Reviews

Stanley Jaki Foundation International Congress 2015. By Paul H. Carr and Paul Arveson, editors. Herefordshire, UK: Gracewing, 2020. 228 pages. Paperback, $22.50.

Stanley Jaki (1924–2009), Gifford lecturer, Templeton Prize winner, scientist and Catholic monk, has had a profound influence on the philosophy of science from the beginning of his scientific and theological career, despite the often dense prose of his over two dozen books, often peppered with personal polemics. The editors of this volume, themselves Catholic priests who studied and worked in physics and engineering (Paul Haffner is President of the Stanley Jaki Foundation and Joseph Laracy his recently awarded doctoral student in theology), bring together seven articles that, as a whole, provide an accessible and critical introduction to Jaki's life and thought. These easy-to-read essays, by a diverse group of scientists and theologians gathered at Seton Hall University in April 2015, cover topics as diverse as Jaki's early (and still influential) research on radon (Anthony Troha: "The Early Scientific Works of the Rev. Dr. Stanley L. Jaki") and his theories on education (Peter J. Floriani: "Newman, Chesterton, Jaki, and the Founding of the Ambrosian University"). The last essay in the book (Antonio Colombo, "From Gyór to Madrid: A Biographical Sketch of Father Stanly Jaki") gives his biography, although many of the authors reveal in their essays some degree of personal familiarity with Jaki.

Those familiar and unfamiliar with Jaki's work will want an introduction to his argument that modern science is born of Christianity, and two essays by Joseph Laracy ("Creation, Revelation, and the Emergence of Empirical Science") and Stacy Trasancos ("Science Was Born of Christianity: The Facts of Fr. Jaki's Research") provide that introduction. According to Jaki (for whom science is the "quantitative study of the quantitative aspects of things in motion"), only belief in a creator distinct from the universe that such a God has created makes the universe, as a whole and in its parts, intelligible. Belief systems that incorporate the cause of creation within itself (what Jaki calls "mythos," including ancient forms of polytheism and extended to modern idealism) cannot give rise to empirical science, for science in such a system would require the human mind to encompass all being, which, as limited, it cannot do (along these lines, Jaki favored Gödel's incompleteness theorems). One may disagree with Jaki's assessment of polytheistic and cyclical worldviews, but the recent rise of theories of a multiverse by many scientists of note, which remove the cause of this universe from itself, demonstrate Jaki's basic premise without an appeal to a personal creator.

Many of the authors remark on Jaki's polemical tone as a limitation. Richard Liddy ("Jaki and Lonergan: Confrontation or Encounter?") describes this as emerging from the "naïve" Thomistic epistemology Jaki inherited from Gilson, from which "ghetto" Catholics cannot communicate with other epistemologies, and proposes instead Lonergan's dialogical method. Haffner ("Christology and the Cosmos in Stanley Jaki"), on the other hand, argues that all the cultural factors (social, political, economic) that have given rise to modern science are a function of Christian belief informed by such an epistemology.

Each essay contains an extensive bibliography and the whole provides a good starting point for one who is a novice in questions of science and religion or who wants a refresher on the work of Jaki.

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Our Mathematical Universe: My Quest for the Ultimate Nature of Reality. By Max Tegmark. New York: Vintage Paperbacks, 2015. 432 pages. Paperback $17.00.

Professor Max Tegmark's book is cosmology in its broadest sense: from the big bang universe to his quest for the metaphysical, ultimate nature of reality. Tegmark's career parallels that of Alfred N. Whitehead, whose first magnum opus was on mathematics followed by his second *Process and Reality, An Essay in Cosmology*, which founded process philosophy/theology. Contrary to many scientists, Tegmark is not anti-religious.

Tegmark explains the history of big bang, "hot-to-cool" cosmology in an easy to understand manner with helpful figures. Modern cosmology originated in 1916 with Albert Einstein's General Relativity Theory. About 1930, the Belgian priest Georges Lemaitre used Einstein's equations to propose that the universe had expanded from an extremely small primal atom in a hot big bang explosion.

This was largely ignored until 1964, when radio astronomers Penzias and Wilson discovered microwave fossil radiation noise from the hot big bang. They were awarded the 1978 Nobel Prize. They measured noise at only one frequency. In 1993, the cosmic background explorer satellite (COBE) measured the noise of the Whispering Cosmos at many frequencies and found that it fitted Plank's black body radiation theory. The temperature of the radiation was 2.752 K above the absolute zero of temperature. Thus, the extremely hot big bang that occurred 13.8 billion years ago has cooled down to a very cool 2.752 K as the universe expanded. This is indeed "hot" to very "cool" cosmology.

The most interesting part of this book is Tegmark's personal account of how he made a high resolution plot of the "fossil" cosmic microwave radiation nonuniformities present 380,000 years after the big bang. He had convinced young Professor Lyman Page to give Tegmark the microwave telescope data Page had measured at the Canadian town of Saskatoon. Tegmark separated the cosmological signal from the noise using his knowledge of information theory and his ability to do computational number crunching. His beautiful plots showed temperature variations of one part in 100,000. As the universe continued to expand, gravity amplified these variations to form the stars, planets, and galaxies. The nonuniformity in the cosmic microwave background is the same as that of the galaxies.

The next question that needed to be resolved is known as the horizon problem. How can the universe over 14 billion light years apart be in thermal equilibrium at the same temperature of 2.742 K everywhere it is measured? Professor Alan Guth's inflationary universe solved this problem. A tiny fraction of a second after the beginning, the big bang was in thermal equilibrium and expanded at very much faster rate than we measure today. Guth's theory of quantum fluctuations at the Beginning also explained the small, one part in 100,000 nonuniformity observed in the cosmic microwave background radiation. Tegmark describes Guth's inflationary universe beginning as "the gift that keeps on giving." In other words, the process continues and could be creating multiple universes. Tegmark then hypothesizes four types of multiuniverses, but offer no experimental confirmation of their existence.

Present cosmology can explain only 5% of the atomic matter/mass/energy in the universe. The remaining 27% is dark matter, which has gravity but does not emit light, and 68% is dark energy/matter. For many decades, scientists have been unsuccessfully searching for candidate dark matter particles. Present day cosmology has no explanation for dark energy/matter that causes the universe's expansion to accelerate.

In 2019, additional challenges have been measured. The value of the Hubble expansion constant derived from the cosmic microwave black body theory is 67.4 km/sec. Recent measurements of the Hubble expansion constant using Cepheid variable stars as standard candles to measure distance give a Hubble constant of 74 km/sec. Hubble constant measurements using red giant stars to measure distance gives a value of 70 km/sec. Experimental error cannot explain these discrepancies.

We believe these discrepancies and the 95% of the universe that we do not understand must be resolved before Tegmark's multiple universe extrapolations can be credible.

We also believe that the multiuniverses are more metaphysics (beyond physics) rather than physics. In the final chapter, "Life, Our Universe, and Everything," Tegmark, to his credit, includes cosmologist George Ellis, who questions whether Guth's inflationary beginning model is correct. Inflation may not go on forever. We have no way of measuring the processes that Guth proposes for the beginning of the universe. We need new theories that also explain dark energy/matter in a consistent manner.

Tegemark's arguments for mathematics as an ultimate reality resonate with Thororeau's saying that the most distinct and beautiful statement of any truth must take at last the mathematical form. Carr (2006) referenced this in his book *Beauty in Science and Spirit*, in which he defined beauty as "a delicate dance between mystical subjective forms and the mathematical objective functions that maintain the universe and life." This is similar to Tegmark's Chapter 9 "Internal Reality, External Reality, and Consensus Reality." External reality has a mathematical description. Internal reality is subjective perception. Consensus reality is what we agree upon in a classical physics sense, such as our heliocentric solar system.

In the final chapter, Tegmark states, "Our Universe does not give life meaning, but life gives our Universe meaning." One *top down* source of meaning is that we are part of something much greater than ourselves, as embodied by many of the world's religions. This is in contrast to antireligious scientists who say that the universe is meaningless blind chance. Tegmark himself finds *bottom up* meaning in small things such as the "the beauty of the little flowers by the roadside."

"We live on an island of knowledge surrounded by a sea of mystery. As our knowledge island continues to grow, the boundary on the shoreline with mystery increases" (Gleiser 2015).

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