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Science and creation: From Eternal Cycles to an Oscillating Universe

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Lately Matteo Ricci utilized some false teachings to fool people, and scholars unanimously believed him... The map of the world which he made contains elements of the fabulous and mysterious, and is a downright attempt to deceive people on things which they personally can not go to verify for themselves. It is really like the trick of a painter who draws ghosts in his pictures. We need not discuss other points, but just take for example the position of China on the map. He puts it not in the center but slightly to the west and inclined to the north. This is altogether far from the truth, for China should be in the center of the world, which we can prove by the single fact that we can see the North Star resting at the zenith of the heaven at midnight. How can China be treated like a small unimportant country, and placed slightly to the north as on this map? This really shows how dogmatic his ideas are. Those who trust him say that the people in his country are fond of travelling afar, but such an error as this would certainly not be made by a widely-travelled man.¹⁴⁵ The ultimate bone of contention concerned, of course, neither science, nor national pride, but the question whether the world was made by God or was itself god. It was inevitable that Ricci himself should come to grips with that crucial issue. After all, he went to China to lead souls to God. He found no saving grace in the overt pantheism of Chinese Buddhism. But he felt that Confucianism, in its ancient form at least, represented a noble moral ideology, which unfortunately had taken on an increasingly atheistic interpretation during the previous five hundred years. In the methodical exclusion by the Taoists of a First Cause and of a Beginning, Ricci saw a most detrimental phenomenon of Chinese thought. The second chapter of his catechism was devoted to the refutation of the Taoist claim that the "nothing" can for ever give rise to "everything." "Such a doctrine," he wrote, "not only fails to enlighten the world, but is in fact generating a great number of confusing doubts."¹⁴⁶ Obviously, the stricture also bore on the vagueness and ambivalence of the Taoist statements about nature. The clarity and cogency of the laws of Western science,

especially astronomy, could therefore suggest in a most powerful manner that the laws of nature had an exactness that pointed to a rational Lawgiver. True, Ricci taught to the Chinese the Ptolemaic world-view and astronomy. But the latter implied an impressive body of incontrovertible scientific results which stood in irreconcilable conflict with the Chinese (Taoist) interpretation of the world, and especially with its morass of organismic, astrological, and fatalistic notions.

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The passage also gives a glimpse of the inhibitory impact of the belief in cyclic recurrences. The treadmill of perennial returns not only generates pessimism by its spectre of the inevitable decay of man's achievements but it also invites the setting of a complacently low ceiling on attainable goals. For this is what is revealed in Aristotle's words: "probably every art and every philosophy has often reached a stage of development as far as it could and then again has perished."³⁵⁹ Obviously, what was true in art and philosophy had also to be valid for the patterns of social and political life. In *The Politics* Aristotle noted in connection with the caste system and with the custom of using a common table by an entire village community: "It is true indeed that these and many other things have been invented several times over in the course of ages, or rather times without number; for necessity may be supposed to have taught men the inventions which were absolutely required, and when these were provided, it was natural that other things which would adorn and enrich life should grow up by degrees. And we may infer that in political institutions the same rule holds."³⁶⁰ The word "necessity" was very aptly used by Aristotle in the context, provided its full Aristotelian meaning is kept in mind. The necessity of which Aristotle spoke is more than the accidentally occurring constraint posed by the environment. What may seem accidental for the cursory analyst of events and circumstances was in Aristotle's eyes an inevitable and periodically recurring consequence of the great cycles that ruled the cosmos and everything and everybody in it. It was not long before Greek thought began to strain under the oppressive weight of such an outlook on existence and human endeavour. As a matter of fact a principal if not the primordial preoccupation of the Stoics,³⁶¹ who from the third century on eclipsed the Peripatetics, consisted in an agonizing effort to escape the debilitating clutches of the prospect of eternal recurrences. Already the founder of the Stoics, Zeno, who came from the town of Citium in Cyprus, was imbued with the belief, perhaps under Oriental or

more specifically Babylonian influences, that after each world destruction the same people would attend to the same needs. Anytus and Meletus (politicians of ancient times) would once more make requisitions, Bousiris (a legendary king of Egypt) would start again killing a foreigner each year, and Hercules would display anew his physical prowess by vanquishing Bousiris and his sons. This picturesque account of Zeno's reflections on the recurrence of all is due to the second-century Christian author, Tatian, who turned a gnostic.³⁶² His younger contemporary, Alexander of Aphrodisias, the noted commentator of Aristotle and certainly most familiar with the philosophical tradition, reported much the same about Chrysippus who fused Stoic teachings into a great system of thought. Alexander referred to a book of...

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Among the philosophers it was also the pessimistic component of the concept of cyclic returns that prevailed. Cicero, for one, clearly betrayed an awareness of the despondency exuding from the doctrine of the Great Year, though as a true Stoic he tried to face the inevitable prospect with saddened courage.³⁹⁵ In the closing sections of his *De republica*,³⁹⁶ which contains the famous "dream of Scipio," Cicero took note of the Great Year to warn that no statesman should expect perennial fame as his reward. The world is subject to periodic catastrophes which reduce to ashes all cultures and obliterate all memory and fame. For Cicero the basic unit of time is the period separating the conflagrations and he calls it emphatically the year. He is also very clear on the role of stars in determining the length of the cosmic period: "Men commonly reckon a year solely by the return of the sun which is just one star; but in truth when all the stars have returned to the same places from which they started out and have restored the same configurations over the great distances of the whole sky, then alone can the returning cycle truly be called a year; how many generations of men are contained in a great year I scarcely dare say."³⁹⁷ Yet, he volunteers an estimate which is interesting for two reasons. First, according to Cicero the time which had elapsed from Romulus' death to Scipio's victory over Carthage did constitute less than one-twentieth of the Great Year, an estimate which puts the length of the Great Year as somewhat more than 20×573 , or 11,460 years.³⁹⁸ Such a figure may suggest either Cicero's unfamiliarity with the true period of the precession of the equinoxes, or one may perhaps assume that in speaking of the stars Cicero meant only the planets and borrowed some

earlier opinion about the length of time needed for the return of all planets to the same position at the same time. However that may be, Cicero's belief in the eternal recurrence of all is strongly conveyed in his concluding allusion to the coincidence of the sun's eclipse and of Romulus' death. The allusion also refers to a future eclipse of the sun in the same section of the sky, at the same season and with all the stars being again in the same position.

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Scientific breakthroughs, or new scientific instruments, are never easy to make. But they should seem to appear child's play when compared with the task of bringing about a never before experienced cultural or rather moral climate in which the good, right, and truthful are accorded, in principle at least, unconditional respect. Those who achieved this enormous feat did so in the deep conviction that they were the true, spiritual heirs to the Covenant. The principal aim of the Master from Nazareth consisted in bringing out the basic feature, love, in the image of the Father and Maker of all. If what he said about the love of God and neighbour was already extraordinary, no less astonishing was the effectiveness of his words and very life as the utmost compliance with the Father's will. That will, to recall some of his inimitable remarks, governs the whole of creation, keeps clothing the lilies of the field, prevents sparrows from falling to the ground haphazard, and instituted the human race, as male and female, from the creation. Deep-seated consciousness of the unique importance of the creation sets the tone of one of his few recorded utterances of prayer that starts with the exclamation: "I bless you, Father, Lord of heaven and of earth."⁴⁸⁴ It was the time passed since the days of creation which he used as the backdrop to indicate the enormity of the trials which would signal the approach of the final phase of cosmos and history. His emphasis on the redemptive restoration of all was anchored in the infinite love of a Father who would certainly secure the ultimate triumph of the purpose of creation, the union of all in God. One may or may not agree with the extraordinary claim which the Master from Nazareth made about himself. Many millions have been deeply touched by his humaneness, uncounted others still find distasteful his emphatic other-worldliness. Yet, only the councils of rigid rationalists and dogmatic Marxists would deny that anyone ever changed the world as much as he did, and for the better. His immediate disciples were impressed by him to the point of according him divine honours. But their worship of him was only matched by the magnitude of their and their master's concern, lest any

crack, however slight, be made in the edifice of the jealously strict monotheism of the Covenant. The Master from Nazareth most emphatically endorsed the hallowed phrase of the Covenant as standing for the first of all commandments: "Listen, Israel, the Lord our God is the one Lord, and you must love the Lord your God with all your heart, with all your mind, and with all your strength."⁴⁸⁵ The Israel he had in mind was not to stay confined to its national self. Its spiritual endowment had the destiny to spread across a world lost in polytheism and idolatry. It was, therefore, most logical that the clash between Christianity and the Roman Empire came to a head on the issue of monotheism. The preaching of the Gospel had to be done in an ambience filled...

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Furthermore, Origen stated with similar firmness the idea of an absolute end for cosmic processes, and described it as a state exactly similar to the condition prevailing at the beginning. It is worth noting that Origen connected the finiteness of the universe along the parameter of time (its finite size had been the prevailing view) with the notion of intelligibility, anchoring it in God's ability to comprehend things. Here, Origen ended up in an uneasy position. By insisting that only those processes could be comprehended that have a beginning and an end, he seemed to imply that not even God could comprehend an endless process.⁵⁵⁸ More specifically, he had to face the objection as to what God had been doing before the moment of creation. His reply, "God did not begin to work for the first time when he made this visible world, but that just as after the dissolution of this world there will be another one, so also we believe that there were others before this one existed,"⁵⁵⁹ lacked what it claimed, logic, or at least consistency. For in the same context Origen excluded only the simultaneous existence of several worlds. He failed to recall what he had already previously stated, the absolute beginning and end of all worlds.

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A concise illustration of this is that al-khemi, the Arabic name of the study of materials and compounds, came to stand for alchemy, the very embodiment of obscurantism. The classic summary of Arab alchemy by the Brethren of Purity,⁶⁴⁶ of whom more will be said later, illustrates what happens when mystical and astrological proclivities gain easy

dominance over a whole branch of science. The cultivation of "chemistry" earned, indeed, a bad name even among some Arabs, and was denounced time and again as a largely worthless enterprise by some of the leading Arab scholars.

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It should be easy to see that in such an outlook no sufficient room was left for a rational investigation of the laws of the universe. The connection of all sorts of events with the position of planets demanded imagination, wishful thinking, and phantasy far more than cool reasoning. The Muslim notion of the Creator was not adequately rational to inspire an effective distaste for various types of pantheistic, cyclic, animistic, and magical world pictures which freely made their way into the Rasa'il. There astronomy, for instance, was considered a science not so much derived from observation and calculation as from the "revelation" given to Hermes Trismegistus who allegedly travelled as far as Saturn to gather the true science of the heavens. The prominence given to Hermes Trismegistus should be highly revealing to anyone familiar with the mystical obscurantism dominating those anonymous writings compiled in late Hellenistic times. No wonder that the Rasa'il could not represent a forward step in science. It rather illustrates the conceptual morass that can also be found in the writings of Paracelsus and Bruno, chief advocates during the Renaissance of Hermes Trismegistus and cabbalism.

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contradicted by any sense perception."⁶⁹² It was also Averroes' contention that religion and philosophy should be kept absolutely separate, or else doubts might arise both about faith and Aristotle's doctrine.⁶⁹³ In stating this, Averroes unwittingly revealed the deepest reason of the bondage into which his thinking became entangled. Although a deeply devout Muslim, he was unable to take some of the Koran's major tenets about the Creator and the world as guidelines for reasoning. They might have perhaps led him out of the labyrinths of the Aristotelian interpretation of the world in which the obvious was at times talked away with hardly a second thought in order to prevent a thorough reconsideration of the imposing but hastily erected edifice. The edifice was the Aristotelian system of the world resting on some

eagerly exploited observations and on the systematic slighting of many others.

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A philosophy of nature, systematically ignoring the question of miracles and all they imply, such was Averroes' ideal. If the science of Aristotle or the science of ancients, to use his expression, was so eminent, it was because they did not discuss miracles "although they were known and had appeared all over the world."⁶⁹⁷ The implication was that Aristotle and ancient philosophers in general were familiar with Old Testament miracles (a view often repeated in late antiquity and early Middle Ages by Christians and Muslims), but they wisely ignored them as far as philosophy was concerned. However that may be, it was certainly not true that ancient philosophers did not "discuss any of the things which are said to happen after death."⁶⁹⁸ But life after death could easily be part of a syndrome going on with absolute necessity. Miracles meant precisely that no law of nature was intrinsically and absolutely necessary and eternal. Miracles that were true, or held to be such, could be powerful reminders against attributing to given laws of nature and to the parts and whole of nature an eternal necessity which they demonstrably did not possess. Of this crucial aspect of the problem Averroes remained conspicuously unaware.

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The historian of science and particularly the student of Arab science has, then, the obvious task to explain how a book like *The Guide for the Perplexed*, especially its second, or philosophical and scientific part, could be written in the Muslim milieu and yet evince a mentality far superior to it. This is all the more remarkable as Maimonides showed no condescendence toward Muslim and Greek scholars. He did his best to give them the benefit of doubt as can be seen, for instance, in his famous "Letter on Astrology."⁷¹⁶ There he went as far as to charge with abuses in the matter only Chaldeans, Chaldeans, Egyptians, and Canaanites. According to him the "wise men of Persia" always recognized the utter falsehood of astrology. About the "wise men of Greece, Persia and India" he mentioned only their composition of works about the "exceedingly glorious science" of astronomy.⁷¹⁷ Such was an extremely generous appraisal in view of Maimonides' claim that he read every work on "judicial astrology" translated into Arabic.⁷¹⁸ Those

translations certainly included Ptolemy's Tetrabiblos, to mention only one example, which, like its Hindu and Persian counterparts, exuded that very idolatry from which Maimonides tried to save Jews scattered all over the Arab world. The idolatry implied in astrology turned around the proper relation between Creator and man. In astrology there was no room either for God, creating freely, or for man acting freely and with responsibility.

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Eventually, experimental and observational evidences were marshalled in support of the heliocentric arrangement though not as soon as Galileo expected. Meanwhile faith, and in particular faith in the Creator, was needed to provide firm, logical foundation for the scientific pursuit. This is very clearly evidenced in the reflections on scientific methodology by Descartes and Bacon, the other main heralds of the new age of science. Of the two, Descartes was by far the more systematic. The determination with which he pursued his goal, a mechanistic account of the universe, stamped the three centuries of classical physics with the Cartesian spirit and motto of "matter and motion." But for Descartes this merely represented the superstructure. He was equally concerned with the ultimate foundations of science. What made scientific inquiry possible, according to Descartes, was that the notion and reality of God as Creator secured a double feature for the totality of created entities. One of these was their participation in eternal reasons on which rested the notion of physical law; the postulate of the homogeneity of the universe, of its consistency and harmony. The other was the contingency of nature and this seemed to be most palpable for Descartes in the countless particular characteristics of physical things and processes. The specifications of these particulars and the demonstration of a general law at work in them entailed for Descartes the overriding need for experimentation and the justification of his insistence to part with the mentality of the Schoolmen.

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This is not the place to review in detail Descartes' numerous references to the need of experimenting, or the "countless experiments" he claimed he had performed, or his famous call to all the learned to communicate their experiments to him, the sole possessor of the

unfailing method of interpreting them correctly.¹⁰⁰⁸ Undoubtedly, he had been familiar with the activities and ideas of contemporary scientists, though like many men of science of those times, Descartes grudged to acknowledge others' eminence.¹⁰⁰⁹ This is well illustrated in Descartes' ostensibly generous praise of Bacon.¹⁰¹⁰ It merely served to undercut the intellectual stature of the Lord Chancellor, the renowned apostle of the inductive method. The developments of scientific reflections fully justified Descartes' claim that collection of the facts of nature could only be fruitful if it was done judiciously, namely, with some carefully formed set of assumptions. Descartes was also closer to truth with respect to the idea of an *experimentum crucis*¹⁰¹¹ by which Bacon set great store. In fact, no scientist of any stature ever followed Bacon's endless specifications as to how the scientific method ought to be practiced. Nor did his voluminous writings offer any original scientific observation. In addition, Bacon displayed more often than not a baffling lack of perception about what was truly valuable in the work of the scientists of his time, to say nothing of their immediate predecessors.

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Boyle must have certainly been familiar with the past history of the idea of eternal returns. The England of his time witnessed the ascendancy of the Cambridge Platonists, among them Henry More. The latter's *Immortality of the Soul* had a special chapter for the Stoics' claim about a Great Year ending invariably in an all-consuming fire.¹⁰³⁷ More's principal interest lay not, of course, in the cosmological aspects of the question. He merely tried to show the correlation between some repulsive aspects of the Stoics' ethics and their cosmology.¹⁰³⁸ Characteristically, the cosmology of eternal returns was dismissed out of hand in the much more scientifically oriented *Three Physico-Theological Discourses*¹⁰³⁹ by John Ray, member of the Royal Society. The work, a vindication of the main points of the biblical account of the origin and destiny of the cosmos, was originally published in 1692 under the title, "Miscellaneous Discourses concerning the Dissolution and Changes of the World," but it concerned itself exclusively with three points: the creation of the world, the deluge, and the fiery end of the world. It was in connection with this last point that Ray discussed in a special chapter¹⁰⁴⁰ the idea of the Great Year mainly as the Stoics held it, though he also pointed out the ubiquitous presence of the idea in the antique world. As Ray put it, the "ancient Gauls, Chaldeans, and Indians" could not get the idea from the Stoics.¹⁰⁴¹ But the surprisingly

numerous references by Ray to various antique sources served only two purposes. The first was to discredit the Stoics' ethics on the basis of their weird cosmology; the second consisted in bringing out the credibility of the biblical doctrine of final conflagration as something which was held, however incorrectly, by all peoples and cultures. Ray wasted no time on the idea of cosmic periodicity. In his eyes it was not worth refuting. The assent commanded by the rationality of the once-and-for-all cosmic purpose was, for all practical intent, overwhelming.

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On his part, Newton most explicitly endorsed the notion of a Creation once and for all as the only sound framework of natural philosophy. This he did as he added the Scholium to the second (1713) edition of the Principia and as he kept enriching the subsequent editions of the Opticks with further Queries. The universe for Newton was a clockwork constructed by the Creator out of basic components created out of nothing. It was also the Creator who kept, according to Newton, this world mechanism in good repair by preventing it from a too early unwinding through His repeated interventions. Again, it was the Creator who secured the ultimate transition of this world into its final transformed condition at the end of time.

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By questioning the infinity of the world Bentley attacked one of the most powerful prejudices that ever got hold of scientific thinking. The gravitational and optical paradoxes of an infinite universe had been ignored, dismissed, and belittled with baffling superficiality from at least the closing decades of the seventeenth century until rather recently.¹⁰⁵⁶ In part because of a justified reaction to the Aristotelian universe, preference for infinity in space had grown into an irrepressible intellectual fashion and on its coat-tails came the option for infinity along time, or eternity. Leibniz, whose sincere attachment to the Christian faith cannot be doubted, illustrates well this transformation, as far as eternity was concerned. In his essay, "On the Ultimate Origination of the Universe,"¹⁰⁵⁷ he described the universe as being "engaged in a perpetual and spontaneous progress."¹⁰⁵⁸ By perpetual he meant not continuous but strictly eternal. Recorded history of a few thousand years was only "an infinitesimally small part of the eternity which stretches out beyond measure."¹⁰⁵⁹ Reversals in that grandiose

march toward the ultimate in perfection allowed for some partial reversals, but only to give new and greater impetus to progress. It could easily be seen, however, that the actual world, the earth, to be specific, hardly reflected the best of conditions which should have long since materialized had the world been eternal. Leibniz parried the objection by noting that progress was a continuous line that could be divided into an infinite number of infinitesimally small parts: "the continuum being infinitely divisible, there will always remain in the unfathomable depth of the universe some somnolent elements which are still to be awakened, developed, and improved – in a word, promoted to higher culture. This is why the end of progress can never be attained."¹⁰⁶⁰ The passage is revealing not only of the momentary weakness of a genius capable of being trapped in a sophism which already Zeno had some trouble selling. The image of a universe which Leibniz conjured up stretched to its very extremes the Christian concept of the universe. Leibniz nowhere denied the creation in time, that is, "in the beginning," but he clearly let the idea fade into the background. This was all the more significant as he showed otherwise an acute awareness of the role to be played by the notion of the Creator in the justification of scientific pursuit. His criticism¹⁰⁶¹ of Descartes' Principia is a proof of how seriously he took the matter, namely, the proper analysis of the actual physical laws and of the properties characterizing the true Creator. Two of Leibniz's achievements, the enunciation of the conservation of "vis viva" (later energy) and the foundation of infinitesimal calculus, were used by him to show that the actual physical world was indeed the best and that it had a goal. By insisting on this latter point Leibniz tried to overcome the cold, soulless mechanism...

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On the other hand, Nature unceasingly occupies herself at the opposite boundary of the developed world, in forming worlds out of the raw material of the scattered elements, and thus, while she grows old on one side near the centre, she is young on the other, and is fruitful in new productions."¹⁰⁶⁶ (*Italics added.*) Thus, every region in the universe was to witness throughout eternity an endless recurrence of the same phases of a circular physical process. For as Kant confidently asked: "Can we not believe that Nature, which was capable of developing herself out of chaos into a regular order and into an arranged system, is likewise capable of re-arranging herself again as easily out of the new chaos into which the diminution of her motion has plunged her, and to renew the former combination?"¹⁰⁶⁷ Clearly, the prospect of a cosmic perpetuum

mobile gave him no second thoughts, as befitted any zealous scientific amateur blissfully building his own cosmos. Kant's speculations made no considerable ripple. That his cosmology was essentially cyclic remained unnoticed not only in his time but also by more recent interpreters of his cosmology. Lambert, the most prominent contemporary of Kant among German scientists, wrote his famous *Cosmologische Briefe*¹⁰⁶⁸ with no knowledge of Kant's work published six years earlier.¹⁰⁶⁹ Unlike Kant's universe Lambert's cosmos was finite and basically static, in the sense that Lambert paid no detailed attention to such problems as evolution and decay of planetary systems, stars, and galaxies. Lambert's brief reference to the Platonic Year¹⁰⁷⁰ was rather innocuous. In his hierarchical arrangement of galaxies and of some five hundred higher orders of systems of galaxies everything rotated around an immensely massive, dark, central body. It was, therefore, natural for Lambert to ask the question about the period of rotation of our sun around that mythical centre. Was it equal to the Platonic Year or only a mere fraction of it? To this question Lambert did not profess to know the answer though he did not hesitate to speak

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positively about equally problematic points of his hierarchical world order.

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This is also in evidence when one's attention is turned to Hegel. He expressed his belief in the fundamental nature of circular patterns whether writing about logic, philosophy of law, history of philosophy, or theology.¹¹⁴⁷ He defined the essential point to be observed by science as the circular return of the whole into itself where the first is the last and the last is the first.¹¹⁴⁸ This he explicitly contrasted with the concept of an absolutely given beginning. The Hegelian version of exact science illustrates only too well the morass of arbitrariness which seems to be generated when the pattern of perennial circularity is accepted as the supreme framework of thought and existence.¹¹⁴⁹

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A classic and early illustration of this is the interpretation of the laws of physical science by F. Engels, a chief architect of Marxist dialectic. His

admiration for Hegel was unbounded. Engels' *Dialectics of Nature*¹¹⁶¹ contains well over fifty references to Hegel but only a few of them reveal a touch of criticism. By and large Engels readily subscribed to Hegel's astonishing dicta whether they concerned the laws and findings of physical science or the facts of its history. Thus, he saw merits in Hegel's stultifying pronouncements about what the relative distances of the planets ought to be.¹¹⁶² He even found something basically good in Hegel's definition of electricity as "the anger, the effervescence, proper to the body," or "the angry self" of matter.¹¹⁶³ Hegel's supremacy in physics was again voiced by Engels when he wrote: "If nature itself proceeds exactly like old Hegel, it is surely time to examine the matter more closely."¹¹⁶⁴ Part of that matter concerned Hegel's claim about the presence of a repulsive force everywhere in nature as an indispensable counterpart of universal attraction. "Hegel is quite right in saying," Engels wrote, "that the essence of matter is attraction and repulsion."¹¹⁶⁵ The principal proof of this consisted of the basic laws of Hegelian dialectic on the basis of which it could be established a priori, so Engels insisted, that "the true theory of matter must assign as important a place to repulsion as to attraction, and that a theory of matter based on mere attraction is false, inadequate, and one-sided."¹¹⁶⁶ Engels' arbitrary handling of scientific theory was fully matched by his evaluation of experimental proofs. According to him, the universal repulsion in nature evidenced itself in the pressure of light which bends, for instance, the tail of comets away from the sun.¹¹⁶⁷

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The passage contains what for Nietzsche loomed large as the incontrovertible proof on behalf of his world conception: if the universe could reach a final stage it would already have reached it in all certainty during its infinite past. For him this consideration constituted the only certainty in cosmology: "If the universe were in any way able to congeal, to dry up, to perish; or if it were capable of attaining to a state of equilibrium; or if it had any kind of goal at all which a long lapse of time, immutability, and finality reserved for it (in short, to speak metaphysically, if becoming could resolve itself into being or into nonentity), this state ought already to have been reached. But it has not been reached: it therefore follows... This is the only certainty we can grasp, which can serve as a corrective to a host of cosmic hypotheses possible in themselves."¹²⁴⁶ The circularity of such an argument comes through clearly in Nietzsche's following statement: "If energy had ever reached a stage of equilibrium that stage would have persisted; it has

therefore never reached such a stage. The present condition of things contradicts this assumption. If we assume that there has ever been a state absolutely like the present one, this assumption is in no wise refuted by the present state. For, among all the endless possibilities, this case must already have occurred, as an infinity is already behind us. If equilibrium were possible it would already have been reached.”¹²⁴⁷ Evidently Nietzsche kept asserting possible consequences of what he should have established in the first place, the eternity and finiteness of the universe. It

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To grasp the full significance intended by Nietzsche in making such utterances one should recall his ideal of man, the Superman. Among his features one would look in vain for traits characteristic of scientists. As if compelled by a subconscious aversion toward men of science, it was always the mediocrity of the average scientist that Nietzsche liked to belabour. The unique qualities of creative scientists were largely left unmentioned by him. He liked to poke fun at the average scientist, whom he carefully distinguished from the genius. The scientific man was for him an old maid, a person of commonplace virtues, of unimposing attitudes, but always in covert search for recognition, for "the sunshine of good name," for the "perpetual ratification of his values and usefulness." According to Nietzsche, a chief motivation of the man of science was "the inward distrust which lies at the bottom of the heart of all dependent men and gregarious animals." The learned, or rather, the scientific man was, in his words, "full of petty envy," and had "a lynx-eye for the weak points" in those whom he could not emulate. The man of science was a person who grew cold and reserved because of his inferiority complex with respect to the Superman, or "the man of the great current." By contrast, the appearance of a scientist evoked for Nietzsche the image of a "smooth and irresponsive lake, which is no longer moved by rapture or sympathy."¹²⁶⁴ Nietzsche's myopia about scientists was matched by his vision of the scientific movement. He viewed it with heavy blinders indeed. He was unable to distinguish convincingly between classical or mechanistic physics, and the mechanistic dogmas which enjoyed undue popularity in his time. Like Goethe, whose revulsion for the mechanistic nightmare of the Enlightenment he approvingly recalled,¹²⁶⁵ he failed to see the profound difference between physical science and the mechanistic philosophies foisted upon it by some of its non-scientist interpreters.

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What irritated Nietzsche about science was not primarily its allegedly "lifeless," mechanistic character. Underlying the often superhuman efforts of the great men of physics there was the unshakable conviction in the progressive value of scientific research. Copernicus' vision of the heliocentric arrangement of planets was born of his belief in a universe structured on an immutable, once-and-for-all established pattern. Kepler's heroic struggles to unfold the laws of planetary motion were sustained by his faith in the eternal character of the fundamental patterns of the universe. Galileo, in turn, had already seen the chief glory of scientific work in its cumulative character. The great masters of

physics in Nietzsche's century were animated by the very same convictions. Nietzsche possibly sensed the enormous contrast between the spirit of science and the atmosphere of eternal recurrences: not even the most shocking pages of *Thus Spake Zarathustra* contain a hint about the same scientific discoveries being made all over again an infinite number of times. Could a Galileo derive any comfort from the prospect of going through his trial not once but endlessly? Would he or any other man of science have been willing to care for a world in which no ignorance and error could be definitively displaced by the results of science? Clearly, anyone with Nietzsche's absolute commitment to the idea of eternal recurrence could only look askance at the fact that more than one scientific achievement and conclusion evidenced the unmistakable characteristic of permanency. Nietzsche's preferences leaned towards a pre-scientific age when fables and fairy tales served as clues to nature and existence: "The wonderful did so much good to those men, who might well get tired sometimes of the regular and the eternal. To leave the ground for once! To soar! To stray! To be mad! That belonged to the paradise and the revelry of earlier times; while our felicity is like that of the shipwrecked man who has gone ashore, and places himself with both feet on the old firm ground – in astonishment that it does not rock."¹²⁶⁶

Note:

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The choice of the Pope was justified for at least two reasons. First, the process of creation postulated by the Steady-State theorists was diametrically opposed to the Christian idea of Creation. According to the latter, Creation is the work of an absolute, transcendental Being. According to the former, it is an emergence out of nothing but without a Creator.¹³⁵² Second, part of the originality of this "creation" was the daring by which an assertion flying in the face of elementary logic was upheld by its proponents. Equally surprising was the ready acceptance of the newfangled idea of creation by many scientists usually very keen on logic in scientific matters at least. Thus it happened that from the early fifties on, it has become the mark of cosmological sophistication to talk about rival cosmologies.¹³⁵³ The rivalry existed largely on the level of wishful thinking, and of wilfully created publicity, rather than on the level of an urgency created by experimental hints. As a matter of fact, the theory has failed so far to secure a single piece of experimental verification. In addition to this and to the preposterous concept of spontaneous creation, together with its overtly anti-theological, or rather anti-Christian motivations,¹³⁵⁴ it should also be pointed out

about the Steady-State Theory that it is but a subclass of cosmologies based on the idea of perpetual returns.

Note:

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The contracting phase has its own additional mysteries and paradoxes, for which physical astronomy does not even have a tentative solution. Of these the chief is the gravitational collapse which should naturally come at the end of the contracting phase. But even if the universe should be spared this, although on the basis of general relativity it is difficult to see why it should, there still remains the crucial question which should be answered if the idea of an oscillating universe is to remain within the ken of respectable scientific speculations: can there be any evidence of the contracting phase, say in the form of some radiation, that could be detected in the following expanding phase or vice versa? The most likely answer is the negative. Or as E. J. Öpik, the astronomer-author of a book distinctly in favour of the idea of an oscillating universe, described the situation when the whole universe precipitated itself into a narrow space, almost into a point: "Everything will perish in a fiery chaos well before the point of greatest compression is reached. All bodies and all atoms of the world will dissolve into nuclear fluid of the primeval atom – which in this case is not truly primeval – and a new expanding world will surge from it, like Phoenix out of the ashes, rejuvenated and full of creative vigour. No traces of the previous cycle will remain in the new world, which, free of traditions, will follow its course in producing galaxies, stars, living and thinking beings, guided only by its own laws."¹³⁶⁶ If, however, such is the case, then the properties of one phase will remain an unknown entity for scientists living in the ensuing phase and can hardly form the object of consistent scientific discourse. That such elementary considerations could escape a distinguished astronomer merely illustrates the point once made by Einstein: "The man of science is a poor philosopher."

Note:

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Such and similar examples of inept evasiveness in the face of fundamental questions about the universe should command the utmost attention in an age in which the question about the interaction between science and culture can no longer be evaded. This concern, at least in its seriousness, is relatively new. For well over two centuries Western Man lived in the Belief that science was an infallible and unfailing road to

Utopia based on the completely rational ordering of things and persons alike. The conviction had firmly entrenched itself that science, or rather more science, was the magic cure for all the ills and woes of mankind. Such an outlook on science received its classic expression in Herbert Spencer's once highly esteemed poetry in prose:

Note:

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In our century, Marxism and Nazism earned the dubious distinction of being the two most violent manifestations of such pseudo-philosophies and pseudo-sciences. Characteristically, both displayed most explicit ties to the dogma of cyclic recurrences. In this respect Nazi ideology was in a sad sense the more consistent of the two. Unlike the disciples of Engels who tried to imagine an end to the dialectical cyclic process in the establishment of the heaven of a classless society, Nazi propaganda organs restricted their mad ambitions to the "next thousand years." After that the rotation of the swastika was to put other races into the driver's seat. Such is, however, a detail of relatively minor significance. What should command far greater attention in both cases is the inaptitude of the scientific realm to set up effective barriers against the rise and spread of totalitarian trends steeped in the anti-science of dialectic and cosmic recurrences. Science, both in Nazi Germany and in Communist Russia, had been successfully harnessed by irrational ideologies. If there remained in both systems a largely clandestine reaffirmation of trust in man's rationality, purpose, and inalienable dignity, the credit for this should go to convictions reaching far deeper than purely scientific training and information.

Note:
