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The Importance of the Reality of the Universe in the Work of Stanley L. Jaki

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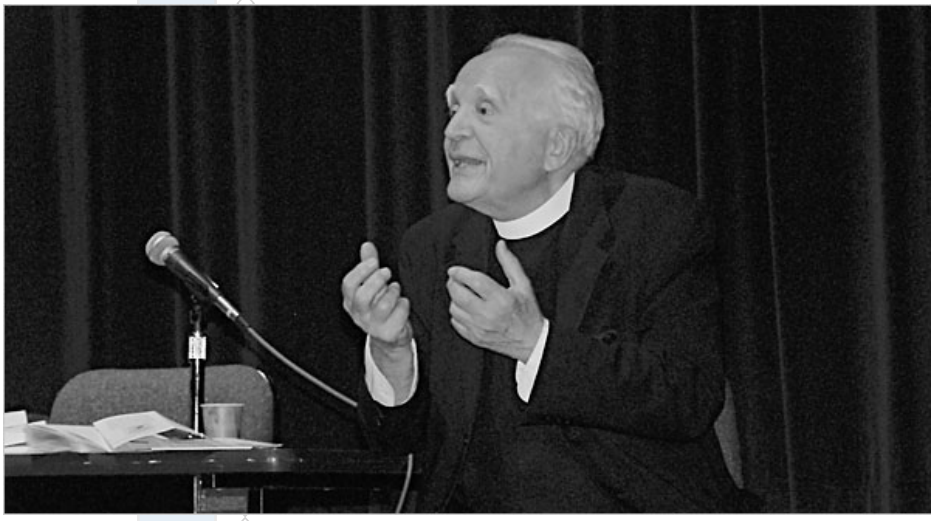
ALTHOUGH FATHER STANLEY L. JAKI'S EXTENSIVE STUDIES OF THE RELATIONSHIP between science and philosophy and theology have earned him some of the highest honors which can be accorded a scholar in his field, including the Templeton Prize for 1987 and his 1991 nomination by Pope John Paul II to the Pontifical Academy of Sciences, his work has only now begun to receive within theological circles some of the attention which its significance deserves. Those few studies of Jaki's work which have been published to date[1] have generally focused on his better known contributions to the reassessment of Christianity's role in the medieval birth of the scientific enterprise and, to a lesser extent, to delineating the epistemological limits of quantitative science. These studies, however, have tended not to discuss what is perhaps the Benedictine theologian-scientist's most original achievement: his almost single-handed fight to have the question of the reality of the universe addressed in contemporary scientific, philosophical, and, ultimately, theological discourse.[2]

Jaki himself concedes that "in this age of scientific cosmology no topic may seem more superfluous than the reality of the universe."[3] Nonetheless, he argues that the question is a vital one, given that while the universe remains "the ground that alone can assure consistency to scientific as well as philosophical discourse,"[4] it "has failed to be given its due not only in philosophy and theology but also in science."[5] To remedy this perceived neglect, Jaki has returned to this theme constantly in his writings, to the extent that it has become a sort of Ariadne's thread weaving in and out through the volumous writings which constitute his corpus. This study, consequently, is an attempt to follow that thread synthetically, beginning with Jaki's argument for the reality of the universe, followed by a survey of the context of this argument in the history of scientific and philosophical thought, and concluding with a note on the contemporary relevance of Jaki's contribution.

Jaki takes as his starting point the very moment in which "the science of cosmology had at long last come of age":[6] the publication in 1917 of Einstein's famed fifth and last memoir on General Relativity, which addressed the cosmological consequences of the theory.[7] There, for the first time as Einstein specified formulae for the total mass and radius of the universe, non-Euclidean geometry was systematically used to obtain a quantitative account of the totality of gravitationally interacting objects. The scientific content of Einstein's memoir can be briefly summarized as follows. First, the assumption is made that the distribution of matter in the universe is homogeneous on the large scale. This means that if one were to count the number of galaxies in a fairly large volume of space, one could obtain a reliable figure for the average density of matter throughout the universe. Second, another assumption is made that the permissible paths of motion for gravitating bodies correspond to lines that can be drawn in spherical Riemannian geometry. The one line that cannot be drawn in this type of geometry is a strictly straight infinite line. Consequently, all gravitational lives of force have a curvature. As a result, no mass, whatever may be its initial velocity - up to the

absolute upper limit which is equivalent to the speed of light - can escape into infinity. Therefore, the universe can be taken for a finite sphere, the radius of which corresponds to the permissible path of motion with the minimum of curvature. Furthermore, the total mass within that sphere can be calculated from the average density as shown above. Jaki, however, notes that these considerations pale before one basic consideration: the "power or ability of General Relativity to treat in a scientifically consistent manner the totality of material particles endowed with gravitation"[8] and thereby, by implication, lay to rest any ideas of an infinite Euclidean universe. With Einstein's contribution, it is now "possible for the first time to speak of the whole cosmos to the point of sizing it up in a strictly quantitative manner, and without suggesting that there were limits to the cosmos in an anthropomorphic sense."[9]

There were, of course, cosmologies in the unrestricted sense of the term before Einstein. The difficulty with these, however, lies less in the unavailability of reliable data regarding the cosmos prior to the present century than with basic theoretical contradictions. The idea of an infinite Euclidean universe, associated with the school of thought around Newton, carried with it two contradictory or paradoxical features. The first, known as Olbers' Paradox, consisted in the inference - valid under certain assumptions - that in a homogeneous universe, the starlight would have had to have been of an infinite intensity at any given point at any given time. Thus, the very darkness of the night sky would seem to contradict the supposed infinity of the universe. The second, the gravitational paradox, interestingly enough, was first raised against Newton himself by an Anglican clergyman, the Reverend Richard Bentley. The paradox is that in an infinite Euclidean universe, the gravitational potential is likewise infinite. Such a universe, however, is not a physical possibility as it would collapse in on itself.[10]



Fr. Stanley L. Jaki

Another difficulty with an infinite Euclidean universe is that it is made up, by definition, of an infinite number of objects. Such a number, an actually relized infinite quantity, is a mathematical impossibility, as Johannes Heinrich Lambert pointed out as early as 1761.[11] Lambert tried to solve this dilemma by postulating a hierarchical ordering of galaxies around an absolute central body, assuming the orbital speeds to be perfectly balanced by the gravitational pull to the center. Lambert, however, failed to note the possibility of the dissipative effect, or resistance in cosmic spaces, which rendered such a scheme highly unstable.

This brief historical sketch helps one to appreciate the full significance of Einstein's achievement.[12] With his General Relativity - and its related theories of Special Relativity and Unified Field - the universe became a genuine object of scientific inquiry and, as Jaki notes, this "ability made scientific cosmology possible for the first time."[13] However, Einstein, like many cosmologists before and after him, failed to appreciate the philosophical background and significance of their work. As Jaki comments, "Einstein's admission that the man of science is a poor philosopher has more to it than meets the eye."[14] It is here that Jaki fills in the lacuna by drawing out the extensive philosophical background.

Immanuel Kant, for one, was not slow to appreciate the pivotal role which is played by one's acceptance of the universe and one's philosophical outlook. Jaki describes the *Critique of Pure Reason* as "a vast effort to establish on the so-called critical principle the claim that universe, soul, and God - the three main objects of metaphysics - were but bastard products of the metaphysical cravings of the human intellect." The reason for this being that "if such is the case, man can indeed be his own master, he can even create his own religion without being truly religious."[15] As Kant tried to demolish the cosmological argument, he argued that the universe was an unreliable notion since science could not establish anything definite about the universe: "If the world is a whole existing reality in itself, it is either finite or infinite. But both alternatives

are false (as shown in the proofs of the antithesis and thesis respectively). It is therefore also false that the world (the sum of appearances) is a whole existing in itself."[16] This much said, Kant was free to roam "across a science-coated fantasy world as he listed the physical and moral characteristics of the inhabitants of each of the planets."[17] It is no wonder that only three short years after the publication of the Critique, Moses Mendelssohn characterized its author as "the great destroyer."[18]

Since God himself was safe from such Kantian sophisms, what was really destroyed by Kant's negation was the universe itself, or at least man's rational confidence in its existence. In post-Kantian philosophy, the universe becomes a mere word, if it was used at all. Jaki indicts a century of philosophers when he writes:

> The word "universe" had no place in the positivism of Auguste Comte and of J.S. Mill. The pluralistic universe of W. James's pragmatism is just as illogical as is the universe within Dewey empiricism. There is no room for the universe in existentialism and in phenomenology. Whatever else the universe may be, it is not a phenomenon. And insofar as the universe means coherence, it is irreconcilable with the radical separation among all events as postulated by Sartre. It should be no surprise that deconstructionists can at most repeat Kant's false arguments about the universe. As if to prove how far they are behind times, they are the least willing to construct a philosophy about the universe in this age of scientific cosmology.[19]

The universe hardly fared any better under the various forms of idealism, Berkeleyan or Hegelian, to which it was at best a mere concept. As Jaki notes wistfully, "trust in the reality of the universe could but suffer through the fondness of many modern cosmologists for idealism."[20] The ink had barely dried on Einstein's landmark memoir when W. De Sitter, in the context of speaking of the formal formulation of scientific laws as the only true reality for scientists, declared the universe to be a meremathematical formula.[21] Thus, he became the first in a long line of modern cosmologists who seem to think that mathematics about the universe a priori must turn into its physical reality, a proposition not far removed from the bad science fiction of Kant's Universal Natural History.

This type of wishful thinking is characteristic of the type of physicist-cum-science-popularizer epitomized by Stephen Hawking, who makes the extraordinary claim that mathematical formalism is equivalent to knowing the mind of God and thus makes the Creator superfluous.[22] Part of Hawking's popularity no doubt lies in his call for an ultimate cosmological theory which would be "so unique as to be understandable in broad principle to everyone, not just a few scientists. Then shall we all, philosophers, scientists and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist."[23] To achieve this dubious end, Hawking suggests recourse to the philosophical traditions of Aristotle and Kant, although he fails to show any awareness of the fact that the realist legacy of the former is inimical to the idealism of the latter.

In any event, at least for Aristotle, the universe was a coherent and consistent reality. Nonetheless, in neither Aristotle nor his millenia-old tradition is there to be found a philosophical proof for the universe. Motivated by his belief that in the sphere of the fixed stars one could see the very confines of the universe, the Master of the Lyceum went on to declare that it is "immortal and divine."[24] As Jaki notes, in such a pantheistic universe, for Aristotle "the Primer Mover is not a personal God, a Creator. In the very same context, in the last book of his Metaphysics, where he speaks most thematically of the Primer Mover, Aristotle states that the universe is like a house without a master, or like an army without a commander."[25]

Despite Aquinas the philosopher's attempts to put the best face on these Aristotelian notions,[26] Thomas the theologian argued that there had to be a universe since God's work must show forth his rationality and coherence. As Jaki observes,

> It was about the universe that Thomas stated: "The perfection of the totality (*universitas*) of creatures consists in its similitude to God," a similitude which could not be meaningful if it lacked a thorough unity. According to Thomas, God's own intrinsic order and harmony was reflected in the order of the pervading universe which was its very perfection. The unity of the universe was in

> Thomas' very words, the effect of the unity of God's mind! This is why the order of the universe could not be the result of chance but had to be intended and willed by God himself.
>
> For Thomas the universe as God's word was so comprehensive that "outside" it there was only God's eternity. Since, therefore, the universe was the only manifestation of the one God, there could be nothing inordinate ... in it.[27]

Nevertheless, "like all of his contemporaries, Thomas too believed that he could see the confines of the universe by looking at the sky. Possibly, for this reason, Thomas did not explore the purely philosophical way of proving the strict totality of things."[28] However, he does hint at it in his Five Ways (*Quinque Viae*) for demonstrating the existence of God.[29] In the Third Way, often taken for a cosmological argument, the Angelic Doctor rejects regress to infinity (in a metaphysical sense) as a mere postponement of the answer about the sufficient reason for the reality, or universe, at hand. The implication, therefore, is that contingent realities form a finite series.[30] From this, Jaki concludes that "In any of those five ways the starting point is the material object or thing insofar as its existence is registered or recognized. On a cursory look this may appear a purely empirical starting point, but for Thomas it includes an emphasis on the existence of the thing in question and on its being perceived in its rationality, that is, representing something general in its individuality."[31]

In the centuries after Aquinas, however, Jaki sees an irony in the neglect of the universe by Scholastic philosophers and theologians, a neglect which "becomes even more pronounced when seen against the credal statements of Christian faith."[32] These statements all begin, in one way or another, by professing faith in the Father Almighty, maker of heaven and earth, of all things visible and invisible.[33] Jaki has commented that "this tenet of the Creed has more interest to it than the fact that it is a tenet which can be known both by reason and by faith. A still unexplored interest of the tenet lies precisely in the direction of our topic, the reality of the universe. The Creeds nowhere ask us to believe in the reality of the universe. The Creeds rather assume the reality of the universe and challenge us to believe in its maker, the Father Almighty."[34] Put another way, one can only argue from a real, existing universe to a real, existing God.

Jaki argues that the very word "almighty" serves to prove this point, when taken in its Greek original, pantokrator. This phrase includes *to pan*, which denotes not only a mere sum of aggregates, but also that totality which is the universe. The universe is likewise denoted by the Hebrew expression "heaven and earth" and its more philosophical casting "all things visible and invisible." The least one can say is that the universe is certainly taken seriously in the Creeds.[35] And rightly so. The entire seamless garment of the Christian faith - creation, fall, incarnation, redemption, resurrection, final judgment, and a new heaven and earth - hangs on the first tenet of the creed, the Father all-mighty. This tenet, and thus the entire garment, unravels if the universe, *the all,* is not real. Against this backdrop, Kant's strategy becomes startlingly clear: "Any shadow cast on the reality of the universe will be a long shadow cast on the rational recognition of the existence of God and consequently on the fact of revelation."[36]

How then does one proceed to prove that there is a universe, a strictly consistent and coherent totality of things? The very word "universe," Jaki suggests, may provide a clue: "The very closeness of 'universal' to 'universe' may suggest the correctness of basing on this doctrine about the universals the validity of knowing whether there is a universe."[37] Before departure, however, note should be duly taken of the Thomistic dictum that the categories of the mind are abstracted from sensory experience.[38] Incidentally, once this starting point is adopted, it is possible to avoid the Kantian idealist trap and proceed to demonstrate that there is a universe.

The essence of all this is grasped by looking at the relation of the particular to the universal in terms of which the particular or individual is understood. In fact, one may say that to understand is to grasp some totality; the totality as such is never seen. For example, man as such does not concretely exist: only the individual man, denoted by the phrase "this or that man," exists. "Hence the thing which is a man has something more in it than has humanity. Consequently, humanity and a man are not wholly identical; but humanity is taken to be the formal part of a man, because the principles whereby a thing is defined are regarded as the formal constituent in regard to the individualising matter."[39]

Jaki presents another argument in the form of a variant of Thomas' Fourth Way, which is based on the hierarchy observed within any class of perfections.[40] The argument begins by stating that any totality, as a form of

perfection, is truly and consistently understood only insofar as it is set within the context of a larger, more inclusive totality. This larger totality is, in turn, subject to the same injunction. What is implied is somewhat analogous to Godel's theorems in mathematics according to which no sufficiently broad or non-trivial set of arithmetical propositions can have its proof of consistency within itself.[41] In short, any totality presupposes for its consistent understanding a larger, more inclusive totality. As a result, one may conclude that the sensory understanding of any totality depends on the reality of its supreme kind, which is the universe. Only in this way can regress to infinity be avoided.

Jaki, however, concedes that, despite its reliability, such an argument may nonetheless not be entirely convincing in a scientific age characterized by skepticism towards the claims of metaphysics. Since, for better or for worse, this skepticism is fomented by science itself, the question is whether or not there is a proof of the reality of the universe with what Jaki terms "a distinctly scientific flavor," meaning thereby that "only the addition or coating can be scientific but not the substance or at least the starting point."[42] He outlines the following as the basis for one such proof:

> To prove on this quasi-scientific ground the reality of an absolute totality and secure to it a convincing character should seem important in an age in which philosophical thinking is uncertain of itself unless confident of its being approved from the scientific side. The proof will further gain in convincing character by considering that science, as long as it has to cooperate with integers, cannot raise objection to the idea of that totality as being a totality consistent throughout.[43]

In short, science must admit that "there ought to be really existing things before there can be really quantitative properties."[44] Consequently, starting with real matter, the totality of which is the material universe, one must par force stake out a metaphysical position. As a result, science has no right to frown on the use of metaphysics as an illegitimate intrusion, much less the "bastard product" of Kant.

A universal characteristic of all real matter is that it can be counted or measured. The basis of all counting or measurement is the set of integers which, as the great mathematician J.F. Gauss pointed out, excludes the unit of infinity. The latter is, at best, a *facon de parler*.[45] An actually realized infinite quantity is a contradiction *pace* Cantor and his theories of "transfinite numbers," which Jaki dismisses with the remark that they may be "of interest to pure mathematicians, but not to physicists dealing with real matter." In this regard, Jaki quotes approvingly Hilbert's remark that potential infinity "is nowhere to be found in reality."[46]

"Science must admit that "there ought to be really existing things before there can be really quantitative properties."

From this discussion, one can safely conclude that any sane consideration of integers must end in the conclusion that real matter can exist only in a finite quantity. Jaki further notes that "convincing character can also accrue to the proof from a brief look at the much glorified notion of chaos."[47] All statistical ensembles which are useful for physics must, by definition, rest on invariable parameters, including the type of randomness ascribed to each ensemble. In this regard, Jaki cites Karl Popper as "the classic proof that attention to cosmology is not necessarily a respect for the cosmos." The "open universe" advocated by Popper is eternal. In it, all possibilities - that is, all possible universes, would be realized as time goes on, while only one of them would actually exist at any given cosmic phase. By definition, however, Popper cannot specify the sequence of these cosmic phases. Jaki, therefore, scores Popper's chaos theory of an "open universe" as "that void, the absence of the real, with which science has no business."[48]

Mathematics, therefore, is extraordinarily helpful in justifying the notion of a universe which is a true totality because of the limitedness of matter to a finite quantity. But this totality is rendered a true universe in the strict sense of the word only if it takes into account a common basis of understanding. In this regard, the insights of science, specifically mathematics, are likewise valuable. As noted above, integers provide the basis for measurability, which is a kind of universal understanding. The physical universe, insofar as it is a fitting object of science, is assumed to be measurable throughout. Any doubt cast on this assumption undermines the universal validity of scientific laws. Although some of those laws appear to be mutually irreducible, they have one element in common in that they are all cast in quantitative terms.[49]

Thus, taking for example the still-ongoing research into particle physics and a Grand Unification Theory (GUT), one can say that the nuclear force is stronger than the electromagnetic force by a specific quantitative ratio and that the electromagnetic force is, in turn, stronger than the gravitational force by a likewise specific quantitative ratio. Not entirely without reason has been the attempt by a number of leading scientists to discover in purely mathematical ratios the basic architectural plans for the material universe.

At this point in a highly conceptual scientific discourse, the theologian may be forgiven for inquiring in line with Tertullian: "What indeed has Athens to do with Jerusalem?"[50] Jaki's answer is, in effect, an unqualified: "Everything." By way of explanation, he elaborates his conviction that:

> It should not be difficult to see the importance of all this for Catholics who are the only major religious group committed irrevocably to the cosmological argument. While some Catholics may grow oblivious to the definitions made at Vatican I about reason and faith, the Vatican *will* keep reminding all Catholics that reason can infer from the visible realm the existence of the Creator and can do so with certitude. Science has certainly discredited some hallowed objections to the reliability of the ultimate jumping board toward God which is the universe.
>
> This further unexpected alliance of the latest and best in science with Catholic dogma should be of immense joy to the Catholic. After all, he should realize that if he lets the universe slip through his intellectual grasp, his very Creed will ultimately vanish from his hold. For what remains of the Creed if its very first statement about heaven and earth, all things visible, has for its reference point a universe which is the mere figment of the intellect? In that case, all the Creed goes down the drain, all the Bibles may be safely discarded, and all Catholic churches and colleges may just as well shut their doors. The stakes for the Catholic are truly cosmic stakes. For how can a Catholic creditably look toward a new heaven and earth if his mental look at this heaven and earth is but a fanciful theory?[51]

Writing over half a century ago, G.K. Chesterton, one of Jaki's favorite modern authors[52] noted that "the nineteenth century left everything in chaos; and the importance of Thomism to the twentieth century is that it may give us back the cosmos."[53] Theologians - and all Catholic theologians should, to some degree or another, be Thomists[54] - can rise to this challenge only if they learn to appreciate modern scientific cosmology for its contributions to their craft. Shedding the temptation to "mixsecond-hand information in science with theologies and philosophies steeped in trendiness," they must "achieve a firm hold on those foundations in order to see what is gold and what is chaff in modern scientific cosmology."[55] As for the chaff, enough has been said above about it. As for the gold, it includes the fact that by achieving a contradiction-free account of the totality of gravitationally interacting entities, modern cosmology implicitly discredits the very foundations of Kantian idealist agnosticism which, for two centuries, called into doubt the very validity of the notion of the universe and, by implication, the very notion of its Creator and his objective laws which can be known by reason as well as revelation. For the real genius, and consequently danger, of Kant's strategy "lay precisely in his claim that in order to make impossible the step from the universe to God, one had to destroy access to the universe itself by declaring it a notion unworthy of the intellect."[56]

Furthermore, by showing over the mind-boggling span of seventy orders of magnitude a most specific universe, modern cosmology has also provided a powerful demonstration of the contingency of creation.[57] Like any specific thing, the specific universe has to be the result of a choice among many other possibilities. But since the universe is the totality of things, the choice for its specificity can only be looked for "outside" that totality. And as Newman remarked, the "idea of the universe is so great that only the idea of its Maker is greater."[58] As Jaki notes:

> Most reliable philosophically is, however, the message of modern scientific cosmology that the universe is real and that it is no less specific than any real thing. Both these points were glaring in Einstein's fifth memoir which contained formulas for the total mass and radius of the universe. But if the universe is so specifically real, nothing could have been more logical than to ask: why is the universe what it is and not something else? With that question, one would have, of course, placed oneself within the perspective which shows not a divinized universe, impotent to answer that question, but a personal God free to choose to create one among an infinitely large number of possible universes.[59]

Jaki nourishes the hope that once theologians familiarize themselves with these lessons from modern cosmology, they can "act as leaven in a world more scientific with each passing year and scientific in the most encompassing sense which is given in scientific cosmology."[60] And it is in appealing to scientific cosmology that they can proclaim the truth of the unique reality of the universe, which in turn is the supreme witness to Truth itself, that Truth which is identical with the one God who has revealed himself to truly be the Father Almighty.

Notes

1For example, see Paul M. Haffner, *Creation and Scientific Creativity: A Study in the Thought of S.L. Jaki* (Front Royal, VA: Christendom Press, 1991); also P.E. Hodgson. "The Significance of the Work of Stanley L. Jaki," *Downside Review* 105 (1987), pp. 260-276, as well as John-Peter Pham, "A Christian Genius," *Modern Age* 37 (1994), pp. 88-91. The study by Haffner is the only monographic treatment of Jaki's thought in print, and contains a useful bibliography of Jaki's published works.

2In fairness, however, to the authors of these studies, it should be noted that while this theme has been at least an implicit part of Jaki's work from the very beginning, it has only begun to receive separate, explicit mention by him and, consequently, to take on the fundamental importance that it enjoys within his corpus, during the course of the last decade.

3Stanley L. Jaki, "The Reality of the Universe" (unpublished lecture given at the International Congress on the *Philosophy of Nature*, Pontifical Lateran University, Rome, 10 January 1992).

4Jaki, *Is There a Universe*? (New York: Wethersfield Institute, 1993), p. viii.

5 "The Reality of the Universe."

6*Is There a Universe*?, p. 10.

7For an English translation, see A. Einstein, "Cosmological Considerations on the General Theory of Relativity," in *The Principle of Relativity: A Collection of Original Memoirs on the Special and General Theory of Relativity* by H.A. Lorentz, A. Einstein, H. Minkowski, and H. Weyl, with notes by A. Sommerfeld, trans. W. Perrett and G.B. Jeffrey (London: Methuen, 1923), pp. 177-188.

8Jaki, "The Absolute Beneath the Relative: Reflections on Einstein's Theories," in *The Absolute Beneath the Relative and Other Essays* (Lanham, MD: University Press of America and Intercollegiate Studies Institute, 1988), p. 9.

9Jaki, *The Road of Science and the Ways to God* (Chicago and London: University of Chicago Press, 1978), p. 190.

10For details on these two paradoxes, see Jaki, *The Paradox of Olbers' Paradox* (New York: Herder and Herder, 1969); also see the essay on "The Gravitational Paradox of an Infinite Universe," in Jaki, *Cosmos in Transition: Studies in the History of Cosmology* (Tuscon, AZ: Pachart, 1990), pp.189-212.

11See Jaki's translation, with introduction and notes, of Lambert's Cosmological *Letters on the Arrangement of the World-Edifice* (New York: Science History Publications, 1976).

12For an account of modern cosmology's curious path of development, see Jaki, *The Milky Way: An Elusive Road for Science* (Newton Abbot, Devon: David & Charles, 1973).

13"The Absolute Beneath the Relative," p. 9. For a more detailed discussion of this point, see Jaki, "Teaching Transcendence in Physics," *The American Journal of Physics* 55 (1982), pp. 884-888.

14Jaki, Miracles and Physics (Front Royal, VA: Christendom Press, 1989), p. 54.

15Jaki, Angels, Apes & Men (Peru, IL: Sherwood Sugden, 1983), p. 31.

16 Immanuel Kant's *Critique of Pure Reason*, trans. N. K. Smith (London: Macmillan, 1929), p. 449; quoted in

in Jaki, *God and the Cosmologist* (Washington: Regnery Gateway, 1989), p. 9, n. 20.

17 *Is There a Universe*?, p. 4. For more details on this point, see the introduction and notes to Jaki's translation of Kant's *Universal natural History and Theory of the heavens* (Edinburgh: Scottish Academic Press, 1989); also Jaki, Planets and *Plaetarians: A History of Theories of the Origin of Planetary Systems* (New York and Toronto: John Wiley & Sons, 1978), pp. 111-122.

18 Mendelssohn, *Schriften zur Philosophie und Aestetik,* vol. III/1 (Stuttgart: Friedrich Fromman Verlag, 1974), p. 3. Jaki recounts the story of the physician Marcus Herz, whom Kant used as a sounding board in the years preceding the publication of the *Critique*. Having read half of the manuscript, Herz gave it back to kant, fearful that were he to read the whole he would go mad. See *Angels, Apes & Men*, pp. 29-30.

19 "The Reality of the Universe."

20Ibid.

21See W. De Sitter, *Kosmos* (Cambridge, MA: Harvard University Press, 1932), pp. 133-134.

22Hawking, *A Brief History of Time: From the Big Bang to Black Holes* (Toronto: Bantam Books, 1988), p. 175. For Jaki's enlightening commentary on Hawking, see *God and the Cosmologists*, pp. 90-95.

23Hawking, *A Brief History of Time*, p. 175.

24Aristotle, *On the Heavens*, trans. W.K.C. Guthrie (Cambridge, MA: Loeb Classical Library, 1960), 279a; quoted by Jaki in *Is There a Universe*?, p. 91, n. 24.

25*Is There a Universe*?, pp. 91-92.

26See Jaki, "Thomas and the Universe," *The Thomist* 53 (1989), pp. 565-566.

27 "Thomas and the Universe," pp. 563-564.

28*Is There a Universe*?, p. 92.

29For a helpful, but succinct, overview of the Five Ways, see Brian Davies, *The Thought of Thomas Aquinas* (Oxford: Oxford University Press, 1992), pp. 25-31.

30See *Summa Theologica* I, q. 2, art. 3.

31*Is There a Universe*?, pp. 92-93. 32Ibid., p. 88.

33For details on the cosmological significance of the Christian professions of faith, see Jaki's 1992 Pere Marquette Lecture, Published as *Universe and Creed* (Milwaukee: Marquette University Press, 1992).

34 "The Reality of the Universe."

35 See *Universe and Creed*, pp. 40-45. 36"The Reality of the Universe."

37*Is There a Universe*?, p. 95.

38For a detailed discussion of this point, see Etienne Gilson, *The Philosophy of St. Thomas Aquinas*, trans. Edward Bullough, ed. G.A. Erlington (New York: Dorset Press, no date), pp. 260-283; also Frederick Copleston, *A History of Philosophy*, vol. II (New York: Doubleday, 1962), pp. 388-397.

39*Summa Theologica* I, q. 3, art. 3; quoted in Is There a Universe?, p. 95, n. 29.

40 See "The Reality of the Universe"

41 For details of Jaki's highly original use of Godel's theorems, see his monumental work, *The Relevance of Physics* (2nd ed.; Edinburgh: Scottish Academic Press, 1992); also God and the Cosmologist, pp. 84-110, as well as Jaki, "Physics and the Ultimate," Ultimate Reality and Meaning 11 (1998), esp. pp. 70-71. In another context, Jaki employs the theorums in his argument against the possibility of a true artificial intelligence, see Jaki, Brain, Mind and Computers (3rd ed.; Washington: Regnery Gateway, 1989).

42 "The Reality of the Universe."

43 *Is There a Universe*?, pp. 121-122.

44 Ibid., pp. 122-123.

45See Gauss' letter of 12 July 1831 to Schumacher, in *Briefwechsel zwischen C.F. Gauss uttd H.C. Schumacher*, vol. 1(Altona: Gustave Esch, 1860), p. 269; quoted in *Is There a Universe*?, p. 112, n. 4. Jaki also details some of Gauss' unfavorable views a propos Kant's system in ibid., pp. 114-115.

46See Is There a Universe?, pp. 112-113.

47Ibid., p. 122.

48Jaki, "The Only Chaos" in Jaki, *The Only Chaos and Other Essays* (Lanham, MD: University Press of America and Intercollegiate Studies Institute, 1990), p. 5; also see jaki, "Das Weltfall als Zufall - ein Mythos von kosmischer

Irrationalitat," in *Zur Kritik der wissenschaftlichen Rationalitat: Festschrift Kurt Huber*, ed. H. Lenk (Munich : Karl Alber, 1986), pp. 487-503.

49See Jaki, "Chance or Reality: Interaction in Nature Versus Measurement in Physics," in Jaki, *Chance or Reality and Other Essays* (Lanham, MD: University Press of America and Intercollegiate Studies Institute, 1986), pp. 1-21.

50Tertullian, *De praescriptione haereticorum*, 7.

51Jaki, "Science for Catholics," in Jaki, *Catholic Essays* (Front Royal, VA: Christendom Press, 1990), pp. 19-20.

52See Jaki, *Chesterton: Seer of Science* (Urbana, IL: University of Illinois Press, 1986); also Jaki, "Chesterton's Landmark Year: The Blatchford-Chesterton Debate of 1903-1904," *The Chesterton Review* 10 (1984), pp. 409-423.

53G.K. Chesterton, *St. Thomas Aquinas* (New York: Sheed & Ward, 1933), p. 204.

54See *Codex Iuris Canonici*, c. 252 * 3, which describes St. Thomas as the "particular teacher" of all Catholic students of theology. The Code bases itself on the Second Vatican Council's Decree on the Training of Priests, *Optatam Totius*, n. 16.

55*God and the Cosmologists*, p. x.

56Ibid., pp. 22-23.

57See *God and the Cosmologists*, pp. 27-56, 170-200.

58John Henry Newman, *The Idea of a University* (8th ed.; London: Longmans, Green and Co., 1888), p. 462; quoted in *Is There a Universe*?, p. 126, n. 34.

59*God and the Cosmologists*, p. 22.

60*Universe and Creed*, pp. 78-79; also see Jaki, "Science and the Future of Religion," *Modern Age* 33 (1990), pp. 142-150.