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Preview

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Mary-Jane Rubenstein, an associate professor of religion at Wesleyan University whose earlier works have focused on, among other topics, post-structuralism, apophaticism, and wonder, investigates, in *Worlds Without End*, historical and contemporary accounts of the multiverse. In doing so, she examines the relationships that have obtained between order and its chaotic shadow, between a largely male -dominated pursuit of cosmology and its gendered discourse, and between religious or non-religious motivations for proposing multiverse theories.

The term 'multiverse' coined by William James in his 1895 address "Is Life Worth Living" has had a number of different referents: it can refer to a collection of universes separated spatially; to universes dispersed temporally; to the collection of universes generated, according to quantum mechanics' Many-Worlds Interpretation, through subatomic 'decisions'; and, fourth, to the entire collection of all possible universes that, according to Max Tegmark, actually exist and are separated from each other inside and outside space, time, and quantum mechanics (3-7).

In the first two chapters, Rubenstein reviews several ancient multiverse theories. For Timaeus, as we learn through Plato's eponymous dialogue, the universe now singular, perfectly crafted, and eternal is the product of the demiurge's ordering of primordial chaos. Against the Atomists, who argued for numerous coexisting universes, and the later Stoics, for whom the universe is repeatedly destroyed and reborn, Plato/Timaeus held that a plurality of universes, whether spatially or temporally dispersed, would indicate that the demiurge had failed to organize chaos perfectly (23). However, in exalting the unity of the universe, Plato/Timeaus also, perhaps unwittingly, showed how the order of the universe is grounded on difference insofar as it is composed of various parts, such as as in the first tale the soul and the body or as in the second tale *khôra* and the forms.

For Aristotle, too, unity merges with multiplicity. Responding to the Platonic cosmology as well as the cosmologies of the Atomists, Aristotle argued, like Plato/Timeaus, that the universe is singular and eternal, but

unlike Plato/Timeaus, he held that the universe has no beginning. Were there other worlds, they would be like our own. And insofar as they are like our own, earth would fall and fire would rise, bringing about cosmic collisions. Yet, insofar as Aristotle holds that the stars must have their own movers, he makes an argument for the existence of either fifty-five or forty-seven prime movers. From this consideration, as Rubenstein extrapolates, we can see that despite his protests to the contrary, for Aristotle, "if each planet has a mover, then each planet must surely be a world in its own right" (36). And this, in turn, would make Aristotle a multiverse advocate.

In the second chapter, Rubenstein turns to Atomist, Epicurean, and Stoic multiverses. For Leucippus, because the void is infinite and the number of atoms in the universe is also infinite, there must be other worlds that have emerged from the interactions of other atoms within the void. Epicurus, taking up the atomism of Democritus and Leucippus, argues that "this world must have arisen elsewhere, even an infinite number of times, in time or space" (42) and Lucretius, taking Epicurus's multiverse further, holds that there is an "infinite universe, teeming with worlds" (43).

Like the Epicureans, the early Stoics also held to a plurality of worlds. However, unlike the Epicureans, whose many-worlds are extended in space, the early Stoics held that the universe will endure an infinite number of creations and destructions: from the flames of this universe, "a new universe will be born, live for a time, and then be set on fire again and the process will repeat eternally" (54). Much of this speculation, though present in some Christian writings, was condemned by Augustine of Hippo who found the idea of a series of infinitely successive universes highly unpalatable: "God forbid that the soul, having finally escaped this 'hellish' life into beatific existence with God, might have to do it all over again" (66). With Augustine and those who followed him, both Stoic and Epicurean multiverses were dismissed.

In the third chapter, Rubenstein focuses on three main medieval responses to the multiverse hypothesis: those of Thomas Aquinas (1225-1274), Nicholas of Cusa (1401-1464), and Gordiano Bruno (1548-1600). According Aquinas, although it might seem attractive to posit multiple universes as a testament to the infinite power of God, the possibility of infinite material worlds risks trivializing the infinite divinity both as the creator of all worlds and as the end or goal of all creation (73). And while the Condemnation of 1277 held as heretical the notion that God is incapable of creating many worlds, it was not until Nicholas of Cusa that strong doubts about the unity of the universe again arose. Unlike the Atomists, however, Cusa held the universe to be indefinitely, not infinitely, large and suggested that the many worlds do not collide but intermingle with each other. Such a

universe allows for the possibility of a God who is always able to be present in each place without hierarchical mediation: "it is a dynamic holography in which God is fully and equally present to everything in creation" (82). This view of intermingling worlds also distinguished Cusa from the later, more contentious, Gordiano Bruno who argued in favour of there being distinct universes spatially separated.

The following chapter features the cosmologies of Johannes Kepler (1571-1630), René Descartes (1596-1650), Isaac Newton (1642-1727), and Immanuel Kant (1724-1804). Kepler, in spite of his belief in elliptical orbits, was reluctant to follow Cusa further and remained convinced that the sun was located in the center of our finite and singular universe (110). He was even more repulsed by Bruno's multiple worlds and cited scripture to support his own, more Aristotelian, position. Descartes, unlike Kepler, did not argue for a finite universe but insisted, in his *Principia Philosophiae* (1644) and later works, that we should, like Cusa, regard the universe as indefinitely extended, filled not with empty space but with matter: "a space so 'filled' with matter that it is matter itself" (118). Newton, in his *Principia* (1687), challenged the notion that matter is coextensive with space and argued, instead, that gravity operates through empty space and in a universe infinitely extended. Unlike Kepler or Descartes, Newton posited an infinitely extended universe. Why? Because in a finite universe "gravity would cause all the matter in the universe to implode" (125). Kant, in his early *Universal Natural History and Theory of the Heavens* (1755), constructed, out of Newton's arguments and conclusions, a cosmology that competed with that of Descartes. For Kant, the infinite universe came to be through the interaction of particles with attractive (gravity) and repulsive forces. After the particles acquire a state of equilibrium, having issued from a primordial chaos, "[t]he resulting 'solar world' (*Sonnenwelt*) is sustained by the continued operation of our two primeval forces: the attractive force that pulls bodies toward the center and the repulsive force that pushes them away" (131-132). This is true, not only of our own solar system, but of our own galaxy and even galaxies beyond our own. But, as Rubenstein notes, Kant, intimidated at the idea of a possibly infinite number of universes, posits a center the place of origin to the system that can bring unity to the spatially and temporally extended whole.

After Kant, astronomers during the next century and a half until the 1920s persistently believed the Milky Way to be the only significant galaxy. Then, in 1924, when Edwin Hubble (1889-1953) "confirmed Kant's guess" (143) that there were multiple galaxies and Albert Einstein's (1879-1955) theory of general relativity showed the universe to be expanding, astronomers were forced to alter their previously held views. Many

reluctantly accepted that the universe might have a finite age, although some, like Fred Hoyle (1915-2001), offered an alternative steady state theory, later refuted, that avoided attributing to our universe a finite age.

But this is not all. As Rubenstein explains, with the discovery of dark energy, the fine-tuning problem the improbability of the universe being the way it is reaches such a degree that theorists have begun positing the existence of a multiverse with universes of all kinds coming into and out of existence, making our own just one of many. There is the inflationary multiverse, according to which an infinite number of universes come into being after inflation has led to a big bang. Skeptics of the inflation theory, Paul Steinhardt (b. 1952) and Neil Turok (b. 1958) have developed an alternative 'Ekpyrotic Scenario' in which this universe is one of two separate branes that collide and reform once every trillion years or so, "a neo-Stoic rival," Rubenstein states, "to the neo-Atomist theory of inflation" (172). And there are still other theories, such as the Baum-Frampton model that rejects an "absolute cosmic starting point" (175), Bojowald's loop quantum theory, Germani's 'Cosmological Slingshot', or Roger Penrose's 'Conformal Cyclic Cosmology' (176).

Venturing from the cosmological to the subatomic, Rubenstein, in the sixth chapter, turns to theories of multiverses that are not strictly responses to questions of the origin of the universe: there is the Many-Worlds Interpretation of quantum mechanics first proposed by Hugh Everett (1930-1982) according to which "every possible outcome *actually* happens each in a different universe" (178). There is also the Hawking-Hertog proposal which holds that all possible worlds are contained within this universe: "unlike in the inflationary scenario, each of these possible worlds lies 'within' the same universe; that is, each of them emerged out of the big bang" (182); the Mersini-Houghton 'multiverse-bath' in which repulsive and attractive forces interact to produce universes (186); the universe-birthing black-holes of Lee Smolin (b. 1955); and Edward Harrison's (1919-2007) intelligently and artificially crafted universes.

Taken together, these proposals, Rubenstein suggests in the conclusion of her book, look back to earlier, more philosophical theories. Though there are some key differences between contemporary and historical multiverses, they all struggle with the thought of our uniqueness: why are we here now and in this place? Often, such a question is answered theologically. But Rubenstein demonstrates that, when it comes to multiverse theories, there are no clear non-theistic or theistic responses. Perhaps the multiverse demonstrates the power of God, as Cusa and Bruno believed, or maybe the multiverse is an attempt to explain the universe without resorting to an intelligent creator, as many contemporary astrophysicists believe. Regardless,

there is no clear solution, no clearly non-theistic or theistic position to take. In some cases, even, it seems that religious authorities, by defending the singular universe, are defending the possibility of scientific explanation: do we really explain anything when we say that our universe exists because every possible universe exists? Or are we being scientists when we posit the existence of a realm we cannot observe or prove the multiverse in order to avoid believing in a divinity whose existence, it is often said, cannot be observed or proved?

Throughout, Rubenstein's *Worlds Without End* takes a philosophic-ally informed approach to modern and not-so-modern cosmologies, an approach that is not so much interested in which theory is true but in how such theories have come to be (236). *Worlds Without End* is a much needed and often entertaining antidote to the cringe-worthy dismissals of philosophy recently propounded by such figures as Neil deGrasse Tyson and Stephen Hawking, and I would heartily recommend her book to anyone, philosophically inclined or not, who has an interest in ancient, early modern, or contemporary cosmology.

Daniel Adsett