the general picture disappear and with it the true message carried within it. Countless exegeses of Genesis I from the last two hundred or so years are a case in point.¹⁸ Second, the subtlety of that cosmological vista, whose first formulations are in the Old Testament, acted as the mind's saving grace because they implied nothing that could not be perceived by reason.

It is not beyond the powers of reason to speak about the genesis of the world in terms of building a cosmic tent in six days.¹⁹ The time-span of a week conveyed the skillfulness of the enterprise and so did the phases of it. The phases show a builder who has to start from scratch in the most literal sense and proceed in the only reasonable manner. He has at his disposal but a nondescript chaotic material (*tohu va-bohu*). The nondescriptness is so total as to be equivalent to complete darkness, which is possibly the closest to which metaphorical language can go in suggesting non-being.

Only after the builder produces light (1st day), does he proceed to his logical first step in construction, the erection of the frame of the building. The complete superiority of the builder over his raw material is suggested by his ability to construct first the upper structure of the cosmic tent, or the vault separating the upper from the lower waters (2nd day). Only then follows the construction of the ground level or the emergence of a solid earth safely floating on unfathomable waters (3rd day). With the earth there also appear the plants in witness of the commonly held ancient view that moist earth naturally gives rise to all sorts of vegetation.²⁰ Once the whole framework is on hand, the embellishment of its two major parts (upper and lower) can follow. The stars, the sun, and the moon appear on the heavenly vault (4th day), followed by the appearance of birds, beasts, and fish, as the completion of the terrestrial part of the structure (5th day). The 6th day portrays, most logically, the occupation of the cosmic tent by man as the steward of the Divine Builder who rests on the 7th day, a day of repose already in Hamurabbi's code that antedated by more than a thousand years the redaction of Genesis 1. In view of the general validity of a seven-day week in ancient Mesopotamia, the seventh-day rest should not be seen as a specific borrowing from Babylonian lore.

Genesis 1 will appear rationality incarnate when con-

trasted with the gory confusions of *Enuma elish*, the chief document of Babylonian cosmogony. The latter is conspicuously void of statements that the world made by Marduk is really good. The declarations in Genesis I about the goodness of each phase and of the special goodness of the complete work may be taken for a suggestion that no evil power (let alone such a power identified with matter) had any part in the construction of the cosmic tent. But the same declarations may more immediately mean the stability of the entire work. If there is any quality which a *good* construction must possess, it is stability and endurance. Those doubtful about this point may well ponder the rarity of good plumbing in this age of space-technology.

Universe and Covenant: prophets and psalms

The foregoing point about the stability of the world as a construct may appear trivial, but it is certainly theological in the best biblical sense. Studies of the Old-Testament teaching on creation and Creator still have to discover a point there, a point which may undermine by a single stroke a favorite cliché in many Old-Testament studies. The cliché is the contention that the Old Testament is so exclusively and emphatically about salvation history (an interpretative recount of God's miraculous interventions in the history of the Hebrews of old) that no trace of a cosmology equivalent to natural theology is to be found there. The contention is part of that broader contrast or opposition which is claimed to exist between the Greek mind and the Hebrew mind, or more generally, between reason and revelation. The fact, however, is that in the Old Testament the faithfulness of the God of history is supported not only with a reference to another saving intervention of God into human affairs,²¹ but very often also by a pointed and detailed reference to the faithfulness of the regular working and permanence of a nature created by God. Nowhere in the Old Testament is

there a hint that only by focusing on the great events of salvation history can one perceive the evidence of that natural faithfulness and stability. On the contrary, nature's faithfulness (regularity) and stability are declared to be time and again features immediately obvious to any thinking being. Moreover, that obvious regularity or faithfulness was offered time and again as the ultimate ground for believing in the trustworthiness of the God of salvation history.

Some of the most emphatic declarations of this kind occur in most unexpected contexts in proof of their natural availability. Such a context is the languishing of the Israelites in Babylonian captivity. For a spark of hope about the eventual restoration of Jerusalem they expected from Jeremiah a startling sign, indicative of the presence of the God of salvation history. Although their belief in precisely that God was at stake, it was buttressed by Jeremiah with a reference to the faithfulness of the God of nature, evident in the orderly sequence of day and night (Jer 33:20-21). Jeremiah allowed doubts about the faithfulness of the God of history only for those who would hold possible a breakdown in that natural sequence which by its invariability carries on it the seal of the faithfulness of God the Creator.

Jeremiah's argument (rather similar to the one in Ps 88) is clearly a *reductio ad absurdum*, the absurdity of any conjecture that the order of nature would ever show any instability. Almost in the same breath the same *reductio ad absurdum* is in sight as Jeremiah describes the stability of the physical world (the sequence of day and night) as a covenant between Yahweh and nature that would sooner be broken than would His faithfulness in keeping His covenant with the people of Israel (Jer 33:25-26). Earlier the prospect of the disappearance of Israel as a nation is declared to imply the same kind of absurdity that would be inherent in the assumption that the natural sequence of day and night as established by Yahweh would ever break down (Jer 31:35-36).

In falling back on that argument Jeremiah echoes an

already established prophetic tradition. The firmness of judgments that Isaiah and Deutero-Isaiah utter over Israel and other nations is predicated on the unfailing submission of nature to God's word whereby it was produced in the first place (Is 40:12-26). That Cyrus would be an unfailing tool in carrying out a crucial turn in salvation history is made credible with reference to God's unchallenged power over the universe (Is 44:24) which nothing else can challenge and change for that matter. The same power of absolute certainty is invoked to make credible the rebuilding of Jerusalem (Is 45:12). The latter is as firmly to be believed as the firmness with which the earth has been established (Is 45:18). The prophet is not reluctant to generalize and he does so with a cosmic sweep. None of God's utterances relating to salvation history should be looked upon as said in vain because nothing in nature happens in vain (Is 55:10)! This subclose, so Aristotelian and Stoic in appearance, was no less genuinely Hebrew. To be sure, Yahweh and He alone can bring the processes of nature to an end, but this possibility is admitted only with reference to the final judgment of all (Is 23:10-11; 21:13; 24:4).

Whatever the limited familiarity of the people with the writings of the prophets, popular familiarity with the psalms was unlimited. Psalm 88 is nothing less than a thematic development and resolution of the question whether the God of salvation history can be trusted in spite of the upheavals that seemed to wreck the House of David. The resolution is given in terms of the cosmic truth of the heavens' endurance and in terms of the absolute hold which only the Creator can have over the visible world. The move in that Psalm from the "heavens' witness" to "the assembly of the holy ones," and not in the reverse direction, is not a happenstance. The same move is the backbone of Psalm 18, which first recounts the order evidenced by the physical realm before expanding on the moral order provided by the Law, and provides the

framework for Psalm 135. There the phrase of God's "love without end" is interposed between phrases in which first the steps of creation and then those of Exodus are recounted. In view of this, the sequence of two great Psalms, 103 and 104, the first celebrating the physical realm as evidence of the Creator, and the second doing the same about the wonders of Exodus, should not seem accidental at all. Similar is the sequence in Psalm 31 and in Psalm 96.

Instances are numerous in the Psalms when resolution of the sinful individual's unstable predicament is given with a reference to the confidence which the stability of nature as a work of the Creator should inspire (Ps 35, 80, 120). In Psalm 73 the lamentation over the destruction of Jerusalem has its dénouement in the look at God's firm hold over the created realm:

Yours is the day and yours is the night.
It was you who appointed the light and the sun:
it was you who fixed the bounds of the earth:
you who made both summer and winter (Ps 73:16-17).

That God's creative action, which is a function of his mere word, is stable is an idea so natural that it represents a backdrop in Psalm 117 to continued reference to the permanent validity of moral laws:

Your word, O Lord, for ever
stands firm in the heavens:
your truth lasts from age to age
like the earth you created (Ps 118:89-90).

No wonder then that the un failing processes of nature can serve as a supreme token of the certainty of the enduring rule of the Messiah in his kingdom:

He shall endure like the sun and the moon
from age to age . . .
In his days justice shall flourish

and peace till the moon fails . . .
 May his name be blessed for ever
 and endure like the sun (Ps 71:5-7, 17).

What is particularly telling in all these passages is the naturalness of the reference in them to the order and stability exuding from creation (Ps 92, 95, 148). Hesitation in that respect is declared to be the sad privilege of fools (Ps 13 and 52). Evidences of stability are the sun and the moon as "faithful witnesses in the sky" (Ps 88:37-38) and the stars by being fixed there and by their fixed number (Ps 146:4-6). Thinking about the sky as a tent stretched out is no obstacle to seeing it as something to stand firm forever (Ps 103:2, 5). To illustrate God's unlimited endurance the Psalmist can find no better means than a reference to the endurance of the heavens and the earth (founded in the beginning by God) as a mere transition, no more lasting than clothes that are changed and wear out (Ps 101:27-8). Some changes, some wearing out!—a biblical Churchill would aptly add, lest a tyro misread a slighting of cosmic stability done with tongue in cheek.

It is indeed the endurance and stability of the physical realm which in the Bible is the most suitable backdrop for declaring the eternal validity of God's actions and plans and of the eternity of His own very endurance. Cosmic ages are meant when the Psalmist declares the endurance of the plans of His heart (mind) "from age to age" (Ps 32:11). This is why the complete dominion over the world ascribed to God (Ps 49:12) does not imply as much as a hint of capriciousness customary with absolute rulers. God's rule over the world as being consistent is also conveyed by the references to the conviction that the *same* world attests it "from age to age" (Ps 144:4, 13).

Universe and Covenant: Wisdom literature

A people that had these psalmodic utterances in their bones could not help resonating as they heard the stability of the

created realm celebrated in the Wisdom literature. The most puzzling part of that literature is Ecclesiastes owing to a skepticism reverberating through its lines. But even there the apparent meaninglessness of any and all human endeavor is resolved in the end with a counsel to appreciate nature's orderliness (12:1-2). Similar is the solution in Job's story which typifies countless other human trials. Job's answer to the sceptical objections of his three friends culminates in a reference to the wisdom evident in the universe as a creation of God. On hearing Job speak about the will of God that "gave weight to the wind and measured out the waters with a gauge" (23:25), only pedantic minds would claim that this is still not entirely a phrase characteristic of "Greek" rationality. When Job is once more seized with doubts, only a natural remedy is offered to him. He is reminded by God of the wisdom apparent everywhere in the universe. It is in that sense that he is referred to the position and course of the Pleiades, the Big Bear, and other constellations. The clouds and lightning are presented to him as unquestioning servants of God. He is told to think of the wonderful arrangements made for the mountain goat, the wild ass, the hawk, and the eagle, to say nothing of those made for the behemoth (rhinoceros) and for the leviathan (crocodile) (Jb 38, 39, 40).

This picturesque concrete style is not the only way in which the Hebrews of old, still uninfluenced by Hellenism, could look at the universe. In the third chapter of Baruch, certainly on hand prior to the great cultural transformation triggered by Alexander the Great, the Torah is defended as the storehouse of wisdom because it has the same Author whose wisdom is everywhere evident in creation. One of the signs of that wisdom is the firmness with which the earth has been set forever. Another is the unfailing obedience of the light and of the stars to God's order. In the book of Proverbs, three series of instructions about wise behavior are introduced with an encomium of the value of

wisdom. The starting point is a reference to God's wisdom evident in the created realm. A chief indication of that wisdom is once more the stability of natural order, the firmness of the heavens, and of the earth in particular. The celebration of wisdom ends five chapters later with a personification of God's wisdom and with a renewed emphasis on the stability and orderliness of nature set by that wisdom on behalf of God the Creator:

When he fixed the heavens firm, I was there,
 when he drew a ring on the surface of the deep,
 when he thickened the clouds above,
 when he fixed fast the springs of the deep,
 when he assigned the sea its boundaries
 —and the waters will not invade the shore—
 when he laid down the foundations of the earth,
 I was by his side, a master craftsman . . . (Prov 8:26-30).

This celebrated passage, dating from before the invasion of Palestine by Greek teachers accompanying the hordes of soldiers and administrators, is a bridge between the concrete and the abstract. It crowns the Hebrew part of the Old Testament in a manner which, though not a mirror image of Greek thought, is in striking harmony with it. The manner is naturally continued in a famed passage of the Book of Wisdom, composed outside Palestine in full Hellenistic times, and in Greek to boot. There "naturally stupid" is the epithet tagged on men who "from the good things that are seen, have not been able to discover Him-who-is, or by studying the works, have failed to recognize the Artificer" (Wis 13:1-2). Yet, if there is an excuse for them it is specified to lie in their being seized by the beauty of the *cosmos* which means enduring order.²² Tellingly, they are not urged to take that order lightly, but rather to see in it that perfection that alone can properly mirror the perfection of the One who created it. Much more reprehensible are found those who

instead of the great Nature worshiped mere human artifacts. The latter are so many second-rate products, perishable and variable, unlike the work of the One “who arranged all things by measure, number, weight” (Wis 11:20).

This phrase contains the best which the finest Stoics could in their best moments utter about cosmic order or harmony. Of course, the One to whom the passage refers is infinitely superior to the one world (*to pan* or the physical cosmos plus the infinite void around it) beyond which the Stoic celebrations of the “One” never went in a convincing manner. It should not therefore be surprising that the same Book of Wisdom contains statements about stable cosmic order that, unlike the corresponding statements of Stoics (or of Platonists, Aristotelians, and Epicureans), are not tainted by the specter of periodic collapse into complete disorder (by conflagration or by some other “disorderly” means).²³ The reason for this is that the One in question is an absolutely transcendental personal Reason, Power, and Love:

You love all that exists, you hold nothing of what you have
made in abhorrence,
for had you hated anything, you would not have formed it.
And how, had you not willed it, could a thing persist,
how be conserved if not called forth by you?
You spare all things because all things are yours, Lord,
lover of life,
you whose imperishable spirit is in all (Wis 11:24-27).

That no such passage could come forth from within any of those distinguished sects shows something of the distinctness of biblical revelation. Within its milieu alone could mere humans think and speak as if they had been propelled to a height that would be classed purely human had not a Fall made it appear superhuman. The evidence about that milieu is the literary reappearance within it of the same uniquely elevated perspective about matters cosmic. In a

book written by a certain Jeshua (Jesus), Son of Sirach, there is a reference to "the always perpetual moon" (Sir 43:6) as one of the several evidences that can be specified concerning "all the marvels which the Almighty Lord has solidly constructed for the universe to stand firm in his glory" (Sir 42:27). But, according to the same Jeshua, Son of Sirach, if the Lord "has imposed an order on the magnificent works of his wisdom," that is, a consistent continuity, it is only because "He is from everlasting to everlasting" (42:21). This is why the stars never "grow slack at their watch" (43:11), this is why "all things hold together" (43:28).

The continuity of this thinking with the one embodied in the Psalms about the cosmos as the logically primordial evidence of God's wisdom has a striking proof in the first part of Jeshua's book dealing with the wisdom of the precepts of the Law (partly ritual, mostly moral, with many of the latter being a part of a set of natural laws of morality). The permanent and universal validity of those laws is predicated on the permanent and universal lawfulness of the physical universe:

When God created his works in the beginning,
 he allotted them their portions as soon as they were made.
 He determined his works for all time,
 from their beginnings to their distant future.
 They know neither hunger nor weariness,
 and they never desert their duties.
 None has jostled ever its neighbour,
 they will never disobey his word (Sir 16:24-26).

Such a universal and lasting obedience of all inanimate things is equivalent, of course, to their permanent coherence. Quite possibly this is the intended meaning of that often debated expression in the same book that "He created all together." Once the Greek original (*koinē*) of "together" was translated into Latin as *simul*, learned Latin Christians

(unlearned in Greek, such as Augustine) could take it for the creation of all *at once*, that is, in the first moment of creation.²⁴ Whatever the applicability of its Latin version, the adverb *koinē* is in patent harmony with the idea of complete togetherness and lasting coherence of all things celebrated elsewhere and repeatedly in the book of Jeshua, Son of Sirach.

A celebrated book it became, though not in Jewish ambience. It soon turned into the favorite ecclesial book (Ecclesiasticus) in Christian communities that almost everywhere in the *oikumenē* had Hellenistic Jews (often unfamiliar with the Hebrew Scriptures) as their erstwhile constituents. They were also the ones to bring along with them a sacred respect for the Two Books of Maccabees that contain the first biblical appearance of the phrase "creation out of nothing" (*ek ouk ontōn* or *ex nihilo*).²⁵ The heroic martyrdom of seven brothers (and the no less heroic support given them by their mother), which is the immediate context of the expression, should in itself make one suspicious about those scholars who are resolved to see in it not a reference to strict nothing but to a mere "formless" matter. Such scholars patently overlook the fact that the "formless" matter of Plato and Aristotle is very much a *something* compared with strict nothing.

At any rate, no martyrdom, with a hope of bodily resurrection, was ever inspired by a Demiourgos whose "creative" power consisted in the ability to manipulate the already existing "formless" matter into actual shapes. Nor was the Demiourgos ever credited with raising the dead to life. This alone should caution against seeing less than a strict creation out of nothing in St Paul's praise of God "who restores the dead to life and calls into being those things which had not been" (Rom 4:17). Once that kind of creation is seen in this passage, quite natural will appear a favorite argument of the first Christian apologists: the raising of the

dead cannot be beyond the powers of a God who created all out of nothing in the first place.²⁶ No less importantly, only such a God or Creator, who is implied everywhere in the Old Testament by the absence there of a rival power (be it "formless" matter) to Yahweh, could be seen as so superior to nature that the coherence and permanence He granted that nature could not appear as a threat to His absolute sovereignty over it.

Buridan's debt to a cosmic tradition

All this was explicitly or implicitly in the back of Buridan's mind as he penned that historic passage. Even as a lay medieval Christian intellectual he was fully familiar with theology, the Bible, and certainly with the Psalms. Furthermore, he belonged to that intellectual trend (greatly catalyzed by the decision of 1277) in which emphasis was laid on the ability of God to create any kind of world.²⁷ In the other main trend, with Thomas as its chief representative, much benefit of doubt was accorded to Aristotle's account of the structure and dynamics of the world. Buridan was not, however, one of those hotheads who saw plain heresies in Thomas' benevolent utterances on Aristotle's cosmology, as if Thomas had ever endorsed its necessitarian character! Only Ockham and similar firebrands persisted in this after Thomas' canonization in 1323, an event that must have impressed Buridan as it very much involved the Sorbonne. A proof of this is his unhesitating endorsement of the cosmological argument, an anathema for Ockham and his progeny, old and new, religious and secular. Ockham could not have departed further from the long-standing theological and philosophical consensus as he struck at the root of the distinction between creation out of nothing and conservation of beings already created. It is that conservation which was meant by Buridan's reference to "the general

influence whereby He (God) concurs as a co-agent in all things which take place.”²⁸

Conceptually, conservation as God’s act lends itself to more misunderstanding than creation out of nothing. The latter implies a categorical either-or which leaves little room for spurious intellectual maneuvering. The objection that such a creation reifies the “nothing” is a sheer misunderstanding of the phrase and a lack of information about the meaning given it by those 2nd- and 3rd-century Church Fathers who made it part and parcel of Christian theology. The idea of conservation as God’s *creative* act is fraught with all those conceptual pitfalls that have made themselves invariably present in connection with almost any topic dealing with God’s relation to already existing created beings.

One of those pitfalls is the deistic notion, popularized by Voltaire, of God as a watchmaker who after having constructed his clockwork universe leaves it completely alone. In spreading that idea, Voltaire merely divested a very medieval phrase (Oresme used it with great relish)²⁹ of its theological safeguards. Another of those pitfalls is the mystical urge to see God so much everywhere and in everything as to make a coherent nature practically imperceptible. Such was the case when Ockham insisted on the radical disconnectedness between stars and starlight. Today it appears in some theologians’ misguided recourse to quantum mechanics, or rather to its Copenhagen interpretation, where God is turned into a “fill-in” to connect events that are denied causal ties because the physical interaction between them cannot be measured exactly. But this is to anticipate.

Prior to Buridan not a few Christian thinkers were willing to see angels (which they took for the Christian version of Aristotelian and Plotinian intelligences) as motors behind celestial motions. The invocation of angelic agents as motors of physical bodies, especially of such principal bodies as the stars and planets, could easily lead to the personification of

an essentially impersonal physical world. In the process a most precious and least noted contribution of Christianity to the birth of science could have been seriously threatened and compromised. But already at the dawn of the medieval grappling with the relation of reason and revelation explicit statements were made (Adelard of Bath is an example; others are some members of the School of Chartres) on behalf of the impersonal and autonomous character of the laws of nature. The soundness of that outlook, so germane for the eventual fortunes of science, depended on awareness of the only meaning that could be tagged within Christian context to the word *autonomous*.

Belief in creation out of nothing could alone forestall the development which already in the century of genius (as will be discussed in detail in the next chapter) took "autonomous" as true in itself and by itself, that is, on an *a priori* basis. Decrease of theological depth quickly became the harbinger of scientific shallows on which not a few great scientists were to run aground. Their sole excuse lay in that "climate of thought," a phrase coined in the latter part of the century of genius,³⁰ which acted as an opaque cloud. It prevented them from perceiving the Christian provenance of the swaddling clothes which the robustly growing scientific enterprise was disdainfully casting away.

To appreciate that contribution, and to see it in its historical context, we must once more return to Buridan's epoch-making passage. There, as has been seen, Buridan introduced the application of impetus theory to celestial motion with a reference to a long jump, a most ordinary terrestrial motion. To speak in the same breath of these two motions presupposed the conviction that all bodies in the universe were on the same level. This conviction, which in all evidence was a most natural matter for Buridan, would have been most unnatural for a Greek of old. The essential difference between celestial (superlunary) matter and the terres-

trial (sublunary) matter was for Plato and Aristotle not merely a basic tenet but also a religious dogma. The difference practically amounted to one between divine and non-divine. The strength of that conviction or dogma can be gauged by the measure taken against Anaxagoras who held the black stone (meteor) that hit Aegospotamoi in the Peloponnesus to be a simple stone in spite of its apparently super-lunary provenance.

Greeks, Jews, and Muslims

Those Greek intellectuals who tried to break down this wall of division between celestial and terrestrial matter, could do so only at a very heavy price. The latter was the disappearance of rational coherence in a matter brought to the same level. Incoherence ruled that Democritean universe in which atoms as well as worlds were present in all conceivable sizes. The same incoherence lurked in the role which Epicurus (and later Lucretius) assigned to the random swerving of atoms which alone could assure their coalescence into larger bodies. As for the rationality of the Stoic universe based on the universal role of fire, it was merely a brave front put up in face of fundamental irrationality and hopelessness.

The placing of all matter on the same level was a direct corollary of belief in the createdness of the universe. This connection could be seen only when createdness meant strictly, emphatically, and unequivocally a creation out of nothing. In the absence of a firm espousal of such a notion of creation, the "leveling" of all matter, so important for the future of science, did not follow emphatically and at times not even clearly. The lengthy works of Philo of Alexandria, about whose monotheism there can be no doubt, are particularly instructive in this connection. They contain no explicit endorsement of creation out of nothing and only one

statement that strongly suggests it.³¹ A radical break with the Aristotelian distinction between celestial and terrestrial matter is equally absent in the works of Maimonides, the next towering Jewish intellectual with memorable literary output. His critique of Aristotle is just as spotty as the one penned by Crescas³² two centuries later when Aristotle was as heatedly criticized in Latin Christendom as he was revered. The clarity of creation out of nothing is not, of course, to be looked for in the murky flood of cabalistic Jewish lore produced from late Antiquity on through the medieval centuries and beyond.

A brief look at modern Jewish thinking about creation has no less instructiveness. Its non-orthodox branch shows a growing tendency toward pantheism or a dilution of monotheism in the measure in which it does not include the assertion of creation out of nothing. The shying away from creation out of nothing in some modern orthodox Jewish works on creation is justified there on the ground that it is not explicit in Genesis 1, a reasoning which contains more than meets the eye.³³ The real justification may lie in the perpetuation of the radically negative stance which Palestinian Judaism took a generation after Philo against Alexandrian Judaism. The stance carried with it a suspicion about details in sacred books written in Greek within Alexandrian Judaism. The Palestinian rabbinate, which adopted a most conservative stance following the destruction of Jerusalem, could hardly be sympathetic to "innovations" in those books, although they merely made explicit that which had already been implicit in the Hebrew scriptures. More importantly, the sympathy shown by Christian Jews for those books could but generate dislike for them in opposite quarters.

Undoubtedly, secular scholarship will by and large frown on this religious explanation of the failure of Hellenistic and medieval Jewish intellectual tradition to issue in a break-

through similar to the one achieved by Buridan. The preference of that scholarship for purely sociological explanations will appear rather self-defeating when one turns to the Muslim ambience. Unlike the Jewish world—scattered, fragmented, uprooted for over many centuries following the destruction of Jerusalem by the legions of Titus in 70 A.D.—the Muslim ambience quickly turned into a vast politico-social entity: as a huge crescent it stretched from India to France along the southern shores of the Mediterranean. Whatever the status of Muhammad as a prophet (who is to foretell events, an art on which the Prophet was not keen at all), he was certainly a crusader from the very start. He never for a moment considered a peaceful retirement with his views to any safe corner in the Arabian peninsula. Nor did his followers, and for an undoubtedly religious motivation. It consisted in a burning zeal to spread “pure” monotheism. The vista of opulent booty along the holy-war-path did not, of course, dampen that zeal.

The “pure” monotheism promoted by that zeal was purism incarnate in that the Creator-God (Allah) of the Koran was to remain free of any consistency which a world created freely by Him might “impose” on Him. Orthodox Muslim scholars did their utmost to undermine the notion of a universe operating along consistent laws as a taint on Allah’s absolute freedom to do whatever He wanted. The Mutakallimum, or the orthodox Muslim party, were willing to recognize in the laws of nature only some habits similar to the customary riding of the king of a city through its streets. Just as the king could break his riding habit any day, so could Allah change at any moment the pattern of any or all part of the universe. This graphic characterization by Maimonides, physician of the Kaliph in Cairo,³⁴ of the world view generated by the Koran’s notion of the Creator told more about that notion than could be told in long treatises. No less telling was Maimonides’ failure to note the

utterly detrimental impact of that notion for the scientific enterprise.

Beneath Maimonides' graphic simile about capriciousness in nature, there lay the worship of a capricious Creator whose image lurks between the lines of the Koran. Its over-emphasis on the will of Allah as against His rationality set the uncompromising tone of a "pure" monotheism claimed on its basis. For that "purism" the Christian doctrine of the Trinity was a cryptic form of polytheism to be exterminated from the face of the earth.³⁵ The classic Christian answer (which insists on the One God in three Persons while denying separate personal or "psychological" consciousness to Persons defined as *relationes subsistentes* and begs the Muslims to correct their misconceptions) is too well known to be developed here. In this age of science, a more telling answer may be on hand in terms of the immortal dictum "by their fruits you shall know them," provided that scientific fruit or fruitfulness in science is looked for.

Universe and Christology

The Trinitarian dogma is anchored in perceiving a concrete flesh and blood being, Jesus of Nazareth, as *the* Son of a God whom Jews as well as Muslims are fond of calling Father. For Christians, Jesus is an only Son in a sense that prompted on their part a revolutionary break with Greek semantics. That break was expressive of the manner in which the life, words, and actions of Jesus suggested a radical break with all known human patterns. With the Greeks and Romans the expression "only begotten" (*monogenēs* or *unigenitus*) had the universe for its supreme reference point. Such was the use of the expression by Plato, Plutarch, and Cicero to mention only some major Greek and Roman spokesmen of Antiquity.³⁶ They took the universe for *the* only begotten entity because they all saw in it the *par excellence* emanation from

the First Principle, or Supreme Good, or Prime Mover, or whatever philosophical label was compatible with the pantheism on hand. Hence the strict divinity of the heavens and also the non-divinity or partial irrationality of the regions below the heavens within the Greco-Roman perspective.

It should be obvious that that universe had to lose its status as only begotten in the eyes of those who called a flesh and blood being the *only begotten* Son of a Divine Father and did so in the most exalted sense that could be formed by human minds. Admire as they did the universe as the chief evidence of the Creator (the first chapter of Paul's Letter to the Romans is a most memorable instance), their admiration for it was also an act whereby the universe was put in its place, the place above which no mere creation could aspire. With Christians, inspired not by an abstract theologoumenon, but by a most vivid vision of a most tangible *only begotten* Son of God, the universe could not retain its hallowed status as a "begetting" from the "divine," that is, the status befitting an entity sharing divine nature. With Christians the universe had to remain a mere creature. This had to be so in spite of the comprehensiveness of all created perfections that made for Christians the notion of the universe the most exalted notion conceivable apart from that of God Almighty. John Henry Newman merely added the touch of his charmingly simple diction to that age-long Christian view when he declared in *The Idea of a University*: "There is but one thought greater than that of the universe, and that is the thought of its Maker."³⁷

Thus in the Christian perspective the exaltedness of the universe remained intact as it was lowered through that infinite distance which is between Creator and creature. The alertness within a genuine Christian milieu to the danger of toying with pantheism served the proper understanding of the universe in a measure still not sufficiently esteemed by historians of science. It was, historically speaking, the first

manifestation of the saving grace which the Christian doctrine of salvation in and through Jesus of Nazareth, the Son of the Living God, provided for science. The other was unfolded two centuries or so later in the crucible of the first series of Trinitarian debates brought to a head by Arius and his allies.

For some time before Arius, the doctrine of the divine Logos-Son needed articulate defenders. The Gnostics, with their sundry emanationist systems, never tired of speaking of the Logos while divesting the Jesus-Logos of its flesh and blood reality. This is not to suggest that such major opponents of Gnosticism as Hippolytus and Irenaeus were the first to buttress the divine status of Jesus by attributing to Him the work of creation of which only a divine being was capable. Already with St Paul the attribution of the work of creation to Christ is the chief device to ward off the appearance of a duality between the Father and the Son. His most thematic passage (Col 1:15-20) should seem noteworthy also for the sequence in it. He first sets forth Christ's creative work and only afterwards his redeeming function. With his transfer to Christ and the Church of the Stoic portrayal of the cosmos as *body* and *fullness* (*sōma* and *plerōma*) Paul helped the Colossians and all subsequent Christian communities to be on the alert against pantheism. No less formative of Christian perspective on the cosmos was his conviction, expressed in his letter to the Ephesians (3:18), that through Christ they would comprehend what is "the breadth, length, height, and depth." Paul clearly meant to lift Christian views on the cosmos above the splendid morass of Stoic cosmology in which the same expression was a borrowing from astronomical lore.³⁸

Cosmological inferences were not missing as Paul implemented his chief aim, the shaping of Christian consciousness through an emphasis on the pervasive presence of sin from which faith in Christ was the only escape hatch. Thus

he warned about the spiritual threat to that consciousness through the cosmic presence "of Powers, Sovereignities, Dominations, Thrones, and Forces" (Col 1:16 and Eph 1:20-21). As developments lying ahead in the scientific future were to show, science itself would be discredited by a programmatic denial of spiritual dimensions. The denial took place through an exclusive emphasis on the quantitative aspect of the physical realm, an emphasis that readily turned into the dehumanizing trap of physicalism and scientism, obviously to the sheer delight of those Powers and Forces.

No less revealing about that distant future was Paul's outspokenness in the first chapter of his Letter to the Romans which remains the classic New Testament document about original sin. There he minced no words about the moral depravity that ensues from the refusal to recognize the Creator behind the astonishing orderliness of the physical world. Paul would be the first to see the connection between the utter moral relativism of our times and the wholly negative attitude of our intellectual trend-setters toward the cosmological argument. It would certainly be grist to Paul's mill that they paid no heed even to Einstein who warned, though rather belatedly, that the Theory of Relativity had most absolutist features.³⁹ At any rate, it provided, as will be seen in the next chapter, the first contradiction-free account of the universe (hardly a relative entity) in the history of science.

The chief contestation about orthodoxy became riveted not so much on Pauline expressions as on two identifications of Christ in the writings of John. One was *monogenēs*, the other *logos*. About the role of *monogenēs* in the first phase of Trinitarian doctrines debates let it suffice here to recall the following. Arius was willing to settle with *monogenēs*, as were the bishops in sympathy with him. They saw in *monogenēs* the term which could serve as a bridge toward Hellen-

istic culture, though not necessarily (with the exception of Arius and some strictly Arian bishops) toward its emanationist pantheism. Tellingly, the indirectly pro-Arian bishops (to say nothing of their explicitly pro-Arian kind) resisted the term *consubstantial* of the orthodox party on the ground that it was not scriptural! Had they had their way against the young deacon Athanasius, Christianity, as Harnack once noted, would have been completely destroyed.⁴⁰ This possibility should be a perennial warning to those who derive the Church from Scriptures (and in particular from its being printed in millions of copies) and not the Scriptures from the Church in whose bosom they were composed and given the seal of authority. As to "Horatios" who "care not of these things" (owing to their exclusive preoccupation with science as the new savior), they represent the perennial cultural Bourbons. They learn nothing from history, no matter how much they fix their eyes on the scientific past in order to make conjectures about its future.

Undoubtedly, they will not be impressed by the role which the defense of a truly divine Logos played in those Trinitarian debates whatever the patently "scientific" aspect of that role. The aspect in question is the emphasis which the stalwarts of orthodoxy (Hippolytus, Irenaeus, and Athanasius) laid on the full logicity or orderliness of the universe. Their argument was simplicity itself: If the Logos was fully divine, its creative work had to be the paragon of logic and order. From the viewpoint of the historian of ideas or of science, especially telling should seem the fact that the argument implied a thematic reference to the incomplete rationality assigned by Greek sages to the universe. In fact even an Eusebius, undoubtedly orthodox in his belief, but hardly a champion of orthodoxy, was keen on that difference between imperfect and perfect cosmic rationality. A major evidence of this is his early work, *Praeparatio evangelica*, where the first three books deal with Greek and

Egyptian cosmogonies as deprived of rationality precisely because of the role given there to Chance. To be sure, Eusebius sees full rationality in Plato's cosmology, but only because he takes it to be a borrowing from Moses, a mere rehash of Genesis 1.⁴¹

Only a historian of ideas unable or unwilling to take seriously Eusebius' genuine Christianity will write his claim off as a laughable matter. Behind its apparently ridiculous character lies a broadly shared Christian conviction about the full rationality of the universe, a conviction rooted in belief in the strict divinity of the Logos. The historian in question certainly cannot deny the broad continuity of that conviction in Western Christendom within which science was to be born. His only "scholarly" objection can amount to no more than to raising the question whether during the ten or so centuries separating Athanasius or Augustine from a Buridan or Copernicus, the written Christian record about that conviction is sufficiently "continuous" and "complete," if not plainly verbose for the sake of pedants.

This is not the place for reconstructing that record which will be presented in a long work now being written.⁴² At any rate, the historian appreciative only of writings but not of writers, because the latter are not sympathetic to him, will become the prisoner of his own sympathies. He will then take some half-jesting remarks of Buridan and Oresme for a proof that they were not believers but skeptics.⁴³ Underneath this sleight of hand lies the "dogmatic" conviction that no intelligent individual, let alone an individual creatively intelligent in the sciences, can espouse wholeheartedly basic Christian dogmas. The result is that a Copernicus is turned into a Renaissance man. Such is a transparent device to minimize the support he derived from his Christian faith as he conceived and kept developing his views that opened the way to a truly scientific grasp of the universe, the greatest prize for science.

Self-defeating denial

Without anticipating the next chapter, which will begin with a portrayal of the Christian bases of heliocentrism, enough should seem to be on hand to sense the absurdity of the claim that the doctrine of creation out of nothing is the greatest conceivable absurdity. Fichte was not the first or the last in modern times to insist that "the assumption of a creation is the basic error of all false metaphysics and religious doctrine and in particular is the ultimate principle of Judaism and Heathenism." He may have been the first to state that "the denial of creation is the first criterion of truth" as understood by Christ!⁴⁴ In the light of this extraordinary reasoning the art of "reinterpretation" that claims countless victims nowadays may appear the primary manifestation of the first among the secondary effects of original sin.

To make matters worse, Fichte invoked a "properly understood" Johannine gospel on behalf of his claim that has for its only merit the light which it throws, through its utter plainness, on the real nature of German Idealism. Had Saint John been still alive when Fichte delivered, in Berlin in 1806, his lectures on pointers to a "blessed life," he would have repeated to Fichte the words of the Word made flesh in whom God created all: "And men loved darkness rather than light" (Jn 3:19). The carefree rape of the historical record implied in Fichte's claim is part and parcel of a brazenly *a priori* attitude toward history that runs through German idealism from Kant to Hegel and beyond. The self-development of the Absolute Spirit through history almost called for absolutely erroneous illustrations. Accompanying the farce was the proud refusal, already evident in Kant, to admit plain error in matters historical. Hegel's "so much worse for history" may be apocryphal, but unmistakably characteristic.

Logic exacted its due in other notable cases as well.

Fichte's lead was not needed by William James when in his *Pluralistic Universe* he praised Hindu pantheism. Its "intellectual lucidity" was contrasted by him to the "Church doctrine" of creation out of nothing, as if that doctrine meant an "external contriver" and excluded "the indwelling divine."⁴⁵ Pantheism was the only religion compatible with William James' pragmatism, one of the chief substitutes for Western man for his Christian moorings. The substitution is an opting for a new savior. Fichte found his savior in a "Wissenschaft" hardly identical with hard science. No wonder that he spoke as little as possible about the real universe. James, always at his weakest when he elaborated on exact science into which in vain he tried to turn psychology, tended toward polytheistic mysticism. Within it the universe became quickly dissected into irreducible pluralities, as if made by several gods.

To notice the utter lack of novelty in James' option one has to be aware of an argument of Athanasius, by now more than a millennium and a half old: "If there were a plurality of gods, there would necessarily be also more universes than one. For neither is it reasonable for more than one God to make a single universe, nor for the one universe to be made by more than one God because of the absurdities which would result in this." The passage, tellingly, comes from Athanasius' great book *Against the Heathen*.⁴⁶ As the next chapter will show, the absurdities were to include in our times monumentally antiscientific ones, precisely because they were bound to touch on the universe, the most monumental object available for man's scientific understanding.

A pivotal pattern of intellectual history, closely tied to the history of science, may seem to constitute an argument of overwhelming force in this age of science. It would, however, be a thorough misunderstanding of the Christian doctrine of salvation to expect a ready conversion on the part of addicts to Idealism or to Pragmatism (which between them

cover many of the anti-Christian options) on being presented with such an argument. After all, not even all those who cherish being the beneficiaries of that salvation have their eyes steadily fixed on a major pattern set forth in this chapter, possibly because they find in science a less easy subject than in theology. They should realize the threat posed to theology by its alleged easiness. In a sense far deeper and wider than one may suspect, there is a need for a theological salvation of the intellect in this age of science and with a reference to science. That salvation may help rescue theology from the edges of a precipice to which it has steadily edged for some time mainly because many theologians tried to be "scientific," without knowing hard science. They have overlooked the elementary fact that intricate patterns, the business of science, must, in order to exist, inhere in beings or things that exist. This is why they have grown insensitive to the totality of beings, the universe, although it remains, insofar as it *exists*, the only safe road for the theologically tuned intellect to the Being that gives existence to any and all.

Chapter Three

UNIVERSE AND SALVATION

Everything matters—except everything

G. K. Chesterton

Heliocentrism and Christian faith

To a Christian, salvation means the Savior's coming in the fullness of time. The Christian sense of that fullness has always evoked a mystery though not to the extent of depriving it of reasonableness. Various reasons—biblical, archaeological, literary, and political—support the theological perception that by Caesar Augustus' time Jewish Messianism was ripe to be forcefully reminded of its spiritual goals and have them fulfilled. As to the mysteriousness of the fullness of time, one aspect of it was that only five centuries later did it become the starting point of a new and ultimately global chronology. Therein lay a notable fruit of the wisdom of hindsight for which the brave social engineers of the French Revolution had little use a thousand years later. They obviously thought their work to be a foregone success as they started counting the years from 1793. Possibly they were encouraged by the fact that only fifty or so years earlier the chronology known as Anno Domini had at least two rivals. Then a year, say 1743 A.D., still could be written as 2546 (counting from the foundation of Rome), or 5563 (counting from the creation of the world in terms of a simplistic reading of the Old Testament). Contrary to the expectations of those social engineers, the sudden exclusive-

ness (in Western Europe at least) of a chronology starting with Christ (not decreed by Pope or King) easily survived a cultural turmoil, although Christ and Christianity appeared at one moment to be definitely eliminated by Robespierre and his cohorts.

Fullness could easily be felt about the decades that saw the politico-cultural unification by Romans of an *oikumenē* largely restricted to the shores of the Mediterranean—a mere inland sea. This view, within which so much was made of a great instauration predicted by Virgil with an eye on Caesar Augustus, became less convincing when the *oikumenē* suddenly shrank to the status of a mere province on a vast globe. This happened when ships sailing from once famous Roman ports (Genova, Seville, Lisbon, Nantes, and Plymouth) reached the Caribbean, opened the vast new world of America, and established steady ties with China and Japan. Inhabitants of the latter put on the spot no less a preacher of Christian salvation than St Francis Xavier with their question about the timing of Christ's birth.¹ Had the Japanese suspected at that time that at least a hundred thousand human generations had preceded them, the birth of Christ could appear to have come hopelessly late to any and all. At any rate, they objected to Xavier's message on the ground that no message could be of real importance if its delivery was delayed by fifteen hundred years. All that Xavier could offer as an answer was a counter-objection: did not the Japanese feel, prior to his coming with the gospel (good news) about Christ, that murder and especially theft (in the latter he quickly recognized a native vice among his hosts) were an unqualified evil? Only when this was admitted did Christianity gain a foothold. Familiarity with Christianity could not, however, be achieved without exposure to the Western world.

Though not Xavier, other Jesuit missionaries were to make much of the superiority of Western science, especially

astronomy, as they tried to make Christianity respectable in China in which they quickly recognized the potentially greatest prize for the future of Christendom. The astronomy they offered was Ptolemaic. Though they were eager to show the telescope, Copernicus was not to be mentioned.² This is not to suggest that the non-infallible character of the two condemnations of Galileo had not been realized as soon as they were laid down. Descartes and a little later the Protestant Leibniz were memorable witnesses on this point. That papal infallibility escaped only by a hair's breadth from the crucible of the Galileo case³ could, however, become clear only in the measure in which heliocentrism obtained its experimental proofs in the course of the 19th century by the observation of stellar parallax and by Foucault's pendulum experiment.

In the early 17th century no full scientific conviction would be carried by the enormous simplification that resulted from the heliocentric arrangement of planets. A chief reason for this lay in the inability of Copernicus to offer more precise predictions of planetary positions than was possible on the basis of geocentric astronomy as set forth in impressive detail and cogency in Ptolemy's *Almagest*. Copernicus' work could almost appear a mere rewriting of Ptolemy. The idiom, Euclidean geometry, was the same, together with such staple parts of it as epicycles, deferents, and eccentrics, to say nothing of its archaic trigonometry. Also, the data were almost the same. Copernicus added fewer than thirty observations of his own to the hundreds he took from the *Almagest*. Last but not least, his tools of observation were age-old. The invention of the telescope still lay in the misty future.

Why is it, one may ask, that Copernicus was not anticipated by the Greeks of old? The ready answer that Copernicus was a genius is a mere begging of the question, and all the more so as geniuses were not lacking among the Greeks,

and certainly not in the field of astronomy. One of them was Aristarchus of Samos. His method of measuring the absolute sizes of the moon and the sun and their relative and absolute distances from the earth still fill with astonishment any sensitive mind when first exposed to it. No less a genius was Archimedes who made much of that method as he calculated the total number of sand grains that could be accommodated within the sphere of the fixed stars, standing for the entire universe. Archimedes meant it to be a teaser, a means for entertaining his royal patron in Syracuse.

Both Aristarchus and Archimedes could have easily preceded Ptolemy by three and two hundred years respectively in writing an essential equivalent to the *Almagest*. If such is the case, may not one reasonably entertain the possibility that Aristarchus of Samos could not only have written a short *Almagest* but also a teaser, a heliocentric version of it? As a teaser it certainly would have remained within the perspectives of the great majority of Greek astronomers. They had fully subscribed to the methodology set by Plato. Their learned, intricate combination of circles, arcs, and radiuses were to be offered as so many devices "to save the phenomena."⁴ They were means of prediction but in no sense a reflection of reality. The program was a sophisticated resignation, a glittering abdication of search for truth about the physical universe. Nothing would have been more tempting within this sadly facile perspective than to write a heliocentric teaser in which the dislocation of the earth from the center of the universe could have been but a clever make-believe and a purely calculational tool at best.

It seems that Aristarchus aimed at much more than another unconvincing "saving" device. Possibly this is the reason why his idea was endorsed by only one ancient Greek astronomer (Seleucus). Had Aristarchus not given at least some touch of realism to his heliocentrism, it would not have been denounced by such a genuine spokesman of Hel-

lenistic culture as Plutarch as a sort of sacrilege.⁵ Plutarch, for years a chief priest in Delphi, the very center of Greek paganism, must have sensed the challenge posed to it by heliocentrism. Ptolemy, who could have easily worked out a brief technical sketch of Aristarchus' suggestion, dismissed it as rank impiety in the very first pages of the *Almagest*.⁶

For these reasons alone, it would be natural to assume that very different religious motivations may have helped Copernicus, as he boldly cast his scholarly lot with heliocentrism. The standard claim that he was a Renaissance man is a cheap red-herring. He was certainly not one of those many Renaissance humanists who poured scorn on science as incompatible with the dignity of "Letters" often reduced to hairsplitting in matters grammatical. He was not known to have engaged in alchemy and in that obscurantist animization of the universe which had Paracelsus, Bruno, and Fludd for its chief promoters. He was in fact at poles removed from the pan-animism which Bruno used as a cover-up for pantheism. The credit for writing the first book on Copernicus belongs, of course, to Bruno, but the misunderstanding and abuse of heliocentrism in his *Ash Wednesday Supper* were glaring. Francis Yates, Bruno's foremost modern student, who expected exactly the opposite as she began reading that book, reached the verdict that had Copernicus been still alive in 1584, he would have bought up all copies of the freshly-printed *Ash Wednesday Supper* and burned them outright.⁷

This was not the first and last turn in the history of modern science that should help evoke to all but the proudly self-blinding rationalists the specter of fallen man. If heliocentrism was to be saved and with it the future of science, it was to be saved not so much from the grasp of fallible churchmen, who in the long run could and did learn their lesson. Heliocentrism was to be saved rather from the hold of the pontiffs of a secularist counter-church ready to hide

their obscurantism under a cloak that symbolized an infallibility falsely attributed to science.

Long before those pontiffs had established themselves, Copernicus himself had to muster some saving grace. That the grace in question was strictly religious in character may be surmised from an admission telling for its brevity. It was made in a much applauded book on the astronomical revolution by a sophisticatedly tendentious historian of science, Alexandre Koyré, whom many in a now aging generation of historians of science have been fond of recalling as *the* master. Koyré's chief aim was to discredit Duhem's claim that medieval science, especially in the form given to it by Buridan and Oresme, grew organically into the science of Galileo. He therefore could not say more about Copernicus' religious conviction than that he was a "good Catholic."⁸ Coming as it does from a professed agnostic, fond of the spirit of the French Enlightenment, this brief admission admits enormously much. Not that Koyré would have wished to explain the various possible meanings of being a "good Catholic." In all appearance he wanted the expression to stand by itself. That way it could suggest that Copernicus was a good but not necessarily a thinking Catholic. But this is precisely what will not do in the case of a thinker of Copernicus' stature.

Copernicus was, of course, a Catholic of *his* times. As such he was fond of the fashionable phrases of the day. For some time already and for a while yet, thoughts were presentable only when offered in a verbal garb overdecorated with references to Greek and Latin celebrities. Hence the references of Copernicus to various antique authors in the letter dedicating his *De Revolutionibus orbium coelestium* to Cardinal Schönberg. Being a good Catholic and in Renaissance times, the Cardinal did not have to think that he might be deceived as was Isaac whom Jacob approached as if he were Esau. The Cardinal expected the Catholic voice to

come in Renaissance garb. Instead of the biblical Lord of Hosts, Copernicus spoke of the divine Artificer. Yet Renaissance as the expression could appear, good Catholics of Renaissance times were fully aware of its equally biblical use in the Book of Wisdom (13:2), which they revered as a revealed word of God. But the confidence which Copernicus expressed in the full rationality of the universe could not be referred to Greek and Latin sources. That confidence was the echo of the voice of Athanasius whose "Nicene" creed Copernicus, as a canon of the Cathedral of Frauenburg, recited every Sunday.

Non-Christians usually find it difficult if not impossible to sense the impact of that confidence which credited the universe with full rationality long before its exact details were traced out by exact science. Even today some Catholics with centuries of exact science behind them discover the anchoring force of that faith only after they have cast it overboard as cumbersome ballast. At any rate, Copernicus fully needed that confidence. The impetus theory, which he used to answer dynamical difficulties posed by the moving earth, was still to reveal its fruitfulness by being built into the Newtonian edifice. Copernicus' recall that the Pythagoreans had already held high the view according to which the large fiery Sun was the center of all, could be no more than mere literary décor. It failed to convince the pagan Greeks and could only tease Christians convinced about a higher rationality. Moreover, the confidence implied trust in the human mind's rationality as something created by God in His own image.

Galileo was to rely explicitly on this consideration. Any geometrical order perceived by that mind in the universe could, so he argued in the *Dialogue*, be confidently taken for an insight into the plan of the universe set by God Himself.⁹ That the plan was throughout geometrical or mathematical was not something to be learned from Archimedes, divine

as he was called by Galileo. Whether they liked to admit it or not, the men of science of the Renaissance owed much to that medieval tradition where one of the most often quoted scriptural phrase was the one in the Book of Wisdom (11:20) according to which God disposed everything in measure, number, and weight.¹⁰ No dictum of Archimedes had ever approached in emphasis that phrase which formed Christian perception with an efficiency still to be fathomed.

The pitfalls of an infinite universe

The Christian confidence in the rationality (along geometrical and mathematical lines as well) of the universe was as healing and saving as it could be fraught with dangers. Copernicus undoubtedly proposed his heliocentrism as a mirror of reality. There is nothing in his writings to indicate that he held the heliocentric theory to be the *only* form in which the universe could have come forth from the hands of God. This fateful surplus of confidence about the rationality of the universe asserted itself in the measure in which man's understanding of the universe advanced. Only historians of science open to the tragic sense of life or history will sense here something of a drama ready to unfold. And if the drama is taken for a real series of events and not for a mere play, the specter of original sin that unbalanced the intellect through pride will not be difficult to spot.

The first three great Copernicans—Kepler, Galileo, and Descartes—are so many illustrations of this theological point. With Kepler, perhaps because of his hypersensitive psyche, the *a priori* bent of mind dictating the shape of the universe was still balanced with a keen recognition of the Creator's absolute superiority. This is why he bowed to the fact that the orbits of the planets were not perfect circles but unmistakably elliptical. This outcome was for him a humbling pie to swallow, but he still knew that a Christian

without a goodly dose of humility ceased to be one. The balance is already tilted toward the *a priori* in Galileo. With him man's understanding of quantities is no less perfect than the Creator's knowledge of them.¹¹ It escaped him that he equated not so much two kinds of knowledge but two appreciations of an idea. Galileo's appreciation of the circle and circular motion was unbounded. Did it follow from this that God too had to look at circles with the same exclusive admiration? Presumptuousness quickly exerted its price even in the history of science. Galileo could blame only his hubris that he lent deaf ears to Kepler's communications to him about the elliptical orbit of planets, without which heliocentrism would have remained stuck in a place, however elevated, where it was left by Copernicus.

With Descartes the balance becomes heavily tilted in favor of human preconceptions. His chief work, *Principes de la philosophie*, had one main aim: to secure absolute certainty for human reasoning and in a measure co-extensive with the universe. In trying to bring the full light of absolute certainty to man, he probably did not realize how close he came to the role assumed by Lucifer.¹² Already his most outspoken contemporary, Pascal, noted that the upshot of Cartesian world-making was that the world needed no God.¹³ Those uneasy with this theological perspective, clearly evoking the Fall of Angels that precipitated the Fall of Man, still have to meditate at length on the blind alley into which Descartes and the Cartesians steered physics in particular and cosmology in general. Are not deep "moral" lessons implied in the fact that after so promising a start and with so many geniuses on hand, things seemed to head in the wrong direction? Was there not something potentially frightening in the fact that all conclusions of Descartes about the impact of bodies were partially or completely wrong? And what if his call had been heeded that all men of science should communicate to him their experiments

because he alone could give them proper interpretation? Disciples Descartes certainly had by the hundreds, but few of them experimented.

Kepler, the most painstaking and the most decisive genius among the three, failed to inspire discipleship. And what if Jeremiah Horrocks, the sole capable admirer of Kepler in mid-17th century, had not lived in England? What if his short life (he died in 1641 at the age of twenty-three) had run its course two decades earlier or two decades later? In either case, the crucial bridge between Kepler and Newton might not have been on hand. Kepler's three laws as re-argued by Horrocks greatly helped Newton in deriving the inverse square law of gravitation. Newton might have, of course, taken that law for granted as he was more of an *a priori* thinker than he wanted to be known. In fact the inverse square law in optics had already been stated by Kepler on the purely *a priori* ground that the spreading of light had to be homogeneous. Herein lay an application of Euclidean space-perception both fortuitous and perilous.

As photometry was to prove three hundred years after Kepler, the intensity of light decreased indeed with the square of distance from a point source. As to Euclidean space-perception, insofar as its flat three-dimensionality appeared most natural, it was certainly tempting to assume that Nature "naturally" had to conform to it. Herein lay the moving force behind the rush, more "philosophical" than scientific, toward the idea of a necessarily infinite universe. In compliance with the "homogeneity" of Euclidean space, the infinite universe too was to be homogeneous, that is, constituted of stars homogeneously distributed. The idea must have been widely talked about, even if not put in print, otherwise it would not have been the object of an animated refutation in just about ten years after the publication of Newton's *Principia*.

Not that Newton advocated the idea of an infinite homo-

geneous universe made up of an infinite number of homogeneously distributed stars. In a note antedating by a dozen or so years the publication of the *Principia*, Newton spoke of a strictly finite material universe forming a sphere and surrounded by space or void extending to infinity in all directions.¹⁴ Forty or so years later he turned that infinite into the sensorium of God in the famous Scholium added to the third edition of the *Principia*. But privately, Newton sounded favorable to the idea of a strictly infinite homogeneous material universe inasmuch as he refused to see any merit in objections to it, whatever their cogency. They were cogent and irrefutable regardless of not having the kind of precision with which later generations could formulate them. Newton did in fact become guilty of paralogsms and non-sequiturs as he laid precisely these charges at the door of Richard Bentley, chaplain of the King and future Master of Newton's own college, Trinity.¹⁵ A hundred and thirty years before George Green worked out the theory of potential, which allowed a strict demonstration of the impossibility of an infinite homogeneous universe obeying the inverse square law of gravitation, Bentley had correctly, though only intuitively, offered a demonstration of that impossibility. In the infinite Euclidean universe there would be no gravitational pull precisely because of the symmetrical pull in it at every point in all directions.

To his credit, Bentley also perceived that the idea of an infinite homogeneous universe might serve as a scientific cover-up for atheism. Physical infinity could readily be taken for infinite perfection and from there it was but a step to taking the infinite universe for the ultimate perfect Being. However, the intellectual atmosphere still had traditional Christian elements in it to prevent the idea of infinite universe from gaining quick and broad popularity. Even in 1756, when the article "Infini" appeared in Diderot's *Encyclopédie*, the danger of attributing infinity to a material

entity, be it the universe, was explicitly mentioned.¹⁶ Possibly the procedure was part of that speaking with tongue-in-cheek which is regularly in sight in that multivolume plea on behalf of a rationalism that quickly became a half-way house toward plain pragmatism or strict materialism. The latter readily flooded over the European scene after the post-Napoleonic revulsion to the Revolution had run its course. From the mid-1850s on, a materialism preached in the name of science and of an infinite universe began to produce runaway bestsellers as if never to be discredited again.¹⁷

An early and telling incident in that development is tied to Halley who, of course, had much more to hide than had Newton whose Unitarianism involved the denial of Incarnation and related Christian dogmas. Halley had to hide plain atheism, for which he would have been immediately deprived of his chair in Oxford. As an atheist, he could be expected to do his best to save the notion of an infinite homogeneous universe. He did so by producing in 1720 the first printed discussion of the optical paradox of such a universe.¹⁸ The paradox (or debilitating objection) consisted in the inference that in such a universe the starlight would be infinite at any point. Does the solution offered by Halley appear ambiguous because it was given in a phrase born of momentary scientific parlance? Or did Halley intentionally offer an unusual expression within a syntactically poor phrase so that its mysteriousness might disarm the non-expert? Or did he admit (a preferred interpretation of his garbled phrase) that the distribution of stars was not homogeneous and consequently neither was the universe?

If such was the case, to what extent did Halley perceive that his atheism was at stake? A very specifically non-homogeneous universe cannot help raise the question: why such and such specificity and not another? It could not be unknown to Halley that Leibniz, the great continental rival

to British leadership in science, had stressed this point in 1714 in a widely read periodical and with direct reference to the universe.¹⁹ At any rate, even if the universe were homogeneous in the sense in which it appeared a metaphysical threat to Bentley, was it immune to questions about patent inhomogeneities within it and about the specificity of its factual homogeneity? Behind these questions lay the challenge to admit that only a Creator could choose a specificity involving the entire universe.

From blindness to schizophrenia

About the physical universe as a totality of things with quantitative properties it was spiritedly argued in medieval times that it could not be infinite because an actually realized infinite (unlimited) quantity was a contradiction in terms. Quantity is limitedness by definition. Interestingly, Halley's article contained a passing reference to that problem (well known to the medievals) but nothing more. But the most serious defect of that now famed article lies elsewhere. A budding scientist, Halley was the first modern man of science to observe the Southern Sky from Saint Helena in 1679 and to see the Milky Way in its entirety. He was not the first modern man of science to miss its significance for an understanding in depth of the physical universe. Galileo, the first to observe through a telescope the stunning density of stars in that whitish belt, did not exploit it against the Aristotelian "perfection" of the sphere of the fixed stars. Nor did Galileo see in it a major corrective for a narrowly heliocentric universe. Much less did he, with his covert disdain for metaphysics, see in the Milky Way a gigantic evidence about the overall specificity of the universe. Newton's only reference to the Milky Way was triviality at its briefest, indicative of myopia if not plain blindness.²⁰ Is not blindness to the obvious the strongest hint about some wound in the

human intellect, and should it not be especially absent in an intellect which is almost superhuman?

Questions like these crowd upon one another as one meditates on the hundred and a half centuries of scientific dicta on the Milky Way that followed the first recognition of its true structure. The year is 1749, the *dramatis persona* is Johann Heinrich Lambert, a 25-year-old family tutor in a castle near Chur in Switzerland. On a clear August night, as he watched the sky, the obvious dawned on him: the Milky Way's whiteness is the optical effect produced by a multitude of stars confined within a lentil-shaped space when one looks at it parallel to its main plane. Eleven years later, Lambert, self-taught from his eighth year on but soon to become a member of the Berlin Academy of Sciences, turned the Milky Way into the basic pattern of his account of the universe in his *Cosmological Letters*.²¹ That account was the first contradiction-free cosmology offered until then and for some time afterwards. Lambert clearly recognized the gravitational paradox of the infinite homogeneous universe. Therefore he postulated a complete balance between centripetal and centrifugal forces within a flattened sphere, the imaginary boundary of a strictly finite number of celestial bodies. At their center was a celestial body, so colossal that its gravitational pull could keep in steady orbit all celestial bodies grouped into systems and systems of systems (built on the pattern of the Milky Way). Few apart from Lambert looked for those hypothetical central bodies, all of which were postulated by him to be dark for obvious reasons.

That the explanation of the Milky Way as a lentil-shaped confine of an immense number of stars was an obvious one is suggested by the fact that, almost simultaneously with Lambert, two other amateurs in science hit upon it. One was Wright, who built his correct account of the Milky Way into a morbid system of infinitely numerous Milky Ways, so many places for eternal reward or punishment. The other

amateur was Kant, whose wider view of the Milky Way was not more rational than that of Wright. He made his explanation of the Milky Way's whiteness a pivotal part of his cosmogenesis which is an abuse of science throughout.²² Most revealingly, Kant asserted the existence of an infinite number of galaxies organized in ever more encompassing systems. According to him, they rose from cosmic homogeneity and returned to it so that they might rise again as the legendary phoenix does out of its ashes. The process resembled a spherical density-wave spreading from a hypothetical central point, with the maxima and minima of density standing for the alternation of specificity with homogeneity. Twenty-six years later, Kant implicitly disavowed all this as he claimed in his *Critique of Pure Reason* that the notion of the universe was a bastard product of the metaphysical cravings of the intellect.

When Kant, after some eclipse, came back into respectability, philosophers (and theologians inspired by them) mostly remembered his dismissal of cosmology, whereas many astronomers referred to him as the great guarantor of the (Euclidean) infinity of the universe. The first astronomer to do so was Olbers who brought the paradox discussed by Halley back into scientific consciousness and offered as its solution the absorption of starlight in interstellar ether. That Kant's hierarchical cosmogenesis pointed not so much toward a supreme celestial *hierarchos* as toward plain bedlam was conveniently forgotten. But is not something sinful at play when the human intellect chooses to see certain things and certainly not others? The fallibility of modern man would not rival that of aborigines if a chronic fallibility had not been on hand ever since the First Fall, or original sin, as a convenient filter against truth and evidence.

A most telling example of this was provided by late-19th-century cosmology.²³ Scientific authorities at that time pictured the universe as an infinite three-dimensional

homogeneous agglomerate of galaxies which consisted of two main parts. One part, spherical in shape, was observable: it consisted of the Milky Way as its main plane and of countless much smaller spiral galaxies around its vertical axis. Such seemed to be a neat, almost "natural" arrangement, perhaps even amenable to being treated by celestial dynamics. In only one book on astronomy written around 1900 did I find a reference to the Milky Way as a band which the cosmos carries on its forehead as evidence of its contingency. The reference was in a nutshell the cosmological argument as based on the specificity of the cosmos, the only sound starting point for that argument.

The foregoing use of the word *part* in reference to an infinite universe was an unforgivable misnomer. In a whole, where one of the parts is infinite, the finite part, however large, is far less than a drop which is never spoken of as a *part* of the ocean. Whether the Milky-Way-Universe was about twenty thousand light years in diameter, as estimated around 1900, or five times more, as it turned out to be in the 1920s, it was less than a drop compared with a universe assumed to be infinite. About the infinitely larger part two statements were current among leading scientists around 1900. One statement asserted that it was forever unknowable. The tacit proof of this was based on the other statement according to which the physical influence of the infinite part on the "puny" known part was negligible. Underlying both statements was the assumption that the solar system was close to the center of the Milky Way. When twenty years later our sun was convincingly located in one of the outer arms of the Milky Way, many saw a repetition of man's dislocation from the center, initiated by Copernicus. Half a century later, man was back in the center in a sense far more serious than cosmic topography could provide.

Those who celebrated that second cosmic dislocation of man as his further downgrading failed to see that man's

intellect was slighted in the view according to which the infinitely large part had no sensible impact on the relatively puny finite part. As worked out in a great mathematical parade by Lord Kelvin, the view represented a stupefying obeisance to the dogma of infinite Euclidean extension as the only conceivable framework of physical existence. For one, Lord Kelvin and others showed the utmost disregard for arguments, by then decades old, that refuted any variety of the solution proposed by Olbers to the optical paradox. Contrary to that solution, the infinite part of the universe could not be neglected in any self-respecting physical cosmology. Nobody seemed to realize, let alone deplore, that obeisance to the dogma of an infinite Euclidean universe resulted in the sundering of an entity, the universe, that either meant cohesive totality or was not a universe.

Minds capable of living with that cosmic split showed the symptoms of intellectual schizophrenia. It was the fruit of a dogma that rested on the deceitful preconception that the universe was "naturally" what it was. The logic at play had dynamics that moved from the *a priori* to the real. The direction was exactly the opposite to the logic which, starting from the incomparably grandiose reality of Jesus of Nazareth, went through the crucible of a most rigorous testing posed by the quest of understanding the Trinitarian dogmas. There was a logic in the outcome that those dogmas proved themselves to be the best safeguard of an understanding of the universe that moved from its facts towards its rational ordering.

Relativity as road to the universe and beyond

The most ironic aspect behind that blind and blinding acceptance of a split universe lay in its being markedly behind the best cosmological work already in the making. From its very inception on, that work revealed itself as the means

whereby science would achieve for the first time in its history a contradiction-free account of at least the gravitational universe, without postulating, as Lambert did, wholly hypothetical celestial bodies. Scientific history, or rather historiography, is still to give due credit to Zöllner who in 1871 invoked four-dimensional Riemannian geometry as a solution of the gravitational paradox. His idea was immediately hailed by the British mathematician W. K. Clifford as the reinstatement of the universe in its intellectual respectability.²⁴ All this remained unnoticed less than a decade later as the academic world prepared for the 100th anniversary of the publication of Kant's *Critique of Pure Reason*. Once more, academia payed its respects to the philosophical hollowness and unscientific character of Kantian antinomies on the basis of which Kant reached his sinister dictum that the notion of the universe was the bastard product of the metaphysical cravings of the intellect.

Within the small segment of the scientific world keen on cosmology nobody recalled Zöllner when in 1896 Schwarzschild computed in the pages of a prominent periodical the space-time curvature of the Milky Way as if it stood for the observable universe. Even if Einstein did not learn of Zöllner's work (a rather unlikely case), he could hardly remain unaware of Schwarzschild's work. At any rate, the latter followed with great interest the installments of Einstein's General Relativity. They were not yet completed when Schwarzschild had already pointed out a momentous consequence of it: if the mass of a star was sufficiently large and dense, the star could be subject to gravitational collapse. Gravitation was, of course, the prime candidate among physical forces for helping turn the abstract tensor-world of General Relativity into physics. Gravitational acceleration could readily illustrate the equivalence of all accelerated frames of reference, a basic claim of General Relativity. A mark of Einstein's scientific genius was that from cases

involving only two accelerated reference systems (the orbit of Mercury, the bending of light around a massive star, and the gravitational red-shift of light coming from such a star) he boldly pushed toward the case of all such reference systems. The result was given in 1917 in the last installment of General Relativity dealing with its cosmological consequences.

There, for the first time, the gravitational universe appeared as a closely knit unity with such specific marks as its total mass (computed from its average density) and its space-time curvature or the inverse of the radius of the largest permissible path of motion allowed by that total mass. The totality of those permissible paths of motion formed a spherical net, the reason for identifying the Einsteinian universe with a sphere. Of course, the sphere was four-dimensional. As such it could be visualized by reducing it to a three-dimensional model, a huge spherical surface, with infinitely thin two-dimensional coins on that surface representing three dimensional humans or any moving objects. Since their only permissible motion would be a sliding along that surface, none of their moves, however long, could result in a dash toward infinity.

Infinity, at least in its Euclidean sense, could no longer be regarded as something called for "naturally" by cosmic physical existence. Scientific voices, that registered keen disappointment if not some bewilderment on that score, were "naturally" forthcoming in the 1920s as the first shock-wave of General Relativity washed over the scientific world. Hopes about the applicability of Euclidean infinity to the universe were reluctantly abandoned. It did not sink into scientific consciousness that the grief did not relate to Euclidean infinity as such, which in itself is a specific case among other no less specific geometries and infinities. The source of sorrow related to the alleged "naturalness" of that infinity as it seemed to ward off the specter of cosmic

contingency. Was it not tragicomical that man moaned rather than rejoiced? Did not that cosmic contingency enlarge his vistas of rationality in a measure that was infinite in a far deeper sense than geometry could provide?

That kind of rejoicing was not heard when Einstein came to grips with another infinity that could accommodate an infinite amount of gravitationally interacting things. It turned out to be anything but "natural." It resembled spiraling space-time or a network of permissible paths of motion. Einstein dismissed it as an "amusement" not to be taken seriously.²⁵ (Another infinity, proposed later, resembled a hyperbolic surface with no limits, something like the surface of a saddle that has no edges). Beneath Einstein's cavalier attitude there lay motivations or preferences that went far beyond physics. They were indeed genuinely metaphysical or rather counter-metaphysical. The evidence for this came as soon as Einstein learned from de Sitter that his "spherical" universe was not stable. That Einstein was shocked by the news can only be explained by his attachment to a spherical universe insofar as it was static, that is, immobile or supratemporal. Such a sphere, no less than in the case of Aristotle and other noble pagans, old and new, appeared to Einstein too as a "natural" form of existence. "Natural" meant that it had to be what it was and could not be anything else, and therefore did not point beyond itself and certainly not to that "beyond" which God alone is with respect to the universe.

In his resolve not to look "beyond" the universe, Einstein could psychologically be helped by a static spherical universe and only be troubled by its possible expansion. Nothing forces one so much to look "beyond" than the passing of time. To take the "beyond" out of scientific cosmology, he introduced a corrective factor, which he called "cosmological constant." It was to save the immobility of the universe. Eventually he had to recognize in it the greatest blunder of

his career, though only long after a Belgian priest, the Abbé Lemaitre, derived on theoretical grounds the rate at which the Einsteinian universe had to expand, a rate quickly verified from the red-shift of galaxies. But Einstein, the anti-metaphysical cosmologist, was not to surrender. He rather reversed his first and very negative judgment on the idea of a universe that not only expanded but also contracted, that is, oscillated. In the wake of the intellectual trauma caused to him by Lemaitre's work, he found a ray of hope for cosmic eternity in the idea of an oscillating universe.²⁶

The thrust of logic could not, however, be immobilized by patently subjective options. Only six years before his death Einstein felt it important to reassure a close friend of his that he was not to become a believer through cosmology. As an argument he could offer only two unconvincing remarks. One was *ad hominem*, or rather aimed at "Pfaffen," a German pejorative for priests, already busy, according to him, exploiting his cosmology on behalf of the cosmological argument: "let the devil care what they do with my cosmology!" The other was to fall back on the claim, a favorite in rationalistic circles, that it was not rational to go "beyond" the universe. It was largely forgotten in those circles that the Kantian brand of rationalist philosophy forbade one to go "rationally" even as far as the universe itself. Thus irony was lurking between the lines as Einstein wrote to his friend: "There is no logical way to go beyond the universe."²⁷ It would have been more logical on Einstein's part either to remember Kant's precept or to reassert right there and then his Spinozistic cosmic religion. He extolled that religion when, in sailing to America, he wired his answer to Rabbi Herbert S. Goldstein's inquiry about his religious belief.²⁸ For his equating Nature with God, Spinoza was expelled from the orthodox Amsterdam synagogue. Since then a part of Judaism has lost too much of its spiritual acumen to feel saddened by Einstein's cosmic reli-

gion, a form of paganism. It made him resist from the very start the deeper thrust of his marvelous cosmological work that pointed "beyond." The price he had to pay was to espouse on occasion weak science and even weaker philosophies thrown into the bargain.

Exorcists in scientific garb

Einstein's fighting the metaphysical thrust of his cosmology also symbolizes the grim resolve of most modern scientific cosmologists to exorcise the metaphysical "beyond" from their subject. Their efforts follow two main tactics: One consists in the construction of cosmological models aimed at denying the universe its time-conditioned character. The other is the skillfulness with which escape-hatches from cosmic temporality are made to appear far more scientific than they actually are.

First came the theory of a steady-state universe. Its proponents—Hoyle, Bondi, and Gold—postulated the emergence at a steady rate (and out of nothing!) of hydrogen atoms everywhere in space. The rate was to be such as to keep the density of matter the same while the intergalactic space increased owing to the recession of galaxies. In the eyes of Hoyle and Cie this sameness would have assured eternity and uncreatedness to the cosmos. Such was the gist of the "perfect cosmological principle" about which H. Dingle, president of the Royal Astronomical Society, wanted to call a spade a spade, that is, to call it "the perfect agricultural principle."²⁹ Dingle should have referred to the crucial help which science received for the previous three hundred years from the recognition of the strict conservation of matter in all physical processes. But in his chief objection to Hoyle and Cie, Dingle merely deplored the wasting of fine mathematical talent on something utterly useless. As a pantheist, Dingle was not to probe into an

emergence out of nothing and without a Creator!³⁰ Still another decade later, Hoyle definitely came clear as he put in print "God \equiv Universe," the sign \equiv standing not for equality but for identity by definition.³¹

One wonders who in that august meeting of the Royal Astronomical Society thought of the age-old Aristotelian (pagan) resolve to take the universe for the perfect being because of its alleged steadiness or permanence? Whether Hoyle explicitly thought of Aristotle in speculating about a "perfect" cosmological principle is irrelevant. Within the metaphysical use or abuse of science the basic options are few. The choice among them is instinctively made according to a long-standing pattern even in the absence of specific information about their respective erstwhile provenance.

Tellingly, the first warning about the counter-metaphysics implied in the steady-state theory came from a priest and a priest of no less rank than Pius XII. Speaking in 1950 to a gathering of astronomers from all over the world, with Hoyle and Gold present among them, the pope offered, for reasons of courtesy, a stricture not too explicit. A decade or so later the continuous creation of hydrogen atoms, as conceived by Hoyle and Cie, was declared not to be incompatible with the Christian dogma of creation in the cosmology volume of the almost 200-volume *Twentieth Century Encyclopedia of Catholicism*!³² This shows, if any evidence was needed, that the weakening of the intellect through original sin is not absent even among those reputedly in possession of remedies whereby the damage might be mitigated. As for the scientific community—to say nothing of its popularizing mouthpieces—the steady-state theory soon enjoyed within it the respectable status of being one of the three main rival cosmologies. The two others were the simply expanding universe and the oscillating universe.

About the oscillating universe it was thoroughly demonstrated already in the early 1930s that its oscillations have to

die out gradually. The proof was provided by no less a cosmologist than R. C. Tolman and made available in an impressive volume by no less prestigious a publisher than Oxford University Press. His findings meant that the oscillating model had to be looked upon as a mere variant of the linear model represented in its starkness by the expanding model. This important result was ignored for all practical purposes. Thirty years later P. C. W. Davies could present it almost as if it were a novelty.³³ In 1983 a prominent cosmologist did not want to believe me that Tolman's great book, which he often consulted, had already contained the information and even some diagrams offered by Davies. It may, of course, be all too natural not to notice what one does not want to see and, conversely, to see something where there is nothing. The same cosmologist is one of the promoters of what could best be called the cosmic pumping station theory. It postulates the pumping of fresh matter out of nothing and in cosmic quantities into the universe at the end of each cycle so as to make the next cycle as energetic as the preceding one.

Scientifically more respectable, though very desperate, has been the experimental search for the missing mass. The measure of possible despair may be gauged from the fact that the known density of cosmic matter is only one percent of the density that would provide enough gravitational pull to slow down and ultimately reverse the actual expansion of the universe. A long series of candidates to do the trick—dwarf stars, neutron stars, quasars, black holes, and what not—failed to turn up in even remotely sufficient number. The opposite impression, created by headlines exuding superior joy of fulfillment, turned out to be so many cases of wishful thinking.³⁴ The heavy neutrino, the latest and most ardently bet-on candidate, turned out to be counter-productive in the highest measure. Its existence even in an appreciable fraction of the quantity desired would mean that

galaxies could not have formed, which means that stars would not have developed either, to say nothing of planetary systems. One cannot help thinking of the exorcism that ended in the coming of seven devils far worse than the one expelled in the first place.

The metaphysics of the physical universe

Failures to locate the "missing" mass is but another page in a long story still to be written up in full. It represents an indirect though vast evidence on behalf of the expanding universe, usually referred to as the Big-Bang, an evidence that came in especially heavily through the investigation of the early stages of the universe. That work received a powerful spur from the discovery of the 3°K cosmic background radiation in 1965. The evidence proves something even more important and deeper than the fact that, like anything else, the universe too is time-conditioned. Birth, life, and death as a single, irreversible, and unrepeatable process remains a reminder of the contingent, that is, non-necessary character of existence. This is undoubtedly a potent psychological preparation, especially in this age of metaphysical insensitivity, for learning from the universe a monumentally deep though stunningly simple lesson in metaphysics. Even if a proof of the eternity of the universe were on hand—not, of course, from experimental science which cannot deliver experiments of eternal duration—the lesson in question would convincingly prove the contingency of the universe, namely, that the universe is not necessarily what it is, but that it could have been something else. As such it has therefore to be the result of a free *meta*-physical choice, which then implies that the universe did not even need to exist at all. No more and no less than that can be meant by the contingency of the physical universe which is a lesson in metaphysics.

The first stage of the lesson is provided by the fact that all the early phases of the universe appear to be the very opposite to that nondescript homogeneous stuff out of which the actual universe had, until recently, been claimed to have developed. The claim received its most popular form when Herbert Spencer turned Laplace's nebular hypothesis from an explanation of the origin of the solar system into a genesis of the entire universe. As such, the nebular hypothesis became a mainstay of bourgeois as well as bolshevik materialism. The alleged homogeneous starting point of the universe assured countless superficial minds that such a point was so simple as to make unnecessary further questions about it.³⁵ A hundred years later, cosmology, after having reached a truly scientific status, is discovering invariably non-homogeneous, specific, subtly asymmetrical cosmic states as one early stage of the universe is traced to another still earlier stage.

One such state is connected with the "cooking" of light elements shortly after the first three minutes of cosmic expansion were over.³⁶ Their "cooking" could come about only if for every proton, neutron, and electron almost exactly 40 million photons were on hand. Clearly, this is not a homogeneous or symmetrical state of affairs, the kind which is so readily taken for a "natural" and therefore "necessary" form of existence. Much "earlier" in those first three minutes, that is, much closer to the hypothetical zero point, a no less startling asymmetrical or "unnatural" situation is on hand. Information about it came through the discovery of a strange asymmetry in the decay of neutral K_2 mesons. Out of a thousand of their decays two do not turn into the expected three pi-mesons (pions) but into a pair of them. From this it follows that in the "primordial" moments the production of ordinary matter slightly outpaced that of anti-matter by about one part in 10 billion. Such a minimal departure from symmetry may be more startling than a patently tilted balance.

Herein lies the second stage of the one-two-punch message of modern scientific cosmology, a message going far beyond the physical realm. That cosmology first assured modern man that the validity of the notion of the universe cannot—Kant and all his intellectual progeny notwithstanding—be attacked on the ground that science offers contradictory conclusions about the universe. Actually, the fact that physical science in Kant's time could not offer anything exact about the universe undercut his claim that metaphysics, if it was to be "exact" or reliable, should be moulded on physics.³⁷ The fact that modern scientific cosmology offers a wealth of exact details about the universe should seem to strengthen greatly the reliability of its notion in this scientific age of ours when, rightly or wrongly, everything, including philosophy, is appraised from the scientific point of view. Second, modern scientific cosmology unveiled the universe as a most specific entity, both in its actual and overall features and in its earliest moment as well. The specificity is so striking as to be translatable into simple terms from a forbiddingly mathematical apparatus.

To escape the metaphysical clutches of such a picture of the universe one can try two tricks, one rather primitive, the other very sophisticated. The primitive and juvenile trick is to say that what is simple does not need to be explained. Thus Israel Isaac Rabi, a future Nobel Laureate, on hearing as a young teenager about the Copernican system, told his pious parents: "It's all very simple, who needs God?"³⁸ Such a reason for parting with religion was not simple but simplistic. An equilateral right-angled triangle may, without a formal proof, reveal itself as being but half a square. But this will still leave unanswered the question—why such triangles and not others?—which can legitimately be posed in the case if the earliest phases of the universe were found to be equivalent to a congeries of triangles. The answer that a triangle is mathematically the necessarily primordial form of geometry would hardly sound creditable to anyone who

had seen forms other than triangles and even various kinds of triangles. But when the same answer is offered with a view to the system of elementary particles (a very sophisticated affair), the layman may be prevented from spotting a basic flaw beneath a vocabulary which is as plain as it is arcane. For behind the verbal facade of virtual clouds, strangeness, gauge symmetry, false vacuum, string defect, and superunification, there lies a shocking oversight of the heaviest shock ever dealt to pretentious scientific aspirations.

Chronic may not be the appropriate word for a symptom that is not yet six decades old. But in view of the rapidity with which scientific data, arguments, and startling conclusions have been communicated, published, received, sifted, retained, or abandoned in this century, chronic is the only word to describe the mental inertia of physicists about Gödel's incompleteness theorems submitted in 1930 before the Vienna Academy of Sciences. The inertia is all the more baffling because leading mathematicians immediately realized that their fondest hopes were shown to be unrealizable.³⁹ The target of those hopes was a final form of mathematics encompassing all its branches, a form expected to be true on the basis of the inner consistency of its postulates. Gödel's theorems showed, however, that even in arithmetic, a relatively simple form of mathematics, the proof of the consistency of any set of non-trivial propositions could come only from an assumption not included in that set.

The applicability of all this to scientific cosmology should be obvious because of its heavily mathematical character. No less obvious should be the only sound reaction to any boastful assertion that before long (whether within three months or three years should seem irrelevant) the final form of the system of elementary particles, which would be true on an *a priori* basis, will be on hand.⁴⁰ Such a system, in view of the identity of work on the earliest phases of the universe

with fundamental particle research, would, of course, mean a system of cosmology about which one could make the most far-reaching claim possible. The truth of the claim would mean the truth of an *a priori* derivation of the only shape in which the universe can exist. In that case it would no longer be possible to argue the contingency of the universe, namely, that the actual specificity of the universe is the result of a choice from among many other possibilities. Since such a choice implies the existence of a Creator, the support which Gödel's theorems provide for metaphysics and theology should seem obvious. The theorem is a most incisive scientific tool to discredit by a powerful stroke that scientistic hubris which, from the time of Galileo, has been casting a dark shadow on scientific aspirations. This is not the place to quote utterances of Eddington, Oppenheimer, Weinberg, Gell-Mann, Hawking and other prominent physicists⁴¹ who specified time and again their main goal in words that are so many variations on a memorable dictum of Einstein. His was the hope that his Unified Theory would be such that even the good Lord could not come up with something better.

Of course, Gödel's theorems do not mean the impossibility of a physical theory that would account for all physical phenomena. Those convinced of the divine guarantee behind the phrase that all is arranged "according to measure, number, and weight" should under no circumstance bank on such an impossibility. They should be the last to exploit the great difficulties met by efforts, ever more intense and admirable, to formulate a Supertheory. In such a theory all physical forces would appear but different aspects of one single force or rather mathematical formalism. Far from being a threat to the contingency of the universe, such a formalism would by its striking peculiarity be a heavy pointer toward that contingency. Nothing more needs to be known by Christians in order to retain a commanding men-

tal posture when confronted in better-grade science popularizations with the latest forms of "supertheories." About all of them they should be able to see a feature which can easily be summed up in one of them, called Superstring Theory. A string, especially when it is only two-dimensional, is surely specific to the point of being fantastically so. In the case of an eventually successful formulation of a Supertheory, Christians should rejoice over the stunning scientific evidence on behalf of a truth sealed by Revelation that God's creation is a single and supremely coherent work.

Illusions of being creators

About the plurality of universes, on which much printer's ink is wasted by some scientists nowadays, one elementary point should suffice. Those universes either interact or they do not. In the former case they constitute one universe. In the latter case, they are mutually unknowable and therefore certainly irrelevant for science. Although this point is a matter of elementary logic, it is most relevant to the inflationary theory of the universe for the following two reasons: One is that it provides an illustration of cosmic magnitude for Edmund Burke's foreboding: "Custom reconciles us to everything."⁴² The other is that the logical demand for the unity of universes imposed itself on the inflationary theorists insofar as they wanted to remain within the bounds of sane science.

When the inflationary theory began to be outlined in the late 1970s in the hands of physicists, some of them still in their twenties, they represented the leading edge of the third generation of physicists exposed to the marvels of quantum theory. It would have been simply unthinkable for them to rely on anything but quantum mechanics as they investigated the earliest phases of the universe where all physical

interactions are compressed too far below the scale where General Relativity is still applicable. Their chief problem was to come up with a model of the early and incredibly puny universe that would account for the coherence which the universe displays as it reaches the stage of the formation of the lighter elements and subsequently of galaxies. Raised on the statistical methods of quantum mechanics they constructed a form of Schrödinger's equation which, by being in essence a probability function, "predicts" a large variety of embryonic universes, each with a different set of laws. Our actual universe as well as all the other universes owe their existence to "emergence by chance" within a framework which is probabilistic by definition and therefore can yield but probabilities.

Most serious philosophical questions should be generated by the inflationary theory of the universe, which, in its scientifically sane part portrays the universe as "inflated" in the earliest embryonic phase at a speed much larger than in its subsequent "expansion." Unfortunately, even non-scientists may not be troubled by the phrase "emergence by chance." The general educated public has by now become largely accustomed to a claim which scientists have been making now for sixty years, a time-span long enough for the growing up of a third generation of them. The claim, which has no justification in quantum mechanics, is the essence of the standard philosophical interpretation of quantum mechanics put together by Werner Heisenberg and especially by Niels Bohr, in Copenhagen. (This is why it is customarily referred to as the Copenhagen philosophy of quantum mechanics.) Both took a basic consequence of quantum mechanics about the impossibility of measuring certain interactions with complete accuracy for the justification of the following proposition if not plain somersault in logic: an interaction that cannot be measured exactly, cannot take place exactly.⁴³ And in the same breath they began to

celebrate the demise of causality, with the consequent enthronization of chance.

With little or no second thoughts on that incredible somersault, scientists quickly began to assume that "chance" could supply the bits of energy or matter which, owing to the impossibility of exact measurement, could not be accounted for mathematically. This preposterousness—certainly indicative of an erstwhile blow to the human intellect—gained so much scientific respectability that twenty years later Hoyle and Cie could postulate the emergence out of nothing, at every second, of hydrogen atoms in quantities amounting to entire stars. They did not have to fear wholesale indignation within the world of science, already sold on the idea that cheating with energy and matter on a very small scale was an intellectually respectable procedure. Thirty years or a full generation later, the proponents of inflationary theory met with no stunned disbelief as they claimed to "generate" countless universes by their clever-looking mathematics. One of them in fact repeatedly boasted: "The universe could be the last free lunch."⁴⁴ Ironically, the boast was first sounded in precisely those years that saw the definite disappearance of "free lunches," owing to the realization that unless credits and debits are balanced the whole economy is to collapse.

When a sense of superiority over the real takes on a measure in which the universe itself is engulfed, only foolhardy minds would refuse to sense the replay of a hubris which in the first place was motivated by the lure of "you will become like gods." Luciferian undertone may be hiding in Hawking's recent encomium of the inflationary theory that ended with the question: "What place then for a Creator?"⁴⁵ Those unwilling to entertain this theological perspective still have to face up to a purely philosophical one. It is the frequently voiced admission by several leaders in quantum mechanics, made at times with no trace of embarrassment,

that its Copenhagen interpretation has solipsism for its logical outcome. Since the solipsist should consider himself immune to any argument, the trick of pulling entire universes like so many rabbits out of a cocked hat should be left without any further comment.

That solipsists keep talking to others, although their philosophy bars them from doing so, is evidence that no philosopher, or scientist for that matter, can completely deny his sane humanity. It is a sign of unintended sanity, though of enormous instructiveness, that on seeing the multitude of their universes different from one another and with no physical ties to one another, proponents of the inflationary theory quickly looked for means to turn those "universes" into a coherent universe which has to be single if it is a uni-verse. Romans of old would mutter: "Should you expel Nature with a pitchfork, it would still reappear on the scene . . ."

Dealing with scientists still relatively young, it would be too early to probe into their religious beliefs. It is, however, a fair bet that most of them would shrug their shoulders as so many Gallios on being asked about God. No wonder. As the commissar in *Darkness at Noon* knew it: "As long as chaos dominates the world God is an anachronism."⁴⁶ Yet here too Nature or normalcy comes out on top. A chaos that "rules" is a contradiction in terms. A ruling which does not rule consistently in the sense of doing it always, is not a rule. To this one should only add that a thorough or absolute chaos is inconceivable. The human mind will forever remain moored in that normalcy which is logic and from which it cannot sever itself. Lately, this began to dawn on some quantum theoreticians as they started spotting the obvious, namely, the tacit assumption of non-statistical parameters beneath the level where chance is given the contradictory role to rule.

Since for a while the absence of a reference to Popper's philosophy of falsification in any discourse on science has

been taken for a lack of proper information, a word needs to be said about his claims concerning the universe. The chief of them is that the universe is open, that is, will, in the course of time, become the unfolding of all possibilities. This is but a rehash of Democritus' ideas by one who decades ago had already celebrated "Democritean" ethics."⁴⁷ Even that cosmic unfolding, wholly speculative of course, justifies the searching question: why a process in this and not in some other sequence? Still more searching questions may be in order about Popper's semiprivate claim that he had constructed a watertight demonstration that rational proofs of the existence of God are impossible to construct. His resolve to keep to himself that demonstration lest he make the life of many believers miserable,⁴⁸ will reveal genuine logic as long as he does not keep undisclosed the measure in which his atheism may have conditioned his philosophy of falsification. The other context had long been provided by Bertrand Russell as he insisted, long before Popper, that no induction is strictly conclusive. With exemplary logic Bertrand Russell also admitted that after eating thousands of meals, one could not have rational certainty whether one's next meal would be nourishing. Those who seek intellectual certainty about the universe on the basis of empiricist induction, deprive themselves of certainties that alone make everyday existence possible and livable.

A warning for Catholics

If some Catholics after all this fail to see what is at stake in the universe for their Christian standing, they can only blame their subjection to original sin. If they look for a more "respectable" reason, they only cast an additional vote on behalf of that sin's reality. Many of them have been misled by transcendental Thomism which is the grafting of

Kant on Thomas Aquinas. Within that most unphilosophical miscegenation, best called Aquikantism, the universe (and with it the cosmological argument) becomes suspect not because of logic but because of the subjectivism which even a mere touch of Kant's philosophy is bound to generate. The spread of Aquikantism was not due to its logical appeal, which is nil, but because a subjectivist climate, that has long been around, could readily accommodate a spurious intellectuality. The thirty-or-so-year-old record of the fruits of Aquikantism inside the Catholic Church is a poignant justification of the warning made by a non-Catholic clergyman at a time when Aquikantists suddenly gained prominence:

Intellectual objections to Christianity nowadays, and the fact that there are at present no convincing answers to them, both grow out of one root. This is that there is no general or widely accepted natural theology. I know that many theologians rejoice that it is so and seem to think that it leaves them free to commend Christianity as Divine revelation. They know not what they do. For if the immeasurably vast and mysterious creation reveals nothing of its originator or of his or its attributes and nature, there is no *ground* whatever for supposing that any events recorded in an ancient and partly mythopoeic literature, and deductions from it can do so.⁴⁹

Coming as it does from a non-High-Church Anglican, this warning should have credibility to Protestant Christians. Some of them will perhaps see that the credibility of the Bible itself cannot be argued without recourse to an epistemology that justifies the cosmological argument. Catholics, still to see through the subjectivism rampant in modern Catholic biblical scholarship, may find a warning by Schillebeeckx, a most uncertain trumpet of objectivism,

most revealing. It comes from his biblically oriented book: *Christ: The Experience of Jesus as Lord*:

If a man is left alone with a world for man which is not at the same time and more fundamentally the world of God, the assurance of faith remains in the subjectivity of man and is therefore constantly exposed to the suspicions of being a pure projection. The God of the universe and also of nature is one of the elements which can keep open [free] the religious subjectivity of 'subjectivism.'⁵⁰

This warning would have been far more in keeping with the Bible if Schillebeeckx had been emphatic on the earliest Christian perspective on Jesus as the Logos or Son in whom the work of Creation was carried out and in whom the universe is kept together. Christians faithful to their Creed have always sensed that emphasis without resorting to biblical studies. For the Creed—which is largely about Jesus the only begotten Son who is the Savior from Sin, original and personal—predicates belief in Him on belief in the Father, the Maker of Heaven and Earth or UNIVERSE. Any hesitation about the reality of the universe, any decrease in the utmost respect for its rationality, inevitably casts a doubt on the Father. But if the Father is doubtful, however slightly, what happens to the Son?

That a most subjectivist age in theology saw half-a-dozen Christian clergymen come up with a book, *The Myth of God Incarnate*,⁵¹ is not a coincidence. Needless to say, they said nothing of the universe. They still have to reach that preliminary stage of philosophy which begins with wonderment. They should take a leaf from a leading fundamental-particle physicist who, in spite of his apriorism, had the mental alertness to wonder about the ability of puny man to grasp mentally the universe.⁵² Of course, the more one takes that wonderment seriously, the more one has to ponder the pur-

pose of that intellectual grasp and of the scientific marvels performed by it, and ultimately the purpose of man himself. As the next chapter will show, here too the only satisfactory answer, historically as well as logically, is anchored in the Savior.

Chapter Four

THE SAVING OF PURPOSE

Another curious aspect of the theory of evolution is that everybody thinks he understands it

Jacques Monod

Purpose and a purposeless matter

To ask about the purpose of one's actions, especially about the purpose of acts whereby one understands, is to set one's mental eyes on something "external" or "superior." More than the merely physical is implied in the fact that through every action made for a purpose man wants to become something more. The most appealing purposeful actions have always reflected man's urge to rise above himself as if his true weight gravitated upward to a higher realm of imponderable intuitions. This is in evidence in a heightened degree in all courses of action that claim to be a way to salvation.

It has become the sad lot of modern post-Christian times to recognize that to have certitude about one's purpose is to enjoy mental health. The diagnosis, psychiatric and other, has been made in countless cases, and by now over three generations, that behind "indispositions" that are of interest to psychiatrists there invariably lies a loss of purpose or a sense of helplessness with respect to some deeply desired goal. The inability of modern man to get "outside" himself, let alone to rise above himself, has become a commonplace for diagnosticians of contemporary culture. The immediate

causes—for instance, the rat race which technological progress is accelerating instead of alleviating, and the ominous specter cast by some of its most spectacular tools—have been listed for some time in unison and with emphasis. The voices become muted and far from unanimous when it comes to identifying the deeper sources of this widespread predicament of purposelessness. A goodly segment of the scientific community and the scientifically enlightened public will hardly have sympathy for efforts that try to locate within their milieu a chief of those sources. Reluctance of the patient to admit that he is in need of cure is usually the first hurdle to overcome on the path to healing.

A convenient starting point toward that source may be the puzzlement, mentioned at the end of the previous chapter, of a prominent cosmologist. Punny man's puzzlement about his ability to have a scientific grasp of the entire cosmos is a principal aspect of what astrophysicists have been fond of calling the anthropic principle for the past fifteen years or so.¹ Long before that it was known that the earth's biosphere had a relatively narrow variability which corresponded to the no less narrow limits posed by man's physical endurance. The "fitness of environment," to recall the title of a classic investigation now half a century old,² could not at that time be articulated with exactness beyond the confines of the earth. The new science of the early stages of the universe has provided for that fitness a cosmic perspective by the time the on-site exploration of the moon and other planets made our earth appear as a very special place for life.

The anthropic principle stands for the recognition that from its earliest stages the universe headed toward a state which alone can by its physical properties account for two developments: One is the formation of stars around which alone planetary systems can exist. The other is the cosmic preponderance of carbon in the proportion in which it is

necessary for the emergence and maintenance of life. Biological evolution is widely assumed to result ultimately in the formation of intelligent organic beings such as man. No less widespread is the assumption that a planet with an environmental fitness similar to that of the earth is a most likely occurrence in planetary systems that are expected to arise around a certain class of stars.

This is not to suggest that recognition through the anthropic principle of the fitness of the cosmos for intelligent life prompted in the first place the search for extraterrestrial intelligence (ETI). The confidence of the promoters of that search had its chief source in what should be called—and right at the outset—integral Darwinism. According to it life and intelligence are the necessary and inevitable outcome in a world in which particles of matter and their physical characteristics (forces) are producing ever new situations and configurations in immense varieties whose succession is a limitless flux. Within this strictly materialistic perspective nothing is more natural than to claim that “we are not alone”³ and to look, if not for advanced civilizations, at least for evidences of lower forms of life even in our own planetary backyard. Contrary to the assurances given by a blue-ribbon committee of the National Academy of Sciences, no lichens and mosses were found on Mars. Its surface-soil was found to contain not even the traces of death.⁴ The quarantining of astronauts for three days after their first return from the moon, lest they release “lunar” bacteria with a possible threat to all life on earth, proved to be wholly unnecessary.

Although only a few diehards are still looking for traces of life outside the earth within our planetary system, the prospect of detecting radio messages from other planetary systems still exhilarates many. One source of their undisguised joy is that the mere likelihood, to say nothing of a concrete sign, of ETI would discredit more than anything

else the most concrete form of belief in purpose, which is the belief in the Incarnation of the Son of God on this very earth. It was in context relating to the history of ETI that the image of a planet-hopping savior was evoked, and with an ill-concealed grin, to be sure.⁵ Addicts of ETI research hardly ever think of the dark lining behind the silvery façade of their expectations. The most frightful of those dark hues is not that, instead of distant cousins ready to fraternize with us, we might contact an alien species that would take our bodies for a convenient protein reservoir and live up thereby to the Darwinian principle of universal struggle. Fortunately, all good physics supports so far that Nobel Laureate, E. Purcell, who in 1961 concluded that space travel would forever remain in its hallowed place: the cover of cereal boxes.⁶

A far more serious threat is what already hits home, indeed, at the most central location in man which is not in his body but in his mind. For if intelligent life is but an inevitable, however unforeseeable and precarious, result of the interplay of dark matter and blind forces, what ground remains for trusting the intellect itself? Is it still possible in that case to have the certainty that the human mind really *knows* things and is not merely a molecular rubberstamp of them? Does not in that case the mind become a momentary spark on a cosmic scintillation screen which does not know itself as far as this can be known? The latter alternative is hinted at time and again in the debates about the true meaning of the anthropic principle. The blunt inference is usually couched in erudite circumlocutions, instead of being spelled out in its stark nakedness. Behind those verbal exercises there lies the view that the categories of the mind predetermine the notions and findings of physicists.

This rank solipsism, couched or not in references to Berkelian idealism, did not become a vogue among physicists until after the anthropic principle forced them to face

up to such non-physical factors as design and purpose. The thinking of physicists who have been tempted to give an *a priori* derivation of the physical properties of the universe has for some time shown traces of solipsism, the worst imprisonment conceivable for man. One could only wish that all of them had Eddington's frankness to say that in finding anything on the vast shores of the unknown the physicist merely finds his own footprints.⁷ Yet, even an Eddington failed to recognize that the turning of the thinking-self into a self-sufficient unit deprives of meaning not only the efforts of physicists but any effort whereby man purposefully tries to go beyond or above himself in his pursuit of goals.

Solipsism is the carrying of a train of thought to the bitter end which is a stance palatable only for a few hardy souls. Far more satisfactory appears to be that philosophical half-way house which allows its residents to enjoy their natural sanity and make a theoretical illusion out of it. The most elaborate and alluring of such houses was built by Kant. His sufficiently learned readers should have noticed the artifices (conceptual trapdoors, illusory partitions, false staircases, make-believe windows) whereby he tried to make it appear plausible that man chased phantoms as he espoused the three main notions of traditional metaphysics: universe, soul, and God. Rationally speaking, so Kant insisted, man was alone; he could in no rationally respectable way go to that "outside" that constitutes the universe. Nor was it rational, according to Kant, for man to infer from his inner world to the existence of a moral Lawgiver. It could not be known, in terms of Kant's third and fourth antinomies, whether man was free or not, and therefore morally responsible or not. If such was the case, his purposeful acts had to appear as illusions, to say nothing of their moral horizons.

The trend of this intellectual strategy toward plain materialism and atheism was fully known to Kant and he stuck

by it. His treatment of Christ in his *Religion within the Limits of Reason*⁸ was as telling as was his stern refusal, in his final sickness, of the ministrations of Lutheran clergy. The sophisticated atheism, which he had bequeathed, allowed some pragmatic acceptance of the Christian religion with some of its ceremonies, but not a serious belief in them. The broad educated public understood very little of all this and took it largely on faith that the great sage of Königsberg brought metaphysics "down to its essence."⁹ This phrase is from the travelogue, already quoted, in which Gautier described his passage through eastern Prussia on his way back from St. Petersburg to Paris. Clearly, he was repeating an already classic cliché.

One should not, of course, expect from novelists what most Kantian philosophers fail to realize, namely, that anyone, especially a novelist, who writes a book, contradicts and endorses Kant by one and the same stroke. By writing a book the novelist produces something that exists even when not observed or read, and becomes thereby much more than a Kantian "phenomenon." By appealing to his readers' imagination, the novelist endorses the very same device whereby Kant, in contradicting the "critical" status of his philosophy, tried to salvage the coherence between sensations and categories. This is why Kantian philosophy became in Vaihinger's hands a mere *als ob*, a convenient make-believe: One should think and act *as if* outside reality existed and were coherent. In such a perspective, rooted in an imagination that could not transcend matter, purpose could be no more than a pleasant illusion at best.

Purposelessness of a materialist evolution

Vaihinger was also Kantian in that he spoke of imagination without ever being imaginative. Quite the opposite was true of Darwin, whose chief appeal lay in his powerful use

of imagination. He used it with precisely one aim: to destroy intellectual conviction about purpose. It showed the acumen in him that he cast his project in a global, nay, cosmic framework. It was not to the credit of his acumen that he noticed only on occasion that he was destroying thereby one's intellectual confidence in one's mind. This explains the three chief reactions to the *Origin of Species*. One was a resolute opposition to it. The deepest reason behind that opposition was not the fear that if the *Origin* had given the correct answer to the large variety of living form, visits to the zoo would become so many visits to one's ancestors. The deepest reason was, as Chesterton aptly put it, that Darwin's theory could be true only if all distinctions, the basis of reasoning, disappeared in a gray flux.¹⁰ Unfortunately, Bishop Wilberforce did not perceive this when he challenged T. H. Huxley on the far less important issue, namely, whether he had descended from the gorilla on his mother's or on his father's side.

The second reaction was a widely shared exhilaration. Victorian society quickly grasped that its hidden unbelief and concealed immorality obtained a *carte blanche* as the six hundred pages, full of graphic details, of the *Origin* were voraciously perused. None other than a Huxley, Aldous, admitted this in reminiscing about his pre-World War I youth. In fact he singled out sexual license as the chief immediate benefit to be derived from agreeing with the *Origin*.¹¹

The third reaction emerged in circles where Darwin would have felt at home. There positivism was looked upon as a means of justifying a rationally and ethically dignified human living without resorting to belief in a Supreme Being, let alone in a Supernatural Savior. Darwin would have agreed with T. H. Huxley that the absorption of the full message of the *Origin* demanded a great deal of Stoic refusal to ask about the purpose of big and small "developments" if

there were any. To be sure, Darwin did not always remember his motto: "never say 'higher' or 'lower'." He, however, would have pleaded incomprehension on hearing the outcry of sudden helplessness, the response of some of those who registered "a sense of being aimlessly adrift in the vast universe of consciousness, among an infinity of other atoms, all struggling desperately to assert their own existence at the expense of all others."¹² Such was the reaction of a "layman." Even the expert could feel some vertigo. Herbert Spencer admitted of having been haunted by the "paralyzing" question: "What if, of all this, that is thus incomprehensible to us, there exists no comprehension anywhere?"¹³ A generation later, the same frightening conundrum could be evoked through reference to an apparently purely technical puzzle. H. S. Harrison struck indeed at the very heart of Darwinism when he reminded in 1930 the British Association: "Man did very well before he was man at all, and no one has given any reason why he ceased to be an ape."¹⁴

Harrison did not seem to perceive the philosophical depth beneath his technical registering of the fact that primitive man's brain developed far ahead of his actual "mental" needs. The same may not be true of Wallace, the first to make the same objection which provoked Darwin to pen an imperious "No!" on the margin of Wallace's paper. Darwin may have thought that he was merely standing for the materialistic implications of his theory. He did not have the mental depth to realize that Wallace's objection could have been motivated by the intellectual part of humanness that cannot accept the destruction of reason by "reasoning" (Darwinian or other). Darwin's admirers have always found it easier to recall his personal humanness rather than his intellectual powers. In doing so they had to take lightly Darwin's own reminiscences about the delight he had derived from shooting, just for the fun of it, hundreds of birds on a good

sporting day. The purposeless savagery that could surface in young Darwin is still to be analyzed in full by psycho-historians who are becoming more and more numerous among historians of science. It is not certain that more than a few, if any, will have the courage to perform such analysis.

In writing his autobiography Darwin did not recall the delight he experienced as he perceived in the course of filling his first Notebooks that if his evolutionary theory were correct and if "conjecture" was allowed "to run wild," then we—animals and humans—"may be all melted together!"¹⁵ Much less would he have been willing to recall that this "melting of all together" in a purposeless flux and especially the "melting down" of man into just another species was his chief inspiration from almost the moment he stepped ashore from the *Beagle*. The publication in full of Darwin's *Early Notebooks* forces one to conclude that in writing his *Autobiography* Darwin consciously lied when he claimed that he had slowly, unconsciously slipped into agnosticism. He tried to protect his own family as well as the Victorian public from the shock of discovering that his *Notebooks* resounded with militant materialism. The chief target of the *Notebooks* is man's mind, the "citadel," in Darwin's words,¹⁶ which was to be conquered by his evolutionary theory if its materialism were to be victorious.

The few years that separate the naturalist, who piously lectured officers of the *Beagle* on hearing them curse, from the materialist crusader of the *Notebooks* may contain a personal crisis. Any detail about it could serve as a key to that relentless resolve with which Darwin pursued a goal for almost half a century. The goal was in its last analysis less scientific than anti-religious, just as in Hume's case philosophy was less important than an irreligious peace of mind. Hume had his "conversion" while he was in his late teens. Darwin was in his late twenties when he "converted." Hume mentioned the revulsion which the brimstone and

hellfire sermons evoked in him. Darwin was surrounded by urbane clergymen whose liberalism became the prime target of the Oxford movement headed by John Henry Newman. They did not set great store by the literal interpretation of Genesis 1 which Darwin seems to have offered as the reason for his total break with biblical Revelation. A great many Christians could part with that interpretation without seeing any necessity for throwing overboard Revelation as well. Darwin's real reason may never be known, but it must have been almost traumatically sudden if his resulting resolve is to have an explanation.

Victorian society was not to change so dramatically in a short period of time. It preferred to slide gently along a rosepath toward materialistic bliss rather than to be suddenly transplanted into it. The road from the *Origin* to the *Descent* was relatively quick but contained no radical novelty. The *Descent's* materialism, apart from a few instances, was not as crude as that of the early *Notebooks*, though just as complete. While a sudden exposure to the full implication of evolutionary materialism would have certainly made Victorian society feel something of the price of the bargain, the same society could find a touch of salvation in the *Descent's* last page. Here, too, as with most other books, the last page was the first to be read. There Darwin offered the distinctly Lamarckian panacea that "after long practice virtuous tendencies may be inherited."¹⁷ What a satisfaction for comfortable Victorian families! Still nominally Christian, but in reality nobly (or ignobly) pagan, they owed no more to the Reformation than a share in its proprietary spoils as they maintained their refined living with no taxation of income and of inheritance.

The only saving grace in that stupefying recourse to Lamarckism lay in a difference between the *Descent* and the *Origin*. In the *Origin* Darwin repeatedly decried Lamarckism and therefore made only furtive use of it. In the *Descent*,

owing to his heavy use of Lamarckism, he could not decry it. Darwin, who devoted his life to the purpose of showing that there was no purpose, was bound to provide (through the inner force of logic) many more evidences of the illogicality which is implied in such a program. They certainly amounted in the long run to "an interesting subject for study," to recall a Whiteheadian phrase,¹⁸ though not for the purpose of capitalizing on its biting sharpness that aimed more at Darwin and the Darwinists than at Darwinism itself. The regular surfacing of inconsistencies and contradictions in the writings of Darwin and of Darwinists is, however, a fact. Although this was noted as soon as the *Origin* triggered the mighty current of Darwinist accounts of evolution, some salient details bear recounting.

The wages of materialist evolutionism

A cursory look at the table of contents of the *Origin* should make it clear that its very title is a misnomer. Even if the arguments set forth there had been sound, they would have justified only "the origin of *new* species" as a title. Darwin simply assumed the existence of species without giving a satisfactory definition of it. Without knowing, in all appearance, anything about age-old philosophical debates concerning the reality of universals, with the notion of species certainly among them, he was continually driven back to its problematic character and filled with frustration. The result was a series of ambivalent statements, some of which have a realist touch while others sound nominalist. The critics pursued him (and other Darwinists), following the lead of a great naturalist at Harvard, Louis Agassiz, who asked, in the very wake of the publication of the *Origin*: "If species do not exist at all, as the supporters of the transmutation theory maintain, how can they vary? And if individuals alone exist, how can the differences which may be observed among them prove the variability of species?"¹⁹

Those ready to dismiss these questions as metaphysical drivel, do so at the risk of finding themselves in conflict with some prominent Darwinists. One of them, Ernest Mayr, had the courage to admit, though with a touch of flippancy, the legitimacy of those questions.²⁰ In fact a call for the working out of a metaphysics for biology was made no sooner than had the euphoria of the centennial celebration of the *Origin* faded out.²¹ The inconsistency or conflict will, however, appear in its truly Darwinian context only when seen against the sneers at metaphysics in Darwin's early *Notebooks*. One of them reads: "He who understands baboon would do more toward metaphysics than Locke."²² Darwin, who many years later spoke in his *Autobiography* of Herbert Spencer as one of the greatest philosophers ever, could only mean by the phrase, "do more toward metaphysics," the undoing of it.

Darwin suspected nothing of the philosophical haplessness hidden in his naive boasting: "I have worked on true Baconian principles, and without *any theory* collected facts on a wholesale scale" (*italics added*).²³ Any twentieth-century philosopher of science (unless he is a rabid positivist) would only smile at Darwin's (and Bacon's) claim. All empirical investigation is theory-laden, primarily because the knowledge of any fact implies the recognition of the universal in the singular, the very same problem which on a more complex level lies hidden in the very title of the *Origin*. Worse, Darwin, while still filling his early *Notebooks*, read and annotated a paper by a certain E. Blyth who had set forth in 1835 and 1837 the idea of natural selection at length and in words that Darwin echoed in print twenty years later to a stunning degree.²⁴ To ward off the ominous specter of plain plagiarism, Darwin's admirers can only come up with the exceedingly dubious defense that he had long forgotten about that article as he rushed into print with the *Origin*.

Natural selection as a concept proved to be for Darwin as hard a nut to crack as the survival of the fittest proved to be

for Herbert Spencer. Both concepts turned out to be specious tautologies, all too often covered up by the ruse of personifying sheer physical forces and factors as if they could choose or have a strategy. Only in the 6th edition of the *Origin* did Darwin at long last recognize that "in the literal sense of the word, natural selection is a false term," and deplored its lure as a metaphor.²⁵ The latter, it is well to recall, is a device more suitable for poets than for scientists. The tautology remained intact when the phrase, "survival of the fittest," was replaced by neo-Darwinists with "differential reproduction."²⁶

Darwin did not live to see the day when wholesale doubts arose about the basic role which he attributed to sexual attraction. He would have immediately recognized that "Selection in Relation to Sex," the very subtitle of the *Descent*, was in jeopardy. Yet the *Descent* should have included his admission of the fact, valid then as well as today: "In no case has it been demonstrated that such selection occurs in wild populations."²⁷ Studies of the latter only provided blatant counter-examples in the behavior of cuckoos, one of the birds Darwinists do not like to talk about. The combination of at least a half a dozen independent factors, which is at play in the cuckoos' cunning use of other birds' nests for hatching their own eggs, has for some time caused sleepless nights to honest Darwinists. That male cuckoos are promiscuous and female cuckoos are polyandrous is the kind of additional information that can but turn those nights into nightmares. The traumatic catharsis which nightmares may provide will come to Darwinists when they seem themselves typified by cuckoos. Ever since Darwin, the reasoning of Darwinists has shown patently promiscuous features as they resorted to a large variety of philosophical schools for intellectual fertilization. Worse, their most effective reasonings were, as will be seen, so many offspring that could be hatched only in the nests of metaphysics.

Among domesticated animals the peacock (and its relatives, the argus pheasant, for instance) provide only such hypothetical evidence on behalf of sexual selection that amounts to a factual rebuttal of the principle of adaptation. The splendid ornament of peacocks deprives them of basic defense mechanisms, such as efficient flying and running, whereby birds cope with a hostile environment. And certainly that kind of ornament is useless as a camouflage. Darwin never vented in public the true weight of his own experience of which he spoke in private: "The sight of a feather in a peacock's tail," he wrote to Asa Gray, "whenever I gaze at it, makes me sick."²⁸ That the camouflaged grasshopper betrays itself by its chirping is one of the countless contradictory adaptations in nature that should have given Darwin similar nausea.

Such cases could but turn the question about the *why* of adaptation into a threat. As to its *how*, nothing brought the problem closer to home for Darwinists than the eye. It is an organ that has been studied with far greater accuracy than any other organ. Exact measurements and theories of physics have been added to anatomical studies of the eye to such extent as to deprive Darwinists of their chief strategy: general if not vague qualitative speculations about the specific steps of evolution. Yet they cannot help admitting, without contradicting the exactness of physics, that, in the words of one of them, "even if the slightest thing is wrong—if the retina is missing, or the lens opaque, or the dimensions in error—the eye fails to form a recognizable image and is consequently useless." Garrett Hardin, the Darwinist in question, then faced up to the question: "Could it [the eye] then have evolved by small, successive, Darwinian steps?"²⁹

Hardin would not have earned his reputation as a tough-minded Darwinist if he had not attempted some answer. But to put, as he did, existing and prehistoric eyes in a

carefully graduated morphological sequence, is not the answer. He himself admitted that the sequence is not to be taken for the "historical" or evolutionary sequence. Also, all those eyes are all perfect in themselves, that is, not "transitional." Nothing is known concerning transitions between them. Hardin, too, is obviously haunted by the eye because a hundred and fifty pages later he explodes: "That damned eye—the human eye," words that would fit as an inscription over the entrance of the studies of Darwinists as a reminder of their true predicament. While they staked their fortunes on the straining of their eyes, nothing contradicts them more than the very organ of vision. Why would it then be far-fetched and improper to see in this fearful paradox of illogicality a retribution from on high for a self-imposed myopia approaching voluntary blindness? Such features of "intelligent" behavior, the wages of materialist evolutionism, should evoke for their explanation the very vistas of an "aboriginal fall."

The slighting of evidence

Systematic efforts to slight the evidence are the reverse side of that myopia. Darwin anticipated the experience of many Darwinists in admitting the failure of such efforts. "I remember well the time when the thought of the eye made me cold all over, but I have got over this stage of the complaint, and now small trifling particulars of structure often make me very uncomfortable."³⁰ It seems that sins committed in the name of Darwinism against the intellect are so great as to partly invalidate Burke's dictum already quoted: "Custom reconciles us to everything." Darwin and Darwinists should have become cold all over also in the presence of numerous phenomena (marvels would be the most appropriate word) of parasitism, mimicry, and metamorphosis. Is the metamorphosis of silkworms, a sequence

of very different life-forms and habitats, explained by the custom of turning it into a first experiment in biology for countless schoolboys? Is it an explanation to sidestep questions about the quantitative steps involved in that and countless other cases with a qualitative appeal to the truth of the Darwinian mechanisms of evolution? Have those mechanisms ever measured up against stunning accuracies involved in heat-conducting surface layers in the wings of butterflies without which they cannot become airborne?

Darwinists invariably shy away from giving a detailed Darwinian "explanation" of any of those "marvels." That their "explanations," jazzed up nowadays with easy references to "multiple messages" encoded in the genes, amount to attempting the practically impossible, may transpire by reading any moderately detailed description of such marvels. They may in fact become forever engraved in one's memory as this happened to me when I was told, at the age of sixteen (now almost half a century ago), about the first of the three following cases:

The water-spider (*argyroneta natans*) which spends most of its life under water, makes a tent of silk on the floor of the pool, mooring it to stones and the like by silk threads like tent-ropes. Sometimes the shelter is woven among water-weeds. If the tent is on the floor of the pool it is flat to begin with, but the spider proceeds to buoy it up with air. Helped by a special thread, fixed at the bottom and to water-weed at the surface, the spider ascends and entangles air in the hairs of the body. Climbing down the rope, like a drop of quick-silver because of the air bubbles, it passes under the silken sheet and presses off the air. The air is caught by the silk sheet, and after many journeys the nest becomes like a dome or diving bell, full of dry air. In this remarkable chamber, dry though under water, the mother-spider lays her eggs, and there her offspring are hatched out.

The dry dome may be used as a shelter during the winter, when the spider remains inactive.

Worthy of great admiration are the trap-door spiders that sink shafts in the ground in dry sunny places . . . The hole is excavated by the strong *chelicerae*, and the interior of the shaft is made smooth with silk. The opening on the surface is closed with a hinged lid, which helps to exclude intruders. Sometimes this door is merely a loose flap of silk, which was woven and fastened over the entrance, and then cut all around except at the place where the hinge is left . . . But in other cases the lid is more elaborate. It is made of alternate layers of earth and silk; it has considerable thickness and fits the entrance with precision. It works on a silken hinge and the under-surface has a notch or several little holes by which the spider is able to hold it firmly on the inside . . .

There is a Queensland spider called *the magnificent*, because of the fine colouring of the female. But it is her way of catching moths that concerns us at present. She hangs down from a line and spins a thread about an inch and a half in length, bearing at the free end a globule of very viscid matter, a little larger than the head of a pin. The thread is held out by one of the front legs, and on the approach of a moth the spider whirls the thread and the globule with surprising speed. The moth is attracted, caught, pulled up, killed, and sucked. When it is touched by the whirling globule it is helpless as a fly on fly-paper. We may well say of the magnificent spider, *c'est magnifique*.³¹

The continuation, in this case, of *c'est magnifique*, should not be *mais ce n'est pas la guerre*, whatever the endless skirmishes provoked by the illogicalities of Darwinism, but, rather, *ce n'est pas la sélection naturelle*. It is still to be shown that natural selection can produce the magnificence, worthy of being called a plain marvel.

Yet are not these marvels also *facts* about which T. H. Huxley claimed that they alone deserve utmost, unconditional respect? "Sit down before facts like a child . . .," he wrote in reply to the Rev. Kingsley who spoke to him (following the death of his only son at the tender age of seven) about immortality though not with sufficient explicitness about the one tied to the fact of Christ.³² More of this later. Whether the sole facts of nature had truly given Huxley the peace of mind he claimed is not the point at issue here. It is rather the failure of Huxley and all other Darwinists (who ought not to be taken coterminous with evolutionists) to live up to the precept to hold any scientific belief or theory "with a light hand" and "to part with it cheerfully, the moment it is really proved to be contrary to fact, great or small."³³ The only excuse Darwinists can claim is that so far no experiment or observation has disproved the Darwinian mechanism of evolution, for the simple reason that, for all practical purposes, no experiment or observation can prove it. As for those who take Popperian falsification as the theoretical test of the truth of a theory or mechanism, they still have to learn to live with Popper's dictum that Darwinism is not falsifiable.³⁴

The boomerang of Darwinism

It is not pleasant to be hit by weapons of one's own making and launched by one's own hands. No wonder that Darwinists prefer to gloss over a host of reconsiderations unfavorable to their theory, and especially to the very mechanism they proposed for the explanation of the succession of all living forms. Quite a few things erstwhile Darwinists "saw" and held most important faded into relative insignificance in the eyes of neo-Darwinists or representatives of the "synthetic" theory, of which more later. Darwin himself set great store by comparative anatomy (morphology) and

inspired much valuable research. Today morphology is held of little value for the understanding of evolution. The same is true of embryology. Once the darling of German-speaking Darwinists, it was referred to by G. G. Simpson as "the overgeneralized and much abused aphorism of the nineteenth century."³⁵ Even more revealing is the disrepute into which the tree-diagrams of evolution have fallen among Darwinist scholars, a development with which the popularizers of Darwinism still have to catch up. Worse, not only the whole tree has become questionable but its most valuable branches too, such as the twig showing the *orthogenesis* of horses.³⁶ This or any other small branch depended on its growth for the accumulation of favorable small changes. It was Darwin's great hope that a process, which professional breeders could not push very far, nature could carry to unlimited lengths. The *Origin* ceased to contain only from its sixth edition on Darwin's vision, if not wishful thinking, about growth along a branch which presumably began with a bear and ended with a whale. A whale of a growth indeed.

Darwin never suspected that his theory implied an upside-down version of the evolutionary tree, even if the theory was sound. The Darwinian mechanism of evolution could conceivably produce effective differentiation only on the level of species or subspecies because of the extreme minuteness of changes it had to rely on. Compared with the huge gaps separating the genera, let alone the higher groups (families, orders and classes) from one another, the distance from one species to another could appear relatively small so as to be covered by a fortunate accumulation of minute changes. Darwinian evolution could start only on the level of species that occupy the end points of the branches of the evolutionary tree. An ordinary tree with one trunk and with branches shooting in a more or less upward direction is therefore to be turned upside down in order to illustrate Darwinian theory. A banyan tree with its many branches

rejoining the ground as so many roots could have served the purpose only by assuming that all those branches grew from the ground up in the first place, and independently of one another. But in that case their successive joinings-up becomes an intractable problem.

The tautologies and contradictions, for which Darwinian theory became a major breeding place, were crowned by the belated insistence that cooperation was no less a feature of organic life than a grim struggle with no quarters given. That cooperation could in no way be made a logical part of Darwinian theory was the main theme of the last major address delivered by T. H. Huxley. Decades later, when the support derived from Darwinian ideas for warmongering became all too clear,³⁷ Darwinists began to bend over backward to put cooperation and struggle for life on one and the same pedestal. They presented a sorry spectacle as they were falling back into dualistic mythologies in which good and evil were forever locked in inconclusive battle. Two thousand years earlier the frustration generated by that perspective prompted a rush toward a saving reality which, through its gigantic human concreteness, offered a definitive escape from those mythologies. Romanes, one of the early and notable Darwinists, discovered for precisely such reasons the perennial timeliness of that saving reality which is Christ.

Contrary to first expectations, Darwinism was not effectively shored up either by genetics or by those vast studies in biochemistry that followed the announcement in 1953 that the structure of chromosomes was a double helix made of specific sequences of amino acids. The exactness of biochemical research did not exactly turn into a bonus for those Darwinists who expected to turn with its help the evolutionary theory into an exact science. It is now known with exactness that missing links are no less conspicuous by their absence along the parameter of molecular relatedness than

they have been between man and his still hypothetical anthropoid ancestors.³⁸

In fact, links, that is, forms of minutely graduated transitions—a central requirement for the truth of Darwinism—are missing everywhere in the evolutionary record. While Darwinists unearthed an incredible wealth of data about the plant and animal kingdoms, they failed to come up with a single convincing evidence about those transitional forms, the very thing they were constantly looking for. About this fact, sporadically hinted at for over many decades in the Darwinist literature, none other than Stephen J. Gould, the present-day pontiff of Darwinism in America, served a blunt reminder, though not without serving it up also as a red-herring.

Gould began by putting an unjustified blame on Darwin in trying to draw attention away from the fact that Darwinism was really at fault. Contrary to Gould, natural selection could from the first appear but a sheer fiction had Darwin, in disregard of a last minute suggestion from Huxley, not assigned it a very slow rate of operation. As to that slow rate, producing transitional forms at measured pace, Gould confessed that

The fossil record, Huxley argued, proclaims it incorrect. And the fossil record still proclaims it false, after more than a century of diligent search for gradual change. Paleontologists have documented virtually no cases of slow and steady transformation, foot by foot up the strata of a hillslope—not for horses, not for humans.³⁹

This was the type of candid admission which, in view of the basic illogicality of natural selection, could shift the blame from Darwinism to Darwin only by making Darwinism appear even more mystifying. Conceptual boomerangs can be no less devastating than their material kind. For if the

transformation of one species into another came in sudden bursts, either the transitional forms had to be still visible, though piled upon one another in relatively thin strata, or their invisibility amounted to pulling not a single rabbit but hordes of beasts from under a hat.

Unrepentant Darwinists and non-Darwinian evolutionists

Actually, what is really under the hat of unrepentant Darwinists is a rigid ideology that accepts evolution only in a form which, as Darwin wanted, excludes God and soul and leaves one with blind matter. Gould blamed liberal capitalism, distrustful of sudden (and revolutionary) changes, as the factor that imposed on Darwinist evolutionists the idea of change working at a quietly slow rate. In doing so, he threw a red herring in the path of those who might have noted the ideology operative in all Darwinists who, and this cannot be emphasized enough, should not be taken coterminous with evolutionists.

At any rate, since ideology has no control over scientific findings, it should not be surprising that the problems of Darwinists have been further aggravated by setbacks they have recently suffered through the work of some physicists. A new chapter was added thereby to an old story. Physicists were at first an ominous specter for Darwinists as they did not grant billions of years for the earth as postulated by Darwin. Peace reigned between physicists and Darwinists following the first radioactive estimates, around the turn of the century, of the earth's age in billions of years. Those long ages no longer look like the quiet affair Darwin and Darwinists hoped for. The finding in the 1960s of iridium in high concentrations in widely separated spots close to the earth's surface prompted a renewed look at some major though not sufficiently appreciated features of the paleontological record. One of them is the sudden disappearance

of trilobites from the sea during the Cambrian period, about 500 million years ago. Another occurred on a far more devastating scale about 250 million years ago during the Permian period when almost all marine life became extinguished. Most dramatized is the wholesale death of dinosaurs 65 million years ago, toward the end of the Cretaceous period. A new look, strengthened by radiometry, at the entire fossil record suggests that notable extinctions have for the past half a billion years occurred on the earth every 23 million years.

The triggering device for these regularly occurring devastations of life is the periodic encounter of the sun with large showers of comets and meteors. Their impact with the earth results in a dust cloud that produces a lethal greenhouse effect over thousands of years. Opinions vary whether the periodicity in the sun's movement is due to a still hypothetical tenth planet or to a dark companion (dubbed Nemesis) of the sun moving around it in a highly eccentric orbit. Very recent findings that Pluto, the ninth planet, is a former satellite of Neptune detached from it by a close encounter of the sun with another sun, should further discredit the views, very dear to Darwinists, of the planetary system as a machine that has quietly hummed ever since its formation. Last but not least, Darwinists are now quite defenseless for having left the search for evidences of major geological catastrophes to writers who blissfully mixed sense and nonsense, data and fiction, in books that have become best-sellers.

The most recent instance of studied neglect of facts on the part of Darwinists is part of a wider picture of the illogicality which Darwinism has amply generated from its inception. Darwin, who once described himself as a "master wriggler" in meeting objections, certainly set an effective pattern for subsequent generations of Darwinists. Within their circles any renewed effort to cope with a sud-

den crowding of new (at times very old) facts can result in stultifying debates. A recent illustration of this is the aftermath of the efforts of N. Eldridge and S. J. Gould to make the best of the periodic dimming of life on earth. Their theory of "punctuated equilibria" states that species remain unchanged for long periods of time but when they change they do so with great speed. The occasion may be provided by the elimination of most of the competing species through geological catastrophes, leaving the field open to the few survivors. The theory is patently un-Darwinian for two reasons: one is the suddenness of development, the other is the absence of that very competition which, according to Darwin, is evolution's chief propellant though at a very slow rate. Such unorthodoxy can readily produce disillusioning verbal exchanges with representatives of orthodox Darwinism. One of them confessed to having been tempted to shift to a field with greater intellectual honesty. By naming the used-car business,⁴⁰ he obviously meant to hand down a damning indictment.

Plenty of damning should be on hand for Darwinism in its being unique in one respect among all major scientific innovations or revolutions. As a rule, a scientific revolution proves itself by the fact that once the generation that first opposed it dies out, it is universally accepted. Within a generation or so after the publication of Newton's *Principia*, its triumph in Cartesian France was complete and so was the demise of scientific Cartesianism. Opposition to quantum mechanics was practically non-existent once Planck's older contemporaries had departed from the scene. The same is true about the opposition to Einstein and his theory of relativity. With respect to Darwinism, which is spoken of time and again as a discovery of as great, if not greater importance than the one contained in Newton's *Principia*, the situation is very different. The four generations that have gone by since the publication of the *Origin* have witnessed

the tenacious survival of a scientifically most respectable minority of biologists. For all their anti-Darwinism, they have not become anti-evolutionists.⁴¹ Their survival is all the more significant, because they were all too often the victims of rank intolerance on the part of the Darwinist "consensus." One aspect of that intolerance is the myth created and carefully nurtured in Anglo-Saxon and especially in American Darwinist circles that non-Darwinist biologists are a practically defunct species.

Catechism without salvation

One will understand this brazenly "non-scientific" strategy only when facing the fact that Darwinists all too often acted as if they formed a church of anti-religion. To be sure, most of their leaders allowed themselves only occasional barbs at religion, especially Christianity, barbs usually as brief as George G. Simpson's passing reference to "higher superstitions celebrated weekly in every hamlet of the United States."⁴² But by and large they give tacit support to those who loudly proclaim the anti-religious and especially anti-Christian bearing of Darwinism. T. H. Huxley offered no protest when W. K. Clifford, professor of mathematics at the University College of London, spoke of the *Descent* as the evidence that "the Kingdom of Man is at hand," and as the justification for Man to declare, "Before Jehovah was, I am."⁴³ In Germany David Strauss, busy in weeding all miracles out of the Bible, hailed Darwinism as the definitive answer to miracles. The last in Germany to oppose Strauss would have been Ernst Haeckel, the first major German champion of Darwin. In his *History of Creation* man was turned so outspokenly into a product of an exclusively materialistic evolution that for a while Darwin thought that there was no reason for him to write the *Descent*.

There was hardly a leading Darwinist who did not speak of Darwinism as a comprehensive view of life and existence. In doing so Sir Arthur Keith explicitly classed Darwinism as a religion and with a reference to chance that dominates a card game: "To each of us cards are dealt out: we have to accept the hands given to us and make the best of them. The game cannot be played without a *religion* of some sort. We who are now playing the game must have a *creed* which will carry us in hope through periods of adversity and in humility through periods of prosperity" (Italics added).⁴⁴ The misguiding nature of that *creed* could be clear to anyone mindful of the elementary error underlying it. Contrary to Sir Arthur's claim, Nature did not deal her cards evenly. They were invariably stacked in favor of ever greater disorder, a point known with the exactness of statistical thermodynamics for half a century prior to 1925 when Sir Arthur lent his scientific luster to a lectureship established in memory of Moncure Daniel Conway. The latter's intellectual odyssey went from Methodist ministry through Unitarian ministry, followed by the abandonment of prayer, to penning a biography of Thomas Paine and an exposition of Eastern wisdom . . .

About twenty years later Julian Huxley entertained the Darwinist faithful with his *Religion without Revelation*. In recent years, Professor E. O. Wilson, of sociobiology fame, singled out "the evolutionary epic" as "the very core of scientific materialism" and "the best myth we will probably ever have." Its chief advantage of being a myth was its adjustability to truth in the greatest possible measure in which "the human mind is constructed to judge the truth." Kant would have loved the last phrase which shows that Darwinism can give only such explanation of the mind in which ultimately the truth content of all facts is turned into a function of the intellect itself. The whole difference is that for Kant the categories of the mind were still absolute,

whereas with the Darwinists they are (or at least have to be) part of an endless flux. If Darwinists claim a progressive approximation of truth through the evolutionary process, they do it only in terms of a postulate which is wholly extraneous to the genuine science contained within Darwinism. Most revealingly, Wilson also admitted that the religion or myth of materialists still has to satisfy "the mythopoeic requirements of the mind" in order "to reinvest our superb energies."⁴⁵ Clearly, the resorting by Darwinists to catechism, to recall a stunning admission by Professor Gould,⁴⁶ failed to provide a solution, which, if truly satisfactory and fundamental, would constitute the very salvation the teaching of true catechism is to provide.

The Fall of man through Darwinism

Respect for the self-imposed limitations of the scientific method should provide more than enough justification for opposing the evolutionary *myth*—which should never be confused with evolution. Such resolve should grow into missionary zeal on recalling also the contradictions, inconsistencies, and the lack of proofs that have accompanied Darwinism ever since its inception. Should one not feel compelled to crusade on behalf of mental sanity when Darwinist biologists churn out statements like this:

Since Darwin's day, Evolution has been more and more generally accepted, until now in the minds of informed, thinking men there is no doubt that it is the only logical way whereby the creation can be interpreted and understood. We are not so sure, as to the *modus operandi*, but we may rest assured that the process has been in accordance with great natural laws, some of which are as yet unknown, perhaps unknowable.⁴⁷

One wonders whether R. S. Lull, long-defunct biologist at Yale, cared to show this sentence to any professor of logic there. Actually, even an undergraduate student of logic, not yet brainwashed by Darwinist phraseology, could have easily reached the conclusion that only minds lulled into insensitivity about logic could read the foregoing phrase and not feel revulsion. Clearly, if one could not be *so sure* about the mechanism of Darwinian evolution, one could not be expected to *rest assured* about it, let alone about something which was a bold projection beyond it. The same student would have also rightly wondered about the accordance of that broader projection with "great natural laws," if they were only partially known and some of them would probably remain forever unknown.

The same undergraduate would have most likely found nothing wrong with Professor Lull's claim that there was no doubt about Darwinian evolution "in the minds of informed, thinking men." He and other teachers of Darwinism in prestigious universities (eagerly aped by faculty in run-of-the-mill colleges) took care lest students should suspect the existence of a respectable non-Darwinist minority among the very experts on evolution. Nor could the undergraduate in question easily suspect something fishy in Professor Lull's use of the word creation. By the 1920s, and even more so in subsequent decades, the meaning of the word creation was hardly ever taken as creation out of nothing, that great revolutionary sense given to creation in centuries of Christian tradition. In fact, Darwinists have always done their best to cheapen the semantic value of that term through continual references to the "creative role" of natural selection or evolution.

They do so mostly by leaving those references as an unexplained metaphor in full knowledge of the fact that it is the role of metaphors to suggest more than their face value. Only when Darwinists explain their usage of the term can

its inflationary effect be suspected. A case in point is the claim of the famous geneticist, H. J. Muller, that natural selection is more creative than a sculptor or a poet, because both, according to him, transfer an already actual form from one locus to another. His claim, that a sculptor merely unfolds the figure already in the block of marble,⁴⁸ represents a rank ignorance about what is done by a sculptor or by a poet for that matter. But such a shabby conceptual background was needed so that the work of natural selection could be seen as the eliciting of the actual from the potential. Darwinists ready to turn the halls of philosophy into a theater specializing in comedies never sense the irony hiding in a grim Darwinist's assertion that "anyone who does not honor Darwin inevitably attracts the speculative psychiatric eye to himself."⁴⁹ Rarely has the shoe been more convincingly on the other foot.

Nothing can reveal more poignantly the depth to which man can fall than that very high level at which he is ready to take sickness for health and vice versa. While most careful in distinguishing physical health from physical disease, modern man has taken it for a sign of sophistication to play an irresponsible game with concepts, insofar as the game is expected (though in vain) not to spill beyond the mental level. A misleading game with words is taken for learnedness as if the forming of words did not represent man's greatest learning. Darwinists have been in the forefront in this game ever since they started discussing the evolution of the human brain and of language. On the face of it they are engaged in producing pleasing paradoxes such as that "we are smarter than we are." The justification offered by Professor Gould, responsible for that paradox, is that the human brain increased much faster than the human body. Indeed, its increase took place in an interval that is a mere instant on the geological scale. Since to see in this fact something thought-provoking is "unconventional" for Dar-

winists, Professor Gould rushed to undo the possible harm to the cause with the remark: "It does reinforce an ego that we do well to deflate."⁵⁰

If paradoxes can be sheer tragedies, this is certainly one of them. For a Darwinist's affectation of mental humility is in fact a brazen reaching out for exaltation. It is the natural equivalent to the sin against the Holy Spirit which the Savior himself identified as the only insurmountable barrier to salvation. This is why Professor Gould's paradox cannot do for Darwinists what paradoxes, to recall a priceless remark of Chesterton, are supposed to do, namely, to "awaken the mind."⁵¹ Darwinists still have to wake up to the fact that the overpowering witness on behalf of evolution is that the mind's eye can see incomparably farther or deeper than the physical eye, aided as this could be by such marvelous inventions of the intellect as microscopes and telescopes.

The true ground for the truth of evolution

The adverb *incomparably* is meant to be taken literally. Now that astronauts have seen the entire globe from outer space, it may not be a sheer flight of fancy to conjure up in a single composite image what has always been the most compelling evidence on behalf of evolution. The screen, gigantic of course, would show the flora and fauna of islands, such as St Helena, Galapagos, Celebes, and of continent-islands such as Madagascar and New Zealand. About each of them the gigantic screen would show strange peculiarities. To mention only one specific example: 130 or so species of beetles on St Helena, most of which belong to genera that are not found on the nearest mainland. This is not the place to retell in any detail the argument from geographic distribution. It is an argument in which the mental view goes *infinitely* beyond the physical view and conjures up what only the

eyes of the mind shall ever see: the emergence of new species of beetles. Nor shall the physical eye ever see the impact which the isolation of those beetles from their mainland-relatives had, in imperceptible steps to be sure, on their special development. Nor will a supercamera show the actual and infinitesimally small steps in which that development took place. Only the eyes of the mind will see all this and see it confidently.

The reason for this is that the mind's nature is to *understand*. That a verb which is so "physical" in the immediate connotation of its components (to stand under something) can also denote an action stunningly non-physical and by a mere reversal of its components, is in itself a marvelous pointer toward that marvel which is understanding. For the mental act which is *understanding* is indeed a single grasp of the complexity and multiplicity of any visual image so that a unifying principle may be seen beneath it, and to be seen with that confidence which is implied in the act of any firm stand, its only kind worthy of the name. It should not therefore be a surprise that in all areas of learning the increase in understanding has always meant a growth in reducing (and with confidence) the multiplicity to unity. What has been said about the space-parameter (geological distribution), can equally be said about the time-parameter (the chronological sequence of sediments and the fossils in them).

Anti-evolutionists so keen on saving the mind from the clutches of evolutionary materialism still have to realize the enormity of the risk they are taking. By insisting on proofs about every detail of the evolutionary process they may by implication deny the need for mental vision and with it the reality of the mind (soul), the very citadel of anti-Darwinism. The chief objection to Darwinists should never be a charge that they claim to see vastly more than what actually can be seen. Nor should one bank too heavily on their being

divided into querulous factions even when the problem on hand may seem so simple as the evolution of hair. For even their hapless division on a far more important matter, the origin of flying, may one day yield to their being united in a reasonably good explanation of it. Anti-Darwinists should not be mystery-mongers about a physical universe concerning which nothing is so misleading (and anti-Christian) than the claim that it is "mysterious."

Against Darwinists there is only one argument which is perennially valid and goes to the heart of the matter. Their vulnerability to it would be far greater if T. H. Huxley had admitted on more than one occasion that the view connecting data and circumstances very distant in space and time is a metaphysical vision, a philosophical act of faith.⁵² The argument's chief target is the Darwinist's inability or refusal to see the true metaphysical nature of his evolutionary vision. The argument is that there is a metaphysical vision upon which scientists as well as non-scientists fall back each time they utter a phrase however trivial, let alone when they offer daring generalizations. The construction of the argument falls, of course, under the validity of an extended form of Gresham's law. That bad money drives out good currency is also true of epistemology and metaphysics.

Only an epistemology free of any taint of Kantianism can show the embedment of metaphysics everywhere in the physical and even on levels that may seem void of any metaphysics. Early Darwinists may have relied with unbounded confidence on comparative anatomy precisely because it could appear to involve but a mere juxtaposition of shapes, hardly a metaphysical procedure at first sight. Comparative anatomy served Darwinian purposes insofar as it implied the "mental" spotting of elusive analogies. The act involves the spotting of what is better known as *Gestalt* or that "whole" which is always more than its parts. The analogy in question is not exactly the same which in realist

metaphysics is called the analogy of being. Its recognition can, however, serve as a propedeutics for mental sensitivity about the presence of the analogy of being in more than one "Darwinist" context. One of them is on hand when the Darwinist, ready to be enlightened about his mental operations, ponders the respective measure in which a crystal, a virus, a plant, and an amoeba are living beings, or reflects on the various senses of life that are called for by the immense gradations of the nervous system from primitive chordates to man.

Good epistemology and metaphysics are no less in demand if extrapolation, a chief device of Darwinians, is to be justified rationally. When Darwin held high Baconian principles, he obviously meant the inductive method without suspecting that in itself it remains inconclusive. The conclusion of an inductive argument is a kind of mental act that without a sound metaphysics cannot be transformed from a "fiducial" if not "fideist" leap, which a Darwinist may not perform in public, into a well-reasoned inference. Without metaphysics the Darwinist can only resort to a similarly embarrassing act if he is to account for his fundamental contention about the unity of the physical universe and of its forces. And if he begins to feel embarrassed, however slightly, he may perceive something of the starkly metaphysical nature of the claim that all is matter, the basic dogma of his materialist religion.

If the Darwinist is unwilling to proceed along these lines in order to perceive that all his basic procedures and claims are so many votes on behalf of the mind, he still has to take a look at what has happened in physics. He has to do so in the name of consistency. After all, he is one of those biologists who have never given up hope that biology may one day be as exact a science as physics is. In the first place, the Darwinist in question has to realize that gone are the heady days of mechanistic physics in which mathematical formalisms

seemed to be exact reflections of pieces of machinery. Putting those pieces together could appear to require, on a superficial view at least, nothing more than a mechanical putting together, by trial and error if necessary, of a jigsaw puzzle.

The enormous increase in the exactness of physics in the 20th century turned out to be a function of a very different use of the brain. Einstein, who had the closest personal experience of that mental operation, found no better words for it than "the free creative acts of the mind."⁵³ In fact, he was so convinced on this point as to be ready to face the charge of being guilty "of the original sin of metaphysics."⁵⁴ Darwinists rejoicing nowadays over the "relaxation" of matter in terms of quantum mechanics,⁵⁵ may learn from Einstein another most important point. For all his enchantment with mental creativity, Einstein kept a healthy respect for matter as the ultimate arbiter in physics. This is why he opposed to the end the Copenhagen philosophy of quantum mechanics in which matter ultimately turns into a mathematical fiction, a mere shadow of reality, though a fulfillment of misguided hopes about a cosmic "relaxation," the *par excellence* work of a fallen intellect.

The saving of matter and mind

Taking matter for what it is remains far more important for the biologist as long as his field stays at enormous remove from the "blissful state" of complete mathematics. This was a chief reason why R. Fisher's mathematically worked-out theory of dominants left prominent geneticists dissatisfied. Steeped in working with the real, they could only be taken aback by the fact that the success of the theory depended on the hypothetical existence of further genetic factors that could make their already complex field even more complicated! Nor could they really be relieved by a mathematiza-

tion through which natural selection resembled, in the very words of Fisher, "a mechanism for generating improbabilities,"⁵⁶ as if they had not already a flood of them on hand. Some Darwinists refused to let their field of investigation be reduced to a "numbers game," because of their commitment to work with real matter.

The results of that work, even though they fall far short of the hoped for goal, are vast. They attest that profound confidence in the potentiality of matter which Tyndall, an early supporter of Darwin, held high. His admission that a mind was needed to see beyond microscopes as life was investigated did not liberate him from the one-way vision characteristic of Darwinists. He failed to see that the control of Matter by Mind was even more mysterious than the "mysterious control," witnessed by "every meal we eat and every cup we drink," of the "mysterious control of Mind by Matter."⁵⁷ Yet there was much merit in his call for removing the "opprobrium" laid on matter by precisely those who should have been the last to look at it with crypto-Manichean eyes. The hundred or so years that have since gone by witnessed an accelerated disclosure of unsuspected potentialities of matter. The stage has been reached where materials with astonishing properties can be made to order. Biophysics and biochemistry have made advances that should give more encouragement to those who expect an eventually complete account of all life processes, than to those who wager on the long-standing frustrations that followed sophisticated probings into the origin of life and the storage of memory in the nervous system.

At any rate, mind and matter have never before appeared in so close an interplay as they do today, nor has man ever before depended so heavily and intricately on his mind as well as on the matter at his disposal. An equal respect for both matter and mind should appear more and more the key to success as well as to survival. Respect means, however,

much more than cognition or even the recognition of the reasonability of this "catholic" view. Had philosophy not ceased to be a pursuit of the love of wisdom, it would perhaps serve as a reservoir for that much needed catholicity.

The history of modern Western philosophy does not inspire much confidence. Within that history the tendency is unmistakably toward a slighting of the mind and a growing infatuation with matter. The latter does not always take the crude form of dialectical materialism, but is pervasive enough to deprive of academic respectability philosophical arguments about the immateriality of the mind or soul. A decisive fact in this respect was the speed with which the Cartesian understanding of the mind-body relationship revealed its debilitating weakness through Leibnizian rationalism, the apex of the construction begun by Descartes. His was, as is well known, a burning desire to restore the sense of rational certainty in the wake of the havoc triggered by Ockham and his occasionalism. But to save reason with a recourse to a disembodied shadow of it turned out to be an effort to lift oneself by one's bootstraps. It ended, through the work of Kant and his successors, in the falling back of the mind upon itself, a state where the mind's contact with the external material world was purely putative.

This alone should suggest that genuine respect for man's mind, a respect without which his sense of purpose will be at best anemic, be sought in a perspective of the mind in which its need for matter is fully recognized. To think in this connection of the mythological figure of Theseus, who needed to touch the ground at regular intervals in order to regain his strength, is highly appropriate. It was in the Greek context that genuine mental strength was looked for in a middle road between "scientific" materialism and an idealization of mental activity for which the material realm was but a cumbersome ballast. Yet not enough strength came to man along the Aristotelian middle road so that he

could effectively escape either from the caves of Plato or from the labyrinths of the pre-Socratic "physicists." The reason for this is that Aristotle failed to do justice to the individual mind, the only form in which the mind is known to operate in a materially real world.

That the Greeks did not feel uneasy about the Aristotelian doctrine of the unicity of the intellect was due to their pantheism within which only a universal intellect could be accommodated. Debates on this point quickly emerged within the Muslim world, obviously because the Koran's doctrine of resurrection at the end of time guided attention to the permanence of the individual. But the guidance did not give Muslim sages enough mental strength to turn their back on the unicity of the intellect and cast a firm vote on behalf of an individual soul that survives the death of the body.

This firm vote emerged only within what Gilson aptly called Christian philosophy.⁵⁸ It was a philosophy propelled by the gigantic historic fact of Christ, taken for that unsurpassable unity of mind and matter which became known under such words as incarnation and hypostatic union. A chief and favorable consideration of that philosophy should devolve from the fact that it implied full consciousness of its being anchored in Christ, the God-become-man who remained alive as a man even when his body lay dead for three days in the grave. No intellectually sensitive Christian could recall Christ's words to the good thief—"Today you will be with me in Paradise"—and not think of them as a promise with absolute certainty that the most precious part of a repentant wretch would survive the imminent destruction of his body. Herein lay a stupendous philosophical message about saving purpose in the throes of an apparently total existential debacle. It was not the only occasion when Christ delivered the same "philosophical" message with salvation as its content. He sealed his own mission as a

Savior to be crucified when he declared the immortality of Abraham, Isaac, and Jacob (and by implication of all their dead progeny) on the ground that God was not the God of the dead but the God of the living. Never was the saving of purpose engraved more deeply on minds ready to be exposed to it.

Zeal with substance

So much in the way of a brief background for that most often slighted and scorned part of the Christian creed which portrays Christ visiting, in spite of his physical death, in the underworld (hell). Obviously, he meant to meet there with all those whom even the Pharisees, though they believed in bodily resurrection, were not able to see as living beings in any real sense. It was only with his eyes fixed on that Christ and the creed that Thomas Aquinas, taken here for a representative of Christian intellectual consciousness, went far beyond Aristotle when he spoke of the soul as the substantial form of the body. The archaic technicalities of Thomas' terms leave cold modern minds unwilling or unable to put themselves in his mental shoes, invariably too big for them. What he meant to say was that the mind, no matter how intimately it was interfused with the body, retained its existence even after the latter's dissolution, a point that remains the hottest issue of all time.

In facing up to Thomas' dicta one stands in the presence not so much of a philosophical proof of the immortality of the soul as of a most intense intellectual commitment. A purely logical analysis of the structure of the proof or explanation is not meant to supply the commitment itself even if it conveys assurance of its full rationality. Of that commitment a heroic amount will be needed if man is not to lose his dignity through his scientific wizardry either on the intellectual or on the physical level or both. The agonizing ethi-

cal problems that are crowding upon mankind in the measure in which science becomes an apparently runaway success, have, of course, a bearing that goes far beyond the problems posed by Darwinism. But what has been so far recalled about the tragic mixture in it of brilliance and blindness, of inspiration and demoralization, should clearly suggest the locus where the saving of purpose, including the purpose of evolution and of evolutionary research, is to be looked for.

If intellectual history is to be taken for a guide, the saving of purpose through a recognition of man's dual nature will not be mustered without taking Christ for the Savior. He, of course, meant Himself to be a Savior in the measure in which He wanted to be taken for Master. The stance of Master He took from the very start of his public life. Folks with plain common sense rejoiced on finding that, unlike their teachers, He taught with authority. The divine character of His authority first became manifest when He claimed the authority to forgive sins. These two considerations alone should make one highly suspicious of any cosmic portrayal in which He is cast in the evolutionary framework as its Omega Point, though with a methodical exclusion of original sin, this most empirical of all Christian dogmas, from that framework.⁵⁹ The saving of purpose, individual and cosmic, demands not a follower, of which an Omega point becomes an evocation if it is not also spoken of emphatically as the Alpha point, but a leader or *archōn* in that fullest sense which is embodied in the Absolute *archē*, the Creator of all. Such a leader can alone serve also as a savior of purpose if man is to be saved from that sense of purposelessness for which Darwinism has been a chief modern breeding place.

Christians will only chase un-Christian illusions if they hope for a wholesale intellectual victory. Worse, they can only discredit their Christ-inspired sense of purpose if they tie it to a geological timetable measured in thousands of

years, or to the specific creation of plants and animals “according to their kinds,” or to a sequence of creation in which light and dry land come before sun and moon. They should rather search the material world, which carries on it the double divine seals of Creation and Incarnation, with as much, if not greater, zeal than do their Darwinist opponents. Nor should they fear the distance, to echo the words of T. H. Huxley already quoted, to which such search may carry them. If they do, they merely serve further evidence about original sin and the truth of their Master’s observation: “The worldly take more initiative than the other-worldly . . .” (Lk 16:8).

It is one thing to feel visceral revulsion when a Darwinist speaks with unrestrained consistency; it is another to look for the ultimate reason, which is religious if it is truly ultimate, for such a revulsion. In claiming that though a goodly part of mankind might become its victim, AIDS as an epidemic is part of the “normalcy” of an evolution that allows no questions about moral guilt, Professor Gould voiced pure Darwinism.⁶⁰ There is no place for moral revulsion in Darwinism which offers only condescension to those who find revulsive not a few of its logical consequences. It is essential for Darwinism that there should be no essences, no natures, no ontological stability, and therefore no objectively and universally valid ethical norms that can be grounded only in the metaphysical dimensions of things. The opposite view—which has been a persistent thorn since Luther and Calvin in many Christian sides—received consistent support only in official Roman Catholic theology.

Many Roman Catholic theologians are today forgetful, if not plainly contemptuous, of this pattern as they are turning theology into merry options among theological models that are so many evasions about ontological truth. They no longer see the vast implications of the Catholic dogma of

Eucharistic transubstantiation. They are unable to give thanks (*eucharistein*) for the truth of substances and natures, or ontological stability. Such is a present-day Catholic crisis which can only delight perceptive Darwinists.

The Catholic Church, *tam antiqua, tam nova*, has survived far greater crises than the superficially "critical" thinking of many of her theologians. These still have to emulate the perceptiveness of no less an interpreter of genuine Darwinism than T. H. Huxley who made no secret about the unbridgeable difference between *Darwinist* evolution and *Christian* sense of purpose. Nor was it a puzzle for him that the sense in question had its deepest roots in the Roman Catholic system of thought. This is why he singled out as one of the greatest merits of Darwinism the fact that "it occupies a position of complete and irreconcilable antagonism to that vigorous and consistent enemy of mankind—the Catholic Church."⁶¹ Darwinist evolutionism will find an uncompromising opponent in the Catholic Church only on the points of the creation of out of nothing and in time, and of the special creation of each individual soul. But precisely because of this that "vigorous and consistent enemy of mankind" will remain the chief source for saving precepts as his scientific tools confront man with agonizing questions about their ethical use.

Chapter Five

THE ALL SAVING LOVE

Science without conscience is but the soul's
decadence

Rabelais

The losing of innocence

A full generation has gone by since the late 1940s and early 1950s when the scientific community met its hour of truth. Until the explosion of atomic bombs and the first tests of hydrogen bombs scientists could easily posture as mankind's only true benefactors. To be sure, even prior to those fateful events serious doubts could be raised about the rhetoric which invested the body scientific with an aura of innocence and presented science as an invariably high-minded search for the truths of nature. World War I witnessed a slaughtering of humans on a scale that would have been impossible without scientifically produced tools of mass destruction, such as poisonous gases, submarine warfare, and automated firing. Scientists on either side found morally reprehensible only the contributions of scientists on the other side to the war efforts. Their mutual recriminations were so many examples of the proverbial disproportion between noticing a splinter while overlooking a beam.

A detailed account of the ethical shallowness of much of the war literature produced by French and German scientists is still to be written.¹ The work in question might begin

with George Bernard Shaw's reminder, most unpopular in 1919, that in justifying the war with an eye on Darwinian principles the German military complex merely took a leaf from Anglo-Saxon unwisdom.² British scientists, whose homeland had not at that time yet lost its splendid isolation from direct attacks, could perhaps entertain a noble illusion or two. Not, of course, to the point of dreaming that theirs were still the times of early Napoleonic wars. Then no less a British scientist than Humphrey Davy could freely travel across war-torn Europe, precisely because he was a scientist.³ A free movement of scientists during World War I would have been inconceivable. After World War II the foreign travel of scientists has become a greater concern for governments than the movements of fellow travelers. The sudden death of a great physicist is today taken to be equivalent to the loss of a dozen divisions, a point already made when John von Neumann died in 1956.

By then the scientific community in Western democracies had been shaken by major spy scandals and by a much publicized investigation about the connection between scientific know-how and ethical obligations. The Congressional hearings about Oppenheimer's loyalty prompted on the part of several of his colleagues statements that have a theological instructiveness which is inexhaustible. It can be spotted by anyone who has not yet blinded himself or herself to man's doggedly enduring proclivity to do wrong, be it in the form of playing with a fire of unsuspected dimensions. Questions about Oppenheimer's political loyalty implied more than his factual ties with communism. The loyalty in question loomed large as loyalty to mankind and to universal peace. On the basis of Western democratic ideology it was impossible to argue that loyalty to a particular government, however democratic, should be a supreme criterion for a scientist's conscience or for anyone's conscience for that matter. Nor did that ideology provide

answer to the question whether nuclear weapons should have been produced at all. The question could not be answered with references to pressing military needs, namely, that the other side could not be allowed to win the race in producing the bomb.

At any rate, the Oppenheimer hearings provided ample evidence about a moral failure evocative of something persistently weak in man's very make-up. More than one statement made during those hearings testified to a pathetic lack of readiness on the part of most intelligent men to face up to the moral consequences of what they were doing. Once more man appeared to have no strength to extricate himself from a temporizing attitude. In von Neumann's words, it was like acting as children, although with clear awareness that one was no longer an adolescent. James Franck characterized that temporizing as taking refuge in an ivory tower, where he and his colleagues could entertain the illusion that "neither the good nor the evil applications were our responsibility." In admitting that only after the bomb had been dropped on Japan did he and his colleagues begin to think of the moral implications, Hans Bethe clearly admitted that it was immoral to omit giving, from the very start, full-scale attention to the moral perspectives of making the bomb.⁴

To form some idea of the havoc which sins of omission have perpetrated in history, it should be enough to think of a major theme in the first volume, *The Gathering Storm*, of Churchill's account of World War II. There he specified at least four junctures between 1934 and 1939 when England and France should have intervened militarily against Hitler and could have in all likelihood prevented the tragedies World War II brought upon mankind. Had Western intervention in Russia in 1920 not been lackadaisical, no such havoc would have been visited upon mankind as the extermination by Stalin of millions of Soviet citizens. Nor would

twenty million or so Chinese have been sacrificed to the cause of "cultural" revolution had there been enough willingness on the part of influential Western observers to take Mao Tse-tung for a ruthless revolutionary and not for a suave agrarian reformer. The admission by Henry Kissinger's North Vietnamese counterpart that the outcome of a conflict, of which three million Cambodians too became innocent victims, was decided not so much on the battlefields as in the editorial offices of American newspapers, suggests grave sins of omission. The fifth anniversary of the invasion of Afghanistan by Soviet troops should have called for more than a low-keyed bemoaning of a protracted genocide.⁵ In view of the fateful punishment which Germany suffered, in the long run, for the transportation of Lenin from Switzerland to Russia, rudely callous should appear the ease whereby French authorities unloaded Ayatollah Khoumeni on the Middle East. Gigantic proportions can also be gained by many small acts of omissions. Working classes failed to be treated with elementary fairness by the captains of industry who calmly thrived on child labor, slums, and work places that Blake could rightly take for so many Satanic mills. But to return to physicists and science.

In addition to bringing into focus sins of omission, the Oppenheimer hearings revealed an even more telling aspect of the lure which the morally evil can have on the scientific mind. Here too, as in all cases, the morally evil had its sweetening touch. Oppenheimer himself referred to a project's being "technically sweet"⁶ as the factor that prompts physicists and engineers (he could have just as well spoken of the *homo faber*) to achieve first the technical success and think only afterward about moral consequences. The lure of the "technically sweet" was a variant of countless other "sweet" lures that have so far played havoc with mankind, beginning with that presumably sweet fruit of a very spe-

cific tree in the Garden of Eden. Once plucked by Eve, the testing of that fruit triggered a chain reaction in which links have not ceased to be followed by countless links, some of them fearfully ominous. Among the latter, rather unique is the moral impotence of society at large, chiefly instrumental for the proliferation of atomic weapons, whatever the respective measure of the instrumentality of the society of scientists.

In speaking of the irresistible lure of the "technically sweet" Oppenheimer evoked not so much a single event as a continual temptation for the scientific mind. He sounded even more theological as he stated that following Hiroshima physicists have lost their innocence by "having known sin," a knowledge which, in his words, "no vulgarity, no humor, no overstatement can quite extinguish."⁷ The expressions "losing innocence" and "having known sin" unwittingly echo the hallowed account of what Eve and Adam felt on having yielded to the lure of eating from the fruit of the tree of good and bad knowledge. Of course, as wholly secularized Jews, Oppenheimer, Franck, and Bethe had little sympathy for the idea of original sin at work in every facet of human enterprise, science not excepted. After all, the idea of original sin is not to the liking of religious Jews for reasons, to be discussed later, that throw much light on the chief contention of this chapter. The idea of original sin was just as unpalatable to liberal Protestant physicists, such as A. H. Compton, R. Millikan, and J. Conant, who constituted the only significant religious group among physicists who had adequate knowledge of the true nature of the Manhattan project. They all should have blamed their secularist disbelief in original sin for their astonishment that the Soviet Union refused to go along with the Baruch plan, which offered full international sharing of atomic know-how in return for international verification of the scrapping of all atomic weaponry.

Moral impotence and inertia

Disbelief in original sin did not remedy the obvious impotence of scientists as well as non-scientists to put an end to a course of action that could appear far more effective in hastening the advent of doomsday than all the angelic trumpets taken together. Not any more effective in postponing that ominous day proved to be the various appeals of scientists to fellow scientists to stop working on the hydrogen bomb, or on the neutron bomb, or on the "Strategic Defense Initiative," popularly known as Star Wars. Equally ineffective were human roadblocks thrown into the way of trucks transporting nuclear warheads and their delivery systems. The same holds true of publicity campaigns whereby this or that group opposing nuclear weapons expropriates the ethical label "concerned" as if the opposite course had been equivalent to a gross abdication of concern. Only fringe groups responded to patently utopistic appeals for a return to idyllic agrarian life.

While those appeals revealed more naiveté than selfishness, the reverse may be true of the widespread agitation within the USA against nuclear power stations. The moral duplicity appears to be compounded by the silence about the all-out efforts of the Soviet Union to increase the number of its nuclear reactors. There may be more than what meets the eye in the fact that protests within the USA against nuclear power plants markedly decreased once the Soviets announced that in spite of the Chernobyl disaster their nuclear reactors would be tripled in order to meet growing energy needs. Protests against exhaust-pollution are hardly ever coupled with calls for voluntary parting with the second, let alone the third or fourth family car. No dent is apparently made in the armor of moral hollowness which eagerly welcomes the rise of living standards through a technology that poses a threat to them by the same stroke.

Moral strictures are perhaps least in order about the inertia which is the chief characteristic of reactions toward exploiting in full such clean sources of energy as solar power and coastal waves.⁸ Beneath that inertia there lies the awareness that the effective exploitation of those sources would mean colossal dislocation of jobs and working conditions, to say nothing of huge transference of capital investments. The heroism needed to face up to such tasks and implement them over decades is not a commandment even in the strictest moral code. Yet the inertia in question is a telling evidence of the enormous distance that can separate the practical from the ideal, a distance that has been noticeable since time immemorial, but which is particularly acute today precisely because of technology.

The moral inertia of man in the face of problems created by technological accomplishments is compounded by a feature inherent in them. The feature, which is the accelerating rate at which such accomplishments are achieved, would at first sight mean further advance toward more desirable living conditions. The actual result resembles more and more a mixed blessing. The problem is compounded by the fact that little if anything would be gained by solutions that, sound as they appear on the surface, would be impossible to implement. One such solution would come through the heeding of calls for a moratorium on scientific and technological research for a few years. Among such calls none was brought more directly to the attention of the body scientific than the one which the Bishop of Ripon, Dr. E. A. Burroughs, addressed to the British Association for the Advancement of Science at its meeting in Leeds in early September 1927.

The address achieved much publicity by its being reported at length in *The Times* (London)⁹ the very day after it had been delivered on Sunday, September 4. Undoubtedly, the hundreds of participants of the meeting that

attended the customary Association Service, would have agreed with the Bishop who presented the human person as the objective that should be served by all human efforts. Agreement would have been almost as complete on the point that biblical religion has for its most distinctive feature the emphasis on the personality of God. Few if any at that Service would have disagreed with the Bishop as he referred to a famous lecture Bergson had given in 1915 on the neglect of man's soul as the cause of a war in which victorious Britain lost far more than could be seen at that time.

Not a few would have perhaps disagreed with the Bishop as he declared on the authority of the biologist J. S. Haldane that because of modern science "we should try to view the universe as a personality, a spirit, expressing itself through an organism which for convenience we may still call material, even as each individual's *ego* functions through an individual body." It was certainly questionable that this was precisely meant by the opening of the Creed enjoining belief in "God the Father almighty, maker of heaven and earth, of all things visible and invisible." But few if any would have questioned the diagnosis that engrossment with things material, at the detriment of the spiritual, was greatly enhanced by the lure of scientific and technical marvels. Nobody aware of the ever higher degree of specialization demanded by scientific research could ignore its negative effect on man's ability to see the wholeness of things.

But then the Bishop had to spell out specific cures for the ills he had just deplored. In general he claimed that man "would get on very happily if aviation, wireless, television, and the like advanced no further than at present." (There were no homes yet with a television set.) Coupled with that general claim was the particular remark that stopping further research in those areas would mean disappointment only for those "whose life work has lain in those fields." Actually, the Bishop proposed a wholesale "scientific holiday" for no less than ten full years:

Dare I even suggest, at the risk of being lynched by some of my hearers, that the sum of human happiness outside scientific circles would not necessarily be reduced if for ten years every physical and chemical laboratory were closed and the patient and resourceful energy displayed in them transferred to recovering the lost art of getting together and finding the formula for making both ends meet in the scale of human life. Much, of course, we should lose by this universal scientific holiday.

In listing those losses he mentioned the loss of "new forms of comfort and convenience," "new means of making more money for the few at the cost of less work for the many," and "a right curiosity on many points that would go unsatisfied for a time." Compensating for these losses would be that "human happiness would not necessarily suffer." Not a few scientists may have nodded that during that "holiday" the scientific one percent of mankind would have the leisure, in the Bishop's words, "to read up one another's works." Less promising could seem the prospect, held out by the Bishop, that the same "holiday" would allow the non-scientific 99 percent to catch up with what science had achieved during the first quarter of the century. Much less was it probable that wisdom, the clue for putting the human person back on its pedestal, would thereby generally increase.

This brief recall of a dramatic appeal, now two generations old, may contain enough detail to make many recent similar appeals, mostly from ecologists, appear rather unoriginal. In almost all such cases, the printed record itself would be a sobering reminder of plain myopia at work. The column next to the two filled with the Bishop's address, was on a report read during that Meeting about appalling practices in British slaughterhouses. Yet the appeal for a "more human treatment" of animals to be slaughtered could distract the unwary. Only at the end of the column was a

reference made to the Meat Traders Federation that resisted improvements though not to the resistance, of a very different kind, of the broad public. It was not asked whether the public at large would be willing to eat less meat, or that a very large part of that public, chronically deprived of enough meat, should continue being deprived of it and concentrate rather on feeding on more wisdom.

But to return to science proper. Those who would have rejected the Bishop's address on the ground that important and beneficial discoveries would be missed through a decade-long moratorium on research would have been amply justified. In physics, the first five years of the decade stretching from 1927 to 1937 began with the elaboration of quantum mechanics and ended with the discovery of anti-matter, both with incalculable impact for subsequent advances. The same five years were no less epoch-making for mathematics which revealed its essentially incomplete character through Gödel's demonstration of the absence of a built-in consistency in any non-trivial set of arithmetic propositions. About the same time medicine was enriched by pioneering work on penicillin, the first of a long series of wonder drugs that provided uncounted humans with the very basic condition, life, for being happy. A modest familiarity with the unpredictability of major scientific findings should be enough to discredit the expectation that opportunities and moments of insight that had been deliberately laid aside would again be available as if by necessity.¹⁰

For good reasons or bad, scientific research and its technological exploitation have been going on unabated for the past sixty years and will go on even more so in all evidence. There will be uncounted new dilemmas posed by ever new tools that will continue to cut both ways. They will pose ever new challenges to man's moral sensitivity and to his

moral strength which hardly ever equals that sensitivity, rather imperfect in itself. New discoveries will provide unforeseen new twists to the arms race which will in all likelihood live up to its hydra-like character. With one of its heads cut off, it will quickly grow two or three in its place, a point to be kept in mind in reference to sanguine expectations about the prospective dismantling of ICBMs.

The frenzied reaction which new offensive weapons have so far touched off will appear relatively mild in comparison with the reaction to new purely defensive systems. The Soviet reaction to the SDI program is a case in point. The major concessions, including obligatory international on-spot inspections suddenly offered by the USSR which for decades has consistently refused to consider them, can hardly be assigned to an outbreak of Soviet goodwill. Whatever the possibility of miracles, it should not be invoked by those who have only contempt for them. Unlike some home-grown opponents of the SDI program, the Soviets know all too well that technological progress will in all likelihood increase the operational reliability of that program. The speed of computers on which that reliability largely depends will be greatly enhanced by new breakthroughs in superconductivity. Similar considerations are in order with respect to prospective breakthroughs in coding. The unlikely scrapping of all long and short range rockets with their nuclear warheads would still leave plenty of possibilities for a sudden threat to the balance of power. One of them would be brought about by the successful completion of a feverish research on making airplanes undetectable by radar.¹¹ Another would be the construction of a general code-breaking mechanism. The latter would, in addition to mathematical wizardry, rely both on superconductivity and on super chips. The tension which commercial espionage about those chips has recently created between the USA and

Japan may give a glimpse of the magnitude of the stakes they represent.

Those stakes are economic or financial before they become military. That so many wars have been triggered by economic pressure and/or by covetousness should help one perceive the measure of evil on hand when the quest for goods goes uncontrolled, a process with patently moral aspects and tangibly disastrous consequences. A largely uncontrolled quest for materials is at the root of the manifold ecological crises. They all have been brought about by a drive which obtained an unmatched diagnosis in William Blake's phrase: "You never know what is enough unless you know what is more than enough."¹² Such is the logic that produced the potential threat of a global greenhouse effect through the reckless increase in the burning of coal, oil, and gasoline. It is still not certain whether the average temperature of the atmosphere will not thereby increase by a mere 2 degrees centigrade. No more than that is needed to raise, through the partial melting of the polar icecaps, the ocean level by a few meters, enough to inundate many seashore cities, make homeless countless humans, and deprive them of their livelihood.

Greed propelled the aggressive marketing of pesticides, asbestos, and aerosol sprays of all kinds, to mention only a very few items that have made the headlines in recent years. Aerosols may be chiefly responsible for a decrease of the all-important ozone in the atmosphere and also perhaps for that huge ozone hole that has lately formed over the southern pole. In the marketing of food the greed of producers does not fail to find a ready ally in the greed of consumers. The heedless satisfaction of one's appetite leads in the most developed countries to a high incidence of overweight with a large number of attendant medical problems. At the same time, starvation plays havoc time and again with tens of millions in less fortunate lands.

Population bomb and playing with the populace

Needless to say, the problems and moral dilemmas thus created are puny when compared with the problem of what has become known as the population bomb.¹³ Its most publicized and dramatic aspects are the recurrent outbreaks of large-scale starvation or epidemics in underdeveloped countries with high population density and with a soil which is but marginally productive. Yet those millions in Ethiopia, Sudan, Mozambique, and Upper Volta, who felt their strength ebbing away for lack of food, never posed a physical threat to neighboring countries. Such unfortunate masses are too weak to organize and conquer lands where food is not scarce. Skin and bone are no match for bows and arrows, let alone for well-fed troops equipped with machine guns. The plight of the starving masses is only increased by the transitory feeling of moral shame which is created in lands of abundance by gripping TV reports about the wasting away of millions of fellow humans.

Far more enduring are some less dramatic aspects of the population bomb, precisely because they involve the often stealthy march of people with high birth rates into wealthy countries with low birth rates. In the USA a Spanish-speaking South is in the making partly because of illegal immigration from Mexico, the Caribbean, and Central America. In England the number of Muslims has reached the one million mark. They form a group that is most unlikely to become English in the cultural, let alone in the ethnic, sense. Germany is now faced with a sizeable Turkish minority, the result in part of the unwillingness of the native population to engage in heavy labor or to take menial jobs. The bloody extermination of two million Chinese in Indonesia twenty years ago may give a foretaste of the conflicts brewing along the 4000-mile-long border between China and the Soviet Union, a border more porous than a strainer

with large holes. That the Soviet Union is at a loss for a solution to this problem of gigantic magnitude was fully anticipated by Mikoyan's loss for words as he faced a courageous Adenauer. The latter remarked that cocksuredness was not the right attitude when the population across the border was increasing by 20 million per year.

Paradoxically, no scientific import from affluent countries into most underdeveloped ones had become so effective as the medical means that lead to a drastic reduction of the rate of infant mortality. In purely monetary terms this result, whose ethical correctness only a few hard-nosed Darwinists dare to question, would pose a grave threat to the raising of living standards in those countries even if they were not caught in a maddening pursuit of military might. Such is a further indication of the far from innocent condition of the human race. Darwinists have an additional problem on hand on finding that their recommendation of various methods of birth control provokes great resentment precisely where those methods seem to be most needed. Particularly telling in this respect is the charge voiced within the colored population in the USA that birth control programs are so many tricks of white people trying to maintain their racist domination.

While physicists have already met their hour of truth by producing violently sudden explosions, biologists may continue to mistake scientifically coated dreams for reality partly because of the very slow working of the population bomb. Utterances of prominent biologists at a conference organized by Ciba Pharmaceutical Company twenty-five years ago are characteristic of an illusion that has since become trendsetting. There the illusion began with the division of mankind into two parts, an operation which Sir Julian Huxley felt called to perform in his opening address. He spoke of a culturally and genetically low-quality vast majority, and of a very small minority that already consti-

tutes the "fulfillment society." That many, including leading intellectuals, seek in that society fulfillment also through alcohol, drugs, and the psychiatric couch, shows that illusion for what it is. A further aspect of that illusion, banking heavily on genetic engineering, test-tube fertilization, surrogate motherhood, cloning, sperm banks, and what not, is to take lightly the social resistance to wholesale biological manipulation.¹⁴ Professor Crick of double-helix fame would have painted mankind's hopelessness in hues far darker than the one implied in the dogma of original sin, had he not felt he was right in saying that "it would not be very difficult . . . for a government to put something in our food so that nobody could have children." He further opined that the government just as easily "could provide another chemical that would reverse the effect, and only people licensed to bear children would be given the second chemical." Apart from the technical impossibility to administer complex chemicals to billions of people, far more relevant than Professor Crick imagined is the question of "whether there is a drive for women to have children" and whether interference with that drive "would lead to disturbances." Powers like Mephistopheles and Lucifer, thriving on original sin, would doubt the truth of Professor Crick's fervent hope that "inconspicuously applied social pressure and biological education" could nip those disturbances in the bud.¹⁵

Such hope should appear a pipedream when it implies the wholesale genetic engineering of mankind in a blatantly conspicuous manner such as the one suggested at the same conference by Professor Joshua Lederberg, another Nobel laureate. Contrary to his claim, the manipulation of "chromosome ploidy" may not at all "accomplish in one or two generations of eugenic practice what would now take ten or one hundred" on the basis of ordinary eugenics. But even a tentative implementation of techniques like the ploidy or

replication of "desirable" chromosomes would teach to Professor Lederberg and like-minded gurus a much needed lesson: Society at large, which he took to be "not sufficiently intelligent to keep itself from being blown up," may still have enough common sense and moral courage to stand up to scientific overlords.¹⁶

Let us hope that no such popular uprising would ever be needed to remind scientists that nothing is so unscientific as a scientific overlord. Science-based dictatorship is the very opposite to that spirit of freedom whose association with science has for long been a dogma for secularized Western minds. Even the remote possibility of such dictatorship should be a sober reminder of potentially frightful pitfalls. There, given the inherent lability of human nature, the finest achievements of man can become fearsome playthings in the hands of scientists ready to take on the most irresponsible role, which is to play God.¹⁷

The pattern of playing God

As they are tempted to play God in His role of wonder worker, some scientists fail to see even as far as did Juvenalis, the chief satirist of Roman times who, of course, did not care to probe the moral depths of his famous question, *quis custodiet ipsos custodes?*¹⁸ Few men of science have been as blunt as the anthropologist Sir Edmund R. Leach, who claimed that scientists have acquired a God-like ability "to redesign the face of the earth, and to decide what kind of species shall survive to inherit it."¹⁹ As one of most anthropologists "who make it their business to discover just how human beings perceive themselves" but disdain questions about the *truth* of any of those perceptions, Sir Edmund too had to fall back on the shallows of relativist pragmatism as he faced up to the moral aspects of playing God. To his credit, he was consistent to the point of claiming that "there

can be no source for these moral judgments except the scientist himself" and that "the scientist must be the source of his own morality."

This is not to suggest that for Sir Edmund the prospect of a scientifically ruled ethical future was not fraught with fearful prospects. He acknowledged that "unless we teach those of the next generation that they can afford to be atheists only if they assume the moral responsibilities of God, the prospects for the human race are decidedly bleak." As one insensitive to *truth*, Sir Edmund did not perceive that the "scientific" future had to appear bleak only because something at present was already very bleak. Devastating is indeed the bleakness of a "moral" judgment insofar as it resides entirely with the scientist himself, because it constitutes the very denial that subjective judgment can have objective, universally valid truth content. Scientists who espouse the "morality" spelled out by Sir Edmund can only be tempted to act as self-appointed guards who recognize no guardians over them, which is the very denial of the time-honored dictum that the buck must stop at one point or another. The denial is an inevitable outcome whenever a scientist, accustomed to the quantitative or empirical language acquired by the scientific method, touches upon matters of good and evil. Almost invariably, patterns are made to parade as precepts, in conformity with a now rather old pattern.

It is well to recall that the words passed between the serpent and Eve were very "scientific" in that they represented a shift, a transposition, from the ethical aspect of an act (the licitness of tasting the fruit) to its purely empirical or descriptive aspect (the likeness to God to be obtained thereby in a mechanical way). This shift from precept to pattern has set a fatefully perennial pattern. In the hands of Rousseau, a foremost antagonist in modern times of belief in the Fall,²⁰ a similar transposition provided the "enlighten-

ment" which is the source of the ideological darkness presently enveloping the Western mind. Insofar as he championed "unspoiled" nature, Rousseau held high a mere pattern, always a purely empirical matter and the only object of scientific inquiry. Taken for a precept, his pattern became a travesty of true precepts essentially independent of patterns. From there on patterns began to serve as license for every whim and fancy if not plain perversion, all of which can amount to a statistically "significant" pattern if implemented by more than a mere handful. Such was the road charted by Rousseau to a paradise which, precisely because no Fall would occur there, became a cavorting in endless falls. Tellingly, no voice of God can be heard in a "paradise" of patterns. No wonder. Even in true Paradise, the voice of genuine ethics, which is rooted in man's accountability to eternal laws set by God, was heard after the Fall only when God called Adam to account.

While it may be futile to press scientific gurus on the ethical pitfalls gaping beneath this or that scientific procedure, they can claim no insensitivity to the rebuttal which this or that type of biological retooling of mankind may suffer in its own terms. Such a rebuttal is the proposal made in Japan to raise the number of population from 100 million to 125 million.²¹ The proposal deserves, more perhaps than any famous Japanese product, the label "made in Japan," a label standing for a pattern in more than one sense. When in the early 1950s Japan decided to keep its population at 100 million, Japanese pragmatism differed from Western pragmatism only through the cohesiveness whereby the Japanese rallied to the implementation of practical programs. Before long Japanese pragmatism began to display stunning sophistication. In each and every case there was in evidence a meticulous attention to possibilities offered by science, applied rather than pure, as well as a willingness to comply with the social reality of science.

The ever faster steps in which Japanese technology acquired a dominating position in the making of cameras, radios, television, tape-recorders, and is now threatening the supremacy of America's automobile industry and computer technology, have become a daily experience of the lives of everyone in the Western World. Much less known is the readiness of the Japanese to secure their success on the level which, from the pragmatic point of view, is basic: the availability of children in larger numbers so that the extra number of creative scientists and engineers demanded by technological competition would be on hand. On that level the policy is a mere calculation of the actual percentage (a mere pattern) of specially talented children in a given population. In the future, the Japanese may be the first to perform experiments in genetics, so many pure patterns from the empirical perspective, aimed at the production of individuals who are technologically and scientifically inventive in a very high degree.

Whether such experiments or techniques will soon, if ever, become feasible, remains to be seen. For the moment, the Japanese have at their disposal only one means of securing the ever larger number of highly inventive scientists and engineers to keep abreast with industrial competition that now envelops the entire globe. The means is the increase of ordinary population. Strange as it may seem, improvements, no matter how ingenious, in general and specialized education do not assure the emergence of a correspondingly larger number of highly inventive individuals. Their only empirical or pragmatic source is genetic mutation which is proportional to the size of population. While those mutations, even if most favorable, do not by themselves issue in geniuses, they are the necessary substratum for the educational techniques that must, of course, be continually perfected. Those who expect geniuses to sire geniuses in ever larger numbers should recall a now hundred-year-old study

by F. Galton, a pioneering bio-statistician,²² who concluded that most offspring of geniuses are of average capabilities. Worse, the number of their offspring is much smaller than is the case with couples who show little or no excellence.

The Japanese decision to produce more technological geniuses by increasing the population at large confounds various Western "scientific" projects about a wholesale genetic retooling of mankind in their own terms that never go beyond "patterns." All those projects imply, and most explicitly at times, that the increase of the world's population must be brought to a grinding halt and then be decreased if possible. The most appealing reason offered has a wrapping with a moral touch: Is it not a most noble moral aim to assure for all mankind a comfortable and culturally fulfilling existence? The morality of this ideal will appear a mere sham once attention is paid to frank admissions that only a *part* (a pattern) of the actually existing world population can count on that existence.²³ A further aspect of the moral sham can easily be spotted in the fact that the limitation and reduction of world population implies a "selection." The criteria of that selection (the implementation of a pattern) are never spelled out in concrete details. Secretiveness has always been a part of schemes whose morality is dubious to say the least. Vagueness, if not secretiveness, is most necessary at a time when it is still vividly remembered that moral evil was the charge at Nuremberg against the chief executors of the Nazi program of selecting between those who were to survive and have a culturally fulfilling existence and those who were not. Only a generation or two after Nuremberg it is still risky to advocate programs that skullduggery and equivocation alone can make appear essentially different from the Nazi pattern for mankind.

The sham morality of "scientific" Western counterparts of the Nazi design for mankind also gives itself away by the fact that its pattern is not the pattern of science as an ongoing

process. A materially comfortable and culturally fulfilling life for an appropriately reduced (and selected) world population is based on the benefits to be derived from science and technology. But will science continue to provide those benefits if its creativity is made to level off with the levelling off of world population? Is that population going to rest satisfied with actually available marvels of science? Most likely not, unless, of course, each and every human will be injected with a serum that dampens curiosity as well as all forms of longing, selfish or not, for something far more. Such may be a procedure that would please a Mephistopheles or a Lucifer because it would eradicate awareness of two factors simultaneously at work in man. One is his unquenchable longing for something more, materially as well as intellectually and spiritually, the other is his chronic inability to keep that longing in proper channels. Any glossing over of an original sin will logically lead to that "stabilization" of man in which he as well as his science is turned into a standstill which is best exemplified by the phoney dynamism of perpetual motion machines. The impossibility of such machines is a symbol of the impossibility for science to stand still.

No less importantly, the "stabilization" of science could mean an abdication of a most important means whereby mankind can cope with the pollution of the environment, a principal backlash of technological productivity. Good will, effective unselfishness, and self-discipline remain crucial factors in the battle for a habitable earth. But no less indispensable will remain a scientific know-how vastly additional to the one presently available, as greater environmental problems will have to be faced than the ones posed by coal burning and gasoline operated vehicles. For all its apparent desirability based on scientific considerations, the reduction of the size of mankind should seem a most unscientific contribution to the battle for the environment.

Molecular Auschwitz

The forced reduction and even the stabilization of world population has a further moral aspect. Contraceptive methods as well as sterilization have proved far less effective and harmless than they were believed to be only ten years ago. As to abortion, that drastic means of reducing population, estimated to number more than 50 million per year around the world, it is both an often harmful procedure and the source of much psychological trauma. It also counters the built-in urge for men as well as women to have descendants. Tragic scenes have occurred in many instances in China where strict penalties are in store for couples who have children too early or who dare to have more than one child. When the Western world was given concrete glimpses, a little over a year ago, about those at times bloody scenes, it preferred not to take note, in spite of the scientifically sound character of those glimpses, the on-spot sociological studies by a Stanford University doctoral student. He was forced to leave Stanford's doctoral program because the University did not want to endanger its academic ties with the People's Republic of China.²⁴ The lure of the "technically" or "academically" sweet is indeed much broader in the learned world than one may suspect. As to the much publicized commitment of the academia to take into account, and to face up to, all facts, ordinary or upsetting, it should pose a puzzle only to those still dreaming the dream of the French Enlightenment about the limitless perfectibility of a man free of the ballast of original sin.

One does not have to undertake a risky field-study in China's deep interior to see the varied horrors of abortion. The vast evidence available about those horrors in the West has so far made an impact with a paradoxical double characteristic. For the vast majority of mankind the impact has become a topic that is not newsworthy. They make a minor

headline only when the legality of abortion is seriously challenged or when a prominent scientist, who is not suspected of religious motivation, is prompted to speak out in "cultural" terms that evoke ethical dimensions. Even then the news quickly shares the fate of most other tragic news, which is plain oblivion. To be sure, man's memory can absorb new items of information only if it can rid itself by oblivion of a part of data already registered. Yet it seems that newspapers and magazines take more than proper advantage of this hardly fortunate feature of the human predicament.

It is a safe bet that very few of those readers, approximately a million, of *The Times* (London) still remember the report there about an article in the May 21, 1987, issue of *Nature*, the leading British science weekly.²⁵ The report should have been expected to be engraved in memory because in the passage most prominently reported from that article nothing less was evoked than the rapid coming of a "gigantic slaughterhouse, a molecular Auschwitz."²⁶ It is no less a safe bet that only a minute fraction of those reading that passage cared to look up the article itself, which, strangely enough, was not reprinted in *The New York Times*, although it never misses an opportunity to serve full-page and even longer reminders about Auschwitz. The article in question, which would have used up only two-thirds of a page, could hardly be to the liking of a newspaper which has endorsed only one and merely legal restriction on abortion, namely, that it should not be supported by taxpayers' money. "People or newspapers being what they are"—one could now muse with the words of Professor Erwin Chargaff, author of the article and a potential victim of Auschwitz, words that are the quintessence of any good theological treatise on original sin. Yet for all his praiseworthy indignation, Chargaff provided unintended evidence about the working of original sin by his very reasoning. The evidence is the half-way-house character of his denunciation of the

quiet horrors of a "molecular Auschwitz" in which "valuable enzymes, hormones, and so on will be extracted instead of gold teeth."

Professor Chargaff unhesitatingly protested "against the continuous decay of society that is being misled by roseate prospects, in order to screen undesirable deeds. I believe it is time to contrast the maxim, generally accepted by our scientific civilization, 'It is the end that sanctifies the means' with another one: 'It is the means that diabolizes the end.'" He denounced the pressure exerted on a schizophrenic woman to consent to abortion so that the physician might examine the foetus in greater detail. He also stated that the "fate of a human being begins with conception," a statement almost tantamount to endorsing the Pro-Life movement. He characterized it as "ridiculous to determine by scientific means the stage at which what for times immemorial had been called the human soul makes its appearance." He clearly saw through the nullity of providing on a purely psychological or pragmatic basis "ethical guidelines for reproductive technology." His verdict, "a gardening manual written by the goatiest of goats could not be more permissive," would have been worthy of such literary and ethical masters as Chesterton and C. S. Lewis.

It was one thing to denounce all such practical and intellectual monstrosities. It was another to spell out specifically and categorically the moral guidelines. Tellingly, in the entire article only once was the word abortion used. No less tellingly, Professor Chargaff was willing to proscribe *certainly* only "the production of human embryos for experimental purposes." Was the "production" of embryos, which is most readily done through abortions, then permissible when it was a "mere" abortion? Or did that "production" become really evil only when done to promote the financial gains and the scholarly reputation of the researcher?

One would look in vain in that praiseworthy article for an

answer to these questions. No wonder. The answer could not come from criminal law as it has no provisions for the problem. Nor did Professor Chargaff seem to look for eventual help in that direction. It was another matter that as a scientist he wanted no recourse to be made to the science of ethics on the ground that "ethics is a branch of philosophy and should be left there." For then how could one *argue* about the ethical dimensions of an impending molecular Auschwitz? Is not any non-trivial argumentation a plunging, however unwittingly, into deep philosophical waters? Is it not more profoundly Utopian to look for answers to most disturbing questions in disregard of philosophy than to expect that scientists would renounce the pursuit of money and fame as they pursue scientific truths?

Professor Chargaff's thoughts, agonizing as well as self-defeating, are indeed full of philosophy. He articulates a most philosophical set of concerns while not wishing to appear a philosopher. With his philosophical sensitivity and roundabout respect for philosophy he represents a breed of scientists who rapidly approach the status of a near-defunct species. They have been overshadowed for some time by those who made rhetorical endorsements of humanistic studies while proclaiming that "science is the only valid underlying knowledge that gives guidance to the *whole* human adventure." There can indeed be no real use for humanities if it is true that "those who are not acquainted with science do not possess the *basic* human *values* that are necessary in our time."²⁷ Such rhetoric, humanistic in appearance but scientific in its very core, allows but lip-service to non-scientific factors that made possible for the first time in history and in the West the rise of a culture with self-sustaining science. What alone is furthered by that rhetoric is the deepest of all illusions which is the pursuit of Utopia. To see the source of that illusion one may profitably turn to the very origin of the word itself. Its first appearance

is in the title of a small book which had for a century been the most widely read literary work in Europe and certainly in England by the time Shakespeare's plays began to be printed. For all its smallness, it still prominently figures among the Great Books.

No Fall as the pitfall of Utopias

Thomas More's *Utopia* is the portrayal of a society where everyone, but especially the intellectual leaders (who are emphatically presented as being in full command of the scientific know-how of their times) always do what is right, that is, most reasonable. Did More mean humans free of original sin? Or did More mean only that such a society was not to be found in any of the nations of Christendom in the early 1500s, let alone elsewhere? Was he the kind of rationalist who hoped that reason would ultimately reign supreme so that Utopia or "No-place" might arise in a concrete land? Had More been such a rationalist he would have never taken the path of martyrdom to sainthood. He died as witness to a Church which was planted in the midst of earthly kingdoms as a perpetual reminder of the words, "My kingdom is not of this world." Those who look upon that Church as the utmost form of Utopia cannot, however, deny that it has acted for the past 2000 years as a rejection of any and all Utopias to be achieved on this earth.

The chief reason for this is the paradoxical faithfulness of that Church to those words in spite of all her worldliness. The most important thing to note about those words is the existential context in which they were uttered. Had Christ made use of his otherworldly powers against Pilate, He would have gone back on the very reason given by Him for His apparently meaningless self-immolation. Pilate symbolized any and all of those who ruled (not only over men as do politicians, but also over matter as do scientists) because

they had power, whatever its givenness from above. That givenness or divine dispensation had to run its course, because God is not a capricious giver either in history or in nature. Therefore Christ had to counter with His death the inevitable death in which all human failings culminate, because they too must run their course. This is why Christ's "fall" strengthened, more than any other factor, awareness about that pervasive human failure at the root of which stands the Fall.

Nothing even remotely as convincing on that score has been achieved by any other factor. To be sure, literary masterpieces have always been very suggestive. So were historians who offered more than a glorified chronology. No mythology, no sacred book is lacking in poignant references to man's tragic predicament. The Old Testament has not only a Fall almost at its very start, but is in part an endless recital of failings. Worse, those failings are invariably described there as failures to live up to what is implied in the patently obvious: the evidence of nature on behalf of a Creator and the witness of a long succession of stunning miracles whereby God intervened as many times in a special history.

Jewish opposition, and a very staunch one,²⁸ to the idea of original sin and Jewish support of secularist Utopias should seem indeed paradoxical in the highest measure. But that paradox shall puzzle only those Christians (liberal Protestants and neo-modernist Catholics) who no longer have the sense of what constitutes a Christian. That constitutive factor is the sense of the unfathomable measure to which genuine Christian convictions, guidelines, and views are determined by big and small details of the life of Christ. If orthodox Catholics have any effective safeguard against that greatest pitfall which is Utopia, especially in its latter-day scientifically dazzling garb, it is because the Church safeguards for them that Christ who, though absolutely sinless

and infinitely good, subjected Himself to the powers of darkness. Only that Church resists efforts aimed at controverting and subverting the most incontrovertible statement about original sin. It is incontrovertible because it involves in Paul's words not only Adam, but Christ too, and in the same breath. The novelty that constitutes the New Testament rests in reaching more resolutely than does the Old Testament to what is oldest in human history. This is why, unlike in the Old Testament where God's saving Kingdom is but partially distinguished from the vision of an earthly kingdom, in the New Testament the Kingdom of God demands eyes fixed ultimately on a new heaven and a new earth, that is, a state beyond the end of all ordinary physical processes.

Such is a new vision worthy of a genuinely *New Testament*, a vision anchored in the new Adam that made possible the rise of a new and modern historiography through Augustine of Hippo. His *De civitate Dei* is an unabashed casting of all events into a contest between the forces of the Fall and the force of the Resurrection. In Augustine's view the resurrection of Jesus revealed itself as a singular historic force, especially through its power to impose linearity on thinking about history. Unlike the most noble event in classical antiquity, the death of Socrates, which noble pagans could assume to recur in needless numbers of times in a history going through the same cycles to no end, the death and resurrection of Christ inspired the very opposite thinking about all facts: They all appeared as unrepeatable events tied to a single straight filament.²⁹

A telling vote on behalf of Augustine's view of history is that modern historiographers, unwilling to make recourse to Christ, have failed to secure linearity and therefore meaning to history. Their failure, already in plain view before the 20th century reached its mid-point, has since been compounded by the fact that the new historiography of science

denied them the possibility to look at science as a paragon of progress. That even the meaning, that is, progressive character of science can be recovered only by seeing its debt to the unique fact of Christ will not, of course, suit modern palates ready to savor only shifting modes, if not plain moods, and hollow patterns, none of them essentially above the others. Those modes, moods, and patterns crowd upon one another with accelerating speed, partly because of the ever faster unfolding of the potentialities of science. The saturation point may or may not be too far away but it will hardly differ from the state usually defined as anarchy.

On the road to anarchy

A sadly saving grace in this connection is the ease with which academia reveals the true nature of its pursuit of "highest intellectualism" without suspecting something of the farce of its own making. A recent example is Allan D. Bloom's *The Closing of the American Mind*,³⁰ a critique of American universities as so many breeding places of ethical and cultural relativism, and its appraisal by J. O. Friedman, newly-elected president of Dartmouth College. The latter claimed³¹ that Bloom was "too absolutist" in dismissing as "not useful" most of the major minds of modern social science such as Sigmund Freud, Hannah Arendt, and Margaret Mead, all certainly notorious for their advocacy of relativism. Implied in Friedman's claim is the view that it is possible to relativize, however slightly, the absolute and still have it. One wonders what Friedman would have answered if the reporter had quizzed him on his professed aim of education: enabling a student to be comfortable with himself even at 3 o'clock in the morning. Was his view of that "self" equivalent to that immortal soul on which the Founding Fathers insisted as being the only safe bulwark against

governmental totalitarianism?³² And what would he have replied if still further pressed on the threat posed to the "self" by a scientific retooling of society?

As for the critique offered by Bloom, it is a defense of absolutes in which no reference is made to widely heard American defenders of absolutes such as John Courtney Murray, Fulton J. Sheed, George Schuster, and others who were never ashamed of their Catholicism. They and eminent foreign-born Catholic philosophers, such as Gilson and Maritain who made great impact on the American intellectual scene, would have deserved mention also for a reason offered by Bloom himself. After all he seeks in a return to Aristotelian philosophy, which in his very words did not cease to be cultivated in Catholic colleges, the remedy against the closing of the American mind through cultural relativization. Bloom's slighting of the Christian and especially Catholic intellectual and moral tradition on absolutes is hardly an accident. It reveals something of the systematic crusade whereby many agnostic and religious Jewish writers try to turn into a negligible factor the Christian cultural presence, as if it deserved mention only when it can be castigated for its "crimes" against humanity. This crusade finds a ready ally in non-Jewish protagonists of secular humanism—the creed that sets the dominant tone of an academic world to which many Catholic colleges and universities have for some time been eager to cozy up. Their thinking may be conditioned by the Chardinian abolition of original sin. In its light one can imagine that there is already on hand the kind of Utopia wherein the lamb can lie down with the lion.

Catholic Utopians were also given the impression by Teilhard de Chardin's fluent prose that no hard studies are required for a proper mastery of science, and especially of its most complex branch which deals with biological evolution. Nor could they learn from him the necessity of hard

studies to master the conceptual framework—the history and philosophy of science—whereby the data of science produce a cultural climate. The enthusiasm of those Catholic Utopians for Kuhnian paradigms, for Koyrean revolutions, for Popperian falsifications, for Polanyian tacit knowledge, and for Rahnerian complementarity is still to be chilled by intensive and accurate studies. They are still to learn that the appraisal of science in terms of those dubious conceptual cubbyholes has led academia into labyrinths where truth is measured by the always volatile consensus among trendsetters and especially among their camp-followers. That such a devaluation of truth is most effectively done in specious references to science, which is the dominating factor of modern life, should be enough of a warning that one is faced here with a problem that has eaten its way well beyond the world of academia.

Ironically, a well-known American historian and philosopher of science, L. Pearce Williams, gave about the broad ramifications of that problem a description which stands out for its succinctness as well as for the appositeness of its examples. In analyzing the answer which “liberals” may give as justification for civil disobedience, for sexual freedom, for breaking traffic laws, and for conscientious objections to military service, he warned them about their inconsistency in appealing to a “higher morality.” Apart from their failure to define that “higher morality,” they fail to perceive that it “went out with the Victorians, and we now inhabit a society in which all moral opinions seem equally valid.” Liberal advocates of civil disobedience of all sorts still have to learn that “we live in a consensual society in which we often have to do things we don’t want to do, or even think are wrong, because we have agreed to abide by majority rule. Destroy that agreement, and the result is not freedom but anarchy—a condition which the United States seems rapidly approaching.”³³

The Savior of science

Two hundred years ago the anarchy of the Terror was preceded by the destruction of truths in the writings of those who became known not as philosophers but as mere *philosophes*. Whatever the varieties of storms that arise today on the horizon, none will hit home more viscerally than the ideological storm already raging about human reproduction. Those to be found at the center of that storm will largely be Catholics with a sprinkling of Evangelicals thrown in for good measure. Mainline Protestants will be almost completely absent as well as Fundamentalists who will once more discover that emotionalism is not a stable foundation. In setting their face against violent winds of social ostracism, Catholics will look for intellectual support to strengthen themselves. If they invoke natural law they will soon find out that non-Catholic, let alone non-Christian sympathizers will be as scarce as hens' teeth. If they look for a justification of natural law in the very specific laws of the physical universe, they will again find themselves largely alone. Those laws, however exact, specific, coherent, and all-embracing, are all too often taken for mere economies of the intellect that have at most a statistical validity. Within that perspective the basic laws of human behavior can but appear to be so many conveniences which are sanctioned only by transitory cultural preferences.

Those Catholics will find that the heroic stand to be demanded from them will need more than what philosophy or science can provide. They will find that—to take a most burning question, abortion—their stand is ultimately predicated not on this or that ruling of Canon Law or on the lack of dissent among Catholic moral theologians, but on the Church's liturgical awareness of the very start of Christ's life. If abortion will forever remain for Catholics an "abominable crime," it is because Mary, if guided by modern justi-

fications for it, would have had more than one “compelling reason” for getting rid of the Being whose life began in the very moment of her *fiat* to the angel’s words. A week or two later she was in fact greeted by a wholly unsuspecting Elizabeth as “the mother of my Savior.”³⁴

During the first upheaval in thinking about geological past the respective prospects of conflicting theories were estimated with the remark: “Facts will, however, ultimately prevail; we must therefore take care that they be not against us.”³⁵ The past two thousand years, puny on the geological scale, but most decisive in human history, have seen plenty of factual evidence piling up in support of the unique survival value of the Fact of Christ. To speak of fairly recent times, only a few historians can today list the names of those who installed on the High Altar of Notre Dame in Paris a dissolute actress as the token of the arrival of the Age of Reason. They served one more evidence about the depths to which human reason is apt to fall. Similar fallibility was demonstrated by those who, about a hundred years later, expected to bring about the quick demise through a revolution in educational politics. Empirical factuality went hand in hand with unwitting theological accuracy as one of those, most likely connected with the Grand Orient, registered defeat with the remark: “But for the fact of Lourdes, we should long ago have destroyed the faith.”³⁶

Insofar as the future can be guessed with an eye on the past, present-day secularist pressures centering on Catholicism, as the only form of Christianity that refuses to “cave in,” should be no source for anxiety. Among the facts that will prevail with the Fact of Christ is His saving impact on science. Like all impact of Christ, this too has worked in the unassuming manner in which all His other facts have made an indelible imprint on history. Those who frown on all this as mere apologetics are merely engaged in its covert kind.³⁷ They do so by distancing themselves from most relevant

facts as they base their contempt for apologetics on their allegedly unreserved respect for all facts. The "pure scholarship" to be had on that basis should indeed seem tainted with disturbing impurities, so many indices about a Fall not to be stumbled upon as long as one is a "scholar."

Such considerations may be relevant to non-Catholics who try to fathom the real wellsprings of Catholic tenaciousness. It is to be found in the endurance of those Catholics who do not forget for a moment that only one Rock or Foundation was ever assured of permanence. For the same Catholics the considerations given above will be vital in the highest degree in an age in which science achieves ever greater manipulative control over life. That the casting of one's lot with Christ is also an act most worthy of science, may undoubtedly be a comforting thought in an age of science. It is a thought with many aspects. In it one can see Christ as the assurance for such notions as creation out of nothing, creation in time, a fully ordered universe, and purpose (cosmic and individual)—an assurance that alone assured the rise of science.

The truth of all this will seem natural for Catholics ready to reflect on the true grandeur of Christ. A truly divine Incarnate Logos, the Creator and Redeemer of the universe, should, even in a purely conceptual perspective, appear to have universal significance. The same Logos should therefore appear most significant for the rise and future of science which has nothing less than the universe for its framework and subject. The truth of this will be doubted only by such Catholics for whom cultural consensus has become the guarantee of truth. They will transcend their stiflingly narrow cultural conditioning only by pondering the words: "You will be under pressure in this world," a world which certainly includes the world of academia, prestigious publishing houses, and influential editorial offices.

Those words, though they may seem to be words of

defeat to an outsider, are words of triumph because Christ served and sparked gigantic evidence that pressures, nay persecutions, once answered by love, are so many assurances of victory. Human history, especially its modern phase, shows that true and secure victory, in which the enemy is not subdued, excoriated, vituperated, and vanquished but genuinely reconciled, is assured only by the most revolutionary and ever new precept whereby one is enjoined to love one's enemies. That love alone, whereby the hot coals of charity are heaped on the head of one's enemy, will prevent science from turning into a global disaster in the hands of countless competitors and antagonists.

The Catholic will, of course, be gratified by unexpected and startling endorsements of this perspective that come from camps very different from his. Some of those endorsements are purely negative, such as the despair voiced by the socio-economist Gunnar Myrdal. His first major publication was on the crisis due to population growth. It was quickly followed by an even more important one on the Negro problem in America. But he will be remembered mostly as the author of a three-volume study, *Asian Drama: Enquiry into the Poverty of Nations*, completed in 1968. In all those studies he was led by the conviction that economic theory is largely a function of political and social programs. The socio-political program he stood for was in line with that of the French Enlightenment's protagonists who rested everything on reason. Myrdal certainly saw that the poverty of South-East Asia demanded a total break with many irrational traditions dominating those vast areas so that science may have its beneficial impact there. Myrdal lived long enough to see that reason alone was of very limited effectiveness to solve the problem of poverty and other even greater problems. His last years were a period of disillusion. The world, he remarked, was "really going to hell in every respect." It was not hope but grim resolve that made him

add: "We must not let the injustices of the world take over."³⁸

Hope was not so absent in Einstein's often quoted remark: "It is easier to denature plutonium than it is to denature the evil spirit of man."³⁹ Such a view implied that there was something enduringly defective in man's readiness to choose life instead of death in more than one sense. That Einstein did not spell out that process of changing one's nature in terms of love, let alone of Christian love, cannot be simply ascribed to his being above all a man of scientific intellect. Such a man was Bertrand Russell, the co-author of *Principia Mathematica*, who in 1950 spoke of Christian love in terms that would have done credit to the finest and most orthodox Catholic theologian. The most informative thrust of his words, which I have quoted on more than one occasion, is not that they represent a rebuttal of his life-long crusade against religion and certainly against Christian religion which he had earlier denounced for its "depreciation of intelligence and science."⁴⁰ Nor should that thrust be seen in his biting reference to the cynicism with which, he knew, much of academia glorying in science would greet his words. Not even his acknowledgment of Christian love as an already very old and still indispensable commodity which provides a "motive for existence, a guide for action, a reason for courage" constitutes the thrust in question. The thrust is carried in his emphatic statement that only by having Christian love shall one have "an imperative necessity for intellectual honesty."⁴¹

Honesty borne out of *that* love, which demands utter unselfishness, will help one to reconsider cultural history, global as well as Western, and straighten one's resolve to discard hardened clichés, however hallowed. Some of the most misleading among those clichés relate to the historiography of science, burdened as it is with many vested interests. The importance of that historiography is amply

revealed by its taking on the role which the study of classics played until recently in the formation of Western cultural consciousness. A principal cliché in that historiography is that science is *the savior*—a tragic absurdity if one considers the great, potential and actual, setbacks dealt to science by those who presented it as the ultimate and only truth available for man. Condorcet, Comte, Mach, Spencer, the “scientific” Marxists (Lenin, Stalin, Mao), logical positivists and Darwinian paradigmists proved themselves chief enemies of science⁴² as they tried to substitute it for Christ and everything He stands for. Unlike those misguided and self-anointed spokesmen of science, the truly anointed *Mashia* or *Christos* followed a course of proper priorities as befitted One who existed prior to any and all. That course revealed its uniqueness by providing real sense for human history. Modern historiography owes its birth to that sense which also became the matrix for the only viable birth of science. This is why Christ rightly looms large, before eyes sensitive to His unique grandeur, as the Savior of science.

Chapter Six

THE CREATOR IN THE DOCK

Professors of religion are always at a risk of turning Christianity into a religion of professors.

Henri de Lubac

A specific "everything"

For the title, "The Creator in the Dock," I owe a debt to C. S. Lewis. In an essay published in 1948 he portrayed modern man as one who puts God in the dock while setting himself up as the ultimate judge.¹ On re-reading that essay I could not help being struck by the Chestertonian flavor of many of its passages. Possibly C. S. Lewis owed the phrase 'putting God in the dock' to his reading of Chesterton, which was both extensive and enthusiastic. However that may be, C. S. Lewis did not suggest that our modern secular culture put the *Creator* in the dock. C. S. Lewis spoke relatively little about the Creator. A curious thing on the part of one who believed in a Christianity reduced to its basics, to a "mere Christianity."² Precisely such Christianity should seem inconceivable without the tenet according to which God is the Father Almighty, Maker of Heaven and Earth.

Heaven and earth is a Hebrew idiom for everything or the universe. Strange as it may seem, C. S. Lewis, a great Christian author, not once was fired up by the vista of what he called everything. "Everything," he wrote, "is a subject on which there is not much to be said."³ He seemed to

ignore that modern science had been saying more and more for almost half a century, by the time he died in 1963, about the only true everything, which is the universe. Thus the tragedy of his statement cannot be minimized. For unless one uses the universe as a Court, one cannot prosecute modern man and find him guilty of putting the Creator in the dock.

Every trial is a sifting of an argument. In the trial in which secular man is put in the dock, or in that sham trial in which the Creator is put in the dock, ultimately the cosmological argument is found valid or invalid. To use that argument in that trial with no reference to modern scientific cosmology is to forget to call in a star witness.

This is not to suggest that science as such can bear witness to God or testify against Him. But science can bear witness about the supreme platform, the universe, from which alone a rational inference can be made to God, the Creator. Modern scientific cosmology bears witness to the universe in two respects. First, science has re-established the intellectual dignity of the notion of the universe. Those familiar with Kant's efforts, and with the strength of the Kantian philosophical tradition aimed at undermining that dignity, will need no further details. Second, science has disclosed a stunning degree of specificity about the universe. No longer is it scientifically "safe" to do what is logically impossible, namely, to derive this enormously specific universe from an erstwhile homogeneous, nebulous state of affairs.

Specificity is the basic and essential guidepost toward two fundamental philosophical points. One is that things can be recognized as real only insofar as they are specific. The absolutely homogeneous cannot be known. It is almost unthinkable. The other is that next to being a pointer to reality, specificity is also a mark of its contingency, that is, a disclosure of the fact that it could have been otherwise. Nobody would say that this lectern or this sound amplifier

or any tangible thing in this lecture hall or outside it must of necessity exist in the form in which it happens to exist.

Science, modern scientific cosmology, especially when recourse is made to Gödel's incompleteness theorem, assures us that those two points are true about that "everything" or the universe. If, however, such is the case, then it can be shown that the universe is that supreme reality that cannot have within itself the reason for its own existence. Beyond the universe—which is the totality of consistently interacting things—there can, however, be only one being, God, the Creator. This is all that one needs in order to reach the conclusion that the universe had to be created out of nothing, an act of which only a truly transcendental God is capable. So much for the argument that alone can convict secular man in the court of reason that his claim about God's non-existence is a misuse of reason, whatever else it may be.

Not keeping the cosmological argument in focus will invite a catastrophic error in thinking about God and especially about the God of biblical Revelation. If He is not looked upon above all as a Creator of all who is ready to be tried in the court of reason, He will be degraded into a miracle monger. This is one of the tragicomical ways of putting the Creator in the dock among the various ways to which I would call attention today. Of course, it is not the Creator as such who is put in the dock. He is too Infinite to be confined in any way, let alone to be confined into a miserably narrow theological dock. What is put in the dock is our perception of Him, our message about Him. Turning the Creator into a miracle monger is a strategic error that puts into a strait jacket some of His most devout servants and leaves the field wide open to His sworn antagonists.

Creation science: a strategic error

The essence of that strategic error is that it distracts from what can be said about creation as a divine act and shifts

attention to something concerning that act about which nothing can be said. About the act of creation one can meaningfully focus on its factuality, namely, that it happened, that it is an act whereby things that did not exist began to exist. This in a sense is not much. The doctrine of creation out of nothing is possibly the starkest of all doctrines. It is like a huge infinite gap of which only the ramparts or edges can be seen. But those edges put us in contact with the infinite chasm of mere nothing on whose edge perches our puny existence, a gratuitous drop from the infinite richness of God's existence that alone can arch over the infinite abyss of non-existence.

For various reasons it is tempting to grow dissatisfied with that starkly naked vision of the fact of creation. One reason is philosophical shallowness, very characteristic of modern times increasingly engrossed with the *how*. This lopsided interest in the *how* is heavily fueled by science, which is always about the *how* or manner in which processes take place. One of the prominent victims of that lopsided scientific interest was Teilhard de Chardin. His superb poetry in prose made countless poetic as well as prosaic minds think that the supposed manner of creation was far more important than its fact. In the end, many of them ended up with a universe with no Creator and with a man that was not created.

The other reason for shifting attention from the fact of creation to its manner is a rather unenlightened engrossment with the Bible, and especially with its creation story. On the face of it, Genesis 1 is about the manner, the *how*, of creation. Such is a self-defeating exegesis for two reasons. For one, it deprives one of seeing the true message of Genesis 1. According to that message, God is a supreme exclusive Lord over all, because all owes its being to Him. Because of this all is good in a most emphatic way. According to Genesis 1, and it is there that it differs most from Babylonian and Egyptian cosmogonies, God, the Lord, can have no rival, let

alone an evil rival. For another, the taking of Genesis 1 for an account of the manner of the *how* of creation leaves one hapless when it comes to explaining what really happened once Adam and Eve began their career, short-lived to be sure, in Paradise. One day they heard nothing less than Almighty God walk through the Garden of Eden in the afternoon breeze. Of course, God can produce the sensory impression as if He were walking. But this is beside the point. The point is rather that if the manner of creation as given in Genesis 1 is to be taken literally, the phrase of Genesis 3, "God walked in the Paradise Garden," afternoon breeze or not, cannot be taken figuratively. Anyone with a modest respect for consistency will have to grant that. As to those unsure about the meaning of such a big word as "consistency," the story about the gander, the goose, and the sauce may do the trick.

Once this modest amount of consistency is lacking, the Creator will be put in a miserable dock. Once there, God the Creator has to perform in a way that is most undignified not only for Him but also for any finite intellect created by Him and to His image. In that dock God has to perform miracles that are nonsensical, such as the making of light before making a sun. He also has to perform the minutiae of creating, and in a most meticulous sequence, millions of species of plants and animals. Heaps of miracles do exactly what mountains of banknotes do: in both cases the currency loses its trustworthiness.

Once in that dock, where He has to perform endless unnecessary stunts, which the matter created by Him can do just as well, the Creator becomes an easy target of His sworn antagonists. Not that they could touch Him directly. But they most skillfully cash in on some of the jobs that some of the Creator's devotees tag onto Him—such as creating each and every species, of which insects alone constitute tens of thousands according to modest estimates. One

of those sworn antagonists of God the Creator was none other than Charles Darwin. Shortly after he returned from his voyage with the *Beagle*, he suddenly turned from a Bible-waving fundamentalist Christian into a dedicated enemy of Christianity as well as of Creation. Darwin was helped in making that turn by perceiving the ease whereby a Creator busy creating each and every species discredited Himself. Ever since Darwin, this has become the classic strategy of genuinely Darwinist evolutionists, and the keystone of the strategies of their anti-Christian crusade. The strategy sets up huge traps into which fundamentalists—well-known and anonymous—fall almost unawares.

Among the well-known was William Jennings Bryan. The Scopes trial would not be remembered as an exposure of Christian stupidity if Bryan had not wasted his oratorical powers on defending what he believed to be the manner and timetable of creation.⁴ It did not occur to him that by defending the one single fact of creation he could have argued: admit the existence of the Creator of all matter and no room will be left for materialism. He did not seem to realize that the real target was a materialism which is almost invariably the creed of Darwinists, a species to be carefully distinguished from the much larger group of evolutionists.

A similar opportunity has been lost in this very year of 1987. This is not to suggest that the Supreme Court has the competence to rule in matters doctrinal, let alone on the creation of the universe out of nothing. Some members of that august court might have, of course, enjoyed hearing about that doctrine, the most profound of all sound doctrines. Instead, they were asked to listen to an essentially unsound doctrine which is creation science. It is unsound because it pretends to be a science about the manner of creation concerning which nothing can be known provided we mean true creation, which is creation out of nothing. That creation is totally different from "creation" from some-

thing already existing. The latter is an art which is best left to fashion designers⁵ or to those teachers of creative English writing who, after a year, send some of their students to a class in remedial English.

Being busy with creation science, or the science about the manner or timetable of creation, is possibly the most self-defeating strategy a Christian can adopt in an age of science. The strategy is equivalent to renouncing one's ace and handing over to one's opponents a full hand of cards. The ace-card is philosophy or metaphysics or rather a thorough respect for reasoning in depth. Distrust of reasoning in depth is part of that Ockhamist contempt for universals which Luther and Calvin grafted on the spirit of Reformation, including its Bible reading. Contempt for universals can only foster an undue appetite for particulars. In the case of creation science those particulars are taken from Genesis 1 and in such a manner as to foreclose open-minded search about a vast number of particulars that can be found about the universe and its processes. No wonder that proponents of creation science⁶ are invariably reduced to the status of carpenter, who try to find a hole here and there in the vastness of those data.

Their attitude is just as hopeless as the attitude of those who expect a huge fortress to crumble just because a brick or two in its ramparts have not been properly tested. This attitude discredits the Bible on two counts. One is that it undercuts the biblical doctrine according to which it is man's intellect which makes him a being created to the image of God.⁷ The other is that it prevents an enthusiastic commitment to the biblical declaration according to which God made everything according to measure, number, and weight.⁸ This declaration makes sense only if any true finding about the quantitative structure of material things is an evidence of the specificity which God gave to the universe created by Him.

For all their anger about creation science, materialist scientists must rejoice on seeing Christian faith tied to a science which is most unscientific. Their joy would be even more complete if all science cultivated by Christians were creation-science of which the two chief tenets are the age of the earth measured in a couple of thousand years and the special creation of each and every species within that fleetingly short time-span.

A sad and ridiculous spectacle indeed. The jumpy marching of people in early movies, which cannot but provoke smiles today, should seem a dignified affair in comparison with that creation sequence whereby billions of years are compressed into a few thousand years. Creation science puts the Creator in a dock in which all His acts and moves resemble a frenetic shaking of arms and legs. The ridiculousness of the situation can only give credit to the efforts of materialists whereby the Creator is banished on the ground that He is incapable of sitting in the dock for billions of years, let alone for eternity. In both cases Creator and creation are held up for mockery for precisely the same reason: quantities are taken for the measure of the truth of to be or not to be, which is patently a non-quantitative truth.

Darwinists in the dock of metaphysics

The resulting intellectual farce can but delight those evolutionists who do not wish to admit that evolutionary science or any science about evolution, physical and biological, is far more than a matter of quantities. Darwin admitted this, though indirectly, when he boasted that whatever the technical faults in the *Origin of Species*, it was a work of sustained reasoning.⁹ This statement, a somewhat hollow boast, made sense only if more than mere empiricism was needed to give credence to the doctrine of evolution by natural selection. Four short years after the publication of the *Ori-*

gin, T. H. Huxley noted that the same doctrine was a fruit of a vast metaphysical vision.¹⁰

About metaphysics, the basic and obvious truth is that it is not about physics, that is, about physical or observable things, but an inference from them to an unobservable realm. The overwhelming majority of the occupants of that realm are not angels, or disembodied Hegelian philosophers and their transcendental Thomist camp-followers. The most numerous events in that realm are not the flappings of the wings of angels but the countless occasions when human recourse is made to such non-empirical realities as causality, purpose, and freedom of the will. Only a full respect for these countless occasions, without which no intelligent discourse is possible, shall enable one to do two things: one is to take God, the Creator, out of the dock of materialist empiricism; the other is to put all materialists, and in particular their Darwinist brand, into the dock that stands in the very center of the court of genuine reason.

Once in that dock, three main charges should be pressed against materialist evolutionists. The first is about their slighting of reason. A chief offender in that respect was Darwin himself who claimed that it was more profitable to speculate about the mind of a dog than about the mind of a Newton.¹¹ The stereotype, in which Darwin is mentioned in the same breath with Newton, still has to be reconciled with this and similar utterances of the author of the *Descent of Man* where the dog's expectant look at its master is spoken of as an anticipation of the countenance of man absorbed in the worship of God.¹² Then it should be pointed out to materialist evolutionists that because of their slighting of the mind they become prolific purveyors of tautologies, such as the survival of the fittest. By comparison, rather puny though hardly negligible in this group of charges should appear the studied equivocation of Darwinists about the notion of species, to say nothing about genera, families,

orders, classes, phyla, and kingdoms, so many examples of the marvelous generalizations that can be seen only by the eyes of reason. Last but not least, they should be taken to task for the contradictory stance of dedicating themselves to the purpose of proving that there is no purpose.

The second main charge is that evolutionary materialists have not ceased "to resort to catechism." For this priceless expression and admission we should thank none other than Professor Stephen J. Gould,¹³ the unofficial high priest of Darwinism in the United States today. In essence the charge is about unprofessional behavior. Evolutionary materialists have always claimed to be concerned only with factual evidence. Countless is the number of them who have claimed, for instance, for the past hundred and twenty years, that the mechanism of evolution is factually known. Only two months ago, in celebrating the Supreme Court's decision against compulsory teaching of creation science, Professor Gould stated that while evolution could be known as a fact, the mechanism of evolution was still unknown.¹⁴

Clearly, as Professor Gould admitted, he and his Darwinist colleagues preached catechism, that is, urged the acceptance of the Darwinian mechanism of evolution on the basis of mere human authority. They urged the acceptance of a number of other tenets, if not secular dogmas, as well, on the same ground. This is not the place to make even a brief recital of those tenets. They would be far more telling if given by such an indefatigable preacher of Darwinism as Professor Gould who certainly could do it in brilliant prose. He is still to give his own detailed version of what constitutes the teaching of catechism by Darwinists and perform thereby a most valuable and enlightening cultural service. The teaching of catechism, that is, the teaching of a set of absolute truths on the basis of divine authority, has long been known to be fraught with perils, indispensable as such teaching may be. The teaching of catechism by Darwinists

on the basis of sheer human authority is not merely a possible peril but an outright sham.

The third charge derives from a close look at the nature or composition of that human, indeed very human authority. It is made up of leading departments of biology, zoology, and genetics, of leading publishers, of the publishers of most university presses, of editors of most periodicals, weeklies, and newspapers. They come close to constituting a monopoly over information. Almost invariably they give good riddance to manuscripts whose authors question, however learnedly, the shibboleths of the academic establishment which, while making profuse references to bygone inquisitions, reopens daily its own inquisitorial tribunals.

Judges sitting in those tribunals prevent the publication of comments they themselves solicited when the comments do not fit their preconceived ideas. In February 1981, a reporter of *Time* pumped me for more than half an hour about my views on the conflict of creationists with the scientific establishment. Then I was asked to send in a brief summary of my opinion. It read as follows: "The conflict arises from the clash of two extremist camps, both dedicated to a noble aim and bringing alike discredit to it. The creationists aim at a restoration of the sense of existence through impregnating young peoples' minds with the biblical creation story which they expose to ridicule by taking literally all its statements. Their antagonists want to secure the sacred rights of scientific investigation which they equate with materialism, a claim as ridiculous as it is also erosive of all sense of purpose."¹⁵ Had this summary been published, it would have, of course, unmasked the hollowness of a report in which there were only good guys and bad guys.

Is the remedy to be sought in an antitrust law concerning matters intellectual? Taken in itself such a law may seem desirable. Could it not decrease the chances of ever new forms of censorship? Did not Giorgio de Santillana hint in

his *The Crime of Galileo* that Galileo's censors have reappeared in modern and very secular paraphernalia?¹⁶ Would it not have been worth millions of dollars spent in legal fees to show that our schools should not be platforms for those who present theories as established facts? Would it not have been worth a similar amount to expose in the highest court that professional establishment which refuses to recognize the true grounds, even if they are equivalent to metaphysics, on which a vast generalization about biological evolution can command the highest degree of intellectual respect?

The challenge to the Supreme Court

Similar questions could be raised on the basis of the doctrine of separation of church and state, or rather the doctrine that forbids state support to any religion. But if prayers, let alone classes of religion, have no right in public schools, why should it be legal to teach there the religion called Darwinism or secular humanism? This is the question which, on a cursory look, the Supreme Court proceeded to answer in 1987.

In fact, the Court was presented with a very different question. Worse, the question was camouflaged in a scientific garb that amounted to a strait jacket for science as well as for religion. For the question put before the Court was not whether one species can be instrumental in the production of another species. The essence of the question put before the Court was not even whether evolution has been sufficiently demonstrated on the level of orders, classes, phyla, and kingdoms. The essence of the question was whether the Bible was to be made a compulsory reading, on the pretext that it was a guide about scientific matters. Had this not been the case, the Supreme Court could have only declared its incompetence about the matter and said that our legal system is not a forum for intellectual and scientific disputes.

But the Court easily saw that it was asked to establish a religion parading under the name creation science. The Court's decision against a compulsory teaching of *that* science was therefore in full conformity with the Constitution.

In writing the dissenting opinion, Justice Scalia spoke not as a lawyer but as a philosopher. As such, he clearly perceived from the vast material put before him that the mental sanity of our youth is threatened through daily exposure to a public education wherein the voice of a goodly segment of the public is systematically ignored. Most school boards and teachers merrily subvert the sanity of their young charges by steadily exposing them to a sinister threat. They do so by lending a scientific veneer to the Darwinist claim that man is a chance product of purely physical forces and that truth, especially ethical truth, is a matter of sheer convenience. Can that threat, which saps our society of its vital resources, be countered by court decisions or even by new legislation? The answer, unfortunately, is negative. The latest proof of this has been provided by some of the arguments offered against Judge Bork's nomination to the Supreme Court. In those arguments there was voiced a view that the individual is a law to himself to the largest extent in which he can be considered independent of society.

Society at large in the dock

The chief problem with this view is that no action, not even a single thought of an individual, is unrelated to society. A man's thinking determines his acts, all of which have an impact on his fellow man. To claim that acts, concrete acts, such as abortion, decided upon by a lonely teenager and carried out within the confines of a room declared to be a clinic—to claim that such acts are not social acts and therefore acts not subject to law, is the philosophical poverty of sheer relativism. Those senators who argued this way, and

legal pundits and editors who applauded them, reflected, however, the view which today is the majority view not only in America but throughout Western civilization.

It is useless to argue that the great majority of our Founding Fathers and the society they represented two hundred years ago had nothing in common with that relativism. A constitution or a law has practical validity only inasmuch as its underlying philosophy is being practised or firmly adhered to by the commanding majority of the people. Only a hundred years ago the majority of this country still had a philosophy fairly similar to the one held by the Founding Fathers who would not feel at home in today's America.

Perhaps I will not be suspected of reading my theology into the Founding Fathers' mind if I let Mr. James Reston, eminent columnist of *The New York Times*, speak on their behalf. Three and a half years ago he blasted what he called the "White House bully pulpit" for a contradictory stance. From that pulpit, Mr. Reston wrote, abortion was denounced with the simultaneous advocacy of sending troops into Central America. He saw in this the contradiction typical of an authoritarianism alien to our Constitution. Then he ascended his own pulpit: "Even in this secular age," he wrote, "Americans should remember what it is that divides them from the Russians, and [they should also remember] the religious roots and convictions of the founders of the republic." The Founding Fathers insisted, Mr. Reston went on, "that the individual did not belong to the state but had a personal and immortal soul that should be beyond the dictates of any totalitarian regime."¹⁷

Mr. Reston did not seem to suggest that belief akin to belief in an immortal soul is still needed if a constitutional government is to be under and not above the law. In order to suggest this, he should have raised the question: What is law? Is it merely the prevailing majority view which society invests with legal sanction? Cannot such a view, however

majoritarian for the moment, be easily modified through the influence which the combine "aca-media"¹⁸ has over what happens at the polls? But if there are immortal souls that are absolute because they are immortal, are there not also laws that are absolute? And if there are absolute laws can any respect be given to a law which turns gadgets known as forceps into a source of inalienable rights? For such is the law written by our Supreme Court which makes the conferring of those rights on foetuses depend on the latest medical skill whereby foetuses are assured safe exit from the womb. Should not therefore that law contain a clause to the effect that if ten years from now four-month-old foetuses can be given live birth, the criminality of abortion should start from the fourth and not from the sixth month of pregnancy? That our leading pundits do not dare to face up to the logic of this only shows how far they have moved from our Founding Fathers who set so great a store by logic.

Those pundits and society at large could learn logic from textbooks on American history and government written for American boys and girls a hundred years ago. Having had the privilege of browsing through the schoolbooks of the father of my dear friend, Mr. Chauncey Stillman, I hit upon a *History of the United States*, published by the University Press in Cambridge, Mass., in 1884 for the use of schools and academies. The book's concluding section, which deals with the legislative process, has this priceless paragraph:

While the nation is thus governed according to republican forms, the power resides in the people. They are constantly called upon to declare at the polls their choice of officers in the state or nation. These officers are the servants of the people, chosen to execute the will of the people. Thus it depends upon the people whether the nation shall be upright, honest, and God-fearing.¹⁹

Such a passage would be impossible to find in most textbooks nowadays in American public schools. It is no longer asked whether the people shall be upright, honest, and God-fearing but only whether the people will be well-fed, prosperous, and free of any fear, especially free of outdated social taboos, among them the fear of the Lord.

Synagogues and churches in the dock

Such is the age of unwisdom that will surprise only those who have forgotten that the fear of the Lord is the beginning of all wisdom. No wonder that a chief responsibility for the spread of this unwisdom lies with Jews and Christians, or the very ones who should have most keenly remembered that basic point of religion. About large-scale apostasies from God-fearing religion among Jews the eloquent witness is the *Jewish Encyclopedia*. There under the article "Creation" it is admitted that for a large number of Jews belief in God is essentially a belief in the universe, a pantheism of sorts.²⁰ A pantheistic God has never been the object of fear, let alone of hope, precisely because such a God is bordering on non-existence.

As for Protestant Christians, they are no longer the social leaven they were not too long ago—revivalism, evangelicalism, and fundamentalism notwithstanding. Devotees of the latter trends are just as unwilling to confront basic intellectual questions dealing with existence as are their liberal counterparts.²¹ Emphasis on spiritual emotions or social activism can only breed the atmosphere in which existence itself becomes a purely relative matter.

The present condition of Catholicism in the USA received a priceless summary in a remark by Archbishop Pilarczyk on the significance of the Pope's visit. The visit, he said, reminded us that "The Church is not a grocery store, where Catholics are free to take what they want or not."²² Why has

the Pope to come, one may ask, to remind us of basics? Let us hope that our Archbishops and Bishops will tell us one day why so many Catholics, laity and clergy, have taken to the idea that Catholicism is a matter of choice, an idea that would have been unheard of among Catholics only thirty years ago.

If and when a thorough account is given of this stunning shift, a shift that has already devoured one-third of our parochial and high schools, three-fourths of our teaching sisters and brothers,²³ and left most of the 300 Catholic colleges and universities Catholic in name only, the account, provided it is thorough, will have a chapter on philosophy. Its topic will be the shift from Thomism to transcendental Thomism. Thomism is a philosophy about being and existence that always transcend the moment. Transcendental Thomism is at best a misnomer. Since it takes its starting point from the modes and fashions of thinking about phenomena, it can never transcend the phenomena to the level where they reveal objectively existing things.

No wonder that transcendental Thomism has become a chief breeding place for doctrinal and moral relativism which has made heavy inroads into our religious orders chiefly engaged in teaching. This is why in the so-called new Catholic theology questions about creation hardly ever relate to the fact of creation and createdness but almost invariably to the manner of creation. Worse, that manner is taken for a very slow process even in the case of radical transitions from one level to a much higher one. The results are long-winded verbalizations, sophisticated skullduggery, and fairy tales, wrapped in an English that hopes to sound learned by being obscure. In that respect, too, homage is given to Kant, the chief source of inspiration for transcendental Thomists, better called Aquikantists.²⁴

Such is the philosophical road at the end of which we see God put in a dock that is sinister because it is so mis-

leadingly subtle. In any dock, the accused has the first duty and liberty to call himself by his true name. In that subtly misleading dock, fabricated by Catholic philosophers and theologians who should have known better,²⁵ there is no logical opportunity that God be recognized by the name by which, so He told Moses, He wanted to be known. The name is *He Who Is*, a name that cannot be given in the kangaroo courts of relativism, behaviorism, estheticism, and of a theology that has caved in to these and other fashions of the day. Any other name of God—King, Ruler, Father, Judge, Maker, Creator—depends for its validity on the fact that God alone exists truly and that He truly exists. He is Existence and not a phenomenon. This is why the existence of those who are created in order to know Him is not relative but absolute. To that absolute quality of human existence our courts will pay due attention if the great majority of the people authorizing those courts will pay attention to the Absolute.

Whether this will soon happen is not at all certain. Perhaps a major blow at our bank accounts and insurance systems, and a major upheaval of public health in the form of an epidemic triggered by sexual licentiousness will have to come first. Instead of looking for a Utopia beyond the dark clouds of possible wholesale disasters, it is more realistic to face up to the need to fight and refight a battle that flares up anew in each decade and generation. For strength to do that battle over and over again one may best look for a passage in the book of Jesus, Son of Sirach: "Even to the death fight for truth, and the Lord your God will battle for you."²⁶

NOTES

INTRODUCTION

1. Thus, for instance, R. J. Oppenheimer in his essay, "Physics," in *Listen to Leaders in Science*, ed. A. Love and J. S. Childers (Atlanta: Tupper and Love, 1965), pp. 44-45, who, however, stops short of recalling the theological roots of those findings.
2. Actually, Whitehead credited Jehovah only with "personal energy" and identified Greek philosophy as the source of medieval belief in God's rationality! See his *Science and the Modern World* (1926; New York: New American Library, 1948), p. 19. Whitehead's confusion about the tie between the Scholastics and modern science has its roots both in his inattention to the work of Pierre Duhem (of which more later) and in his pantheism that blares forth in his Gifford Lectures, *Process and Reality*, and, even more graphically, in the *Dialogues of Alfred North Whitehead as Recorded by Lucien Price* (Boston: Little Brown and Co., 1954).
3. As emphasized by E. Gilson in his *The Spirit of Medieval Philosophy* (New York: Charles Scribner's Sons, 1936), pp. 51-52.
4. This and another, but not the third, communication of "a German student" are mentioned, but not quoted, in *The Life and Letters of Charles Darwin*, ed. F. Darwin (London: Murray, 1888), vol. I, p. 307. The subsequent quotations from Mengden's letters are translations from a photocopy of the German originals in the Archives of Cambridge University.
5. Darwin's replies are quoted as given in *The Life and Letters of Charles Darwin*, vol. I, p. 307.
6. As carried far and wide in the English speaking world in his books, *The History of Creation* (1868) and *The Riddle of the Universe* (1899).

7. *More Letters of Charles Darwin*, ed. F. Darwin and A. C. Seward (New York: D. Appleton, 1903), vol. I, p. 321.
8. Eusebius, *The History of the Church from Christ to Constantine*, tr. G. A. Williamson (Penguin Books, 1965), pp. 126-27.

CHAPTER ONE

1. T. Gautier, *A Winter in Russia* (1866), tr. M. M. Ripley (New York: Henry Holt, 1874), pp. 1 and 330-37.
2. H. S. Truman, *1945: Year of Decisions* (1955; New York: New American Library, 1965), p. 21.
3. M. McLuhan, *Understanding Media: The Extensions of Man* (New York: McGraw Hill, 1965), p. 5.
4. S. Zweig, *Die Welt von Gestern* (Frankfurt: Fisher Verlag, 1970), p. 15. The English translation of the passage is quoted from P. Vergo, *Art in Vienna 1898-1918* (London: Phaidon, 1975), pp. 9-10.
5. H. Spencer, "What Knowledge is of Most Worth?" (1850), in *Education: Intellectual, Moral, and Physical* (New York: D. Appleton, 1889), pp. 93-94.
6. Similar eye-opening data are now being published about abortion too. The number of officially-registered abortions per thousand women (not counting the four times as many who undergo abortion "privately") is 102.4 in the Soviet Union (and 123.2 in the Russian SSR!), whereas the corresponding figures are 27.5 for the USA and 5.9 for West Germany. See the report about Larissa Remmenik's article in the Soviet weekly *Nedelja* in *La Repubblica* (Rome), Sept. 26, 1987, p. 14.
7. See J. Ellis, *The Social History of the Machine Gun* (New York: Pantheon Books, 1975), pp. 38-41, 94-96, and 104-06.
8. Thus the journey of President Ford to Vladivostok for a meeting there with Brezhnev in late 1974, a time when American prestige and morale were at a low ebb, was preceded by a series of record-breaking performances, in full glare of publicity, by the best American reconnaissance bombers, including flights from New York to London in 1

hour 48 minutes and from London to Los Angeles in 3 hours 48 minutes. About the same time an YQM-98 Compass Cope plane flew, unmanned, for 24 consecutive hours. Quite recently, the fixing of the date of President Reagan's visit to Moscow closely coincided with the disclosure of the Stealth bomber's successful test-flight. See note 11 to Ch. 5.

9. See R. V. Jones, *Most Secret War* (London: Hamilton, 1978) and Churchill's essay, "Fifty Years Hence" (1930), in his *Amid These Storms: Thoughts and Adventures* (New York: C. Scribner's Sons, 1932), pp. 269-82.
10. In that book the last word is given to "Chance" (see Fawcett World Library edition, 1965, p. 63). In writing in the mid-1920s, Remarque could not, of course, be aware of the fallacies of turning "chance" into the basis of science through the formulation of the uncertainty principle or rather through the inability of the scientific community to see there the seeds of further intellectual disillusion.
11. J. B. Bury, *The Idea of Progress: An Inquiry into Its Origin and Growth* (1932; New York: Dover, 1960).
12. A book with the same title, *The Wonderful Century: Its Successes and Its Failures*, was published by no less a prominent Darwinist than A. R. Wallace (New York: Dodd, Mead and Company, 1898). Today it is best remembered for its longest chapter (more than one fourth of the entire book) in which Wallace decried the enforcement of vaccination as a crime against humanity! Although in the last three chapters of the book Wallace deplored the abuse of science through militarism, greed, and the exploitation of natural resources, he concluded that because the 19th century represented, through science, an unprecedented progress, even more spectacular was to be the progress to be achieved in the 20th century.
13. He did so in his Romanes Lecture, "Evolution and Ethics" (1893). See T. H. Huxley, *Evolution and Ethics and Other Essays* (New York: D. Appleton, 1914), pp. 46-116.
14. This dictum of Kettering was not included among his fifty aphorisms that conclude *Prophet of Progress: Selections from the Speeches of Charles F. Kettering*, ed. T. A. Boyd (New York: Dutton, 1961).

15. For details on that position see ch. 15 "Paradigms or Paradigm" in my Gifford Lectures, *The Road of Science and the Ways to God* (Chicago: University of Chicago Press, 1978; 2nd paperback edition 1986).
16. In particular I. Scheffler, *Science and Subjectivity* (Indianapolis: Bobbs-Merrill, 1967).
17. S. P. Langley, "The History of a Doctrine," *Science* 12 (1888), p. 74.
18. S. G. Brush, "Should the History of Science be Rated X?" *Science* 183 (1974), pp. 1164–72.
19. See the reminiscences of H. Rosovsky, "Deaning," *Harvard Magazine*, January–February, 1987, p. 35.
20. In the following pages arguments that were developed in the first six chapters of my *Science and Creation: From Eternal Cycles to an Oscillating Universe* (Edinburgh: Scottish Academic Press, 1974; revised enlarged paperback edition, 1986) will be summarized in a partly new perspective and with new illustrative material.
21. The classic source of information is Herodotus who (Book IV, ch. 42) mentions that the voyage undertaken under the reign of Necho (610–595 BC) lasted three years but that he himself did not believe that the sighting of the sun, as reported, took place.
22. Quoted from L. Cottrell, *Lost Worlds* (New York: American Heritage Publishing, 1964), p. 48.
23. See report in *The New York Times*, May 10, 1987, p. 9.
24. *Maitri Upanishads*. First Prapathaka. Quoted from the *Thirteen Principal Upanishads*, translated from the Sanskrit by R. E. Hume (2nd rev. ed; London: Oxford University Press, 1934), p. 414.
25. M. K. Gandhi, "A Dialogue between an Editor and a Reader," in his much publicized booklet *Hind Swaraj or Indian Home Rule* (1938; new rev. ed. and 3rd printing, 1946), pp. 43–45. No wonder that Gandhi had to dispute time and again the claim that he was against scientific education. The

thrust of his utterances concerning science almost invariably aimed at the “satanic civilization” brought about by the misuses of science and technology. This is very much in view in various selections from his writings, such as R. K. Prabhu and R. Rao, *The Mind of Mahatma Gandhi* (Ahmedabad: Navajivan Publishing House, 1945), pp. 262–63; N. K. Bose, *Selections from Gandhi* (Ahmedabad: Navajivan Publishing House, 1948), pp. 231–45; A. T. Hingorani, *M. K. Gandhi. Modern versus Ancient Civilization* (Bombay: Gandhi Peace Foundation, 1970), pp. 22–29. The latter pages contain Gandhi’s denunciation, from 1909, of medical science as “the concentrated essence of black magic.”

26. J. Nehru, *The Discovery of India* (New York: Day, 1946), pp. 216–17.
27. See the report on a three-day symposium of astrologers in Delhi in late 1982 in *International Herald Tribune*, Jan. 6, 1983, p. 12. Would they meet next in the White House?
28. D. W. Kwok, *Scientism in Chinese Thought* (New Haven: Yale University Press, 1965).
29. Yu-Lan Fung, “Why China Has No Science—An Interpretation of the History and Consequences of Chinese Philosophy,” *The International Journal of Ethics* 32 (1922), pp. 238–60. Lin Yutang, another prominent 20th-century interpreter of China for the West, tried to cope with the problem in his *My Country and My People* (New York: John Day, 1935), that went through 13 printings in four years, by contrasting non-scientific Chinese common sense with patently ridiculous applications of the “inductive” method by some behaviorists (see pp. 85–87). In his *The Importance of Living* (London: Heinemann, 1938), Lin Yutang mentioned science only as a means of enhancing the dignity of the human body (p. 31).
30. L. Binyon, *The Flight of the Dragon: An Essay on the Theory of Art in China and Japan*, (1911; London: J. Murray, 1953), pp. 26–27.
31. B. Russell, *The Problem of China* (London: George Allen & Unwin, 1922), p. 193.

32. Ibid., p. 80.
33. Ibid., p. 187.
34. Ibid., p. 193.
35. That "printing from movable type must have begun several decades before 1450 at the very latest" is the unhesitating judgment of P. Butler in his *The Origin of Printing in Europe* (Chicago: University of Chicago Press, 1940; reprinted 1966), p. 83. Whatever the impeccable scholarly credentials of Butler, the myth about Gutenberg maintains itself in its pristine strength. To mention only a very recent example, the invention of printing is dated c. 1450 in M. W. Browne's report, "A Beam of Protons Illuminates Gutenberg's Genius," *The New York Times*, May 12, 1987, p. C1. Actually the experiment in question provided one more detail (in this case Gutenberg's improvement of the printing ink) about the fact that Gutenberg merely put some finishing touches to an art already much perfected.
36. J. Needham, *Science and Civilization in China* (Cambridge: University Press, 1954-), vol. 2, p. 581. Modern Chinese scientists prefer to ignore the stillbirth of science in their country. Thus Dr. Fang Lizhi, an astrophysicist fired in early summer 1987 from his post after students demonstrated in support of his plea for more freedom, stated in his defense that democracy is no more a Western idea than science or physics is: "In physics we cannot say that there is Chinese physics and Western physics," (quoted in *The New York Times*, July 5, 1987, p. E14). Precisely because this is so, the question raises itself with all the more force about the failure of the Chinese of old to come up with science.
37. The best Catholic treatise is still the now half-a-century-old monograph of L. Capéran, *Le Problème du salut des infidèles: Essai historique* (new rev. ed.: Toulouse: Grand Séminaire, 1934). 2 vols.
38. See Plate II in article "Babylonia and Assyria," in *Encyclopaedia Britannica* 1964, vol. 2.

39. *On the Heavens*, 274a. See pp. 48-51 in the bilingual edition in Loeb Classical Library.
40. The legend was inscribed in marble a century and a half ago in the entrance hall of the Tower of Pisa on the occasion of an international conference held there in 1839 in memory of Galileo. Being written in Latin the inscription strengthens only in a "generic" way the belief of countless tourists visiting there that they are at the place of a historic experiment.
41. That this view of Aristotle (*Metaphysics*, 982b) was echoed by his successor, Theophrastus, who is quoted to that effect in *Athenaeus, The Deipnosophists* (London: W. Heinemann, 1955, vol. 5, p. 299) is a strong indication of the complacency prevailing among Greek intellectuals in the second half of the fourth century BC.
42. For details on Ibn Khaldoun's utterances on physics and other sciences, see my article, "The Physics of Impetus and the Impetus of the Koran," *Modern Age* 29 (Spring 1985), pp. 153-60.
43. For details, see ch. vi "Of Arts and Sciences, Commerce, and General Manners," in *A Survey of the Turkish Empire* by W. Eton (London: Printed for T. Cadell, jun. and W. Davies, 1798; reprinted, New York: Arno Press, 1973), especially pp. 212-16.
44. One, of course, had to look for such items in order to notice their glaring absence in the splendid exhibit on the age of Suleiman the Magnificent in the Metropolitan Museum of Art, New York, in late 1987.
45. In this connection W. Eton noted (*A Survey of the Turkish Empire*, p. 223) that by then France had enacted draconic legislation against "the use of all preparations of lead in wine."
46. In discussing in vol. II of his *The Principles of Psychology* the various facets of scientific psychology, W. James quoted, in a way of contrast, a letter of a Turkish *cadi* to an English traveller asking for various statistical data on the region, a letter originally published at the end of Sir A. Layard's *Nine-*

veh and Babylon. In the letter the *cadi* declines to give information for several reasons, all of them a variation on his question: "Will much knowledge create thee a double belly, or wilt thou seek Paradise with thine eyes?" While quoting the letter with an obvious sense of Western superiority, William James suspected nothing of the absurdity of his remark, "In the middle ages it [science] meant only impious magic," his introduction to that letter (pp. 640-41).

47. J. Hawkes, *The First Great Civilizations: Life in Mesopotamia, the Indus Valley, and Egypt* (New York: A. Knopf, 1973), p. 7.
48. *Ibid.*, p. 8.
49. For further details and an illustration of that mechanism, see my article, "The Modernity of the Middle Ages," in *Modern Age*, 31 (Summer/Fall 1987), pp. 207-14.
50. For instance, L. Mumford, *Technics and Civilization* (New York: Harcourt, Brace Jovanovich, 1963), pp. 13-14.
51. Chapter xxv "The Dynamo and the Virgin" in *The Education of Henry Adams* (1918; New York: Modern Library, 1931), has the Paris World Fair of 1900 for its background. For all his access to the latest and best in historical scholarship Henry Adams never learned from his many top-level intellectual contacts in Paris (or in Harvard for that matter) about the three vast volumes of Duhem's *Etudes sur Léonard de Vinci* (1906-13), though produced by a publisher (Hermann) most respectable in secularist eyes. Those volumes would have helped him suspect that there was another side to his famed remark: "All the steam [engines] in the world could not, like the Virgin, build Chartres" (p. 388). The other side was that without the Birth tied to that Virgin, venerated with undying intensity in Chartres as well as in countless other shrines, there would have been no engines, locomotives or dynamos, embodying the science of motion.

CHAPTER TWO

1. Dr. C. W. Chu of the University of Houston, who made the discovery in question, and others joined the race only after they had read in the September 1986 issue of the *Zeitschrift*

für Physik about the finding that earned the Nobel Prize for K. A. Müller and J. G. Bidnorz with stunning speed.

2. Newton merely repeated a by then hallowed phrase that first appeared in the 12th century in the *Metalogicon* (Bk iii. ch. 4) of John of Salisbury.
3. The title of ch. 3 in Whitehead's *Science and the Modern World*.
4. The first to note this was Pierre Duhem in his *Etudes sur Léonard de Vinci* (Paris: Hermann, 1906-13), vol. 3, p. 582. The correctness of his observation has since been brought out by many studies, especially by those of M. Clagett and W. Wallace.
5. Descartes in fact so much depended on those "scholastic" publications as to borrow from them many of his philosophical terms to which he often gave a rather new meaning.
6. Here too Duhem was the great pioneer, although discoveries of further manuscripts of Oresme's *Le livre du ciel et du monde* (his commentaries on Aristotle's *On the Heavens*) showed that he did not commit himself to heliocentrism.
7. In fact Copernicus claimed in ch. 8 of Book I of his *Revolutions* that Ptolemy and other geocentrists should feel anxiety on account of the consequences of *their* position.
8. This is, of course, true of the published version of the work of Copernicus who eliminated from its manuscript a reference to Aristarchus. See Sir Thomas Heath, *Aristarchus of Samos: The Ancient Copernicus* (Oxford University Press, 1913), p. 301.
9. Aristotle takes pains to show that all opinions that assign some sort of a beginning to the universe are self-contradictory (*On the Heavens*, 279-283b). Immediately preceding that Aristotle declares that the universe is immortal and divine.
10. A very useful collection of related texts, with a translation and interpretation was published by C. Vollert and others under the title *On the Eternity of the World* (Milwaukee, WI: Marquette University Press, 1964).

11. The decree consists of 70 chapters of which the first has "de fide catholica" for its title, a clear indication of its doctrinal binding force (see Mansi, *Amplissima Collectio Conciliorum*, vol. 22, cols. 979-82). None other than Thomas Aquinas wrote on that first chapter a classic commentary which is *Opusculum XIX* in vol. XVI of the Parma edition of his *Opera omnia*.
12. Even with respect to Siger of Brabant, the opinion of F van Steenberghen, the editor of Siger's unpublished works in the series *Les philosophes Belges* (1942), is less severe than the judgment of P. Mandonnet who forty years earlier published the first such edition.
13. Buridan's dicta on the theory of impetus are easily available, with extensive commentaries, in *The Science of Mechanics in the Middle Ages* by M. Clagett (Madison: University of Wisconsin Press, 1961), as Documents 8.2 and 9.1.
14. Aristotle, *Physics IV*, 8 (215a). The technical name of that explanation is *antiperistasis*, a sort of perpetuum mobile, a telling replica of the big universal perpetuum mobile which the universe has to be on the basis of Aristotle's pantheism.
15. Clagett, *The Science of Mechanics in the Middle Ages*, p. 536.
16. *Ibid.*
17. This is the reason for Bacon's signal failure as an interpreter of science, namely, his lack of appreciation of the contributions of Copernicus, Gilbert, and Galileo.
18. That is since the latter half of the 18th century when the analysis by Lambert and Laplace of the stability of the solar system imposed a thinking about cosmic history in tens of thousands of years and therefore a decisive departure from Mosaic chronology. This is why during the 19th century many exegetes adopted a concordist position with respect to Genesis 1 as if its days meant six geological or cosmological ages. This concordism was very different from the one that had flourished previously, with Philoponus as its most systematic articulator. This is not to suggest that the geocentric and static Aristotelian universe could be convincingly shown

to have been proposed by Moses in Genesis 1, but at least in the context of times the enterprise did not necessarily appear a rank distortion of the plain meaning of biblical texts.

19. This theme, together with the idea that the "goodness" of the universe in Genesis 1 is to be taken not so much in a moral sense as in a sense relating to material consistency and coherence, is developed at length in my essay, "The Universe in the Bible and in Modern Science," pp. 137-47, in *Ex Auditu. Volume III* (Pittsburgh: Pickwick Publications, 1988), a collection of papers read on the theme "Creation" at the Second Annual Frederick Neumann Symposium held on the campus of Princeton Theological Seminary, October 16-19, 1987.
20. This is one of the reasons why the idea of spontaneous generation of life had been widely accepted until well into the 18th century, and was not laid to final rest until the famed experiments of Pasteur in the 1860s.
21. The most important among those interventions related, of course, to the flight from Egypt and the crossing of the Red Sea.
22. The force of the argument lies in the fact that long before Hellenistic times the cosmic significance of *kosmos* had been firmly established, as amply shown by the corresponding entry either in Pauly-Wyssowa's *Realenziklopedie* or in Kittel's *Theological Dictionary of the New Testament*.
23. A most ironic aspect of this perspective was that it was called *diakosmesis*, that is, re-embellishment or decorative overhaul, a point overlooked in D. E. Hahn, *The Origins of Stoic Cosmology* (Columbus: Ohio State University Press, 1977), p. 193.
24. It was in that sense that it entered the definition of creation at Lateran IV, as quoted in note 11 above.
25. "I beg you child, to look at the heavens and the earth and see all that is in them; then you will know that *God did not make them out of existing things*; and in the same way the human race came into existence. Do not be afraid of this executioner, but

be worthy of your brothers and accept death, so that in the time of mercy I may receive you again with them" (2 Mc 7:28–30). Actually, the phrasing *ouk ek ontōn* in 2 Mc 7:28 is stronger than *ek ouk ontōn* which could in itself be taken for formless matter.

26. For instance, Justin in his *First Apology*, 10, written c. 152 AD. Early awareness about the same argument is echoed in the so-called *Constitutiones apostolicae*, Lib. 5, cap. 6.
27. The idea was expressed through a denial of the necessitarian character of various aspects of the Aristotelian universe, such as the incorruptibility of the heavenly regions and the circular motion of the heavenly bodies.
28. It is this general influence which distinguishes Buridan's Christian notion of Creator from a deistic conception of a Creator who, as Voltaire was to insist, had nothing to do with the universe once it had been created.
29. Nicole Oresme, *Le livre du ciel et du monde* (Bk. II, ch. 2), ed. A. D. Menut and A. J. Denomy, tr. A. D. Menut (Madison: University of Wisconsin Press, 1968), p. 289.
30. The phrase was coined by J. Glanvill in his *The Vanity of Dogmatizing* (1661), p. 227.
31. As rightly pointed out by F. V. Cournin, "Philo Judaeus and the Concept of Creation," *New Scholasticism* 15 (1941), pp. 46–58.
32. By admitting (with hardly concealed satisfaction) that Crescas' notion of the universe is tending towards that of Bruno and Spinoza, H. A. Wolfson served unwitting evidence in his *Crescas' Critique of Aristotle* (Cambridge: Harvard University Press, 1929), that Crescas failed indeed in his task.
33. See, for instance, E. E. Urbach, *The Sages: Their Concepts and Beliefs*, tr. from the Hebrew by E. Abrahams (Jerusalem: Magnes Press, 1975), ch. IX, and A. Carmell and C. Domb, *Challenge: Torah Views on Science and Its Problems* (Jerusalem/New York: Feldheim Publishers, 1976).

34. According to Maimonides Muslims take the various laws of the universe to be similar to the riding habits of the caliph who can change his leisurely patterns at any moment: "On this foundation their whole cosmological fabric is constructed." *Guide for the Perplexed*, tr. M. Friedländer (2nd rev. ed., 1904; New York: Dover, 1956), p. 128.
35. See Suras 4 and 5 in the Koran.
36. For some passages, see "monogenēs" in Kittel's *Theological Dictionary of the New Testament*.
37. J. H. Newman, *The Idea of a University* (London: Longmans, Green and Co., 1888), p. 462.
38. See J. Dupont, *Gnosis: La Connaissance religieuse dans les épîtres de Saint Paul* (1949; 2nd ed.; Louvain: E. Neuwelaerts, 1960), pp. 476-88.
39. For a documentation of this connection from the works of 20th-century philosophers and cultural critics, see my *The Absolute Beneath the Relative and Other Essays* (University Press of America and Intercollegiate Studies Institute, 1988).
40. A. Harnack, *History of Dogma*, tr. E. B. Spears and J. Millar (London: Williams & Norgate, 1898), vol. IV, p. 43.
41. See Migne PG XXI, cols 846, 867, and 883 (Bk. XI, chs. 1, 9, 14).
42. Under the title, *The Only Universe*. By then Eusebius had also claimed that many Greek authors referred to the Jews and that Greek philosophers postdated the Jewish sages.
43. Such an evasion, which in itself is a brazen disregard for past evidence, presents one also with the task of explaining a problem posed by J. Piaget. According to him children instinctively and naturally hit upon an explanation of motion very similar to the impetus theory of the medievals. But if this is so, no natural explanation can be given for the rise, so late in intellectual history, of the first formulation of the impetus theory, and in a distinctive Christian theological context. On Piaget's statement, see E. B. Fiske's report in *The New York Times* (June 15, 1975, p. 45, cols. 1-2) about a

conference on his ideas organized by the New York State University College at New Paltz. Piaget was quoted as having stated that “understanding what goes on in children can shed light on understanding the history of science and vice versa.”

44. J. G. Fichte, *The Way towards the Blessed Life or the Doctrine of Religion* in his *Popular Works*, tr. W. Smith (4th ed.; London Trübner, 1889), vol. II, p. 385.
45. W. James, *A Pluralistic Universe* (New York: Longmans, Green and Co., 1909), p. 29.
46. Athanasius, *Against the Heathen* §39, in vol. IV of *The Nicene and Post-Nicene Fathers*, pp. 24–25.

CHAPTER THREE

1. Xavier reported the matter in his long letter of Jan. 29, 1552. See H. J. Coleridge, *The Life and Letters of St. Francis Xavier* (4th ed.; London: Burns, Oates and Washbourne, 1927), vol. II, pp. 338–39.
2. See J. Needham, *Science and Civilization in China*, vol. III (Cambridge: University Press, 1959), pp. 443–44.
3. In 1616 Paul V, well known for his penchant to settle acrimonious disputes with categorical decrees, was ready to decide in favor of geocentrism in the same manner. It is still not known why he left matters in the last minute to Cardinal Bellarmine, a point invariably neglected in discussions of the Galileo case. See my article, “The Case for Galileo’s Rehabilitation,” *Fidelity* 5 (March 1986), pp. 37–41.
4. A motto of Plato, it served as the title of Pierre Duhem’s classic historical survey of the pre-17th-century history of the formalist interpretation of scientific theory, *SOZEIN TA PHAINOMENA* (1908), available in English translation by E. Doland and C. Maschler, with my introduction, under the title, *To Save the Phenomena: An Essay on the Idea of Physical Theory from Plato to Galileo* (Chicago: University of Chicago Press, 1969; paperback reprint, 1985).

5. Plutarch did so in his *Concerning the Face which Appears in the Orb of the Moon*, 922F; see Plutarch's *Moralia*, tr. H. Cherniss and W. C. Helmbold, vol. XII (London: W. Heinemann, 1957), p. 55.
6. See Ptolemy, *Almagest*, Bk I, ch. 7.
7. F. A. Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: University of Chicago Press, 1964), p. 297.
8. A. Koyré, *La révolution astronomique* (Paris: Hermann, 1961), p. 19.
9. Galileo, *Dialogue concerning the Two Chief World Systems*, tr. S. Drake (Berkeley: University of California Press, 1962), p. 103.
10. "Every reader of medieval Latin texts knows that few Bible verses are so often quoted and alluded to as the phrase from the Wisdom of Solomon, 11:21 'omnia in mensura, numero et pondere disposuisti,'" stated E. R. Curtius in his magisterial monograph, *European Literature and the Latin Middle Ages*, tr. from the German by W. R. Trask (London: Routledge and Kegan Paul, 1953), p. 504.
11. Galileo, *Dialogue*, p. 103.
12. Descartes was indeed at a loss for an answer when a young Dutch scholar, Frans Burman, confronted him in the Spring of 1648 with the objection that the Cartesian theory of knowledge raised the human intellect to the level of angels. For details, see my *Angels, Apes and Men* (La Salle, IL: Sherwood Sugden, 1983), pp. 11-14.
13. See *Pascal's Pensées*, tr. W. F. Trotter, (New York: E. P. Dutton, 1958), #77 (p. 23).
14. Newton's most emphatic assertion of the finiteness of the material world is in his "De gravitatione et aequipondio fluidorum" (c. 1672); see the *Unpublished Scientific Papers of Isaac Newton*, ed. A. R. Hall and M. B. Hall (Cambridge: University Press, 1962), pp. 139 and 142-43.
15. Newton did so in his first of four letters to Bentley. See *The Works of Richard Bentley*, ed. A. Dyce (London: Francis Macpherson, 1838), vol. III, p. 208.

16. Partly responsible for that caution was Voltaire, whose *Eléments de la philosophie de Newton* contained (from its new edition, 1741, on) the emphatic assertion that the "universe is finite according to reason and Newton." For details see my translation of Kant's *Universal Natural History and Theory of the Heavens* (Edinburgh: Scottish Academic Press, 1981), p. 216 (note 113).
17. See F. Gregory, *Scientific Materialism in Nineteenth Century Germany* (Dordrecht: D. Reidel, 1977).
18. See ch. IV in my *The Paradox of Olbers' Paradox* (New York: Herder & Herder, 1969).
19. Leibniz, "The Principles of Nature and of Grace Founded on Reason," in R. Latta, *Leibniz. The Monadology and Other Philosophical Essays* (Oxford: University Press, 1898), p. 415.
20. The remark had to do with the "uncertain agitation of the tails of comets." See *Mathematical Principles of Natural Philosophy*, tr. F. Cajori (Berkeley: University of California Press, 1962), vol. II, p. 525.
21. He did so especially in Letters X-XII of his *Cosmological Letters on the Arrangement of the World Edifice*. See my translation with introduction and notes (New York: Science History Publications, 1976), p. 7.
22. The scathing remarks of C. V. L. Charlier, a prominent Swedish astronomer, made in 1925, still have to sink into cultural consciousness. See my translation of Kant's *Universal Natural History*, quoted in note 16 above.
23. For details, see ch. VIII, "The Myth of One Island," in my *The Milky Way: An Elusive Road for Science* (New York: Science History Publications, 1972).
24. Clifford's remark was part of his discussion of the cosmological significance of Riemann's geometry at the Royal Institution, reprinted in his *Lectures and Essays*, ed. L. Stephen and F. Pollock (London: Macmillan, 1901), vol. I, p. 386-87.
25. See Einstein's "Cosmological Considerations on the General Theory of Relativity" in H. A. Lorentz and others, *The*

- Principle of Relativity* (1923; New York: Dover, n.d.), pp. 177-98.
26. On Einstein's reactions to Friedmann's work see my *Science and Creation: From Eternal Cycles to an Oscillating Universe* (2nd revised and enlarged ed. Edinburgh: Scottish Academic Press, 1986), pp. 336 and 357.
 27. Einstein, *Lettres à Maurice Solovine* (Paris: Gauthier-Villars, 1956), pp. 102 and 115.
 28. *The New York Times*, April 25, 1929, p. 60. col 4. See *Albert Einstein: Philosopher-Scientist*, ed. P. Schilpp (1949; New York: Harper Torchbooks, 1959), pp. 659-60.
 29. H. Dingle, "Science and Modern Cosmology," *Monthly Notices of the Royal Astronomical Society* 112 (1953), p. 406.
 30. See H. Bondi, *Cosmology* (2nd ed.; Cambridge: University Press, 1961), p. 144.
 31. F. Hoyle and C. Wickramasinghe, *Evolution from Space: A Theory of Cosmic Creationism* (New York: Simon and Schuster, 1981), p. 143.
 32. J. V. Peach, *Cosmology and Christianity* (New York: Hawthorn Books, 1965), p. 105. A superficial reference to the information provided by Scripture (no Magisterium is mentioned) about creation in time is followed by the remark that "the idea of a creation proceeding continuously throughout the universe during all the time would be expected to be sympathetically received by the Christian. It is certainly an idea that would seem foreign to a Deist, but to a believer in Providence it would come quite naturally." But then it remains unexplained why the idea came to such materialists as Hoyle and his colleagues.
 33. He did so in his *The Physics of Time Asymmetry* (Berkeley: University of California Press, 1974), by referring somewhat cryptically to Tolman (p. 188) though not in connection with a diagram (p. 191) very similar to the one offered in Tolman's *Relativity, Thermodynamics and Cosmology* (Oxford: Clarendon Press, 1934), p. 443. The reference is, in fact, so

cryptic and artificially misplaced that it did not alert a world-famous cosmologist who at first did not believe me that Tolman's book, which he had repeatedly read over several decades, did contain the diagram in question.

34. This story that should be appealing as much to a historian of science as to a psychohistorian of science-reporting is still to be written up. A most recent item in that story would be the announcement about "grey dwarfs" (*The New York Times*, March 3, 1987, p. C7), that is, oversized planets and stars that never ignited and should be present by the billions in our galaxy alone that contains 400 billion stars.
35. See W. Whewell *Astronomy and General Physics Considered with Reference to Natural Theology* (Philadelphia: Carey Lea & Blanchard, 1833), p. 149.
36. For further details, see S. Weinberg, *The First Three Minutes: A Modern View of the Origin of Universe* (London: André Deutsch, 1977) and J. S. Trefil, *The Moment of Creation* (New York: Charles Scribner's Sons, 1983).
37. See ch. VII in my *The Road of Science and the Ways to God* (1978; Chicago: University Press, 1978; 2nd paperback ed., 1986).
38. J. S. Rigden, *Rabi: Scientist and Citizen* (New York: Basic Books, 1987), p. 15. The temptation is as old as it is most recent. By claiming that the sphere was the simplest body, Aristotle thought that a spherical universe did not have to be explained with reference to an extracosmic factor. Only a year or two ago, R. Dawkins of *Selfish Gene* fame stated in his *The Blind Watchmaker* (New York: W. W. Norton, 1986, pp. 12 and 14): "The fundamental original units that we need to postulate, in order to understand the coming into existence of everything, either consists of literally nothing (according to some physicists), or (according to other physicists) they are units of the utmost simplicity, far too simple to need anything so grand as deliberate Creation." This incredibly muddy antimetaphysics is then amplified by the declaration, indicative of utter misinformation about the method of physics, that "the physicist's problem is the problem of ultimate origins and ultimate natural laws." On read-

- ing such patent nonsense one cannot help musing about the futility of writing classic works, such as Pierre Duhem's *The Aim and Structure of Physical Theory* (1906), a futility evocative of symptoms for which only original sin can serve as explanation. On the sense in which physics can touch on the ultimate, see my article, "Physics and the Ultimate," in *Ultimate Reality and Meaning* 11 (1988), pp. 61–73.
39. For details see my *The Relevance of Physics* (Chicago: University of Chicago Press, 1966), pp. 127–28.
 40. I was one of the six panelists at the Nobel Conference at Gustavus Adolphus College in 1976 when Murray Gell-Mann (one of the five other panelists with Weisskopf, Weinberg, Hoyle, and Putnam) declared that perhaps within a few months but certainly within a few years he would come up with a theory of fundamental particles that would show that the universe is necessarily what it is and cannot be anything else. An audience more than 2,000-strong heard his statement. In the same context Prof. Gell-Mann indicated his unfamiliarity with Gödel's theorems when I referred to them.
 41. See my *Cosmos and Creator* (Edinburgh: Scottish Academic Press, 1980), pp. 45–46.
 42. Burke, *On the Sublime and Beautiful*, Pt. IV, par. xviii. The context of Burke's often quoted remark is that one's eyes fairly quickly accommodate to darkness, a point not without applicability to the philosophical murkiness implied in the Copenhagen interpretation of quantum mechanics.
 43. The illogicality was pointed out as early as 1930 in the pages of no less a prominent scientific journal than *Nature* but to no avail. For further details on the cosmic consequences of this reluctance to face up to elementary truth, see my *Chance or Reality and Other Essays* (Washington DC: University Press of America and Intercollegiate Studies Institute, 1985), and "Teaching Transcendence in Physics," *American Journal of Physics* 55 (October 1987), pp. 884–88.
 44. Prof. Alan H. Guth has recently gone one better on that boasting of his by claiming that "for all we know, our own

universe may have started in someone's basement." See M. W. Browne, "Physicist Aims to Create a Universe Literally," *The New York Times*, April 14, 1987, pp. C1-C4. Another statement of Prof. Guth, in the same report, "There is a new sense of confidence in the air, a feeling that we really can discover where and how it all began. It is a good feeling," needs only a brief reference to Adam's very short-lived "good feeling" as its best commentary.

45. See *Time*, Feb. 8, 1988, p. 58.
46. Originally published in 1941. See Signet Classic edition, 1961, p. 134.
47. See K. R. Popper, *The Open Society and Its Enemies* (Princeton University Press, 1950), pp. 222 and 641.
48. A personal communication to me by Dr. Popper's assistant.
49. J. S. Bezzant, "Intellectual Objections," in *Objections to Belief*, ed. A. R. Vidler (London: Constable, 1963), p. 107.
50. E. Schillebeeckx, *The Christ: The Experience of Jesus as Lord*, tr. J. Bowden (New York: Crossroad, 1981), p. 530.
51. Published under the editorship of J. Hick (Philadelphia: Westminster Press, 1977). Among the seven contributors there were six Anglicans and one United Reform Church theologian. The book described Christ as an enhanced version of such figures as Gandhi and Mao, a point against which Gandhi would have certainly protested and also a point which reveals shameful unfamiliarity with the 20 million victims of the "cultural revolution" engineered by Mao. Pro-Arianism was very much visible at the Oxford Patristic Conference in 1984, in witness of the strongly naturalistic trends prevailing in many parts of present-day Christian theology. R. Hanson, professor emeritus of theology at the University of Manchester, pleaded in "Arius and the Suffering of God," a leader in *The Times* (Dec. 1, 1984, p. 10), for a creed with *two* Gods, one higher, the other lesser and capable of suffering.
52. Prof. Murray Gell-Mann, quoted in *National Geographic* 167 (May 1985), p. 662: "There will be a new technology, certainly. But most remarkable will be that a handful of beings

on a small planet circling an insignificant star will have traced their origin back to the very beginning—a small speck of the universe comprehending the whole.”

CHAPTER FOUR

1. Their purpose for coining a new word was to avoid either the shallows of anthropomorphism or the philosophical depths of teleology. The result was an inevitable drifting toward anthropocentrism, apparent already in one of the earliest major discussions, B. Carter's "Large Number Coincidences of Cosmological Theories with Observational Data," in M. S. Longair (ed.), *Confrontation of Cosmological Theories with Observational Data* (Dordrecht: Reidel, 1974), pp. 291-98. The solipsistic character of that anthropocentrism received two blatant expressions during the last two years. One of them is the headline, "I Think, therefore the Universe Is," introducing T. Ferris' review in *The New York Times Book Review* (Feb. 16, 1986, p. 20) of *The Anthropic Cosmological Principle* (New York: Oxford University Press, 1986) by J. D. Barrow and F. J. Tipler. The other is the caption which graces the article of M. Rees, "The Anthropic Universe," in *The New Scientist* (Aug. 6, 1987, p. 46): "In the beginning there were only probabilities. The universe could only come into existence if someone observed it. It does not matter that the observers turned up several billion years later. The Universe exists because we are aware that it exists."
2. L. J. Henderson, *The Fitness of Environment: An Inquiry into the Biological Significance of the Properties of Matter* (New York: Macmillan, 1913).
3. W. Sullivan, *We Are Not Alone: The Search for Intelligent Life on Other Worlds* (New York: McGraw Hill, 1964).
4. *Biology and the Exploration of Mars*, ed. C. S. Pittendrigh and others (Washington DC: National Academy of Sciences Research Council, 1966), p. 8 and *Time* Sept 20, 1976, p. 87.
5. S. Dick, *Plurality of Worlds: The Origins of Extraterrestrial Life: Debate from Democritus to Kant* (New York: Cambridge University Press, 1982), p. 89.

6. E. Purcell, "Radioastronomy and Communication through Space" (Brookhaven Lecture Series, Number 1, November 16, 1960), p. 11.
7. A. S. Eddington, *Space, Time and Gravitation* (Cambridge: University Press, 1920), p. 20.
8. Kant's reducing Christ to a mere man, however exalted, whose resurrection (to say nothing of his miracles) was an illusion of his followers (see *Religion within the Limits of Reason Alone*, Harper Torchbooks, pp. 119 and 145-51), did not turn him into an atheist or a materialist. But his studied ambivalence about creation could only be taken for a foil for an immanentism that differed only in name from an atheistic or materialistic position. Within the latter, it was possible to tolerate a religion that was a matter of mere sentiments, that is, the product of purely practical reason, on the basis of which no rational challenge could be posed to disbelief.
9. T. Gautier, *A Winter in Russia*, tr. M. M. Ripley (1866: New York: Henry Holt and Co., 1874), p. 336.
10. Darwinists everywhere suggest "the grey gradations of twilight" because, so Chesterton wrote in *The Everlasting Man* (New York: Dodd, Mead, 1925), "they believe it is the twilight of gods" (p. xvii). Gradations without "grades" mean the abolition of *things*, which is a primary contention of Darwinism. A most recent acknowledgment of this is the concluding remark of J. S. Gould's review of *Simple Curiosity: Letters from George Gaylord Simpson to His Family, 1921-1970*, ed. L. F. Laporte (Berkeley: University of California Press, 1988) where Simpson is presented as thoroughly "committed to the Darwinian view that variety is all and essence is an illusion" (*The New York Times Book Review*, Feb. 14, 1988, p. 15). Gould and other Darwinists still have to explain how varieties can exist without things that can vary. Age-old problems of philosophy do not go away just because one wishes to see them out of the way.
11. A. Huxley, *Ends and Means* (New York: Harper and Brothers, 1937), p. 316.

12. G. Bradford, *Darwin* (Boston: Houghton, Mifflin, 1926), p. 245.
13. H. Spencer, *An Autobiography* (New York: D. Appleton, 1904), vol. II, pp. 548-49.
14. H. S. Harrison, "Evolution in Material Culture," *Report of the British Association for the Advancement of Science* (London: Office of the British Association, 1931), p. 140.
15. F. Darwin, *The Life and Letters of Charles Darwin*, (London: John Murray, 1888), vol. II, p. 6.
16. P. H. Barrett, *Darwin's Early Unpublished Notebooks* (New York: E. P. Dutton, 1974), p. 333 (Notebook N).
17. C. Darwin, *The Descent of Man and Selection in Relation to Sex* (new ed.: London: John Murray, 1901), p. 945.
18. A. N. Whitehead, *The Function of Reason* (Princeton University Press, 1929), p. 12.
19. L. Agassiz, "Professor Agassiz on the Origin of Species," *American Journal of Science and Arts* 30 (July 1860), p. 143.
20. E. Mayr, "Darwin, Agassiz, and Evolution," *Harvard Library Bulletin* 13 (1959), pp. 165-84. There Mayr blamed Agassiz's thorough training in philosophy for his "excessive preoccupation" with the species problem!
21. D. L. Hull, "The Metaphysics of Evolution," *British Journal for the History of Science* 3 (1967), pp. 339-67. A more recent example of that awareness is *Evolution at a Crossroads: The New Biology and the New Philosophy of Science*, ed. D. J. Depew and B. H. Weber (Cambridge, Mass.: MIT Press, 1985).
22. See B Notebook (p. 446) and M Notebook (p. 289) in the edition cited in note 16 above.
23. F. Darwin, *The Life and Letters of Charles Darwin*, vol. I, p. 83.
24. The book-length exposure of that stunning story by L. Eiseley, *Darwin and the Mysterious Mr. X: New Light on the Evolutionists* (New York: Harcourt, Brace Jovanovich, 1979), has only one, though major blemish. It is the unwillingness, in face of an overwhelming evidence, to admit that Darwin

could be a straight plagiarizer. In fact, Eiseley resorts to all sorts of literary devices to absolve Darwin of that most serious charge. Right at the outset Eiseley quotes Goethe's dictum in which all authors and discoverers are described as plagiarizers. It seems indeed that the officers in charge of the secularist hagiography have not yet come to terms with the hallowed practice in another kind of hagiography which recognizes no one as a saint unless his or her records have been exposed to the searching questions of the *advocatus diaboli*. The effects of original sin have indeed surprising ramifications.

25. Once more Darwin thought that he could easily talk himself out of a most serious philosophical difficulty, which became recognized in the long run at least as a scientific problem as well. He pleaded, at the very start of the *Origin*, for a little familiarity with the metaphorical character of the expression natural selection, while admitting that it was very difficult not to personify Nature! But precisely because everybody found it natural to personify Nature, the tautological character of natural selection could appear to be glossed over. As to the scientific side of the problem, more than one Darwinist has recognized in recent times that evolution takes place to a large degree in spite of natural selection. See, for instance, G. G. Simpson, *This View of Life* (New York: Harcourt Brace World, 1969), p. 127 and G. L. Williams, *Adaptation and Natural Selection* (Princeton University Press, 1966), pp. 54 and 139.
26. The expression seems to have started with R. A. Fisher, *The Genetical Theory of Natural Selection* (1930; 2nd rev ed., New York: Dover, 1958), p. 29.
27. J. M. Smith, *The Theory of Evolution* (Penguin, 1958), p. 148.
28. Letter of April 3, 1860 to Asa Gray, in *Life and Letters of Charles Darwin* vol. II, p. 296.
29. G. Hardin, *Nature and Man's Fate* (New York: Rinehart and Company), pp. 73-74.
30. See note 28 above.

31. For accurate and vivid descriptions of such and similar cases one has to turn to older books whose authors, for all their expertise in biology, did not feel it necessary to ruin their case histories with "learned" references to this or that aspect of Darwinian theory as an answer or an explanation of the marvel described. One such author and admirer of Darwin is J. Arthur Thomson whose *Biology for Everyman* (New York: E. P. Dutton, 1935), from which the descriptions of the three spider species were taken (pp. 360-362), may of course be under suspicion of being out of date. A modest reflection on any detailed description of parasitisms can provide the shock of wonderment, gruesome as the details may be, such as the one graphically reported by Sir Charles Sherrington in his *Man on His Nature* (1940; 2nd ed., Cambridge: University Press, 1951, pp. 264-66) about the life cycles of Redia, exploiting the pond-snail, and malaria that exploits both the dapple-wing gnat (*anopheles*) and human beings. One can just as fruitfully meditate on the ability of some sea slugs to eat little animals called coelenterates, whose defense mechanism is a set of coiled sting-cells that lash out at the slightest touch. Yet, those cells do not discharge as the coelenterates are digested by sea slugs, which implant those coils on their own backs as their own defense mechanism after they have consumed other parts of the coelenterates. A similar topic for meditation should be the incredible complexity of the mechanism whereby spinnerets' glands make possible the production of filaments of different kinds needed for web-making, which in turn implies the morphological conversion of legs and abdominal appendages into very different organs. Would any engineer expect such intricate mechanisms to come by through incredibly long series of trial and error?
32. "Science seems to me to teach in the highest and strongest manner the great truth which is embodied in the Christian conception of entire surrender to the will of God. Sit down before fact as a little child, be prepared to give up every preconceived notion, follow humbly wherever and to what-

- ever abysses nature leads or you shall learn nothing. I have only begun to learn content and peace of mind since I have resolved at all risks to do this." Letter of Sept. 23, 1860 to Charles Kingsley, in L. Huxley, *Life and Letters of Thomas Henry Huxley* (London: Macmillan, 1900), vol. I, p. 217.
33. T. H. Huxley, *Darwiniana: Essays* (New York: D. Appleton, 1896), pp. 468-69.
 34. See K. K. Lee, "Popper's Falsifiability and Darwin's Natural Selection," *Philosophy* 44 (1969), pp. 291-302.
 35. G. G. Simpson, *The Meaning of Evolution* (new rev. ed.; New Haven: Yale University Press, 1967), p. 218.
 36. "The frequency," admitted G. Hardin, a most resolute Darwinist, "with which the complex facts of equine evolution have been ignored in favor of merely reprinting this celebrated chart in the Museum of Natural History in New York has led one paleontologist to complain that 'there is a tendency to put the chart before the horse.'" *Nature and Man's Fate*, p. 261.
 37. American eyes were opened (only to be closed quickly) to this fact by the reports of V. L. Kellog, an American biologist working during World War I with a relief mission in occupied Belgium, who was stunned by the frequency with which staff officers at German Great Headquarters were referring to Darwin's theory as a justification of waging war on behalf of the fittest civilization. Twenty years later, Sir Arthur Keith gave plenty of headaches to his fellow Darwinists with his unabashed glorification of war as the great pruning mechanism of evolving mankind.
 38. See M. Denton, *Evolution: A Theory in Crisis* (Bethesda, Md: Adler and Adler, 1986), pp. 293-96.
 39. S. J. Gould, "Evolution: Explosion, not Ascent," *The New York Times*, Jan. 22, 1978, p. E6.
 40. *Newsweek*, April 8, 1985, p. 80.
 41. The first two generations are the topic of P. Bowler's *The Eclipse of Darwinism: Anti-Darwinian Theories in the Decades Around 1900*. (Baltimore: Johns Hopkins University Press,

- 1983). The period 1920-85 is still to be given a careful study and documentation.
42. These words that give away the true sentiments of George G. Simpson in his *This View of Life*, p. 4, may give a clue to the philosophy which underlies his appraisal of the truth of Darwinism.
 43. W. K. Clifford, *Lectures and Essays*, ed. L. Stephen and L. Pollock (London: Macmillan, 1901), vol. II, p. 245.
 44. Sir Arthur Keith, *The Religion of a Darwinist* (London: Watts, 1925), p. 69.
 45. E. O. Wilson, *On Human Nature* (Cambridge, Mass.: Harvard University Press, 1975), p. 209.
 46. S. J. Gould, *Ever Since Darwin: Reflections in Natural History* (New York: W. W. Norton, 1977), p. 146.
 47. R. S. Lull, *Organic Evolution* (1917; New York: Macmillan, 1926), p. 15. This kind of complacent statement in a once famous textbook is typical of Darwinist phraseology. Certainly not an anti-Darwinist, L. Eiseley felt impelled to note in his *The Immense Journey* (New York: Vintage Books, 1958, pp. 84-85) the complacency with which the problem of the rapid evolution of the brain and its obvious availability before it was "needed" is treated in Darwinist circles.
 48. Those familiar with H. J. Muller's materialist and Marxist proclivities will not be surprised at his cheapening the word "creation" in his "The Darwinian and Modern Conceptions of Natural Selection," *Proceedings of the American Philosophical Society* 93 (1961), p. 459.
 49. G. Hardin, *Nature and Man's Fate*, p. 249.
 50. S. J. Gould, *Ever Since Darwin*, pp. 184-85.
 51. G. K. Chesterton, *St. Thomas Aquinas* (New York: Sheed & Ward, 1933), p. 176.
 52. T. H. Huxley, "Biogenesis and Abiogenesis" (1870), in *Discourses: Biological and Geological* (London: Macmillan 1894), pp. 256-57. The same is admitted in a roundabout way when agnostic scientists acknowledge the role of "faith" in scientific work.

53. A. Einstein, *The World as I See It* (New York: Covici-Friede, 1934), pp. 36 and 60.
54. A. Einstein, "Autobiographical Notes," in P. A. Schilpp, *Albert Einstein: Philosopher-Scientist* (La Salle, IL: Open Court, 1949; New York: Harper Torchbooks, 1959), p. 673.
55. As, for instance, E. Mayr in his contribution, "How Biology Differs from the Physical Sciences," in *Evolution at a Crossroads* (see note 21 above) pp. 43-64.
56. R. A. Fisher, *The Genetical Theory of Natural Selection*, p. 74.
57. J. Tyndall, "The Belfast Address" (1874), in *Fragments of Science* (New York: P. F. Collier and Son 1901), pp. 203-04.
58. See Gilson's "What is Christian Philosophy?" in *A Gilson Reader*, ed. A. C. Pegis (Garden City, NY: Doubleday, 1957), pp. 177-191.
59. It is not without a touch of irony that Father Teilhard's "remarks on the place and part of evil in a world of evolution" are a mere "Appendix" in his *The Phenomenon of Man* (New York: Harper and Brothers, 1959, pp. 309-11), with a mere line there about "some catastrophe or primordial deviation" as if indeed the latter were just as unessential to his system of thought as the appendix is to the human body.
60. S. J. Gould, "The Terrifying Normalcy of AIDS," *The New York Times Magazine*, April 11, 1987, p. 33, and my reply, "Normalcy as Terror: The Naturalization of AIDS," in *Crisis*, June 1987, pp. 21-23.
61. T. H. Huxley, "Mr. Darwin's Critics" (1871), in *Darwiniana: Essays*, p. 147.

CHAPTER FIVE

1. Towering above that superficiality is *La science allemande*, the text of four lectures given by Pierre Duhem at the University of Bordeaux in the late winter of 1915, soon to be published in English translation.
2. See the Preface of his *Heartbreak House* (London: Constable, 1919), p. xiii.

3. Even half a century later, the instructions issued by the Admiralty to the captain of *H. M. S. Rattlesnake*, in which T. H. Huxley sailed in 1846 as "a surgeon who knew something about science," included the order "to refrain from any act of aggression towards a vessel or settlement of any nation with which we may be at war, as expeditions employed on behalf of discovery and science have always been considered by all civilized communities as acting under a general safeguard." Quoted in A. V. Hill, *The Ethical Dilemma of Science and Other Writings* (New York: Rockefeller Institute Press, 1960), p. 205.
4. For further details and references, see my *The Relevance of Physics*, (Chicago: University of Chicago Press, 1966), pp. 397-98.
5. *The New York Times*, Dec. 30, 1984, p. D12. A call for an economic and diplomatic embargo of the Soviet Union would have been the only appropriate "moral" reaction, which might have meant the facing up to a most likely expulsion of *The New York Times* reporters from the Soviet Union.
6. "It is my judgment in these things," Oppenheimer stated before the Congressional Committee investigating his loyalty, "that when you see something that is technically sweet, you go ahead and do it and you argue about what to do about it only after you have had your technical success." *In the Matter of J. Robert Oppenheimer* (Washington, D.C.: U. S. Government Printing Office, 1954), p. 81.
7. J. R. Oppenheimer, *The Open Mind* (New York: Simon and Schuster, 1955), p. 88. His statement was originally made at the Massachusetts Institute of Technology on November 25, 1947.
8. A lengthy description of Norway's first wave-power station that has been producing for the past year 850 kilowatts of energy, enough for a community of about 1,000 people, was given in *The New York Times*, Feb. 10, 1987, p. C1. A race of solar-powered automobiles across Australia took place in

early November 1987, a rather impressive follow-up to the operating of superlight airplanes by solar energy.

9. *The Times* (London), Sept. 5, 1927, p. 15, cols 1-2. The report in *The New York Times* (Sept. 5, p. 3, col. 4) came to a close with a quote—"It is not possible to call a halt. If we stopped the world would go to pieces."—from the speech which the physicist, Oliver Lodge, gave Sunday evening, partly as a reply to the Bishop's address.
10. Even Marxist theoreticians would not claim that had Newton not been born, another Newton would have emerged right there and then just because, according to Marxist theory, Newton's inventiveness was a function of the rising industrialization and capitalism in England. The latest developments in superconductivity are a clear proof that crucial discoveries are not the fruits of economic and social conditions but of the preparedness of individual minds.
11. On the actual production of such a plane in the USA, see the report in *The New York Times*, Jan. 10, 1988, p. 1.
12. "The Marriage of Heaven and Hell," in *The Complete Writings of William Blake*, ed. G. Keynes (London: Oxford University Press, 1960), p. 152.
13. An expression given wide currency through the book of P. Ehrlich, *The Population Bomb* (New York: Ballantine, 1971). Eleven years earlier came R. M. Fagley's *The Population Explosion and Christian Responsibility* (New York: Oxford University Press, 1960). They should be studied in connection with *Models of Doom: A Critique of the Limits of Growth*, ed. H. S. D. Cole and others (New York: Universe Books, 1973), and B. J. Wattenberg, *The Birth Dearth* (New York: Pharos Books, 1987), a vastly expanded form of Wattenberg's arguments presented in 1970 in *The New Republic* under the title, "The Nonsense Explosion."
14. It is not even certain whether the majority of mankind would take kindly to the "exciting possibilities being opened up by drugs, like mescaline, lysergic acid, and psilocybin, which can produce astonishing results in minute doses," as

recommended by Sir Julian. For his remarks see pp. 12 and 17 in the text of lectures and discussions published under the title *Man and His Future. A Ciba Foundation Volume*, ed. G. Wolstenholme (London: J. & A. Churchill, 1963).

15. *Ibid.*, pp. 275 and 284.
16. *Ibid.*, pp. 265 and 288. The repeated disparaging remarks about the ethical stance of the Roman Catholic Church provided further proofs on behalf of Peter Viereck's now almost half-a-century-old remark that "Catholic baiting is the anti-semitism of liberals." Catholics could, of course, be proud of the fact that Colin Clark, the world-famous population expert and the only Roman Catholic at the symposium, did not hesitate to declare to an overwhelmingly secularist gathering that "the main purpose of man on earth is to love God and obey his commandments" (p. 292).
17. Concerning genetic engineering, the problem received a well informed treatment in June Goodfield's *Playing God* (London: Hutchinson, 1977).
18. That the context of Juvenalis' often quoted remark in his Satire VI about duplicity in sexual behavior only adds to its timeliness.
19. See his leader, "When Scientists Play the Role of God," in *The Times* (London), Nov. 16, 1968, p. 11, cols. 5-7.
20. In his long public letter (1762) to Msgr. Beaumont, Archbishop of Paris, Rousseau viewed it as a blasphemy to burden human nature with that kind of sin. See *Oeuvres complètes* (Paris: Pléiades, 1964), vol. IV, p. 940.
21. For a broader background study of this interconnectedness, see J. Simon, *Theory of Population and Economic Growth* (New York: Blackwell, 1986), and *The Ultimate Resource* (Princeton: Princeton University Press, 1984).
22. See D. J. Kevles, *Genetics and the Uses of Human Heredity* (New York: Alfred Knopf, 1986).
23. Such is the major theme of G. Hardin's *The Limits of Altruism: An Ecologist's View of Survival* (Bloomington: University of Indiana Press, 1977). Hardin is ready to pour sarcasm at

any moment on old-fashioned Christian altruism, and does not refrain from equating (with tongue in cheek I believe) his preaching of selfishness with the Christian notion of grace (p. 135). In his *Promethean Ethics* (Seattle: University of Washington Press, 1980), Hardin insists on the ultimate futility of Mother Teresa's concern for the destitute of Calcutta (p. 63). Hardin's consistency deserves admiration, as it leaves no doubts about the ultimate implications of the limits of an altruism that has Darwinism for its source.

24. See report in *The New York Times*, Sept. 30, 1986, p. 19.
25. Strangely, there was no report in *The New York Times* in spite of the fact that the author of the article in question is a professor emeritus at Rockefeller University.
26. E. Chargaff, "Engineering a Molecular Nightmare," *Nature* 327 (May 21, 1987), pp. 199-200.
27. These two passages are taken from the last lecture of I. I. Rabi at Columbia University as reported in *Time*, May 26, 1967, p. 48.
28. It received further impetus from the fear that reference to original sin may weaken responsibility for the Holocaust, a point very evident in the leader by Rabbi Bernard Berkovits, "Holocaust: A Jewish Perspective," *The Times* (London), Aug. 15, 1987, p. 10.
29. Augustine's most emphatic assertions of this connection are in Book XII (ch. 13, 19, and 20) of *The City of God*. They are quoted extensively in my *Science and Creation: From Eternal Cycles to an Oscillating Universe*, pp. 177-80.
30. New York: Simon and Schuster, 1987. No mention is made by Bloom of the role which academics played in the exploiting of Einstein's relativity on behalf of relativism. For details, see my *The Absolute Beneath the Relative and Other Essays* (Lanham Md: University Press of America and Intercollegiate Studies Institute, 1988), pp. 3-4.
31. *The New York Times*, Aug. 23, 1987, p. E24.
32. As will be discussed in the next chapter.

33. Letter to the editor, *The New York Times*, Dec. 21, 1983, p. A26.
34. That Catholic biblical scholars have conspicuously failed to call attention to the Visitation's formative power of Christian consciousness about the full human reality of few-weeks-old fetuses kept me enormously puzzled as I was writing my essay, "Christ, Catholics, and Abortion," *Homiletic and Pastoral Review* 85/6 (March 1985), pp. 7–15.
35. J. A. De Luc, *An Elementary Treatise on Geology*, tr. from the French manuscript by the Rev. H. de la Fite (London: printed for F. C. and J. Rivington, 1808), p. 82. The phrase is not attributed by De Luc to Bacon.
36. Quoted in B. G. Sandhurst, *Miracles can Happen* (London: Burns and Oates, 1957), p. 5. See also my essay, "Miracles and Physics," *The Asbury Theological Journal* 42 (1987), pp. 5–42.
37. Thus all my work on the relation of science and religion was dismissed by the editors, D. G. Lindberg and R. L. Numbers, of *God and Nature: Historical Essays in the Encounter between Christianity and Science* (Berkeley: University of California Press, 1986), with the remark that I have "sacrificed careful history for scarcely concealed apologetics" (p. 5). Another recent work, *Theology and Scientific Imagination from the Middle Ages to the Seventeenth Century* (Princeton: NJ: Princeton University Press, 1986), by Amos Funkenstein, comes to a close also with a complete dismissal of my work on the relation of science and rational theism, although with a listing of my various "errors." This is not the place to give the charges in that list a detailed answer which will be given in my review of that book in *The Thomist*. Here I should merely note that Funkenstein's chief grievance against me is that I claim to *know* the causes of a variety of features of the history of science, one of them being the failure of great ancient cultures to come up with a viable form of science (p. 361). I certainly argue my claims with unconcealed commitment in the belief that a firm and clear position is to the benefit of any and all. Such a procedure is at least very

distant from the one which may be responsible for the rank inconsistency that brings to a close the book of Funkenstein who is most eager to distance himself from my "extravagant claims" (ibid). His book, whose story has the 17th century for its terminus, ends with the de-theologization of science by Kant, hardly a 17th-century figure. Kant was certainly a consummate, and also a most schemeful apologist of agnosticism, the position which Funkenstein, together with countless other Jewish intellectuals, seems to prefer, but which is hardly the proper perspective for understanding the Middle Ages, the enormously rich lore of the medieval use of imagination, or even the role which Kant, in final despair, assigned to imagination so that his pseudo-rational system might have the appearance of coherence.

38. Quoted in his obituary in *The Times* (London), May 19, 1987, p. 16.
39. From an interview with M. Amrine in *The New York Times Magazine* June 23, 1946, p. 42. There he also stated that "the real problem is in the minds and hearts of men" (p. 44).
40. B. Russell, *Why I am not a Christian and Other Essays on Religion and Related Subjects* (New York: Simon and Schuster, 1957), p. 45. The statement was made in 1927.
41. B. Russell, *The Impact of Science on Society* (New York: Columbia University Press, 1951), p. 59.
42. For discussion and documentation, see Ch. 11 in my *The Relevance of Physics*, Chs. 9, 10, 14, 15 in my *The Road of Science and the Ways to God*, and Ch. 3 in my *Brain, Mind and Computers*, all dealing with various forms of that cultural curse known as physicalism or scientism.

CHAPTER SIX

1. In his essay, "Difficulties in Presenting the Christian Faith to Modern Unbelievers" (1948), C. S. Lewis correctly traced modern man's almost complete insensitivity to sin to his judgmental dismissal of God. In re-editing that essay with a

dozen others, W. Hooper gave it the title “God in the Dock,” which became the title of the collection itself only in the Fontana paperback edition (London: Collins, 1979); see pp. 99–100.

2. In giving the title *Mere Christianity* to a collected edition of three sets of his essays he had published previously, C. S. Lewis acknowledged that his aim was “to defend what Baxter called ‘mere Christianity.’” (See Fontana Books edition, London, Collins, 1955, p. 5). C. S. Lewis did not give any information about Richard Baxter, although he could hardly have been unaware of the fact, reported even in the *Encyclopedia Britannica* (see “Baxter, Richard,” 1911 edition), that the “mere Christianity” of Baxter, a foremost Puritan preacher of the 17th century whom Cromwell summoned to London “to settle the fundamentals of religion,” was, in Baxter’s own words, such as “might be subscribed by a Papist or a Socinian.”
3. Indeed, C. S. Lewis rushed to the morally right and wrong as the real clue to the meaning of the universe in the opening chapters of his *Mere Christianity* as he asked: “Is it not plain that the questions, ‘why is there a Universe?’ ‘Why does it go on as it does?’ ‘Has it any meaning?’, would remain just as they were?” Whereas this is true about the third question, the first two questions are the kind of philosophical questions for which the proper answer will be greatly helped by attention to modern scientific cosmology that has disclosed the enormous degree of specificity of the universe. In speaking in *God in the Dock* (p. 62) about the “shocking selectivity” of the universe, C. S. Lewis fails to spell out that the universe is “selective” because God selected a specific universe out of an immense number of universes all very specific in themselves. Even God cannot create a material universe which would be non-specific.
4. Even Bryan perceived something of this when, pressed by Darrow, he recoiled from endorsing the literal sense of six 24-hour periods and greatly disappointed thereby his fundamentalist supporters. See R. Ginger, *Six Days or Forever?*

- Tennessee v. John Thomas Scopes* (1958; New York: New American Library, 1960), pp. 145–50.
5. George Gamow's *The Creation of the Universe*, a bestseller in the 1950s, began on such a note.
 6. Thus, for instance, H. M. Morris *et al*, *Creation: Acts, Facts, Impacts* (San Diego: Creation-Life Publishers, 1974) and R. Bliss, *Origins—Two Models: Evolution/Creation* (San Diego, 1978).
 7. The repeated references of Jesus, in his high-priestly prayer (Jn 17), to his mission as a service to make the Father known were no doubt the justification for the insertion there of verse 3 "Eternal life is this: to know you, the only true God, and him whom you have sent, Jesus Christ." While in scriptural parlance *to know* means more than a purely conceptual act, it cannot exist without the latter. A clear warning about this is Paul's insistence (Rom 12:1) that Christian worship should be a *logikē latreia*, that is, a *reasoned* worship.
 8. See note 10 to ch. 3. Once the Book of Wisdom and some other scriptural books were classed as apocryphal, reverence for them has increasingly become a lip-service, in much the same manner as Muslims have grown largely ignorant of the Jewish and Christian scriptures, whatever the praises accorded to them in the Koran.
 9. "One long argument," in his own words. See *The Autobiography of Charles Darwin*, ed. Nora Barlow (New York: W. W. Norton, 1969), p. 92.
 10. See ch. 4, note 52.
 11. The gist of his remark that "a dog might as well speculate on the mind of Newton," in his letter of May 22, 1860 to Asa Grey, in F. Darwin, *The Life and Letters of Charles Darwin* (London: John Murray, 1888), vol 2, p. 312.
 12. *Descent of Man* (new ed.; London: John Murray, 1901), p. 146.
 13. See ch. 4 note 46.
 14. Stephen J. Gould, "The Verdict on Creationism," *The New York Times Magazine*, July 19, 1987, p. 34. "Our continuing

struggle to understand how evolution happens ('the theory of evolution') does not cast our documentation of its occurrence—('the fact of evolution') into doubt" (p. 34). The instructiveness of this statement will stand out only when pondered in conjunction with declarations that present the same "theory" as well established truth, Books written by Darwinists have as their distinctive features statements similar to the one by Julian Huxley, "Our knowledge is merely permitting us to fill in the details and add a few minor modifications" (*Man and His Future*, ed. G. Wolstenholme (London: J. Churchill, 1963), p. 296).

15. I should not have been surprised on finding that my comment was not published. Balanced views are not newsworthy.
16. G. de Santillana, *The Crime of Galileo* (Chicago: University of Chicago Press, 1955), pp. viii–ix.
17. J. Reston, "A Forgotten Foundation Principle," *The New York Times*, April 22, 1984, p. E15 and *The International Herald Tribune*, April 24, 1984, p. 6, cols 4–6.
18. Aca-media is a combination of academe and media.
19. H. E. Scudder, *A History of the United States of America* (Cambridge, Mass: University Press, 1884), p. 429.
20. The article "Creation" in *Encyclopedia Judaica* (New York: Macmillan 1971, vol. V, pp. 1059–71) comes to a close with an endorsement of an 'emergence' savoring of pantheism. In *The Jewish Encyclopedia* (New York: Funk and Wagnalls, 1903, vol. IV, pp. 336–40) it is admitted that the idea of eternal matter "had many adherents among medieval Jews" and that the idea of *creatio ex nihilo* "is of no consequence to the practical religiosity which Judaism means to foster." The concern of orthodox rabbis about the widespread presence of pantheism in the Jewish cultural ambience is too well known to be documented here.
21. The price to be paid for setting "cultural respectability" as the highest theological standard is well documented in *American Mainline Religion* (New Brunswick: Rutgers University

Press, 1987), a sociological study by W. C. Roof and W. McKinney about the decreasing hold which mainline, that is, liberal, Christian churches have on their congregations.

22. Quoted in *The New York Times*, Sept. 21, 1987, p. 1, col 2.
23. These data were quoted in *The New York Times* (Sept. 12, 1987, p. 9), in connection with the beginning of the papal visit in the USA, from *The Emerging Parish* by J. Castelli and J. Gremillion (New York: Harper and Row, 1987), published shortly afterwards.
24. For my first coining the term Aquikantists, see my *The Keys of the Kingdom* (Chicago IL: Franciscan Herald Press, 1986), pp. 157-59. This new word is necessary because few students of philosophy and theology (to say nothing of the educated Catholic public that has recently developed "theological" competence without competent theological learning) realize nowadays that Kantian and Hegelian philosophers, who called their métier transcendental in the first place, denied the possibility to transcend empirical knowledge in a rationally trustworthy manner.
25. Their guilt is all the greater because in the 1960s it was still impossible to ignore the towering presence of Maritain, Gilson, and other genuinely Christian thinkers. But, of course, even then the effects of original sin were not suspended, although they could readily be overlooked in an atmosphere of inebriating "renewal" that had little in common with true reform which has to be self-reform if it is to be genuine.
26. Sirach 4:28.

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Note on the Author

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The Savior of Science

The very title of this book is an invitation to courageous thinking. *The Savior of Science* begins with a portrayal of a most neglected, yet all-important facet of cultural history: the invariable stillbirths of science in great ancient cultures, including Greece and the early Muslim empire. This is the background for the first major thesis of the book: belief in Christ, the only begotten Son of God—a belief absent in all those cultures—secured for science its only viable birth in a period that began in the High Middle Ages.

The author, a renowned historian and philosopher of science, has been known for some time for his erudite courage to oppose long-established cultural clichés about scientific history. Those clichés are roundly contradicted by his further and meticulously argued theses about *Christian* monotheism: it provides intellectual safeguards for the cosmological argument (an argument powerfully supported by modern scientific cosmology), it vindicates the sense of purpose destroyed by materialist theories of evolution, and it secures firm ethical guidelines against fearful abuses of scientific know-how.

On the cover: center part of the 12th-century mosaic of Christ the Pantokrator in the apse of the Cathedral of Monreale, Sicily.

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