

‘The Multiverse and Participatory Metaphysics’

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September 2018

This dissertation is submitted for the degree of Doctor of Philosophy

Jamie Boulding: PhD Summary

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This dissertation brings a new philosophical perspective to an important topic in the contemporary theology and science dialogue, specifically the theological reception of multiverse thought in modern cosmology. In light of recent cosmological speculation about the plausibility of a ‘multiverse,’ a cosmic ensemble in which our own universe is just one of many, theological responses have largely focused on the question of whether such a multiverse might be an alternative to divine design (or might itself be compatible with divine design). However, this approach neglects the fundamental metaphysical issues entailed in the multiverse proposal, including its entanglement of the one and the many (a paradox which has itself been a central concern of theological reflection), as well as its intimations of cosmic multiplicity, diversity, and infinity. In this dissertation I provide the first systematic theological engagement with these metaphysical implications. My approach is to draw on ancient and medieval resources (neglected not only in multiverse discussions but also in the theology and science field more generally) to show that the concept of metaphysical participation provides a particularly fertile ground on which theology can engage constructively with multiverse thought. To that end, I focus specifically on the participatory thought of Plato, Aquinas, and Nicholas of Cusa, each of whom seek to understand how a physical cosmos of complexity and immensity might share in divine existence of unity and simplicity. I bring their insights into interaction with a diverse range of contemporary theological, philosophical, and scientific figures to demonstrate that a participatory account of the relationship between God and creation argues for greater continuity between theology and the multiverse proposal in modern cosmology.

Preface

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text.

It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text.

It does not exceed the prescribed word limit for the relevant Degree Committee.

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Acknowledgements

I am grateful for the support of my supervisor, the Revd Dr Andrew Davison, whose knowledge, wisdom, and generosity of spirit has been invaluable throughout the development of this thesis. I am also indebted to Dr Jacob Sherman, Dr Simone Kotva, the Revd Dr Mark Harris, and the Revd Dr Rodney Holder, all of whom offered kind advice on aspects of the thesis.

In addition, I am especially grateful to the Faraday Institute for Science and Religion for financial support, as well as for providing a community of friends and colleagues dedicated to furthering the dialogue between the two fields. I am also grateful to Gladstone's Library for granting me a scholarship, which afforded me the opportunity to undertake research and writing in a stimulating environment.

I presented papers on some of the key themes of the thesis at the annual conference of the Albertus Institute for Science, Knowledge and Religion (University of Edinburgh, 2014) and at the biannual conference of the European Society for the Study of Science and Theology (Poland, 2016), and I benefited considerably from the responses I received in both settings.

As ever, I am grateful for the love and encouragement of my parents. Above all, I am thankful for Sarah, with whom I am blessed to be sharing this part of the multiverse.

Introduction

Thesis Overview and Purpose

This thesis brings a new philosophical perspective to assessing the multiverse hypothesis in modern cosmology, which has emerged in recent years as a significant and often contentious topic in the contemporary theology and science dialogue. In light of recent cosmological speculation about the plausibility of a ‘multiverse’, a cosmic ensemble in which our own universe is just one of many, theological responses have tended to focus on the question of whether such a multiverse might be an alternative to divine design—or, in a limited number of more positive responses, whether a multiverse might be compatible with divine design. My starting point is that this approach neglects the fundamental metaphysical issues entailed in the multiverse proposal, including its suggestive entanglement of the one and the many (a paradox which has itself been a central concern of Western theological reflection), as well as its intimations of cosmic multiplicity, diversity, and infinity. In light of this neglect, I will provide the first systematic theological engagement with the metaphysical issues arising from multiverse theory. To that end, I will bring the insights of three pivotal participatory thinkers into interaction with a diverse range of contemporary theological, philosophical, and scientific figures to demonstrate that a participatory account of the relationship between God and creation argues for greater continuity between theology and the multiverse proposal.

Perhaps more than any other issue in theology and science, the multiverse hypothesis complicates and entangles the purportedly clear divisions between the two fields, and leads inescapably to metaphysical concerns of more fundamental importance than ‘design’ and with which theology can more productively engage. As such, my thesis will provide the first systematic response to the challenge raised at the end of the American theologian Mary-Jane Rubenstein’s recent multiverse survey. Having developed an illuminating and informative historical survey of ‘many worlds’ and multiverse thought in Western theology and philosophy, she concludes with the observation that, by virtue of its metaphysical implications, the multiverse proposal ‘asks more interesting and more pressing questions than whether the universe has been “designed” by an anthropomorphic, extracosmic deity.’¹ This thesis not only offers the first sustained response to these metaphysical questions, but also

¹ Mary-Jane Rubenstein, *Worlds Without End: The Many Lives of the Multiverse* (New York, NY: Columbia University Press), p. 236. I will engage extensively with Rubenstein’s work, particularly in Chapter 2.2.

stands as the only theological project to argue that metaphysical participation is best able to address them.

In terms of its classification, this thesis may be placed within the broad scope of what is commonly referred to as ‘theology and science’, an interdisciplinary dialogue that has been the subject of renewed attention in light of recent scientific developments and a corresponding theological recognition of the need to clarify certain religious beliefs and concepts in light of such developments.² It is worth noting that much of the recent academic theology and science dialogue has taken place in the Western world, within a Christian context, of which this thesis is a product. The assumptions of other religious traditions will invariably be challenged by multiverse thought, but it is not within the scope of this thesis to pursue such debates.

Thesis Approach

This thesis adopts a new and distinctive philosophical approach to engaging with modern multiverse thought. In the theology and science conversation, history and philosophy have often taken methodological roles in the academic effort to mediate between the two fields; that is, historical discussions of how the two areas have interacted in the past and philosophical investigations seeking understanding of how they might be mutually beneficial today. On this account, my approach would best be understood as the latter type—a philosophical investigation which seeks to identify and develop a metaphysical framework that may be fruitfully applied to an important issue in contemporary theology and science.

To that end, I will draw on ancient and medieval resources (neglected not only in multiverse discussions but also in the theology and science field more generally) to show that the concept of metaphysical participation provides particularly fertile ground on which theology can engage constructively with multiverse thought. I will focus specifically on the

² For a concise and comprehensive survey of contemporary issues in the theology and science field, including discussion of multiverse thought, see Mark Harris and Duncan Pritchard (eds.), *Philosophy, Science and Religion for Everyone* (New York, NY: Routledge, 2018). For other wide-ranging surveys of the ways in which theology and science challenge and inform each other, see Philip Clayton and Zachary Simpson (eds.), *The Oxford Handbook of Religion and Science* (Oxford: Oxford University Press, 2006); Peter Harrison (ed.), *The Cambridge Companion to Science and Religion* (Cambridge: Cambridge University Press, 2010); J. B. Stump and Alan G Padgett (eds.), *The Blackwell Companion to Science and Christianity* (Chichester: Wiley-Blackwell, 2012).

participatory thought of Plato, Aquinas, and Nicholas of Cusa.³ Together, I believe that they are among the most important and consequential participatory thinkers in the history of Western theology. As I will explain, Plato stands as the architect of participatory thinking as it has developed in Western thought. Aquinas follows in this Platonic participatory tradition and plays a pivotal role in its development in Christian theology, while Cusa further explores the conceptual limits of the tradition as part of his uniquely speculative approach. I selected these figures not only because of their leading roles in participatory thought, but also because they devote significant attention to creation and cosmology, exploring issues that are newly relevant in the context of modern multiverse discourse.⁴

Thesis Structure

The structure of the thesis can be described as follows. In the first chapter I will introduce and examine the two central concepts of the thesis: the multiverse hypothesis in modern cosmology and the notion of metaphysical participation as it has developed in Western theology and philosophy. Both topics will of course be further elucidated and explored in subsequent chapters, but it would be useful to establish a general conceptual framework to help situate the subsequent three chapters, which will feature specific thinkers and ideas.

I will give over the three main chapters to an exploration of the three key thinkers outlined above—Plato, Aquinas, and Nicholas of Cusa—and the relevance of their metaphysical thought to modern multiverse discourse. In addition to bringing their insights into contact with multiverse ideas, each chapter will be based on a key theme to help anchor and focus the discussion. For Plato, I will consider cosmic multiplicity, for Aquinas cosmic diversity, and for Cusa cosmic infinity. This will help to connect each thinker more closely with a specific dimension of multiverse thought, and also provide for an overall structure that demonstrates how multiverse thought encompasses an expansive range of themes. I will begin each of

³ Since this thesis addresses the theology and science dialogue, I am primarily concerned with bringing *metaphysical* insights from participatory thinkers into contact with scientific multiverse models, rather than addressing some of the specifically *theological* concerns arising from participation. Such concerns might include Christological questions (regarding the role of Christ in creation) or Trinitarian and salvific questions (regarding the relationship between creation, incarnation, and salvation). While outside the scope of this thesis, the role of participation in addressing these questions is integral to the theologies of both Aquinas and Cusa. For further discussion of the theological dimensions of participation in Aquinas's thought, see Fergus Kerr, *After Aquinas: Versions of Thomism* (Oxford: Blackwell Publishing, 2002).

⁴ Of course, there are other consequential figures in the participatory tradition whose insights could be applied to multiverse models. I discuss such examples in Chapter 5.

these chapters with an extended survey of the notion of participation as developed by the thinker. This will be followed by three case studies in which the relevant participatory thought will be brought into contact with key thinkers working at the intersection of contemporary theology, philosophy, and science, selected for their technical expertise, their academic value, and their interest in multiverse models (or related concerns).

In the fifth and concluding chapter, I will provide a summary of the core insights and arguments developed in the thesis, as well as reflections on the value that the thesis brings to the theology and science dialogue, and final thoughts on possible future research directions in light of the arguments developed herein.

Chapter 1: Multiverse and Participation

In this chapter, I will introduce the two key issues under consideration in this thesis: the multiverse proposal in modern cosmology and the notion of metaphysical participation in theology. The introduction to the multiverse proposal will be twofold: first I will outline the multiverse idea as it is discussed in cosmology, with particular reference to MIT cosmologist Max Tegmark's important multiverse hierarchy; and second, I will summarise initial responses to multiverse theory among contemporary theologians. I will then provide a general overview of the concept of metaphysical participation, which will be useful to establish before proceeding in the main three chapters to consider specific participatory thinkers and ideas.

1.1 Multiverse Thought: Cosmology

Modern cosmologists are increasingly receptive to the notion that the universe we inhabit is one of many, or perhaps one of an infinite set of, universes—an (as yet indeterminate) ensemble described as the 'multiverse'.⁵ Although the existence of any kind of multiverse would have profound theological implications, the idea has typically been invoked to address the 'anthropic principle' (whereby the fine-tuning of our universe is seen as evidence of God's existence) on the basis that, of all the existing universes, we happen to inhabit the one with suitable physical constants for life.⁶ In his authoritative edited volume on recent multiverse thought, astronomer and multiverse proponent Bernard Carr acknowledges that the precise meaning of 'multiverse' depends on the model under consideration, though he hints at a general definition with his observation that 'cosmologists have come to realize that there are many contexts in which our universe could be just one of a (possibly infinite) ensemble of 'parallel' universes in which the physical constants vary.'⁷

⁵ Given that 'universe' is commonly held to mean the totality of everything that exists, there is scope for semantic confusion when the concept of 'multiverse' is introduced. Although there is no settled consensus on a precise definition of the term, it will be sufficient for the purposes of this thesis to understand 'multiverse' to mean an ensemble of parallel or alternate universes, either connected or disconnected from ours, with different physical constants, depending on the specific model.

⁶ Physical constants are physical quantities (including the speed of light, gravity, electromagnetism, and weak and strong nuclear forces) generally believed to be universal and invariant.

⁷ Bernard Carr, 'Introduction and overview', in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), pp. 3-4.

In the absence of a firm scientific consensus on what might constitute a ‘multiverse’, initially it would be useful to outline the most significant multiverse theories, with particular reference to MIT physicist Max Tegmark’s influential (and controversial) four-level hierarchy, which clearly draws together the core scientific theories in a philosophically and theologically suggestive manner.⁸

1.1.1 Scientific Origins of Multiverse Thought

In a sense, the multiverse proposal is unremarkable insofar as it is broadly in line with the gradual historical shift of the scientific worldview—or what Carr refers to as the ‘outward journey’⁹—from geocentric to heliocentric to galactocentric to cosmocentric to the recent move towards a multiverse view.¹⁰ In the second half of the twentieth century, two key factors prompted a turn among some cosmologists to consider the possibility of the multiverse. First, multiverse scenarios have arisen out of developments in cosmology and particle physics, particularly in relation to cosmological inflation, quantum cosmology, and string theory (all of which will be discussed below). The theory of cosmic inflation¹¹—whereby the universe underwent extremely rapid expansion during its earliest stages—is central to multiverse thought in general and the first two ‘levels’ of Tegmark’s hierarchy in particular. In modern cosmology, inflation is used to explain the size, uniformity, and flatness of the universe. In an inflationary multiverse scenario, the majority of space continues to stretch forever, but some regions stop stretching, break apart, and form spatially separate ‘bubble’ universes with different laws of physics. Inflation is considered to be well supported by observations,¹² and its status would be further strengthened by detection of the large-scale gravitational waves that it is said to produce.¹³

⁸ While summarising multiverse theories will provide a necessary basis from which to develop the subsequent theological arguments, it is not the purpose of this thesis to adjudicate between such theories, each of whose details and overall scientific standing continue to be widely disputed.

⁹ Carr, ‘Introduction and overview’, p. 7.

¹⁰ Similarly, Stephen Hawking suggests that, just as the historic assumption of the earth’s uniqueness was confounded, recent cosmological results indicate that our universe is also one of many. See Stephen Hawking and Leonard Mlodinow, *The Grand Design* (New York: Bantam Books, 2010), p. 143.

¹¹ The initial expression of inflationary cosmology is widely attributed to a 1981 paper by American cosmologist Alan Guth. See Alan H. Guth, ‘Inflationary universe: A possible solution to the horizon and flatness problems’, in *Physical Review D* 23 (1981), pp. 347-56.

¹² Andrew Liddle & Jon Loveday, *Oxford Companion to Cosmology* (Oxford, Oxford University Press, 2009), p. 76.

¹³ In 2014, the detection of apparent evidence of primordial gravitational waves—ripples in spacetime created at the beginning of the universe’s existence and consistent with inflation—was widely reported. However, a subsequent report argued that interstellar dust could have influenced the results. See <http://arxiv.org/abs/1409.5738>.

Second, the existence of a multiverse may be implied in applications of the anthropic principle. This suggests that our observation of the life-enabling (or anthropic) fine-tunings implies a degree of necessity that we should exist to observe the fine tunings.¹⁴ It is now widely accepted among physicists that the physical constants governing our universe appear to be delicately and carefully balanced to enable human life to exist. If any of the physical constants had marginally different values, the universe would be radically different and human life almost certainly would not have emerged. For example, if nuclear and electromagnetic forces were slightly different in strength, carbon atoms and therefore human life would not exist. Similarly, if the neutron mass were any more than 0.2 percent lighter or heavier, the conditions of the early universe would have been such that human life would not have been possible due to an absence of hydrogen. In other words, the physical constants appear to be perfectly—perhaps improbably and mysteriously—conducive for humans to exist, or ‘finely tuned’.

From a religious perspective, these anthropic considerations suggest the existence of a God who tuned the physical constants in such a way as to enable humanity not only to exist, but to be capable of reflecting on its own existence and of developing a relationship with God. In John Polkinghorne’s view, the anthropic fine-tunings are not just a ‘happy accident’ but the ‘expression of the purposive design of a Creator, who has endowed it with the finely tuned potentiality for life.’¹⁵ Of course, this is a contemporary and scientifically-informed restatement of an ancient theological argument—the teleological argument, or the argument from design—in which the apparent deliberate design in the natural world is attributed to an intelligent creator.¹⁶ Plato’s *Timaeus*, which will be the central focus of the following chapter, stands as a classical example of a teleological vision whereby the order and harmony of the cosmos is understood to be the product of an intelligent cause seeking to imitate an eternal

¹⁴ The principle exists in weak forms, whereby the fine-tuning is attributed to selection bias in that only a life-supporting universe would enable life to emerge to observe the fine-tuning, and in more contentious strong forms, whereby the existence of observers somehow influences the constants such that the universe is compelled to be such that human life would emerge. Like the multiverse proposal, it is often criticised by scientists as more of a metaphysical or religious statement indicative of our need for an ultimate explanation. See John D. Barrow & Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford: Oxford University Press, 1986).

¹⁵ John Polkinghorne, *Science and Theology* (London: SPCK, 1998), p. 75.

¹⁶ For a comprehensive survey of the history of design arguments, which draws widely on theological, philosophical, and scientific literature, see Benjamin C. Jantzen, *An Introduction to Design Arguments* (Cambridge: Cambridge University Press, 2004). Jantzen argues that modern science has discredited classical design arguments such as Aquinas’s fifth way (see footnote below), but that the complexity and apparent purposive activities of natural systems continue to require acknowledgement and explanation.

archetype. In his *Summa Theologiae*, to be discussed in Chapter Three, Aquinas provides a Christian formulation of the teleological argument, attributing the ‘governance of the world’ to God: ‘We see things which lack knowledge, such as natural bodies, act for an end... Therefore some intelligent being exists by whom all natural things are directed to their end; and this being we call God.’¹⁷ Similarly, William Paley’s *Natural Theology* begins with his famous watchmaker analogy in which the discovery of a complex and functioning watch is taken to suggest the existence of an intelligent watchmaker, just as the complexity and order of the natural world should be taken to suggest the existence of a divine designer.¹⁸

Today, for those who are disinclined to invoke such a divine designer, the main scientific alternative to emerge in recent decades is the multiverse, whereby our universe is one of many—or perhaps an infinite number of—universes, and so it should hardly be surprising that at least one would contain suitable conditions for human life, and that happens to be the one inhabited by us. Martin Rees, the influential British cosmologist who ‘much prefers’ the multiverse perspective to providential design, is persuaded that cosmic design becomes less astonishing if our universe is part of a larger multiverse ensemble.¹⁹ In this sense, the multiverse is seen to provide the most natural explanation of the anthropic fine-tunings, thereby dispensing with God as an explanation of cosmic design. It is precisely because of its ostensibly physical (or at least quasi-physical) explanatory power that multiverse proponents find the theory, for all of the doubt over whether it falls under the experimental and observational enterprise of science, preferable to God. In Bernard Carr’s stark framing, ‘If there is only one universe, you might have to have a fine-tuner. If you don’t want God, you’d better have a multiverse.’²⁰ On this view, the multiverse proposal is perhaps the only way to ensure that the anthropic principle remains legitimate science rather than bad theology, a kind

¹⁷ Aquinas, *ST I.2.3*. This is the fifth way of Aquinas’s ‘five ways’ to demonstrate the existence of God. Aquinas, *Summa Theologiae*, trans. Fathers of the English Dominican Province (London: Burns, Oates & Washbourne, 1920).

¹⁸ William Paley, *Natural Theology*, Matthew D. Eddy & David Knight (eds.) (Oxford: Oxford University Press, 2006), pp. 7-31. More recently, intelligent design advocate Michael Behe has offered an updated version of Paley’s analogy based on the idea of ‘irreducible complexity’ which rejects the possibility of evolution through successive modifications of natural selection in favour of complexity that must have been intelligently designed: ‘The observation of the intelligent design of life is as momentous as the observation that the earth goes around the sun.’ Michael J. Behe, *Darwin’s Black Box* (New York, NY: Free Press, 2006), pp. 232-3. In a 2005 U.S. trial on the teaching of intelligent design in public schools, the court found that irreducible complexity ‘has been refuted in peer-reviewed research papers and has been rejected by the scientific community at large.’ See: <https://law.justia.com/cases/federal/district-courts/FSupp2/400/707/2414073/>

¹⁹ Martin Rees, *Our Cosmic Habitat* (Princeton, NJ: Princeton University Press, 2001), p. 164.

²⁰ Bernard Carr quoted in Tim Folger, ‘Science’s Alternative to an Intelligent Creator: the Multiverse Theory’, *Discover*, Dec 2008, <http://discovermagazine.com/2008/dec/10-sciences-alternative-to-an-intelligent-creator>

of God of the gaps category error in which theological explanations are misapplied to gaps in scientific understanding.

1.1.2 Scientific Legitimacy of Multiverse Thought

In spite of the growing mainstream scientific attention on the multiverse, it remains a highly contentious idea, with a substantial group of cosmologists maintaining that it is excessively speculative, not open to falsification, and therefore not properly scientific. Of course, astronomers are (and may remain) unable to view other universes, and it may never be possible to visit or directly experience such universes, even if they are eventually detected or confirmed. As will be seen, the current ‘evidence’ offered for different multiverse models is invariably indirect, suggestive, or open to varied interpretation. Many physicists do not therefore regard multiverse proposals as legitimate science at all.²¹ For example, George Ellis claims that ‘the very nature of the scientific enterprise is at stake in the multiverse debate’ since its advocates propose the ‘dangerous tactic’ of abandoning testability and explanatory power in light of the prospect of no direct or indirect means of testing the theory.²² He further argues that multiverse observation is impossible due to the lack of causal connection between our experimental apparatus and the multiverse under analysis. He infers that the multiverse is not scientifically testable and must be regarded as a metaphysical assumption: ‘A belief that is justified by faith, unsupported by direct or indirect evidence, should be clearly identified as such.’²³ He also contends that there must be a credible link between presently known physics and the proposed physics underlying a given multiverse—an extrapolation for which there is no (and may never be any) evidence. On the possible existence of an infinite number of universes (of particular reference to Tegmark’s Level IV multiverse), he points out that infinity is not an actual number, not specifiable, and therefore not physically realisable: ‘Whenever infinities emerge in physics, we can be reasonably sure there has been a breakdown in our model.’²⁴

²¹ Princeton theoretical physicist Paul Steinhardt expresses this criticism in particularly hostile terms: ‘The multiverse idea is baroque, unnatural, untestable and, in the end, dangerous to science and society.’ See: http://www.evolutionnews.org/2014/11/princeton_theor090901.html.

²² George Ellis, ‘Opposing the multiverse’, in *Astronomy and Geophysics* 49 (2008) 2.33.

²³ George Ellis, ‘Multiverses: description, uniqueness, testing’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 401.

²⁴ Ellis, ‘Multiverses: description, uniqueness, testing’, p. 397.

Conversely, Martin Rees (among a growing number of more sympathetic cosmologists) underlines that the conceptual status of other universes is no worse than theories such as superstrings or quarks.²⁵ Unlike Ellis and other critics, Don Page believes that multiverse theories *can* be tested, on the grounds that even though such theories usually involve unobservable elements, ‘they may give testable predictions for observable elements if they include a well defined measure for observations.’²⁶ In addition, multiverse proponents claim that, while it might not be directly testable, there are signs that it must be correct. Indeed, Carr regards the anthropic principle as one of the most powerful such signs: ‘In the absence of direct evidence for other universes, I regard the anthropic fine-tunings as the best indirect evidence.’²⁷ Regardless of one’s view on whether the multiverse idea is properly scientific, it has clearly occasioned a profound reconsideration of the role and boundaries of science, while also vividly illustrating the extent to which cosmology intersects with metaphysics. Like theological reflections on the divine, the object of cosmological enquiry (the universe as a whole) cannot be experimented upon or directly tested or observed from ‘outside’.

1.1.3 Tegmark’s Multiverse Hierarchy

While modern cosmological thinking about the multiverse has been characterised by strikingly divergent proposals, Tegmark’s hierarchy of multiverses represents a valuable and widely-discussed reference point from which to consider multiverse theories.²⁸ Its value lies in its conceptual comprehensiveness, drawing together ostensibly disparate theories, and in its insistence that hierarchy is itself significant, allowing for ‘progressively greater diversity’ of reality.²⁹ However, Tegmark’s use of hierarchy can also be problematic and potentially misleading, as evidenced by his (scientifically provocative) claim that the ‘key question is not *whether* there is a multiverse, but rather *how many* levels it has.’³⁰ This might lead one to

²⁵ Martin Rees, *Before the Beginning* (London: Simon & Schuster, 1997), p. 185.

²⁶ Don N. Page, ‘Predictions and tests of multiverse theories’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 428.

²⁷ Bernard Carr, ‘Defending the multiverse’, in *Astronomy and Geophysics* 49 (2008) 2.36.

²⁸ As an alternative example, Brian Greene has identified nine types of parallel universes: quilted, inflationary, brane, cyclic, landscape, quantum, holographic, simulated, and ultimate. Brian Greene, *The Hidden Reality* (New York: Random House, 2011).

²⁹ Max Tegmark, ‘The multiverse hierarchy’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 99. For a further development of the hierarchy see Max Tegmark, *Our Mathematical Universe: My Quest for the Ultimate Nature of Reality* (New York, NY: Vintage Books, 2015). Rubenstein notes that Tegmark’s decision (as a self-identified Platonist) to outline a ‘hierarchy’ is telling since it evokes the Neoplatonic notion of a cosmic hierarchy of being with degrees of reality, extending from objects to animals to humans to angels and finally to God. Rubenstein, *Worlds Without End*, p. 205.

³⁰ Tegmark, ‘The multiverse hierarchy’, p. 100.

imagine a set of sharply distinct levels, with lower levels subordinate to or somehow less ‘real’ than higher levels, or perhaps even a requirement that ‘access’ to the higher levels is possible only after ‘passing through’ the lower levels. Yet, as will be seen below, Level III does not add any new types of universes to Levels I or II. In fact, given the radical nature of Level IV, in which all mathematical structures and possibilities are said to exist, Levels I to III are often grouped together by critics, with IV highlighted as a controversial outlier.³¹

Level I

Nevertheless, Tegmark’s hierarchy ‘begins’ with Level I, which refers to ‘regions beyond our cosmic horizon’, or the domain that cosmologists and astronomers can directly observe.³² This is based on a spatially infinite cosmological model (which he regards as a prediction of inflation), with infinitely many other regions existing beyond our cosmic horizon, thereby realising all possible initial conditions. Level I universes are governed by the same laws of physics as our observable universe, but with different initial conditions. Contemporary inflationary theory suggests that these conditions were created by quantum fluctuations during inflation, resulting in an infinite ‘ergodic’ space containing an ensemble of universes, each with its own random initial conditions: ‘In other words, everything that could in principle have happened here did happen somewhere else.’³³ As a consequence, the Level I multiverse is composed of infinitely many other inhabited planets, including infinitely many ‘copies’ of each person in our universe. If there are many copies of each person, with no certainty about which copy truly represents each person and only probabilistic assessments as to how each copy will behave, Tegmark believes that this ‘kills the traditional notion of determinism.’³⁴ Just as he offers a ‘crude estimate’ of how far away our copies might be, his conception of identity is notably brisk and imprecise. He refers to ‘identical’ copies, but then admits that ‘their lives will necessarily differ eventually’.³⁵ At a minimum, the profound philosophical implications of infinitely many identities warrant much deeper investigation.

³¹ For example, Don Page’s treatment of Tegmark’s hierarchy groups Levels I to III together (since he believes they can all come from a single universe) and IV separately (which he rejects as ‘logically inconsistent and inconceivable’). Don Page, ‘Predictions and tests of multiverse theories’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 423.

³² Tegmark, ‘The multiverse hierarchy’, p. 102.

³³ Tegmark, ‘The multiverse hierarchy’, p. 104.

³⁴ Tegmark, ‘The multiverse hierarchy’, p. 104.

³⁵ Tegmark, ‘The multiverse hierarchy’, p. 104.

Although Tegmark asserts that the central Level I assumption of infinite space is valid—‘If anything, the Level I multiverse sounds obvious. How could space not be infinite? If space comes to an end, what lies beyond it?’³⁶—it remains the case that spatial infinity has neither been proven nor refuted, and might even in principle be unknowable.³⁷ The second assumption on which Tegmark’s Level I multiverse rests—that matter has a uniform distribution—is equally speculative. With reference to recent observations of the three-dimensional galaxy distribution and the microwave background, he suggests that matter is typified by uniformity on large scales, and that assuming this pattern continues, ‘space beyond our observable universe teems with galaxies, stars and planets.’³⁸ His interpretation of the evidence, then, is still explicitly based on an assumption requiring what Ellis regards as an ‘extreme’ extrapolation from our observable universe to unimaginably distant regions beyond our cosmic horizon.³⁹ It is also worth noting that a Level I multiverse, with the same laws of physics across infinite space, would not directly address the question of fine-tuning that is so central to multiverse discourse, unless such a multiverse emerged as part of a broader Level II ensemble, as discussed below.

Level II (and other variants)

The Level II multiverse, which Tegmark believes is also predicted by most currently popular models of inflation, is best imagined as an infinite set of Level I multiverses. In this ‘post-inflation bubble’ scenario, space generally stretches rapidly and forever, but some regions stop stretching and form distinct bubbles. Infinitely many of these bubbles may be created, each becoming an infinite embryonic Level I multiverse, with different laws of physics, particles, and dimensionality brought about by quantum fluctuations during inflation: ‘So the Level II multiverse is likely to be more diverse than the Level I multiverse, containing domains where not only the initial conditions differ, but also the physical constants.’⁴⁰

Whereas certain Level I multiverses could theoretically be accessible in the event of the deceleration of cosmic expansion, Tegmark explains that Level II domains are ‘so far away that you would never get to them even if you travelled at the speed of light forever’⁴¹ since

³⁶ Tegmark, ‘The multiverse hierarchy’, p. 102.

³⁷ According to NASA, ‘all we can truly conclude is that the Universe is much larger than the volume we can directly observe.’ See http://map.gsfc.nasa.gov/universe/uni_shape.html.

³⁸ Tegmark, ‘The multiverse hierarchy’, p. 103.

³⁹ Ellis, ‘Multiverses: description, uniqueness, testing’, p. 401.

⁴⁰ Tegmark, ‘The multiverse hierarchy’, p. 107.

⁴¹ Tegmark, ‘The multiverse hierarchy’, p. 105.

space is being created between our Level I multiverse and other regions faster than it could be traversed.

Tegmark believes that the highly active research area of string theory may offer a ‘specific realization’ of the Level II multiverse. In string theory, which is viewed by physicists such as Stephen Hawking to be the closest account to an accurate description of the universe, the fundamental objects that give rise to elementary particles are one-dimensional strings, not the point-like particles of elementary physics. String theory suggests that there are actually ten or eleven dimensions, with some of the higher dimensions ‘compactified’ and thus beyond direct human experience. This compactification leads Tegmark to propose four sub-levels of increasing diversity: IIa with the same effective laws but different post-inflationary bubbles; IIb with different laws according to supergravity (a type of quantum theory concerning the interactions of elementary particles); IIc with different ‘fluxes’ (magnetic fields) that stabilise extra dimensions; and IId with different compactifications and dimensionality, different symmetries, and different elementary particles. Similarly, Leonard Susskind’s influential string landscape model is based on M-theory (an attempt to unify different versions of string theory), which suggests an immense number of string theory vacua, each associated with a different universe. He concludes that the improbably large number of universes raises the questions of fine-tuning and of our observation of and presence in our own universe.⁴²

On a related point, Paul Steinhardt and Neil Turok’s ‘ekpyrotic’ scenario, in which the Level I multiverse is cyclic and undergoes an infinite series of big bangs and crunches, is based on string/M theory. On this account, the Big Bang was not the beginning of time, but an inflection point with a past filled with endlessly repeating cycles of evolution, each accompanied by the creation of new matter. Our own universe lies on a brane, a multi-dimensional object, called our ‘braneworld’, which is separated by a microscopic distance from a hidden second braneworld with different particles, forces, and properties.⁴³ The only forces capable of crossing this ‘gap’ are gravity and dark energy, which eventually pull the two worlds together, forcing them to collide and then separate, in an event that represents the Big Bang. In this sense, there is an eternal process of destruction and rebirth: ‘If it exists, the ensemble of such incarnations would also form a multiverse, arguably with a diversity similar

⁴² Leonard Susskind, ‘The anthropic landscape of string theory’, in Bernard Carr (ed.) *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 263.

⁴³ Paul Steinhardt and Neil Turok, *Endless Universe: Beyond the Big Bang* (New York: Doubleday, 2007), p. 139.

to that of Level II.⁴⁴ Unlike Level II, though, this ekpyrotic cycle represents a temporal rather than a spatial multiverse and therefore fits uneasily in Tegmark's hierarchy. Contrary to the Level II model, it does not introduce radically distant and unconnected regions of spacetime with different physical constants. Rather, it conceives of the universe as a 'single, coherent entity that exists in a stable cycling state whose properties can eventually be understood as a consequence of the basic laws of nature.'⁴⁵

Although Tegmark claims that Lee Smolin's idea of universes emerging through black holes rather than inflation⁴⁶ can be seen as another Level II variant, Smolin's most recent work is highly critical of multiverse thought in general and Tegmark in particular. Smolin and Roberto Unger argue that there is only one universe at a time, a single causally connected universe that contains all its causes. The universe is not a member of an ensemble of other simultaneously existing universes, nor does it have any copies, nor does it reflect or embody all mathematical structures, as Tegmark's Level IV multiverse suggests. The single universe may extend indefinitely back in time, comprising earlier universes or simply earlier states of one universe. By contrast, Smolin and Unger pointedly reject the 'non-empirical character' of the multiverse idea: 'it combines an absence of empirical validation, or of susceptibility to empirical challenge, with a lack of explanatory function.'⁴⁷ This model of a single universe is another instance of a 'multiverse' theory (in the sense that it involves a Level II-type degree of diversity with its characteristics of eternal succession and transformation) which does not entirely cohere with Tegmark's four-level hierarchy.

The Level II multiverse, with its infinite production of bubble universes, is often invoked in relation to the anthropic principle.⁴⁸ If there are many (or infinitely many) other universes with different physical constants, then it is inevitable that we find ourselves in one suitable for life, and not in other universes with different parameters that are not conducive to such existence. On this account, the statistically improbable degree of fine-tuning in our universe (such as the number of space-time dimensions, the strength of electromagnetic force, and the nature of the cosmological constant) implies the existence of other universes with at least

⁴⁴ Tegmark, 'The multiverse hierarchy', p. 107.

⁴⁵ Steinhardt and Turok, *Endless Universe: Beyond the Big Bang*, p. 223.

⁴⁶ Lee Smolin, *The Life of the Cosmos* (London: Weidenfeld & Nicolson, 1997).

⁴⁷ Roberto Mangabeira Unger & Lee Smolin, *The Singular Universe and the Reality of Time* (Cambridge: Cambridge University Press, 2015), p. 119.

⁴⁸ Indeed, the long-term plausibility of Level II will rest largely on the ability of astrophysics and high-energy physics to clarify the extent to which various physical constants are fine-tuned.

some different physical constants. If this is the case, Tegmark acknowledges that we will ‘never be able to determine the values of all physical constants from first principles.’⁴⁹ As with Level I, it is important to underline that the presumably radically different laws governing inaccessible Level II multiverses seem to present a logical problem for the theory itself (not addressed by Tegmark) insofar as it assumes that the laws governing our universe can provide the basis for speculation about other universes that would, as noted, almost certainly be governed according to fundamentally divergent (and likely unknowable) principles.

Level III

Tegmark’s Level III multiverse refers to the ‘many worlds’ interpretation (MWI) of quantum mechanics, initially proposed in 1957 by Hugh Everett as an alternative to the Copenhagen Interpretation of Niels Bohr and Werner Heisenberg. According to Hewitt, the Copenhagen ‘collapse’ postulate—whereby states of the universe are specified in terms of wave functions which collapse into definite classical states (such as the positions and velocities of particles) upon observation—is unnecessary. Rather, at each event or decision point, reality ‘splits’ in a manner that observers experience as a slight randomness, and every outcome actually happens, each in a different universe, suggesting the exponential creation of new universes as each quantum eventuality unfolds. While the parallel versions of each individual in Level I are situated elsewhere in three-dimensional space, Tegmark believes that they exist on ‘another quantum branch in infinite-dimensional Hilbert space’ in Level III.⁵⁰

Paradoxically, though often regarded as the most controversial and metaphysically radical of the first three levels, Tegmark maintains that Level III ‘adds nothing new beyond Levels I and II, just more indistinguishable copies of the same universes’.⁵¹ Thus, someone experiencing a Level III-type ‘split’ or superposition of outcomes, such as the choice between reading the rest of this paragraph or doing something else, notices the branching as a flicker of uncertainty and is unaware of the quantum alter ego who makes the alternative decision. Likewise, in a Level I multiverse, different versions of the same person make different decisions, with the only difference being that they reside elsewhere in conventional three-

⁴⁹ Tegmark, ‘The multiverse hierarchy’, p. 109.

⁵⁰ Tegmark, ‘The multiverse hierarchy’, p. 113.

⁵¹ Tegmark, ‘The multiverse hierarchy’, p. 113.

dimensional space rather than a separate quantum branch. While the Level I (or II) and III subjects thereby occupy different space, it is possible to understand the Tegmarkian sense in which Level III ‘splitting’ or ‘branching’ can happen in Levels I and II without necessarily adding anything qualitatively new or contentious to the prior levels, though of course the perception of extreme profligacy remains controversial. In this sense, MWI proponents highlight the Copenhagen Interpretation’s relative complexity (since it seems to ‘add’ something extra to account for the ‘collapse’ of the wave function) and solipsism (since ontologically it seems to imply that reality is observer-dependent), in contrast to what Sean Carroll sees as a ‘quite thin’ ontological commitment necessitated by the MWI’s unified wave function.⁵² Further developments in quantum computing may strengthen (or weaken) the Level III notion of parallelism.

Level IV

Finally, Tegmark explores the widely-held physics notion that the physical world is a mathematical structure. He defines mathematical structures as ‘formal systems ... consist[ing] of abstract symbols and rules for manipulating them, specifying how new strings of symbols referred to as theorems can be derived from given ones referred to as axioms.’⁵³ He claims that if it is not the case that all mathematical structures enjoy physical existence, then there would be a ‘fundamental, unexplained ontological asymmetry’ built into reality, splitting such structures into two classes of those with and without physical existence. To escape this apparent dilemma, he introduces the concept of ‘mathematical democracy’,⁵⁴ in which mathematical and physical reality are equivalent, and *every* mathematical structure exists physically and corresponds to a different universe, thus permitting the existence of everything: ‘This implies the notion that a mathematical structure and the physical world are in some sense identical. It also means that mathematical structures are “out there”, in the sense that mathematicians discover them rather than create them.’⁵⁵

⁵² Sean Carroll, ‘Does This Ontological Commitment Make Me Look Fat?’ in *Discover*, June 4, 2012, <http://blogs.discovermagazine.com/cosmicvariance/2012/06/04/does-this-ontological-commitment-make-me-look-fat/>.

⁵³ Tegmark, ‘The multiverse hierarchy’, p. 116.

⁵⁴ Tegmark, ‘The multiverse hierarchy’, p. 116.

⁵⁵ Tegmark, ‘The multiverse hierarchy’, p. 116.

The Level IV multiverse, described by Tegmark as ‘the ultimate ensemble theory’ and by Brian Greene as the ‘Ultimate Multiverse’, allegedly comprises all mathematically possible universes, subsumes all other ensembles, and therefore ‘brings closure to the hierarchy of multiverses’, such that there cannot be a Level V.⁵⁶ While Level I universes join seamlessly, and Level II and Level III universes are demarcated by inflation and decoherence respectively, Level IV universes are completely disconnected. The evidence for Level IV is what Tegmark sees as the ‘unreasonable effectiveness of mathematics’ (that is, the utility of mathematics for describing the physical world, which he attributes to the idea that the world *is* mathematical structure), though he concedes that failure to unify general relativity and quantum field theory, and thus to find a mathematical structure to match our universe, would necessitate the abandonment of Level IV since this would undermine its assumption of the unreasonable effectiveness of mathematics in describing our physical universe.⁵⁷

While the multiverse models depicted in Levels I, II, and III are the subject of varying degrees of debate among cosmologists, Tegmark’s Level IV multiverse has been strongly criticised for its extravagance and profligacy. In response to Tegmark’s troubling and ill-defined conflation of mathematical and physical reality, Ellis notes that we ‘cannot even describe [Level IV] properly, let alone prove it occurs. Claiming existence of something you cannot properly characterize has dubious scientific merit.’⁵⁸ Echoing many scientific (and religious) critics, Page highlights the logical absurdities raised by the co-existence of contradictory mathematical structures. He contends that there must be one unique mathematical structure that describes reality, and so it is logically nonsensical to posit different structures describing different parts of what is ultimately one overarching reality.

Intriguingly, Tegmark suggests that the debate over quantum mechanics and parallel universes is secondary to the deeper conflict between what he sees as the Platonic paradigm, whereby the external/mathematical perspective is real, while our internal human perspective is merely approximate, and the Aristotelian paradigm, which he sees as subordinating mathematical language to the internal perspective: ‘if you prefer the Platonic paradigm, you should find multiverses natural. In this case, all of physics is ultimately a mathematics problem ... there is a TOE [Theory of Everything] at the top of the tree, whose axioms are

⁵⁶ Tegmark, ‘The multiverse hierarchy’, p. 119.

⁵⁷ Tegmark, ‘The multiverse hierarchy’, p. 121.

⁵⁸ Ellis, ‘Multiverses: description, uniqueness, testing’, p. 401.

purely mathematical'.⁵⁹ For Tegmark, the Level IV premise that all mathematical structures exist physically 'can be viewed as a form of radical Platonism, asserting that the mathematical structures in Plato's realm of ideas ... exist "out there" in a physical sense'.⁶⁰ As will be discussed in the next chapter, this idiosyncratic interpretation of Platonism, with reality identified with the physical, seems to be at odds with Plato's vision in which physical things exist as an image of and a participation in the non-physical, eternal Forms, which lie beyond the material world as its source and model. While the particular contours of Tegmark's reading of Plato are dubious, his warning against dismissing things 'merely because we cannot observe them from our vantage point'⁶¹ is a fitting expression of the Platonic love of the unseen and eternal. In addition, the Forms raise philosophical issues of direct relevance to the multiverse, such as the relation of the universe to whatever deeper reality lies beyond it, as well as the metaphysical question of 'universals', or what particular things share in common.

That Tegmark's hierarchy entails progressively greater diversity opens it (and multiverse thought in general) to the charge of violating Ockham's razor, or the idea that any theory should avoid unnecessary complexity.⁶² On this point, Tegmark counterintuitively argues that the higher multiverse levels are simpler due to the 'symmetry and simplicity inherent in the totality of all the elements taken together ... The opulence of complexity is all in the subjective perceptions of observers'.⁶³ He identifies complexity with particularity, such that restricting attention to one aspect of an ensemble detracts from its overall simplicity. In this way, the movement up through the multiverse hierarchy becomes a journey away from complexity: away from the specification of initial conditions (Level I), then away from the specification of physical constants (Level II), and ultimately away from the specification of anything at all (Level IV).

⁵⁹ Tegmark, 'The multiverse hierarchy', p. 116.

⁶⁰ Tegmark, 'The multiverse hierarchy', p. 118.

⁶¹ Tegmark, 'The multiverse hierarchy', p. 100.

⁶² This point will be considered further in the next section.

⁶³ Tegmark, 'The multiverse hierarchy', p. 123.

1.2 Multiverse Thought: Theology

In contemporary theology, multiverse theory is discussed primarily in the context of the question of ‘design’. This is consistent with both the historic theological importance of design (particularly as the subject of natural theology) and the increasing attention in contemporary science on anthropic reasoning (which has itself occasioned the recent turn to multiverse speculation). While the emphasis on design is as important as it is inevitable, the central premise of this thesis is that the ultimately rather limited issue of design fails to reflect the profound theological and metaphysical implications of the multiverse proposal. As noted earlier, Rubenstein concludes her survey with the suggestion that the multiverse could provide the basis for the development of a theology that asks more fundamental metaphysical questions than whether the universe has been designed.⁶⁴ The purpose of this thesis is to outline such a theology by drawing on Platonic and medieval resources to demonstrate that a metaphysic of participation can facilitate an effective theological engagement with the multiverse.

Prior to outlining in Section 1.3 what such a metaphysical framework might entail, it would be instructive in this section to provide an overview of the intellectual context of contemporary theological multiverse assessments. First, I will focus on theological objections to the multiverse, which have tended to characterise the initial theological response. Second, I will assess the more positive (albeit still tentative) ways in which other theologians have approached the subject.⁶⁵

1.2.1 *Theological Criticism of Multiverse Thought*

Design

Given that the multiverse has often been presented in explicitly atheistic terms as an alternative to divine design, with its advocates expecting it to ‘have the same impact in the

⁶⁴ Rubenstein, *Worlds Without End*, p. 236.

⁶⁵ It should be noted that this overview is not intended to be exhaustive. For a survey focused solely on the role played by multiverse theories in contemporary philosophy and theology, see Klaas J. Kraay (ed.), *God and the Multiverse* (New York: Routledge, 2015).

context of cosmic design as evolution did in the context of biological design’⁶⁶ it is perhaps unsurprising that the issue of design has been the focus of initial (and in most cases unsympathetic) theological engagement. Thus, Christoph Schönborn, the Archbishop of Vienna, identifies the multiverse hypothesis (along with ‘neo-Darwinism’) as a hostile scientific claim, ‘invented to avoid the overwhelming evidence for purpose and design found in modern science’.⁶⁷ This careful emphasis on defending what Schönborn sees as the limits and findings of *science* places him in the unexpected position of dismissing the multiverse on scientific rather than theological grounds. His concern is that modern science—‘the light of reason’—is being misappropriated by the ideological project of denying purpose and design.⁶⁸ The logical—and potentially theologically fruitful—corollary of Schönborn’s argument is that a more scientifically modest and restrained multiverse account, not intended to reduce the cosmos to pure chance and necessity, *could* be compatible with belief in God. Contrary to the historic conflict model⁶⁹ suggested by his claim that the Church will ‘again’ defend reason, perhaps it might be possible to reconcile God and the multiverse (and, by implication, theology and science) in a manner that acknowledges the participation of human reason in divine reason, and the proper role of reason in helping to discern its own divine source and ground in the complex ordering of the cosmos.

While Schönborn objects to invoking the multiverse to undermine cosmic design, other theistic multiverse critics argue that its alleged *ad hoc* nature and its metaphysical extravagance serve unintentionally to *reinforce* the notion of design. According to the evangelical theologian William Lane Craig, the fact that ‘detractors of design’ feel obliged to resort to such a radical and scientifically contentious theory merely underlines the point that cosmic fine-tuning is ‘not explicable in terms of physical necessity alone or in terms of sheer chance’ and therefore the multiverse hypothesis is ‘a sort of backhanded compliment’ to the

⁶⁶ Carr, ‘Introduction and overview’, p. 16.

⁶⁷ Christoph Schönborn, ‘Finding Design in Nature’, in *New York Times*, July 7, 2005, http://www.nytimes.com/2005/07/07/opinion/07schonborn.html?_r=0

⁶⁸ Here it should be noted that, even if some scientific multiverse proponents are motivated by the desire to avoid theism, this fact alone would not be sufficient to invalidate the theory. As discussed in Section 1.1, the scientific legitimacy of the multiverse is related to issues of evidence, testing, and falsifiability.

⁶⁹ In Ian Barbour’s influential fourfold typology of science and theology, the ‘conflict’ model holds that each discipline makes rival and irreconcilable statements about the history of nature. The two historical cases often cited as examples of conflict are Galileo’s advocacy of heliocentrism and Darwin’s theory of evolution, both of which provoked religious opposition. Barbour’s other models are independence, dialogue, and integration. See Ian Barbour, *Religion and Science* (New York, NY: HarperCollins, 1997), pp. 77-105.

design hypothesis.⁷⁰ In this vein, Neil Manson suggests that the multiverse might be thought of as ‘the last resort for the desperate atheist’.⁷¹ This approach of acknowledging the profound metaphysical issues raised by the multiverse hypothesis (usually in dismissive and contemptuous terms), followed by a swift retreat back to the question of design, is characteristic of many early theological responses. The premise of this thesis is that, having hinted at the metaphysics, it would be more constructive to pursue this in a sustained manner.

Extravagance and Profligacy

In addition to criticism that the multiverse represents an ideological, rather than strictly scientific, attempt to replace divine design, theologians have also widely criticised the multiverse for its lack of simplicity and economy, particularly in relation to Tegmark’s controversial Level IV multiverse.⁷² This theological perspective goes beyond the standard scientific concern that the multiverse radically violates Ockham’s razor⁷³ to contend that the hypothesis of a divine designer is vastly more simple, coherent, and thus plausible. For instance, Keith Ward argues that Tegmark’s Level IV multiverse, in which everything will be true somewhere, is ‘more extravagant’ than any religious creed: ‘[The Level IV model] does not have much to offer in the way of economy, simplicity, or plausibility...to say that it is simpler than proposing an intelligent Creator is not convincing.’⁷⁴ If the choice is between a huge number of universes existing for no particular reason, and a supreme intelligent being with necessary existence able to bring contingent universes into being for the sake of their value, he maintains that God is the ‘simpler and more rational hypothesis.’⁷⁵ In Ward’s view, the arbitrariness and profligacy of the multiverse can only be redeemed by the existence of underlying value; specifically, a mind-like ultimate existent with the power to bring about the existence of universes for the sake of realising certain values or worthwhile states of affairs.

⁷⁰ William Lane Craig, ‘Design and the anthropic fine-tuning of the Universe’, in Neil Mansom (ed.), *God and Design* (London: Routledge, 2003), p. 171.

⁷¹ Manson, *God and Design*, p. 18.

⁷² As with scientific multiverse critiques, Level IV attracts a disproportionate amount of theological attention. I will argue that theologians should not overlook other multiverse models, particularly Levels I and II, which have striking historical antecedents and might provide more constructive grounds for mutual interaction.

⁷³ Ockham’s original formulation is ‘plurality must not be asserted without necessity’. Multiverse critics should recall that this is meant as a methodological principle, not an ontological premise. William of Ockham, *Philosophical Writings*, trans., Philotheus Boehner & Stephen F. Brown (Cambridge: Hackett Publishing Company, 1990), p. 193.

⁷⁴ Keith Ward, *The Big Questions in Science and Religion* (West Conshohocken, PA: Templeton Press, 2008), p. 233-4. In spite of his objections to the Level IV model, he believes it to be less arbitrary (and thus more likely) than the Level II and III scenarios, whose limited number of universes raise the question of why such limits exist.

⁷⁵ Ward, *The Big Questions in Science and Religion*, p. 235.

On this account, the multiverse would not necessarily be an alternative to God, but rather an extension of the creative power of God.

Similarly, Rodney Holder maintains that the multiverse is ‘distinctly non-simple and uneconomical’ in comparison with belief in God.⁷⁶ He identifies a number of fundamental (and as yet unanswered) problems with the multiverse hypothesis, such as whether infinitely many universes are physically realisable; whether the hypothesis is testable; whether it is simple (and therefore more probable than theism); what kind of explanation it provides; why there appears to be *more* fine-tuning in this universe than is required for life; and why the order for life persists in this universe.⁷⁷ On the apparent surfeit of fine-tuning, Holder refers to Roger Penrose’s research concerning the entropy of the universe, which suggests that our universe is significantly more special than required merely in order for human life to exist. The multiverse proposal might offer an explanation for fine-tuning as such, but not for our own universe’s *ultra* fine-tuning, which remains an ‘unexplained brute fact’,⁷⁸ as does the persistence of order in our universe—neither of which are fully explained by the multiverse hypothesis, and both of which indicate that our universe is much more special than a randomly generated universe within a multiverse.

For Holder, the multiverse is a complex explanation, multiplying entities in a ‘catch-all’ way that is generally discouraged in science, yet still fails as an ultimate explanation, as it does not address the questions of why there is something rather than nothing, and why there is *this* multiverse model rather than *that* multiverse model—or, as the physicist Paul Davies puts it, ‘multiverses merely shift the problem up one level’.⁷⁹ In contrast, Holder believes God provides the ultimate explanation for our single universe, since God exists necessarily, and represents a simpler, more economical explanation of design (and its persistence), on the basis that a good, loving God would bring about (and maintain) the conditions for human life. Due to its lack of observable consequences, Holder dismisses the multiverse as ‘a

⁷⁶ Rodney Holder, *God, the Multiverse, and Everything* (Aldershot, Hampshire: Ashgate, 2004), p. 126.

⁷⁷ Holder, *God, the Multiverse, and Everything*, pp. 109–110.

⁷⁸ Holder, *God, the Multiverse, and Everything*, p. 126. In a presentation to Christians in Science in 2006, Holder referred to Penrose’s calculations as ‘virtually a nail in the coffin for the multiverse idea but totally consistent with design.’ See http://cis.org.uk/upload/Resources/Universe/rodney_holder_multiverse.pdf.

⁷⁹ Paul Davies, ‘Universes galore: where will it all end?’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 497. Davies is an important figure in terms of offering scientific reflections on theology. He argues that the discoveries of twentieth-century physics could point to a unified description of creation that would provide more persuasive answers to religious questions than religion itself. See Paul Davies, *God & The New Physics* (New York, NY: Simon & Schuster, 1983).

metaphysical explanation of life' rather than a scientific one.⁸⁰ As an alternative to Holder's use of Bayesian probability theory to evaluate competing metaphysical hypotheses, which calls to mind Swinburne's similar methodology to 'demonstrate' the existence of God,⁸¹ this thesis will respond to the metaphysical nature of the multiverse proposal, aptly highlighted by Holder and others, by applying the metaphysical framework of participation.

In light of claims by theistic multiverse sceptics such as Holder and Swinburne that an infinite God is a simpler explanation than a randomly occurring universe or multiverse and thereby preferable on the grounds of Ockham's razor, Davies notes that one surprising feature of algorithmic complexity theory (a branch of mathematics that can be used to provide definitions of simplicity and complexity) is that the whole can sometimes be simpler than its component parts. In this way, he claims that 'God-plus-Universe' can be simpler than either in isolation, though this presents the theologically problematic implication that God is part of the whole, as in 'multiverse pantheism' described below. This assumption is not shared by Richard Dawkins, who avers that God must be at least as complex as any system that God creates, nor by Victor Stenger, who concludes his new survey of theological and scientific multiverse thought with a denial of the simplicity of God: 'In the spirit of Ockham's razor, we must recognise that currently God is an additional hypothesis not required by the data. If he were, he would be included in the set of premises that constitute scientific theories.'⁸² If this appears to be a misguided conflation of distinct scientific and theological categories, it is shared and developed in Davies' provocative contention that the multiverse 'is really an old-fashioned God in disguise'.⁸³ He believes that both appeal to infinite, unknowable systems and both require an infinite amount of information to be discarded just to explain our own finite universe. Further, he speculates that algorithmic complexity theory would show that some versions of the multiverse and 'naïve deism' (whereby God picks a single real universe from an infinite shopping list of possible but unreal universes) would be equivalently—and likely infinitely—complex: '[The multiverse] is basically just a religious conviction rather than a scientific argument.'⁸⁴ Regardless of the validity of this hypothesis, Davies is helpful in terms of warning that considerable care is needed in using terms like 'simple' and 'complex' in the multiverse and theology debate.

⁸⁰ Holder, *God, the Multiverse, and Everything*, p. 123.

⁸¹ Richard Swinburne, *The Existence of God* (Oxford: Oxford University Press, 2004).

⁸² Victor J. Stenger, *God and the Multiverse* (New York: Prometheus Books, 2015), p. 371.

⁸³ Davies, 'Universes galore: where will it all end?', p. 495.

⁸⁴ Davies, 'Universes galore: where will it all end?', p. 495.

In addition to concerns about simplicity, theistic multiverse critics often suggest that the complexity (and, it is claimed, absurdity) inherent in multiverse design is at odds with the traditional Christian conception of creation. For instance, Robert B. Mann dismisses the compatibility of God and the Level IV multiverse on the grounds that ‘positing a deity that creates everything is a radical departure from standard monotheism’, particularly traditional Christian belief in God.⁸⁵ He contends that the limitless character of the multiverse necessitates a radical revision of what he sees as the biblical view of creation as ‘limited, subordinate to and dependent on God for its origin, existence, and fulfillment.’⁸⁶ Echoing Ward’s objections, Mann claims that the ‘imbecilic generation of all conceivable universes’ would undermine any alleged link between the intelligibility of God and creation. He adds that the most promising way of reconciling God and the multiverse would be to find ‘some deeper principle underlying the multiverse, one that more fully reflects the existence, glory, and intelligibility of its Creator.’⁸⁷ This longing for a deeper, ultimate intelligibility to our cosmic habitat is evocative of Simon Conway Morris’ theory of convergence, which holds that evolutionary patterns in our biological habitat tend to converge, and that human life is not an accident.⁸⁸ Both approaches seek to restore a sense of purposive design (and thus compatibility with God) in cosmology and biology that might otherwise be threatened by multiverse and evolutionary theory, respectively.

1.2.2 Positive Theological Engagement with Multiverse Thought

As the multiverse has been subjected to heightened scientific scrutiny, there has been a corresponding shift in recent years among several theologians toward a more positive and constructive engagement that denies the dichotomy between attributing anthropic fine-tunings to God or the multiverse. Not only do such figures argue that there is no reason God should not act through the multiverse, some even claim that multiple universes are precisely what we should expect if God exists.

⁸⁵ Robert B. Mann, ‘Puzzled by Particularity’, in Klaas J. Kraay (ed.), *God and the Multiverse* (New York: Routledge, 2015), p. 38. The relationship between divine and cosmic infinity will be explored in Chapter 4.

⁸⁶ Robert B. Mann, ‘Puzzled by Particularity’, p. 38.

⁸⁷ Robert B. Mann, ‘Puzzled by Particularity’, p. 39.

⁸⁸ Simon Conway Morris, *Life’s Solution: Inevitable Humans in a Lonely Universe* (Cambridge, Cambridge University Press, 2003).

Adopting Nicholas of Cusa's analogy of God as creative artist⁸⁹—also evident in the Thomist depiction of creation as *artificiatum divinae artis*, or an artistic product of divine workmanship⁹⁰—Robin Collins argues for a theistic version of the Level II multiverse on the basis that an infinitely creative God would operate through some sort of universe-generator, since this would be 'somewhat more elegant and ingenious than just creating them *ex nihilo*.'⁹¹ Similarly, Robert Spitzer argues that inflationary-type multiverse proposals will likely entail fine-tuning, thus increasing the likelihood of a supernatural explanation.⁹² Instead of negating the need for God, then, the multiverse proposal is perhaps *more* explicable in the context of a purposeful divine designer with a motive for creation; an artist expressing creativity and ingenuity, rather than an engineer concerned only with efficiency.

If the multiverse-generator itself requires design, then this could be said 'to kick the issue of design up one level, to the question of who designed the multiverse-generator.'⁹³ Keith Ward, mindful of Stephen Hawking's memorable imagery of what could possibly 'breathe fire' into the equations and make a universe for them to describe, argues that universes could not be generated by chance through the laws of quantum physics alone. He believes that a 'selection principle' would be necessary, such that a universe would be 'chosen for the sake of realizing some otherwise unobtainable value or set of states and processes.'⁹⁴ This implies a mind-like 'Ultimate Reality', with the causal power to bring universes into being, existing beyond any material universe 'like the classical idea of God as the cause of all finite existence through knowledge and intention.'⁹⁵ However, the idea that a multiverse-generator would itself require (divine) fine-tuning might be thought to be at odds with William Stoeger's warning against putting God in the scientific gaps as a 'secondary or created cause' that could one day be superseded scientifically, rather than as a primary or ultimate cause more suited to a

⁸⁹ See Chapter 4 for further discussion of Cusa's view that creativity in the cosmos is a manifestation and unfolding of divine creativity.

⁹⁰ SCG II.24.5. Aquinas, *Summa Contra Gentiles*, trans. Joseph Kenny (New York, NY: Hanover House, 1955). See Chapter 3 for further discussion of Aquinas.

⁹¹ Robin Collins, 'The multiverse hypothesis: a theistic perspective', in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 460.

⁹² Robert Spitzer, *New Proofs for the Existence of God* (Grand Rapids, MI: Eerdmans, 2010), p. 73.

⁹³ Collins, 'The multiverse hypothesis: a theistic perspective', p. 464. For a similar argument, which maintains the compatibility of Christian scripture and the multiverse, see Jeffrey Zweernick, *Who's Afraid of the Multiverse?* (Pasadena, CA: Reasons to Believe, 2008).

⁹⁴ Ward, *The Big Questions in Science and Religion*, p. 235.

⁹⁵ Ward, *The Big Questions in Science and Religion*, p. 235.

theological or metaphysical frame of reference.⁹⁶ Moreover, the theological imperative to associate multiverse generation with divine purpose is unable to provide a full account of the nature and meaning of creation, and the extent to which it might be considered a divine gift, or act of love, or sharing in God's likeness.

In a variant of God as an artist guiding multiverse design, Peter Forrest proposes a 'selection theory of creation' whereby God is aware of all possible universes and selects some of them to bring into existence, leaving others as unactualised might-have-beens: 'We may think of God as a master sculptor carving one or probably many rough figures out of a vast and variegated block of marble.'⁹⁷ Aside from appearing to closely conform to Davies' definition of naïve deism, this raises (and leaves unexplored) the crucial theological dichotomy of actuality and potentiality, and the notion of what God 'could' do. Forrest favours what he calls the 'Hyperspace' multiverse account (similar to Tegmark's Level I) over the 'bubbling' or 'splitting' universes of Levels II and III on the basis that each 'hyperspace' in these models would require its own God, necessitating a sort of polytheism that he finds unacceptably heterodox (ironically given his own unorthodox pantheistic conclusions). In his view, God does not have power to bring things into existence *ex nihilo*, which raises the problem of how the initial Hyperspace came into being. He explains that the Hyperspace *is* God, thus arriving at a modified pantheism in which God is identified not with our universe, but with the actual Universe, 'which is initially the whole Universe, pregnant with all possibility.'⁹⁸

In line with Collins, Kraay, and Leslie (discussed below), Don Page argues from a theistic perspective that the multiverse might be suggestive of an even more grand design of the universe. If God is infinitely creative, it makes sense to assume that God might create 'a physical reality much larger than the single visible part of the universe or multiverse that we can observe directly.'⁹⁹ Further, 'it might seem simpler' for God to choose many sets of physical constants (a multiverse rather than a single universe) since Page sees no reason that

⁹⁶ William R. Stoeger, 'Are anthropic arguments, involving multiverses and beyond, legitimate?', in Bernard Carr (ed.) *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 456.

⁹⁷ Peter Forrest, 'Multiverses and Theism', in Klaas J. Kraay (ed.), *God and the Multiverse* (New York, NY: Routledge, 2015), p. 82.

⁹⁸ Peter Forrest, 'Multiverses and Theism', p. 85. Yujin Nagasawa has observed that the problem of evil becomes particularly acute for multiverse pantheism, since God encompasses *all* possible evil states of affairs. Presumably Forrest would respond that, in his model, God only brings about *some* universes, according to a certain set of (non-evil) values. Yujin Nagasawa, 'Multiverse Pantheism', in Klaas J. Kraay (ed.), *God and the Multiverse* (New York, NY: Routledge, 2015), p. 186.

⁹⁹ Don Page, 'Does God So Love the Multiverse?' January 17, 2008, available through arXiv/0801.0246, p. 7. I will engage with Page's multiverse thought in Chapter 3.3.

the constants we observe should be uniquely preferred over other possibilities.¹⁰⁰ Like Carr's 'outward journey' (from a geocentric to heliocentric to galactocentric to multiverse view), Page regards the idea as a 'natural extension of our usual ideas of accepting a reality beyond one's immediate conscious perception.'¹⁰¹ As with other theistic multiverse accounts, though, Page only tentatively hints at the motive and purpose underlying multiverse creation: '[God] might prefer elegance in the principles by which He creates a vast multiverse over a paucity of universes'.¹⁰²

Tentative Metaphysics

In a defence of the compatibility of God and the multiverse that begins to move beyond strict considerations of design towards more metaphysical considerations, John Leslie outlines an account of creation that he bases on the Platonic notion (from Book VI of *The Republic*) that The Good, itself 'beyond being', is responsible for the existence of things. He depicts a model of reality in which there are infinitely many universes, each constituting a thought pattern contemplated by a divine mind. He suggests four ways in which God could be conceived in this scheme, although he is neutral as to which is most apt: God is the entire 'infinite ocean of infinite minds'; God is the infinite mind inside which we exist; God is the 'Platonic principle' that the ethical need for the multiverse to exist is its own source of existence; or God is an 'all-seeing, personality-imbued region or aspect of [an] infinite mind'.¹⁰³ While this scheme (at least somewhat) reflects the fundamental Platonic insight that there is a surplus of ultimate meaning, it requires substantial further development, particularly in terms of its conception of God, and is advanced in oblique and immanentist terms. Like various other analytic philosophers of religion, rather than exploring the metaphysical implications of his multiverse model, Leslie restricts himself to a brief consideration of how it might address a rather narrow logical problem in the field, in this case the problem of evil.¹⁰⁴

¹⁰⁰ Don Page, 'Does God So Love the Multiverse?', p. 13.

¹⁰¹ Don Page, 'Does God So Love the Multiverse?', p. 19.

¹⁰² Don Page, 'Does God So Love the Multiverse?', p. 20.

¹⁰³ John Leslie, 'God and Many Universes', in Klaas J. Kraay (ed.), *God and the Multiverse* (New York, NY: Routledge, 2015), pp. 199-200.

¹⁰⁴ Contemporary analytical philosophy of religion has tended to address the multiverse proposal in terms of its implications for logical problems, including possible worlds, the problem of evil, divine freedom, extraterrestrial intelligence, and the incarnation. See Klaas J. Kraay (ed.), *God and the Multiverse* (New York, NY: Routledge, 2015).

1.2.3 Summary

The multiverse proposal, then, has generated a mixed and at times hostile reaction from theologians, though there is an emerging (if minority) group willing to constructively engage with the proposal and in some cases to argue for its compatibility with Christian theism. However, as illustrated in this section, both sides have been largely defined (and constrained) by a persistent focus on whether the apparent fine-tuning of the physical constants is evidence of divine design or a mindless multiverse. Ironically, the scientific multiverse sceptics—the physicists and cosmologists who compare multiverse theory to religious belief in contemptuous terms—might unwittingly disclose a more fruitful approach for a theological revival of the multiverse. In the absence of direct experimental data, Davies dismisses the multiverse as ‘basically just a religious conviction rather than a scientific argument’,¹⁰⁵ while George Ellis contends that it will ‘always’ be a question of faith.¹⁰⁶ Such commentators view the claims of multiverse proponents to be immune to testing or falsification, with a deeply problematic emphasis on infinity that is riddled with logical and mathematical contradictions. For them, multiverse thought belongs more properly to metaphysics rather than science.

Although this is meant as a rebuke to sympathetic scientists, it should remind theologians that the multiverse proposal complicates and entangles the purportedly clear divisions between science and religion, and leads inescapably to metaphysical concerns of more fundamental importance than ‘design’ and with which theology can more productively engage. As Rubenstein concludes, having considered the implications and apparent experimental bases of each level of Tegmark’s hierarchy: ‘every multiverse hierarchy opens in one way or another onto uncannily metaphysical—even theological—terrain...the very observations and experiments that promise to establish the multiverse as “physics” *also* establish it as metaphysics.’¹⁰⁷ In strict etymological terms, metaphysics refers to the conjunction of the Greek words for ‘beyond’ and ‘physics’. The multiverse proposal, perhaps more than any other issue in theology and science, embodies this metaphysical nature through its vision of many universes existing beyond our known physical universe, and its contemporary scientific expression of the ancient philosophical problems of the ontological entanglement of the one and the many, of singularity and plurality, and parts and wholes.

¹⁰⁵ Davies, ‘Universes galore: where will it all end?’, p. 495.

¹⁰⁶ Ellis, ‘Multiverses: description, uniqueness, testing’, p. 406.

¹⁰⁷ Rubenstein, *Worlds Without End*, pp. 220, 226.

As such, I will address Rubenstein's (as yet) undeveloped idea that theological engagement with the multiverse should be situated on metaphysical grounds. More specifically—and in contrast to any other theological multiverse account—I will argue that metaphysical participation is best able to facilitate an effective theological retrieval of the multiverse. I will introduce the concept of participation in the following section.

1.3 Participation

In general terms, the metaphysical concept of participation refers to a structure or order of relations whereby beings share to varying degrees in a perfection received from a source that itself embodies the fullness of that perfection. Participation is central to the development and conceptual framework of Christian metaphysics. In this context, participation expresses the metaphysical relationship between created things as they share in various degrees of being with the absolute source of being, God. The idea is that everything comes from, is sustained by, is utterly dependent on, and in some way participates in God.

In this section I will sketch the meaning and development of the notion of metaphysical participation. Since participation is detailed at length in the following three chapters in the context of the relevant figure, it will be sufficient in this instance to provide a general account of the tradition, its ideas, and its critics. As such, I will begin with a summary of participation as articulated by Plato and Aquinas, two of the central figures in the tradition. I will then trace subsequent developments as the idea falls into relative disuse in the modern era, albeit with a recent revival in some academic theological circles. I will conclude with brief reflections on the thematic applicability of participatory thought to multiverse considerations.

1.3.1 *Plato and Aquinas*

Plato is the first major thinker to examine metaphysical participation and to make a sustained philosophical attempt to address ‘the problem of how to maintain a relationship between two worlds—the divine and the human—that seemed [in Athenian philosophy] to be growing further apart.’¹⁰⁸ Indeed, in ancient Greek philosophy in general, the search for reality—what might be said to be eternal, immutable, and truly *real* as opposed to the everyday world of change and uncertainty—was paramount. Plato’s theory of the Forms is the most powerful expression of this imperative to reconcile divinity and materiality, and hugely influential in terms of the development of Christian participatory metaphysics. In the Platonic vision, reality comprises two distinct but not wholly separate realms—the visible world of material things and the divine realm of Forms—whose relationship is defined and structured by participation. As such, a beautiful tree not only represents the existence of true and eternal

¹⁰⁸ Jacob H. Sherman, ‘A Genealogy of Participation’, in Jorge N. Ferrer and Jacob H. Sherman (eds.), *The Participatory Turn* (Albany: State University of New York Press, 2008), p. 82.

Beauty, but owes its beauty to its participation in Beauty itself. Given that the beautiful tree is an embodiment of the Form in which it participates and from which it receives its beauty, it is evident that the two realms—what might be thought of as *becoming* and *being*—are fundamentally related: ‘The participated Forms are of an ontologically different but nevertheless related order than the particular beings that participate in them.’¹⁰⁹ While Plato describes a profoundly relational (and therefore more theological) universe, in which the identity of each thing is not entirely located within itself but rather points beyond itself to its true source of reality, it is important to remember that the Platonic Forms are not synonymous with God. In Book VI of *The Republic*, which also examines the movement from transient, changeable objects to eternal, immutable truth, the Form of the Good (not God) is disclosed as the ultimate source of all goodness and truth in the world, responsible for the existence of the other Forms.

Although Platonic participation will be explored at length in the following chapter, it is worth noting some indicative instances of this participatory language. In the *Phaedo*, Plato depicts the physical world as ‘participating’ in the Forms, which are ‘immutable’, ‘eternal’, and ‘divine’.¹¹⁰ In the *Timaeus*, participation expresses the connection between the sensible and intelligible world, with the world of becoming depicted as a ‘likeness’ of its eternal source.¹¹¹ More broadly, Plato introduces and explores the notion of cosmic multiplicity with a cosmological vision in which the entire universe is a harmonious and beautiful unity while also composed of differences and pluralities, in a subtle interplay of the one and the many. Plato is concerned not with establishing a stark division between the physical world and the divine Forms, but with a sort of mixing of realms with the presence of transcendent forms in sensible images, governed by a participatory relationship.

This ‘in-between’ realm of participation is closely associated with love. For instance, in the *Symposium* love is depicted as the essential element in moving the soul towards its divine end: ‘Love longs for the good to be his own forever’.¹¹² To return to the earlier example of beauty, Plato depicts the ascent to absolute beauty, driven by love. Love of physical beauty in the world should be followed by a progression to recognising the beauty of the soul, followed

¹⁰⁹ Sherman, ‘A Genealogy of Participation’, p. 83.

¹¹⁰ Plato, *Phaedo*, 78-80. Plato, *The Collected Dialogues of Plato Including the Letters*, Edith Hamilton and Huntington Cairns (eds.) (Princeton: Princeton University Press, 1961). Unless otherwise referenced, all Plato texts will be sourced here.

¹¹¹ Plato, *Timaeus*. This dialogue will be considered extensively in the following chapter.

¹¹² Plato, *Symposium*, 206a.

by institutional and intellectual beauties and, finally, supreme beauty, in which every other beautiful thing participates: ‘Starting from individual beauties, the quest for the universal beauty must find him ever mounting the heavenly ladder, stepping rung from rung... until at last he comes to know what beauty is.’¹¹³ In a vivid metaphor, Socrates compares the soul to a winged chariot, pulled by two horses. Stirred by love, it is capable of soaring to the heavens and participating in the divine: ‘Such a one, as soon as he beholds the beauty of the world, is reminded of true beauty, and his wings begin to grow; then he is fain to lift his wings and fly upward’.¹¹⁴

Plato’s participatory theory of Forms is immensely significant in terms of the development of Christian metaphysics, though his student Aristotle is less sympathetic.¹¹⁵ He argues that the Forms lack explanatory power, merely providing a parallel realm of shadows whose existence is doubtful and whose status as the giver of being to sensible entities is unclear: ‘to say that [the Forms] are paradigms and that other things participate in them is to say nothing and to give poetic metaphors.’¹¹⁶ His God is the final cause, neither an efficient nor formal cause of the physical cosmos, nor the basis for creaturely participation in divine being. While he accepts the existence of forms as inherent in physical matter and possessed by things of the same type, he does not view this in participatory terms—perhaps at most as a notional or paradigmatic sort of participation, not a ‘real’ one. In this sense, whereas Plato envisions a world infused with the divinity from which it originates and in which it participates, Aristotle’s conception of divinity is separated from physicality and multiplicity.

Following Plato, Aquinas is the next major figure in participatory thought. His work is not only rich with participatory language and themes, but also occupies a central role in developing and refining the tradition by seeking to reconcile Aristotelian cosmology with the participatory vision of earlier thinkers such as Augustine and Pseudo-Dionysius. He explicitly considers questions related to creation and cosmology in participatory terms and in a way that will be seen to be of direct and perhaps surprising relevance for this thesis. His influence on subsequent participatory thought, which continues in contemporary theology, also

¹¹³ Plato, *Symposium*, 211c.

¹¹⁴ Plato, *Phaedrus*, 249e.

¹¹⁵ While Aristotle is often regarded as standing in a more complex and antagonistic relation to a participatory outlook, his work is inescapably influenced by his teacher Plato and bears traces and hints of participatory ways of thinking. For a compelling rejoinder to those who interpret the two in terms of conflict, see Lloyd Gerson, *Aristotle and Other Platonists* (Ithaca, NY: Cornell University Press, 2006).

¹¹⁶ Aristotle, *Metaphysics*, trans., Hugh Lawson-Tancred (London: Penguin Books, 2004), 991a.

necessitates his inclusion in any summary of participation. Aquinas sought to address the fundamental question of *why* anything exists, in contrast to the Platonic and Aristotelian systems of *how* things are structured and ordered. Unlike Aristotle, Aquinas accepts that an effect may participate in its cause, a causal view of participation whereby the physical world is dependent upon a perfect transcendent source for its being—precisely the kind of participatory relationship shared by God and created beings. For Aquinas, participation is a structural relationship between beings such that ‘they all share in various degrees of fullness in some positive property or perfection common to them all, as received from the same one source: all finite beings participate in existence from God.’¹¹⁷

Crucially, Aquinas modifies the Platonic notion of participation according to his own crucial distinction between essence and existence. Instead of conceiving of being in terms of essence (the *what*-ness of being), he focuses on the act of being, of existence itself, as primary. Within his creation account, the existence of all things is a gift from God, a continually received participation in and ecstatic relationship with the divine ground of existence. Participation is a measure of our radical dependence on God—or, as Aquinas puts it, ‘the very dependency of the created act of being upon the principle from which it is produced.’¹¹⁸ To exist is to be created and to experience the reception of an infinite source in whose likeness we are made.

Of further significance to Christian participatory metaphysics, Aquinas seeks to reconcile his essence-existence distinction with Trinitarian theology. In his view, God’s essence and existence perfectly coincide, unlike created beings whose essence and existence differ: ‘In God essence and being are identical.’¹¹⁹ The essence of a created being exists in the divine mind (in God’s Word, the cause of all things) as an instance of the dazzling multiplicity of ways in which creaturely participation in God is possible: ‘every creature has its own proper species, according to which it participates in some mode in likeness to the divine essence.’¹²⁰

1.3.2 *Subsequent Developments*

¹¹⁷ W. Norris Clarke, *The One and The Many: A Contemporary Thomistic Metaphysic* (Notre Dame, 2007), p. 318.

¹¹⁸ *SCG* II.18.2.

¹¹⁹ *SCG* I.12.7.

¹²⁰ *ST* I.15.2.

Although metaphysical participation is a central concept of Platonism and Thomism, and what might be viewed as a participatory approach is evident in Church Fathers (such as Gregory of Nyssa, Maximus the Confessor, Pseudo-Dionysius, and John of Damascus), it is relatively marginal in much post-17th century Western philosophy. In particular, the Platonic ascent to and participation in an eternal realm, which is absorbed and reformulated by Augustine, Anselm and Aquinas,¹²¹ assumes a hierarchy of being that is no longer accepted as self-evident in contemporary theology or philosophy. After Immanuel Kant's critique of the notion that it is possible to reason from qualities such as beauty or goodness to the actual existence of a perfect source of beauty or goodness in which those qualities participate and by which they are measured, this metaphysical framework in the Christian tradition is often viewed with suspicion.¹²²

Indeed, Francis Bacon flatly rejects participation on the grounds that, while the world might illustrate God's power and creativity, it need not bear any likeness to its divine source, just as a watch might suggest the existence of a maker but not necessarily exemplify or reflect anything about the maker's nature:

For as all works do show forth the power and skill of the workman, and not his image, so it is of the works of God, which do show the omnipotency and wisdom of the Maker, but not His image. And therefore therein the heathen opinion differeth from the sacred truth: for they supposed the world to be the image of God, and man to be an extract or compendious image of the world; but the Scriptures never vouchsafe to attribute to the world that honour, as to be the image of God, but only the work of His hands; neither do they speak of any other image of God but man.¹²³

In addition to what he refers to as Plato's 'formal' participatory turn (addressing the intelligibility of beings) and Aquinas' 'existential' participatory turn (addressing the facticity

¹²¹ Augustine draws on Plato's idea of creaturely participation in the divine mind with his view that physical beauty and order in the universe point to its eternal source: 'The supreme beauty, you give distinct form to all things and by your law impose order on everything.' Augustine, *Confessions*, trans., Henry Chadwick (Oxford: Oxford University Press, 1998), p. 10. Anselm follows this reasoning with his argument for a perfect being as the basis for degrees of perfection in the world. See Anselm, *Monologion and Proslogion*, trans. Thomas Williams (Indianapolis, IN: Hackett Publishing Company, 1996).

¹²² Kant despairs of 'so much trouble and labour lost' in the philosophical arguments provoked by Anselm's movement from the idea of a perfect being to the existence of a perfect being. Immanuel Kant, *Critique of Pure Reason*, trans., P. Guyer, & A. W. Wood (Cambridge: Cambridge University Press, 1998), p. 569.

¹²³ Francis Bacon, *Advancement of Learning* (Philadelphia, PA: Paul Dry Books, 2001), Book II, VI.

of beings), the American participatory theologian Jacob Sherman identifies a third ‘creative’ turn, a ‘mode whereby not only are essence and existence participated, but creativity itself is shared through the series of participatory mediations.’¹²⁴ He does not associate this turn (which remains in progress in contemporary theory) with any particular figure, but rather as a broad trajectory among philosophers who cannot be easily identified as Platonists and who may not use participatory language, but who nevertheless employ conceptual frameworks that are suggestive of participation. Specifically, he cites Meister Eckhart’s account of human imagination as participating in the divine mind, Benedict Spinoza’s extreme pantheistic variant of creative participation, and Friedrich Schelling’s theory that we participate in God’s creativity, thereby revealing the infinite in finite forms of human expression.¹²⁵

To Sherman’s list, it might be possible to add Gottfried Wilhelm Leibniz’s theory of the participation of monads (basic objects/substances of existence) in the divine mind, or Alfred North Whitehead’s notion of ‘ingression’, in which ‘eternal objects’ can be given expression in physical things: ‘[Ingression] refers to the particular mode in which the potentiality of an eternal object is realized in a particular actual entity, contributing to the definiteness of that actual entity.’¹²⁶ More recently, the German-American theologian Paul Tillich uses strikingly participatory language, such as his contention that participation in ultimate reality brings certainty to religious belief.¹²⁷ In light of the enduring interest in participatory ideas, even if significantly removed from Platonic and Thomistic assumptions, we might consider that the apparent turn away from participation is more akin to a kind of reconfiguration in its expression and application than an outright rejection.

Perhaps, then, the diversity of participatory metaphysical systems devised by philosophers and theologians in recent centuries suggests that the idea of participation is more resilient than might otherwise be expected. While the concepts and language have been transformed almost beyond recognition, the notion of participation—the need to explain and traverse the gap between this world and whatever lies beyond—remains as salient as ever. In fact, in recent years there has been a reconsideration of the participatory thought in Plato, Augustine, and Aquinas, particularly within the Radical Orthodoxy movement which makes use of their

¹²⁴ Sherman, ‘A Genealogy of Participation’, p. 92.

¹²⁵ Sherman, ‘A Genealogy of Participation’, pp. 94-102.

¹²⁶ Alfred North Whitehead, *Process and Reality* (New York: The Free Press, 1978), p. 23.

¹²⁷ Paul Tillich, *Dynamics of Faith* (New York, NY: Harper & Row, 1957).

insights to critique modern secularism.¹²⁸ In addition, there has been a revival in attention to participation in the twentieth century, occasioned by a number of theologians who recognise the significance of participation in Aquinas.¹²⁹

1.3.3 *Multiverse Applicability*

Given that participation is inextricably linked with issues such as universals, analogies, part-whole relations, perfection, and even the problem of evil, it will continue to be of particular relevance in the science and theology dialogue in general and in multiverse thought in particular. The basic premise of participation—that something has its reality by virtue of something other than itself—is fundamental to multiverse theory, yet this insight has been entirely overlooked in contemporary theological examinations of the multiverse.

Moreover, participation necessarily entails theologically suggestive ideas of *sharing*, *likeness*, *donation*, and *reception*—all of which (as will be discussed) might also be useful frameworks for approaching multiverse theory. For example, Aquinas argues that everything exists by *sharing* in God's existence. In blunt terms, creation in itself is nothing because of its *reception* of being from God; it is always held in existence by God's *donation* of being. Here we might think of a multiverse (or its constituent parts) as not one entity apart from God, but as held in existence in all its diversity and immensity by God's generous donation of being. We might also consider cosmological models that seem to suggest different cosmic realms in a multiverse share a common source or bear a likeness to a governing principle or source of being. These are preliminary lines of enquiry, but indicative of the openness to interaction between participatory thinking and multiverse thinking that will characterise this thesis.

In the following chapters, I will draw on Platonic and medieval participatory resources (often overlooked in multiverse discussions and in the broader theology and science field) to

¹²⁸ John Milbank, Graham Ward, and Catherine Pickstock are the leading figures in the radical orthodoxy movement, of which the 'central theological framework...is "participation" as developed by Plato and reworked by Christianity, because any alternative configuration perforce reserves a territory independent of God.' See John Milbank, Graham Ward and Catherine Pickstock, 'Suspending the material: the turn of radical orthodoxy'. In John Milbank, Catherine Pickstock, Graham Ward (eds.) *Radical Orthodoxy* (London: Routledge, 1999), p. 3.

¹²⁹ For important examples of this development, see W. Norris Clarke, *The One and The Many: A Contemporary Thomistic Metaphysics* (Notre Dame, IN: University of Notre Dame Press, 2001); Rudi te Velde, *Participation and Substantiality in Thomas Aquinas* (Leiden: Brill, 1995); Cornelio Fabro, *Participation et Causalité Selon St. Thomas d'Aquin* (Louvain: Publications Universitaires de Louvain, 1961); Louis Bertrand Geiger, *La Participation Dans La Philosophie de S. Thomas d'Aquin* (Paris: Vrin, 1942).

demonstrate that the concept of metaphysical participation provides an invaluable way for engaging with, and helping to illuminate, important ideas within multiverse theory, such as multiplicity, diversity, and infinity. I will begin with an examination of Plato's participatory metaphysics and its applicability to the startling cosmic multiplicity that is inherent in the multiverse hypothesis.

Chapter 2: Multiplicity (Plato)

In this chapter, I will bring Platonic participatory metaphysics into constructive mutual interaction with key figures in the appraisal of multiverse theory in the theology and science dialogue. I will show that, in each case, this new approach would add significant theological and philosophical depth to an area of interdisciplinary study that is insufficiently metaphysical. Plato, as the father of Western participatory thinking, provides a logical starting point for engaging systematically with questions of cosmic multiplicity, which will be the theme of this chapter.

The structure of the chapter is as follows. Initially, I will provide a general overview of Plato's doctrine of metaphysical participation, with particular reference to the development of his participatory thought in the *Phaedo*, *Parmenides*, *Sophist*, *Philebus*, and *Symposium*. Second, I will focus specifically on participation in the *Timaeus*, Plato's account of the creation of the universe, which is often cited in theological multiverse discourse yet hitherto without any reference to its participatory basis.

In the subsequent three sections, I will draw on this rich metaphysical inheritance, entirely neglected in theological responses to multiverse thought, and critically engage with important thinkers in the contemporary theology and science dialogue. First, I will take up the concluding thought in Mary-Jane Rubenstein's recent volume that the multiverse proposal raises fundamental metaphysical implications. I will apply this logic to her own account of the *Timaeus* and I will also suggest ways in which such a metaphysical perspective can enhance theological engagement with multiverse theory, such as Laura Mersini-Houghton's model of a 'connected' multiverse. Second, I will evaluate Max Tegmark's identification of Platonism with multiverse theory. I will argue that a properly metaphysical understanding of Plato would strengthen certain aspects of Tegmark's influential multiverse hierarchy in ironic and unexpected ways. Third, I will consider Verity Harte's discussion of metaphysical structure, which is of particular relevance in the creation account of the *Timaeus*. I will identify an underdeveloped strand of participatory thinking in her work in order to highlight new ways of thinking about a multiverse model from a theological perspective.

2.1 Plato on Participation

In this section, I will provide a brief general overview of Plato's participatory metaphysics, which he develops to bridge the ontological gap between the sensible and intelligible realms, and to provide a relational structure in which the two realms might be defined, explained, and reconciled. With this general background in mind, I will then consider his notion of participation in the *Phaedo*, *Parmenides*, *Sophist*, *Philebus*, and *Symposium*. It is important to consider the range of his participatory works in this manner for two reasons: first, to demonstrate the development in his language and thought over time; and second, to provide the broader context in which to consider participation in the *Timaeus*, which inherits and preserves the theory of participation in the other dialogues, and which I will discuss at length in the following section.

The concept of participation (*methexis*)¹³⁰ has a long and complex history in Western thought. In general terms, it refers to a structure or order of relationship whereby beings share to varying degrees in a positive quality or perfection, received from a source that exemplifies this perfection. Thus, for Plato, to be beautiful is to participate in the Form of Beauty itself. He is the first major figure to employ participation not just in the trivially familiar sense of sharing in something, but as a fundamental philosophical idea intended to make sense of a world in which divinity seems to be at once immediately present and radically distant.

While his participatory turn was itself singular and momentous, it was also a function of the long-standing and fraught dilemma in Greek philosophy of how to reconcile the sensible and intelligible realms. Amidst a physical world of change and contingency, the intelligible realm—eternal, immutable, perfect—seemed to be of an entirely different order. In addition, the transience and fragility of the physical world—the troubling sense that it does not contain its own reason for being—appeared to represent an inadequate basis for the possibility of intelligibility and value, and therefore for long-term social cohesion and security.

¹³⁰ The common Greek word for participation is *methexis*, whose prefix (*met-*, meaning 'with') reinforces the idea of a constitutive relationship of the two realms of sensible and intelligible being. Due to the enormous influence of the *Timaeus*, to be discussed in the next section, the term has been taken as expressing this connection. Plato, though, uses a wide range of words when describing participation or participatory themes, including *mimesis* and *mixis*, or imitation and mixture, respectively (as discussed in the *Republic*). In each case, the language is deeply suggestive of participatory notions of copying, sharing or likeness, or the conferring of being or some perfection.

In Plato's metaphysical vision, reality consists of the intelligible realm of the Forms and the human realm of physical particulars, the material things comprising our everyday experiences yet not self-grounding and always subject to change. Although these two realms should be clearly distinguished, they are not to be thought of as entirely separate or different. They share a constitutive relationship, with participation (or *methexis*) explaining the connection of one realm to the other. To return to the example of beauty mentioned above, a beautiful flower is beautiful by virtue of its participation in the Form of Beauty itself. In this scheme, the flower embodies and exemplifies the Form of Beauty in its own physical mode. The Form is ontologically different, yet fundamentally related as the constitutive cause of being (or beauty) in the participating being. The two realms are thus neither identical nor wholly different, but share a participatory and, in a sense, causal relationship: a beautiful flower is not just incidentally beautiful, but embodies Beauty by virtue of a constitutive relationship to (the Form of) Beauty itself. The notion of 'cause' in participation—with the Form of Beauty as the cause which makes things beautiful by its presence somehow within them—will be considered further in the discussion of the *Phaedo* below.

2.1.1 *Phaedo*

The *Phaedo*, a seminal dialogue of Plato's middle period,¹³¹ is the first text in which he discusses *methexis*. This arises in a dialogue between Cebes and Socrates in which the latter reflects on his youthful excitement with natural science and explanations of causes, including how things occur in the heavens and on earth. He describes Anaxagoras' stated view that 'mind' directs and causes all things, and that everything is arranged for the best in a teleological manner such that, for example, the heavenly bodies move the way they do because this is the best possible way for them to be. Upon closer study, though, Socrates came to believe that Anaxagoras did not in fact attribute causality for the order of the world to mind, but rather to reductive materialist explanations such as air, ether, and water. He sees this kind of explanation—which would attribute his presence in the room to his bones and sinews—as 'a very lax and inaccurate form of expression. Fancy being unable to distinguish between the cause of a thing and the condition without which it could not be a cause!'¹³²

¹³¹ The dialogue was widely read and commented upon by a number of ancient philosophers. For a recent assessment of such ancient readings, see Sylvain Delcomminette, Peter d'Hoine, Marc-Antonie Gavray (eds.), *Ancient Readings of Plato's Phaedo* (Leiden, Netherlands: Brill, 2015).

¹³² *Phaedo*, 99b.

Having rejected as unacceptable the materialist explanations of his youth, Socrates formulates his own alternative approach, widely referred to as his ‘second voyage’.¹³³ This nautical metaphor refers to the moment at which the natural progression of a journey with wind in the sails (representing the easy answers of the naturalists) is interrupted by an absence of wind, necessitating a second voyage made with the strenuous effort of rowing (representing the new method of ascending to the intelligible realm of the Forms and grasping the real truth of things). As noted earlier, this new approach entails the twofold classification of reality into the sensible realm and the intelligible realm of the Forms. In the latter case, he assumes ‘the existence of absolute beauty and goodness and magnitude’.¹³⁴

In the next crucial participatory step, Socrates employs these Forms as explanations for all other things: ‘It seems to me that whatever else is beautiful apart from absolute beauty is beautiful because it partakes of that absolute beauty, and for no other reason.’¹³⁵ To explain beauty in terms of colour or shape or any other attribute is to fall into Anaxagoras’ error of reductionism. Instead, he encourages his interlocutor to consider the participatory ‘explanation that the one thing that makes that object beautiful is the presence in it or association with it, in whatever way the relation comes about, of absolute beauty... it is by beauty that beautiful things are beautiful.’¹³⁶ In other words, participation expresses a *relational* order of being. The flower is beautiful by virtue of its relationship to Beauty itself, not because beauty is attributed or assigned to it in terms of its colour or shape. It is by beauty that beautiful things are beautiful. Likewise, it is by Largeness that large things are large, and by Smallness that small things are small.

In response to this preliminary participatory account—a ‘makeshift approach’ to which Socrates clings ‘no doubt foolishly’¹³⁷—one might ask how it is possible for the Form of Beauty to be present in many different things, and whether the Form might have something in common with them. Here Socrates introduces a threefold participatory structure: the Form (such as Beauty), which exists in the intelligible realm; the participated quality or perfection (beauty), which exists in many ways in different beautiful things in our physical realm; and the thing that participates in the form (such as a flower or a human), which receives the

¹³³ *Phaedo*, 99d.

¹³⁴ *Phaedo*, 100b.

¹³⁵ *Phaedo*, 100c.

¹³⁶ *Phaedo*, 100d.

¹³⁷ *Phaedo*, 100d.

participated beauty by which it is beautiful.¹³⁸ The second factor—the participated perfection, or the Form-in-the-thing—enables the transcendent Form to exist as an immanent perfection in different ways in different participants. In this way, a single Form can be in many different participants and have something in common with them. It is because of this commonality that participants may be named and identified accordingly: ‘the various forms exist, and the reason why other things are called after the forms is that they participate in the forms’.¹³⁹ As the dialogue shifts to the issue of the immortality of the soul, any misgivings about the relationship of participated perfections to Forms and participants are left to be further discussed in the *Parmenides*.

2.1.2 *Parmenides*

In this complex dialogue,¹⁴⁰ which in many ways takes up some of the unanswered questions raised by the *Phaedo*, Socrates defends his theory of participation against a series of powerful criticisms by Parmenides. In particular, he addresses the above-referenced problem, only tentatively explored in the *Phaedo*, of how it might be possible for a single Form to be present in many different participants: ‘Then each thing that partakes receives as its share either the form as a whole or part of it? Or can there be any other way of partaking besides this?’¹⁴¹ Given the description in the *Phaedo* of Forms as immutable, eternal, and divine, it would be incoherent to suppose that a single Form might be divided among many participants. Yet for a Form to be present entirely in a thing also seems to be unacceptable, given that the two realms, while related, are nevertheless ontologically distinct.

Socrates therefore proposes an alternative view of Forms as ‘patterns fixed in the nature of things. The other things are made in their image and are likenesses, and this participation they come to have in the Forms is nothing but their being made in their image.’¹⁴² So a participant is not merely like the Form in which it partakes, but is *made* (or caused) to be like it, and exists as an image of it. This causation is the result of the direction of the Form as an

¹³⁸ *Phaedo*, 102b-d.

¹³⁹ *Phaedo*, 102b.

¹⁴⁰ While scholarship on the proper interpretation of Platonic dialogues is often divided, *Parmenides* is particularly enigmatic and thus subject to a vast and conflicting literature on the best way to understand Parmenides’ criticisms of the theory of participation. See footnote 144 for an influential example of interpretative engagement.

¹⁴¹ *Parmenides*, 131a.

¹⁴² *Parmenides*, 132d. As will be seen, the idea that Forms are patterns that serve as models for their participants is also presented in the *Timaeus*.

exemplary cause (which refers to the pattern or model conceived by an intelligent being to bring about some effect) and the mental activity of the physical and intelligent agent as an efficient cause (which refers to the agent that produces the action). Both of these causalities are the subject of further examination in the *Sophist*, which will be discussed in the next subsection.

With this notion of participation of things existing as the image of Forms, it is possible to more clearly understand the origin of participated perfections and the way in which many participants might share in the same Form. To return to the earlier example of beauty, the Form of Beauty produces beauty exemplarily by directing the participant towards beauty through its intelligent activity. The combination of the direction of the Form as source and pattern, and the efficient activity of the agent, means that the Form can represent the source of many participated perfections, which remain distinct from the Forms and the participants. So the participated perfection of beauty enables the participant to be beautiful, enables the Form of Beauty to be present in the participant, and represent the commonality between the Form and its many different participants. The Form of Beauty is not divided or weakened, but remains entirely what it is (as described in the *Phaedo*) while also being shared in by many participants through the participations of beauty.

It is worth noting that the idea of Forms as patterns in nature presented in this part of the *Parmenides* is significant in terms of Aristotle's criticism of participation and, in particular, what came to be known as the Third Man argument. As noted earlier, Aristotle believes that the Forms lack explanatory power and that the notion of things participating in them is akin to poetry rather than philosophy. To a certain degree, Plato himself seems to anticipate such criticism of participatory thinking in the form of Parmenides' criticisms.¹⁴³ In a piece of reasoning that was further developed by Aristotle and came to be known as the 'Third Man' argument, Parmenides suggests that participatory metaphysics implies an infinite regress in the sense that if something (such as a beautiful flower) is what it is by virtue of participation in the form of what it is, then a third form would be required to account for what both the thing and its form are, and so on. On this account, participation merely adds another thing or realm to be explained, which would itself then require explanation, *ad infinitum*.

¹⁴³ 132a-b.

While the logical structure of this argument has been the subject of intense philosophical scrutiny,¹⁴⁴ it overlooks the radical difference in the ontological status of that which participates and that in which it participates. For Plato, the realm of the Forms is not equivalent or comparable to the sensible realm. Rather, the Forms are transcendent and should not therefore be understood in the same logical terms as imperfect physical entities. There are many beautiful things that might participate in the Form of Beauty, but the Form itself is not just another thing to which other beautiful things can be compared, but a wholly different order of being. In addition, the criticism of an infinite regress does not take into account the third factor of participated perfections, and the way in which they relate to Forms and participants, as described above.

2.1.3 *Sophist*

The *Sophist* is a late Platonic dialogue in which he continues to develop his metaphysics having subjected the theory of participation to sustained criticism in the *Parmenides*. He provides additional clarification about the causal factors of participation, particularly in terms of the efficient causality of the intelligent participant. If such an agent, operating on the basis of intelligence, is central to participation (as is the Form as model or pattern), then intelligence itself must be of a higher order than might generally be supposed. In a rhetorical flourish at the end of a debate about reality between two characters—‘a battle of gods and giants’,¹⁴⁵ or whether reality is physical or non-physical—Plato (through the words of the Stranger) appears to elevate intelligence to the same level of reality occupied by the Forms: ‘But tell me, in heaven's name, are we really to be so easily convinced that change, life, soul, understanding have no place in that which is perfectly real—that it has neither life nor thought, but stands immutable in solemn aloofness, devoid of intelligence?’¹⁴⁶

Since intelligence is so valuable that it should be regarded as perfectly real, it is reasonable to infer that Plato similarly believes that the kind of efficient causality brought out about by intelligent participating agents is a vital aspect of participation. In his final analysis of the philosopher who truly values intelligence, he dismisses the false dichotomy of the gods/giants

¹⁴⁴ See, for example, Gregory Vlastos' important article in which he celebrates (and logically scrutinises) Plato's willingness to construct an argument that, if successful, would be damaging to the foundations of his own life's work. Gregory Vlastos, 'The Third Man Argument in the *Parmenides*', in *Philosophical Review* 63 (1954), pp. 319–349.

¹⁴⁵ *Sophist*, 246a.

¹⁴⁶ *Sophist*, 249a.

battle in which reality is either changeless (the Forms) or changing (intelligence). Instead, the philosopher must declare that ‘reality or the sum of things is both at once—all that is unchangeable and all that is in change.’¹⁴⁷ In participatory terms, this suggests that a comprehensive vision of reality includes both exemplary and efficient causes (the Forms and intelligent agents) as key factors in allowing the multiplicity of creation to participate in the eternal, divine, immutable Forms.

Plato goes on to employ the metaphor of divine and human artistry to illustrate the nature of exemplarity in participation, which will also be an important aspect of the discussion in the next sub-section on the *Timaeus*. All physical things in our sensible world come into being, not as a result of spontaneous natural causes, but ‘divine craftsmanship’.¹⁴⁸ Everything in existence is a product of divine artistry, coming from ‘a cause which, working with reason and art, is divine and proceeds from divinity.’¹⁴⁹ Just as a human artist might build or paint according to a certain model or pattern, so the divine Forms produce effects according to a pattern. Each thing in our human realm has been made to be a likeness of and a participation in that divine pattern, such that there are two products of divine workmanship—‘the original and the image that in every case accompanies it.’¹⁵⁰ In this sense, the entire physical universe is defined and permeated by participation, with the universe itself standing as a work of divine art, a likeness of its perfect image.

2.1.4 *Philebus*

In the *Philebus*, generally agreed to have been composed in the last two decades of his life, Plato returns to the problem of participation, particularly in terms of how Forms might relate to particulars in the sensible world. In the dialogue, Socrates confronts the dilemma of the vast diversity and multiplicity of being. This threatens to collapse into the kind of infinite regress discussed earlier: he suggests that the one-many dilemma is central to the plausibility of the Forms themselves; that is, how it can be possible for Forms to retain their unity if they are, so to speak, split up or divided among an indefinite number of sensible particulars: ‘[how are we to conceive of] this single unity [that] subsequently comes to be in the infinite number of things that come into being—an identical unity being thus found simultaneously in unity

¹⁴⁷ *Sophist*, 249d.

¹⁴⁸ *Sophist*, 265c.

¹⁴⁹ *Sophist*, 265c.

¹⁵⁰ *Sophist*, 266c.

and in plurality.’¹⁵¹ Socrates argues that all things consist of a one and a many, ‘and have in their nature a conjunction of limit and unlimitedness.’¹⁵²

Socrates proceeds to delineate a fourfold classification of beings. First, he describes the Unlimited, encompassing all that allows an indefinite variation in magnitude or degree. For instance, he believes that temperature is indicative of an unlimited or boundless quality, since anything can be hotter or colder than it already is: ‘Once you give definite quantity to “hotter” and “colder” they cease to be; “hotter” never stops where it is but is always going a point further, and the same applies to “colder”; whereas definite quantity is something that has to be stopped going on and is fixed. It follows therefore from what I say that “hotter”, and its opposite with it, must be unlimited.’¹⁵³ Second, as indicated in the previous quotation, Socrates describes Limit, which refers to whatever does not allow for variance, such as precise mathematical numbers, ratios, and measurements. Third, there is said to be a ‘mixture’ or combination of both of these constituents in which the precision of limit is applied to a magnitude of a certain (unlimited) quality in the correct proportion. For example, there is a definite ratio or balance of ‘hot’ or ‘cold’ or ‘moist’ or ‘dry’ indicative of good health, and which at a certain point should not be further modified. The process of changing a quality such as temperature and then arriving at a determination of the correct ratio (at which limit can measure and regulate potentially unlimited degrees of variance) is, according to Socrates, a ‘coming-into-being’.¹⁵⁴ Fourth, Socrates attributes the agent responsible for the process of bringing proper mixtures into being to a kind of universal intelligence that imposes limit on the unlimited and thereby facilitates all perfections such as goodness, beauty, and truth.

With this fourfold classification of being, Plato suggests that a metaphysics of participation is the only way to reconcile the one and the many, to bring meaning and coherence to the multiplicity of reality, and to help bridge the gap between the sensible and intelligible realms. The third category of mixture, which might be associated with the way in which universals (or Forms) can exist in diverse concrete particulars, is directed by divine intelligence (the fourth category) working as an exemplary cause. With the Limit and Unlimited reconciled in

¹⁵¹ *Philebus*, 15b.

¹⁵² *Philebus*, 16c-d.

¹⁵³ *Philebus*, 24d.

¹⁵⁴ *Philebus*, 26d.

mixture, which is itself ordered toward and participating in divine intelligence, it becomes possible for the philosopher to begin to bring order to the cosmic manifold.

2.1.5 *Symposium*

In the *Symposium*, Plato depicts his celebrated metaphysical ascent to absolute beauty in strikingly participatory language. This ascent expresses his central participatory insight that what lies beyond the human realm is eternal and most important. He depicts love as the essential element in stirring the soul to seek its creator; it ‘longs for the good to be his own forever’.¹⁵⁵ The ascent towards beauty and divinity begins with love of physical beauty, then recognition of the beauty of the soul, and then recognition of institutional and intellectual beauty, and ultimately apprehension of divine beauty, in which every other beautiful thing participates: ‘the quest for the universal beauty must find him ever mounting the heavenly ladder, stepping from rung to rung... to the special lore that pertains to nothing but the beautiful itself—until at last he comes to know what beauty is.’¹⁵⁶ Given the centrality of participation to Plato’s thought, to live a good life is to be drawn by desire and love towards the beauty of participation. This might be thought of as the *aesthetic* side of participation. The beauty and plenitude and perfection of the intelligible realm draw finite beings toward their perfection. For Plato, beauty is an alluring force which draws us on, towards knowledge and wisdom, but also towards what lies beyond our own physical realm.¹⁵⁷

In fact, the role of love in Platonic participatory metaphysics is related to the cosmological account of the universe’s features in the *Timaeus*, to be discussed in the following section. Physical motion is generated by the ontological gap between eternal perfection and physical finitude. The beauty and perfection of ideal being in the intelligible realm draws created being in our contingent physical world toward its perfection. In this sense, motion itself is the mechanism by which finite beings participate in and embody the perfection of the intelligible realm. The desire for beauty, driven by love, draws us towards participation in perfection:

¹⁵⁵ *Symposium*, 206a. See also Catherine Osborne’s important account of the central role of love in Plato (and subsequent Christian thought), in which love is understood not in transactional terms of motive, but in terms of an ontological vision in which the beloved is transfigured by love. Catherine Osborne, *Eros Unveiled: Plato and the God of Love* (Oxford: Clarendon Press, 1994).

¹⁵⁶ *Symposium*, 211c.

¹⁵⁷ In the *Phaedrus*, Socrates compares the soul to a winged chariot, pulled by two horses. Stirred by love, it is capable of soaring to the heavens and participating in the divine, which is the true beauty by which the wings of the soul are nourished and grow. See 246a, 249e.

‘For Plato, then, insofar as he makes participation central, the good life, the religious life, and the philosophic life come together in an erotic journey toward the persistent discovery of beauty in the participatory mediations of the phenomenal world.’¹⁵⁸

2.1.6 Summary

In Plato’s metaphysical vision, the human realm participates in the divine realm. In the *Phaedo*, he explains how things participate in their Forms, which cause the things to be what they are through the presence of participated perfections. In the *Parmenides* and the *Sophist*, he connects participation with exemplary and efficient causality to explain the production of participated perfections without compromising the unity or the transcendence of the Forms. In the *Philebus*, he applies a metaphysic of participation to account for the multiplicity of the physical universe, while he provides vivid and poetic metaphors of the ascent to the divine realm of the Forms in the *Symposium*, as well as in the *Phaedrus* and the *Republic*. In light of the foregoing ideas and themes, it will now be instructive to focus in detail on the *Timaeus*, whose participatory metaphysical framework is directed to cosmological ends and is therefore of particular relevance to the dialogue with scientific multiverse theory.¹⁵⁹

2.1.7 *Timaeus*

In this section, I will discuss Plato’s cosmological account of the formation of the universe, with particular focus on its participatory language and themes, which broadly preserve the theory of participation inherited from the other dialogues. The reason for giving over a full section to consider participation in the *Timaeus* is that, as will be seen in the following section, this dialogue is often cited in theological studies of multiverse theory as an important historical example of a philosophical system that rejects cosmic pluralism. However, such a literal and narrow reading misses the profound value of the text’s rich and complex participatory thought. In the *Timaeus*, the world of becoming is a likeness of its intelligible archetype, a world which finds its meaning only in its origin and participation in the divine realm of the Forms.

¹⁵⁸ Sherman, ‘A Genealogy of Participation’, p. 85.

¹⁵⁹ A. E. Taylor’s overview of the cosmological and scientific aspects of the *Timaeus* is particularly useful in terms of providing an extended survey of the historical and philosophical context of the dialogue. See A. E. Taylor, *Plato: The Man and His Work* (Mineola, NY: Dover Publications, 2001), pp. 436-462.

Initially, I will discuss the participatory metaphysics underpinning his cosmological vision in the *Timaeus*. I will demonstrate how Plato's metaphysics of participation expresses the connection between the sensible and the intelligible world. I will then focus on the important concept of the Receptacle, which functions as the fundamental participant in our physical universe. In the subsequent three sections of this chapter, I will draw on Plato's participatory metaphysics, with specific attention to the *Timaeus*, in order to engage with three key thinkers in contemporary multiverse discourse at the intersection of science, theology, and philosophy.

Cosmology and Participation

The question of whether reality is one or many is perhaps given its most significant philosophical expression among Plato's dialogues in the elaborate and multifaceted dialogue of the *Timaeus*, written in the 4th century BC during the later stages of Plato's career. Its titular character asks, 'Are we right in saying that there is one world, or that they are many and infinite?'¹⁶⁰ For Timaeus, arguing against the contemporary atomistic belief in innumerable worlds, the universe's eternity can only be secured by its singularity as one permanent universe, unthreatened by any 'external' realities or forces. He seeks to describe the creation and the nature of the cosmos, in a way that is scientific insofar as it delineates an orderly cosmos which behaves according to certain harmonious proportions and patterns, but also theological insofar as the cosmos is understood as an active, living, complex realm of becoming, and in terms of its participation in its transcendent origin and purpose.

Initially—and *pace* the later Aristotelian critique of participation as introducing a kind of unhelpful poetical ambiguity and perhaps even an entirely new layer of complexity—it is important to recognise that the *Timaeus* is inescapably and intentionally poetic. In its imaginative treatment of the rational ordering of the cosmos, patterned on and participating in its eternal source, the dialogue should not be interpreted narrowly and literally in the manner of a piece of scientific literature. Given the changing nature of the cosmos and its constituent parts, Plato's participatory vision is inherently poetic, imprecise, incomplete, and at times even inconsistent. That is not, however, to say that the dialogue (and, in particular, Plato's participatory metaphysics) is not intended to express truth. The participatory character of the

¹⁶⁰ *Timaeus*, 31a.

dialogue is a kind of truth that cannot be subjected to the modern logic or language of materialism.¹⁶¹

For Plato, the order and beauty of the universe is striking and requires an explanation. While his protagonist Timaeus follows his Atomist predecessors in maintaining that the formation of the cosmos represented an ordering of disorder, he differs in attributing this process not to the mindless work of a random principle, but to the creative, purposeful creation of a divine craftsman, or creator God, the ‘Demiurge’. This Demiurge imposes order upon preexistent visible chaos to create a universe that is good and ordered by necessity and emblematic of an unchanging and eternal model: ‘God desired that all things should be good and nothing bad... out of disorder he brought order, considering that this was in every way better than the other.’¹⁶² The visible universe is declared to be a living creature made in the likeness of (and therefore a participation in) an eternal original, a kind of generic Form of Living Being containing within it the Forms of all species that inhabit the cosmos: ‘But let us suppose the world to be the very image of that whole of which all other [beings] are portions. For the original of the universe contains in itself all intelligible beings, just as this world comprehends us and all other visible creatures.’¹⁶³ In other words, the Demiurge, finding the universe to be disordered and inharmonious, fashioned it after the likeness of an eternal model belonging to the divine realm of Forms from which it derives its being and meaning.

This eternal model, according to which the Demiurge generates order out of existing chaos, exists independently of the Demiurge. For Plato, this Form of the Living Creature contains within it the Forms that correspond with the different kinds of creatures and parts in our visible world. On this account, the whole visible universe is a living creature, participating in and corresponding with the intelligible living creature. As a consequence, the physical universe—as an image of, or participant in, divine perfection—is ‘the greatest, best, fairest, most perfect’.¹⁶⁴ Since the Form of the Living Being, serving as the model to direct divine creative activity, is the most ideal and complete intelligible reality, it follows that our universe’s sharing in its perfection provides the highest degree of goodness and beauty for the whole and each of its constituent parts.

¹⁶¹ Carl Sean O’Brien has recently provided a helpful overview of the divide in modern scholarship about whether to interpret the *Timaeus* (and specifically the Demiurge) in literal or metaphorical terms. Carl Sean O’Brien, *The Demiurge in Ancient Thought* (Cambridge: Cambridge University Press, 2015), pp. 18-35.

¹⁶² *Timaeus*, 30a.

¹⁶³ *Timaeus*, 30c-d.

¹⁶⁴ *Timaeus*, 92c.

In spite of his initial emphasis on cosmic singularity, Plato proceeds to radically complicate his cosmological portrait with layers of multiplicity and complexity. The world's body, he reports, consists of water, air, fire, and earth, carefully proportioned to provide the highest degree of internal unity.¹⁶⁵ The world's soul, which was made before the body and might therefore be expected to be immaterial, is in fact composed of a bewildering mixture of mixtures. With mystifying symbolism whose precise meaning is not entirely clear and has been variously interpreted, Timaeus explains that, in addition to 'indivisible existence' (the eternal realm of perfect being) and 'divisible existence' (the temporal world of becoming), the Demiurge adds and mixes 'a third and intermediate kind of being.'¹⁶⁶ He fashions a 'compound intermediate' between sameness and difference, and finally blends the three together into one form. Although the world soul thereby comprises one form, it is a mixture with many components and subdivisions. In this way, the very soul of the cosmos is an entanglement of, and multifaceted negotiation between, sameness and difference, oneness and multiplicity.

For Plato, both the world soul and all individual souls in the cosmos belong to and participate in the realms of both being and becoming. As eternal and indestructible, the soul bears a likeness to the unchanging Forms in the divine realm, and particularly the eternal model on which all of creation is patterned. At the same time, though, the soul is unlike the Forms in the sense that it is alive and intelligent and therefore subject to the contingencies of change and time. Like Nicholas of Cusa's idea of an infinite God without centre and circumference (to be discussed in chapter four), Plato's world soul is described as extended throughout the centre and circumference of creation: 'And in the center he [the Demiurge] put the soul, which he diffused throughout the body, making it also to be the exterior environment of it, and he made the universe a circle moving in a circle'.¹⁶⁷ In this sense, it shares in the divided, third form of being mentioned above, extending to and pervading every part and every living creature in the cosmos. This is the intermediate form of existence, mixing the temporal and eternal realms. Individual souls comprise the inferior residue of the world soul, and are ultimately embodied in physical bodies.

¹⁶⁵ *Timaeus*, 31b. In participatory terms, it is also worth noting that fire, air, water, and earth are caused to be like their Forms by divine activity shaping them from triangles into geometrical solids (53c-55c).

¹⁶⁶ *Timaeus*, 35a.

¹⁶⁷ *Timaeus*, 34b.

Having subverted his own insistence on oneness, Timaeus proceeds to subvert his entire creation narrative by abruptly deciding to ‘return again and find another suitable beginning’.¹⁶⁸ This is because, he explains, the Demiurge has been acting subject to limitations over which he has no control, and that—halfway through the story—it is now necessary to go back to the *real* beginning of the story, not to discuss divine intelligence, but to consider the governing principle of ‘necessity’. In the first part of the dialogue, it could be said that Plato was observing the universe from above and beyond, while the second part is more concerned with the perspective and the limitations and the inheritances of the Demiurge. The structure of the cosmos is determined as a matter of necessity, and it is not entirely open to the Demiurge to change or eliminate the structures and their properties. The properties enable the Demiurge to act in certain desirable ways to bring order out of disorder and to fashion the universe as closely as possible according to divine intelligence. The universe is therefore a mixed product of the combination of reason and necessity, not a chance product of random natural forces, but highly expressive of rational and intelligible design.

Receptacle

In addition to its portrayal of the participation of the physical universe in its perfect model, the *Timaeus* is also significant in terms of metaphysical participation because Plato describes in considerable detail what might be said to function as the basic participant through the universe: the Receptacle. It represents a third form of reality, in addition to the eternal model and physical world already outlined in the dialogue. It is ‘the receptacle, and in a manner the nurse, of all generation’¹⁶⁹ in which the cosmos becomes itself. The universe is not self-subsisting, but requires this Receptacle to support and sustain it. The Receptacle is ‘invisible and imperceptible by any sense, and of which the contemplation is granted to intelligence only.’¹⁷⁰ It is ‘the universal nature which receives all bodies’, receiving all things but never departing from its own nature.¹⁷¹ It is not matter, nor is it out of which things are made, but rather *in which* our physical world comes to exist. The Receptacle has no distinctive qualities of its own before others enter it: ‘she is the natural recipient of all impressions... the forms which enter into and go out of her are the likenesses of eternal realities modeled after their

¹⁶⁸ *Timaeus*, 48a.

¹⁶⁹ *Timaeus*, 49b.

¹⁷⁰ *Timaeus*, 52a.

¹⁷¹ *Timaeus*, 50b.

patterns in a wonderful and mysterious manner'.¹⁷² Timaeus likens the Receptacle to a quantity of plastic material, molded and remolded into different shapes. The Forms impress themselves in some mysterious way on the Receptacle, changing and modifying it in a constantly shifting and complex pattern. As Receptacle, its purpose is to be the participant of participated perfections of Forms through the divine intelligence bringing into existence the physical universe.

To illustrate the concept of the Receptacle, Timaeus draws an analogy between the father, the mother, and the child, and the eternal Form, the Receptacle, and Becoming: 'we may liken the receiving principle to a mother, and the source or spring to a father, and the intermediate nature to a child'.¹⁷³ Strikingly, for the purposes of an account of Platonic participatory metaphysics, Timaeus goes on to suggest that the Receptacle is not only invisible, characterless, and all-receiving, but that it should be seen as an 'invisible and formless being which receives all things and in some mysterious way partakes of the intelligible, and is most incomprehensible'.¹⁷⁴ This is ambiguous language, but might be understood as a kind of bridge or link between the realms of being and becoming, or of the former somehow informing and imprinting upon the latter.

Before the coming into being of the ordered world, there were three 'distinct things': being, the Receptacle (or *khora*), and becoming. Without a Receptacle for it to come into being, there was no becoming as such, just a primordial state of chaos in which the contents of the cosmos were held in non-relation, continually being separated and scattered in various directions.¹⁷⁵ Yet in the pre-cosmic state, prior to the activity of the Demiurge, the Receptacle is erratic and disorderly, and its contents—which subsequently come to be known and shaped as fire, air, water, and earth—are merely 'faint traces of themselves'.¹⁷⁶ Thus, the role of the Demiurge was to ensure that these elements became genuine images (or participations) of their respective Forms and to ensure that their proportion and volume would be suitable to enable the existence of a cosmos that would be patterned on and participating in its ideal model.

¹⁷² *Timaeus*, 50c.

¹⁷³ *Timaeus*, 50d.

¹⁷⁴ *Timaeus*, 51a-b.

¹⁷⁵ *Timaeus*, 52e.

¹⁷⁶ *Timaeus*, 53b.

The ordered cosmos, as constituted by the interplay of divine intelligence and necessity, is a result of bringing the three aspects of reality (being, Receptacle, becoming) into existence by relating, mixing, and entangling them. Although the Forms might seem to exist beyond the world of becoming, the mechanism for their existence in the context of our cosmos is the Receptacle. In this sense, the three realities are interdependent, each a part of the mixed fabric and layered structure of the cosmos—which itself embodies multiplicity and plurality to a far greater extent than is initially suggested in the text and is generally admitted in the readings of multiverse sceptics who seek to conscript Plato as a proponent of a simplistically singular universe.

2.1.8 Summary

In the *Timaeus*, Plato presents a physical universe that is the most excellent, beautiful, and perfect creation possible, as a consequence of its likeness to and participation in an eternal model, brought about by the work of the divine workman operating according to intelligence and necessity. In the dialogue, Forms serve as both models (in which physical things participate) and goals (by which the physical universe is caused to be good and beautiful). The Receptacle, whose description is enigmatic and elusive, seems to function as an initially errant and disorderly factor, which nevertheless proves to be the essential and pervasive participant of the transcendent Forms.

Ultimately, *Timaeus*'s narrative, which is itself multifaceted and intricately structured, with its mixture of mixtures, or multiplicity of multiplicities, is entirely consistent with the participatory insight that a changing world of finitude is best able to reflect the infinite and infinitely creative God through overwhelming diversity. Moreover, the participatory vision of Platonic cosmology outlined in the *Timaeus* provides a particularly fertile ground on which to reconsider the metaphysical implications of multiverse theory, which will be the focus of the rest of this chapter.

2.2 Mary-Jane Rubenstein on Multiplicity

In this section, I will critically evaluate the American postmodern philosophical theologian Mary-Jane Rubenstein's imaginative and important work on multiverse cosmology. I will argue that her acute insight that theological receptions of multiverse thought have been insufficiently metaphysical might usefully be applied to her own study of Platonic cosmology, which is excessively preoccupied with postmodern questions of perspective and is also marked by elusive and ambiguous language. To that end, I will argue that her reading of Plato's *Timaeus* fails to consider the participatory nature of the dialogue's cosmological narrative in general, as well as the role of the Receptacle in particular. I will propose that an explicitly participatory reading of Plato would be more consistent with her own demand for rigorous metaphysical scrutiny of cosmic multiplicity. Finally, I will apply just such a participatory approach to the American cosmologist Laura Mersini-Houghton's connected multiverse theory. I will note that multiverse theorists like Mersini-Houghton cannot avoid using participatory concepts and thus inescapably find themselves in this territory, bearing witness to the participatory tradition.

2.2.1 Rubenstein on Multiverse Cosmology

In the context of theological engagement with scientific multiverse thought, Mary-Jane Rubenstein's recent study, *Worlds Without End: The Many Lives of the Multiverse*, is highly significant for two principal reasons. First, her work is the most comprehensive theological excavation of the historical and conceptual roots of the current debate on multiverses.¹⁷⁷ Second, she concludes with the intriguing (and regrettably brief) insight that multiverse cosmology implies an 'ontology that entangles the one and the many... [and] a theology that asks more interesting and more pressing questions than whether the universe has been "designed" by an anthropomorphic, extracosmic deity.'¹⁷⁸ The idea that theological multiverse engagement should move beyond narrow questions of design to consider metaphysical issues is central to this thesis and, more broadly, is likely to be pivotal in terms of encouraging theologians to adopt a more constructive and historically-informed approach to multiverse thought.

¹⁷⁷ Victor Stenger's recent historical survey is similar in scope, but less philosophically rigorous and more dismissive of the role of theology in multiverse thought. See Victor Stenger, *God and the Multiverse: Humanity's Expanding View of the Cosmos* (Amherst, NY: Prometheus Books, 2014).

¹⁷⁸ Rubenstein, *Worlds Without End*, p. 236.

For Rubenstein, multiverse cosmology—even if it could be subject to empirical testing and falsification—is inescapably metaphysical in two ways. In a broad sense, she uses the term metaphysics to refer to that which is beyond the physical—the idea that multiverse theories ‘posit realms that, however imprinted on or entangled with our own, remain inexorably *beyond* it.’¹⁷⁹ In a more technical philosophical sense, she regards multiverse theories as metaphysical because they address the fundamental question of ‘what is’—the idea that Western metaphysics is an ongoing journey to ascertain whether reality is one or many. Throughout her rich historical survey, she traces the cosmological expressions of this conundrum, from Plato to Aristotle, Aquinas to Descartes, Giordano Bruno to Kant, and among modern scientists and philosophers. She discovers that proponents of cosmic singularity find themselves colliding with plurality (as she argues in the case of the *Timaeus*), and vice versa (as with the cosmic pluralist Bruno ultimately admitting that unity is paramount), such that each episode merely serves to demonstrate that ‘the world is neither one nor many, but many in its oneness or one in its manyness or many in a certain light and one in another.’¹⁸⁰

According to Rubenstein, this emphasis on cosmic multiplicity has implications for how we might understand the ‘many worlds’ of multiverse theories. In some way, these worlds must be ontologically connected (and not wholly ‘other’) if they are ever to be the subject of scientific observation and experimentation. At the same time, though, they must remain extremely ‘other’, separated by space (as in inflationary or bubble universes), time (as in cyclical universe models), or branches of reality (as in the many-worlds interpretation of quantum mechanics). While Rubenstein artfully and imaginatively traces the persistence of cosmic multiplicity, or the ‘many-oneness’ of reality, throughout the history of western thought on many worlds or universes, she arrives at a rather ambiguous, elusive, and equivocal conclusion. She tentatively hints that, from a divine perspective, ‘it may be that... there is only one world. It may be that there are many.’¹⁸¹

This playful, wayward, vague and mystifying language is a function of the self-consciously postmodernist tradition in which she operates and which often serves primarily to obscure the

¹⁷⁹ Rubenstein, *Worlds Without End*, p. 227.

¹⁸⁰ Rubenstein, *Worlds Without End*, p. 228.

¹⁸¹ Rubenstein, *Worlds Without End*, p. 228.

thrust of her arguments. As we will see, her reading of the description of the Receptacle in the *Timaeus* is heavily influenced by Jacques Derrida, and her language and style are similarly in keeping with the obscure and enigmatic way in which the French philosopher expresses his ideas. In another instance of the elusive nature of her project, she closes with what she refers to as an ‘unscientific postscribble’ in which she speculates that whether the universe is one or many, infinite or finite, will depend on ‘the theoretical and experimental configuration that examines it. In other words, the shape, number, and character of the cosmos might well depend on the question we ask it.’¹⁸² This is another instance of her ‘perspectival’ reading of the multiverse whereby its singularity or plurality, or its finitude or infinitude, depends on the theoretical configuration under which it is scientifically examined. In this sense, her approach echoes the recent turn among some postmodern theologians to ‘polodoxy’, the idea that the decline of religious institutions and authority will lead us to recognise the value of a multiplicity of individual perspectives and their interrelations.¹⁸³ It is sufficient to observe in this instance that such an unmistakably postmodern approach is not evident in Plato, for whom participation expresses the relationship between the sensible and intelligible realms. He is thereby concerned with eternal and unchanging truth, not the kaleidoscope of perspectives coveted by polodoxists.

Having identified the ‘many-oneness’ inherent in many philosophical antecedents of multiverse thought, Rubenstein opts not to focus on the metaphysical implications in any systematic manner. While the scope of her project is clearly to provide a broad historical perspective to the current multiverse debate, many of her case studies would be enriched by adopting a participatory approach that would be more in line with the kind of metaphysical outlook she advocates at the end of her study. This is particularly true in terms of her treatment of Plato’s *Timaeus*, which it would now be useful to examine.

2.2.2 Rubenstein on the *Timaeus*

As Rubenstein observes, the cosmological vision of the *Timaeus*—which seems to privilege singularity over plurality, order over disorder, and unity over difference—would be

¹⁸² Rubenstein, *Worlds Without End*, p. 235.

¹⁸³ See Catherine Keller and Laurel C. Schneider (eds.), *Polydoxy: Theology of Multiplicity and Relation* (New York, NY: Routledge, 2011). In Chapter 4 I critique Keller’s postmodern interpretation of infinity in Nicholas of Cusa. She anachronistically reads a postmodern celebration of perspectives into Cusa, who sees cosmic infinity as an image of the infinite God and as a way we might come to know God.

profoundly influential in setting the trajectory of Western cosmology up to the present day. The conventional—and overly literal and insufficiently metaphysical—reception of this vision also accounts for why it is often cited in the theology and science dialogue as an important example of a philosophical system that rejects cosmic pluralism and is therefore of doubtful value or relevance to multiverse discourse.¹⁸⁴ Against these standard readings, she correctly identifies within the *Timeaus* a subtle yet highly consequential insistence on multiplicity: ‘Plato offers a unique and undivided cosmos that is nevertheless composed of difference, mixtures, and pluralities.’¹⁸⁵ In her view, Plato’s cosmological vision is therefore better understood as an *interplay* of singularity and plurality, of order and disorder, and of unity and difference. It leaves us not with a simplistic emphasis on oneness, but with a ‘strange dance between the one and the many.’¹⁸⁶

Initially, Rubenstein associates Plato’s project of ‘mixing the multiple’ with his description of the world’s soul, which (as discussed earlier) appears to comprise a threefold combination of aspects of the Forms, the physical world, and a third kind of mixed intermediate between them. These three components are then mixed into a single unity, which she describes with characteristic obscurity as ‘a conglomeration of indivisible existence, divisible existence, indivisible sameness, divisible sameness, indivisible difference, divisible difference, neither divisible nor indivisible existence, neither divisible nor indivisible sameness, and neither divisible nor indivisible difference.’¹⁸⁷ The Demiurge then finishes the soul by making subdivisions, each containing a mixture of the three components. Rubenstein proposes to classify this bewildering ‘cosmic intermingling’ as an instance of ‘the multiple’.¹⁸⁸ Whenever the *Timaeus* seems to assert the oneness of the cosmos, in the manner attributed to the text in most theological multiverse readings, it actually ‘collides with something like multiplicity...

¹⁸⁴ In his recent collection of theology and multiverse essays, Klaas Kraay notes that Plato ‘rejected the idea of a plurality of worlds’. Klaas J. Kraay, *God and the Multiverse* (New York, NY: Routledge, 2015), p. 2. Likewise, Stenger highlights the *Timaeus* as a key instance in Greek cosmology of the rejection of multiple universes. In particular, he laments the long-term influence of the theological character of Plato’s cosmological vision: ‘[t]he often-unquestioned authority of Plato...has not always been to the benefit of human progress.’ Stenger, *God and the Multiverse*, p. 48. Multiverse sceptic Rodney Holder also suggests that the *Timaeus* is concerned with describing the creation of a singular universe. Rodney Holder, *Big Bang Big God* (Oxford: Lion Books, 2013), p. 67.

¹⁸⁵ Rubenstein, *Worlds Without End*, p. 18.

¹⁸⁶ Rubenstein, *Worlds Without End*, p. 24.

¹⁸⁷ Rubenstein, *Worlds Without End*, p. 25. In the dialogue, this single unity is referred to as ‘one form’. *Timaeus*, 35a.

¹⁸⁸ Rubenstein, *Worlds Without End*, p. 26.

one cannot help but agree that the will toward oneness in the *Timaeus* finds itself multiply interrupted.’¹⁸⁹

Having detailed this mixture of mixtures, Rubenstein proceeds to consider the introduction of the Receptacle as the dialogue turns to its second precosmic beginning. Although she uses notably participatory language to describe the Receptacle (referring to its function in terms of reception, bearing, and tracing),¹⁹⁰ her reading owes more to postmodernism and deconstruction than a Platonic or Christian Neoplatonist account. In line with Derrida’s conception of the Receptacle as the space of deconstruction, eluding all history, theology, and truth,¹⁹¹ Rubenstein describes it in terms of non-reality and non-being as ‘nothing’ and that which ‘is not’.¹⁹² She goes on to argue that the work of creation is to bring things into existence by relating and mixing them together. So ‘chaos’ refers to the unrelated plurality of being, Receptacle, and becoming, while ‘cosmos’ refers to their ‘interrelation—the mixture of mixtures that worlds the world.’¹⁹³ On this account, the three distinct realities can only be said to exist in relation to each other, having been mixed together by necessity: ‘each of them is woven into the (mixed) fabric of the cosmos, becoming itself only as part of this melee... [so a world is born] from unrelated differences to their related mix—from plurality, one might add, to multiplicity.’¹⁹⁴

Yet this interpretation does not take into account the participatory nature of both the Receptacle and Plato’s cosmological vision in general, and thus does not go far enough in offering the kind of metaphysical attention that Rubenstein herself identifies as so crucial to theological engagement with multiverse thought. Contrary to the notion that the Receptacle is ‘nothing’ or to be viewed in terms of negation, it is in fact a participant that affords a basis for the participated perfections it receives. It is like a mirror or, as Francis Cornford puts it, ‘the room or place where things are, not intervals or stretches of vacancy where things are not.’¹⁹⁵ It has some kind of permanent being, retaining its own nature as the basic permanent participant in the physical universe: ‘[The Receptacle is the] universal nature which receives

¹⁸⁹ Rubenstein, *Worlds Without End*, p. 26.

¹⁹⁰ Rubenstein, *Worlds Without End*, pp. 28-29.

¹⁹¹ Jacques Derrida, *On The Name* (Stanford, CA: Stanford University Press, 1995), p. 124. See also John D. Caputo’s claim that it is ‘atheological and nonhuman.’ John D. Caputo, *The Prayers and Tears of Jacques Derrida: Religion without Religion* (Bloomington, IN: Indiana University Press, 1997), p. 36.

¹⁹² Rubenstein, *Worlds Without End*, p. 28.

¹⁹³ Rubenstein, *Worlds Without End*, p. 29.

¹⁹⁴ Rubenstein, *Worlds Without End*, p. 30.

¹⁹⁵ Francis Macdonald Cornford, *Plato’s Cosmology* (London: Kegan Paul, 1937), p. 200.

all bodies [but] never departs at all from her own nature and never, in any way or at any time, assumes a form like that of any of the things which enter into her; she is the natural recipient of all impressions.¹⁹⁶ It is all-receiving, the place in which the ‘likenesses’ (or participations) of eternal realities appear. In some mysterious way, it serves to be the participant of participated perfections (or images) of the Forms, ordered and directed through divine intelligence.¹⁹⁷

Absent from Rubenstein’s account is the recognition that, with the Receptacle, Plato presents additional detail and depth to his doctrine of participation. As discussed earlier, the *Phaedo* examines the threefold relationship between Forms, participated perfections, and participants. In the *Parmenides* and *Sophist*, he connects participation with exemplary and efficient causalities to explain how participation can happen without dividing Forms. In these preceding dialogues, though, he makes only brief references to participants.¹⁹⁸ By contrast, the *Timaeus* provides considerable detail about the Receptacle, as the eternal, all-receiving participant of the cosmos. Of crucial importance, the Receptacle lends itself to a specifically participatory understanding, rather than Rubenstein’s postmodern account of different cosmic parts being mixed together, as with the ingredients of a cake. Platonic participation is a matter of donation and reception, and not just a matter of mixtures or multiples. This participatory outlook will now be applied to a new multiverse theory in modern cosmology, Mersini-Houghton’s connected multiverse.

2.2.3 *Laura Mersini-Houghton’s Connected Multiverse*

To illustrate the applicability of Platonic participatory metaphysics to a contemporary multiverse theory, it would be instructive to consider the example of cosmologist Laura Mersini-Houghton’s ‘connected’ multiverse, not least because it is briefly assessed in a different part of Rubenstein’s volume, but without any reference to her earlier discussion of

¹⁹⁶ *Timaeus*, 50b.

¹⁹⁷ Plato’s description of the Receptacle is notoriously enigmatic and so there is considerable dispute about what is meant by it. In a helpful sketch of the controversy, Donald Zeyl depicts it as a kind of enduring substratum that temporarily in its various parts takes on the Forms it receives, which would not be inconsistent with a participatory outlook. See Donald Zeyl, ‘Visualizing Platonic Space’, in Richard D. Mohr and Barbara M. Sattler (eds.) *One Book, The Whole Universe: Plato’s Timaeus Today* (Las Vegas, NV: Parmenides Publishing, 2010), pp. 117-130.

¹⁹⁸ In the *Phaedo* (102b), for example, there is a brief discussion of the relationship between Forms (Tallness, Shortness), participated perfections (tallness, smallness), and their existence in participants, in this case Simmias, who is taller than Socrates but shorter than Phaedo, and therefore seems to contain both perfections.

Plato. In the past decade, Mersini-Houghton has argued that, in its very early moments, our universe was ‘connected’ to other universes in a kind of pre-inflationary cosmic bath containing all possible initial conditions. As our universe grew unimaginably rapidly, it separated from the other universes, but remains ontologically entangled with them due to the unitarity principle of quantum mechanics, whereby information about a system is never destroyed. In fact, the extent of the entanglement is such that this theory can be (and in some aspects has already been) empirically tested through measurement of the strength of the cosmic microwave background, the distribution of matter in the universe, and observation of the entanglement at large scales.

As discussed earlier, the cosmological theory of inflation (the exponential expansion of the early universe) provides the basis for some major multiverse theories, including the first two levels of Tegmark’s hierarchy. Although inflation seems to explain the flatness, homogeneity, and structure of the universe, Mersini-Houghton begins her investigation by questioning the origin and nature of inflation itself. In the same way that the selection principle of multiverse theories is often identified as a foundational problem to be solved,¹⁹⁹ she notes that the selection of the initial state of inflation is ‘a new and more severe mystery’.²⁰⁰ She believes that the kind of inflation behind the expansion of our universe was oddly improbable and far less likely than starting with a large universe structured as ours is today.

To explain the emergence of our own universe within a broader multiverse, Mersini-Houghton starts with a pre-cosmic and disorderly ‘bath’ of all possible initial conditions on the string landscape. As discussed in Chapter 1 in the context of Tegmark and others, string theory holds that every landscape vacua corresponds with a potential universe. To this chaotic mix, she applies a kind of principle of natural selection whereby only a fraction of possible universes out of the ensemble of all possible universes survive. The so-called ‘survivor’ universes start at high energies and low entropies and are physically able to develop into physical universes. Other initial states, starting at low energies, are subjected to gravitational instabilities that crunch them into nothing, resulting in no universe. As such, this theory provides a ‘superselection rule’ for the birth of the universe on the basis of the quantum

¹⁹⁹ See Keith Ward and Peter Forrest in Chapter 1.2.2 for further discussion of selection principles.

²⁰⁰ Laura Mersini-Houghton, ‘Birth of the Universe from the Multiverse’, September 22, 2008, available through arXiv/0809.3623, p. 2.

dynamics of gravity and matter on a string landscape with all possible initial conditions.²⁰¹ In her view, it provides a satisfactory explanation for the inflation of the early universe, or the ‘deep mystery of the selection of the initial state’.²⁰²

Of particular relevance to this section, Mersini-Houghton is mindful of the profound ontological implications of her theory. If our universe started in a mixed state in the precosmic bath, or landscape multiverse, it is fundamentally entangled or connected with all other universes. According to the unitarity principle of quantum mechanics, whereby information can never be lost, our universe can never evolve into a purely independent self-contained state. The entanglement of our cosmic domain with everything else in the multiverse leaves ‘imprints’ on the cosmic microwave background and large-scale structure of the universe in numerous observable ways. In her memorable expression, this remarkable ontological connectivity ‘leaves its traces everywhere in the present observable sky.’²⁰³ Since all parts of the connected multiverse are ‘relevant parts of reality for all times’, she argues that this model is more likely to describe reality than Tegmark’s Level IV multiverse with its disconnected domains governed by different fundamental laws of physics. The connected multiverse is more economical since all its parts share the same background spacetime, in contrast to the wholly different parts of spacetime proposed in Level IV.

There are suggestive resonances between Mersini-Houghton’s connected multiverse and the participatory cosmological vision described in Plato’s *Timaeus*. In particular, it is difficult not to see the Receptacle as a kind of philosophical analogue to her precosmic, chaotic bath of initial conditions. As discussed earlier, the Receptacle is the basic participant of the physical universe, which existed before the universe, and is the space or ‘nurse’ which gives birth to all items in the universe. The Forms which pass through the Receptacle are the ‘likenesses of eternal realities modelled after their patterns’²⁰⁴ in some mysterious manner. It receives ‘every variety of form’ in a constantly shifting pattern, while itself remaining ‘formless and free from the impress of any of those shapes’.²⁰⁵ Just as the various initial states in the bath of the connected multiverse are subject to gravitational instabilities, so the Receptacle is described as naturally chaotic, transferring chaotic motion to the traces of the elements

²⁰¹ Mersini-Houghton, ‘Birth of the Universe from the Multiverse’, p. 7.

²⁰² Mersini-Houghton, ‘Birth of the Universe from the Multiverse’, p. 8.

²⁰³ Mersini-Houghton, ‘Birth of the Universe from the Multiverse’, p. 8.

²⁰⁴ *Timaeus*, 50c.

²⁰⁵ *Timaeus*, 50d.

contained within: ‘when the world began to get into order, fire and water and earth and air did indeed show faint traces of themselves, but were altogether in such a condition as one may expect to find wherever God is absent.’²⁰⁶ So when Mersini-Houghton describes the ‘traces’ in the sky left by the connected parts of the universe, there is a direct and distinct echo of the depiction of ‘traces’ within the Receptacle. Divine intelligence, in the form of the Demiurge, was responsible for bringing the elements in this chaotic Receptacle into suitable proportion and harmony so that the cosmos would exemplify the goodness and beauty of its eternal model. With Plato’s Receptacle and Mersini-Houghton’s multiverse bath, we have pre-cosmic depictions of tumultuous landscapes that nonetheless operate according to distinct principles giving rise to ontologically connected parts of the cosmos, whose physical characteristics bear traces of their underlying common source.²⁰⁷

It is possible to suggest one further point of contact between the sense of unity in multiplicity embodied by Plato’s participatory cosmology and the notion of tracing and entanglement in Mersini-Houghton’s concept of a connected multiverse. As discussed earlier, the Demiurge in the *Timaeus* constructs the cosmos as a perfect image and participation of the Form of the Living Being, which contains the Forms of all other beings and thus all parts of the cosmos. As a consequence of our cosmos sharing in the Form of the Living Being, it is as good and beautiful as possible, both in terms of its totality and each of its constituent parts. Just as the goodness and beauty of a certain part of the Platonic cosmos is indicative of the broader whole (and its underlying source), the connectivity of Mersini-Houghton’s multiverse means that the entanglement of our domain with all other parts of the cosmos leaves imprints in various observable features of the physical cosmos.

With these noteworthy similarities between aspects of Platonic participatory thought and the connected multiverse, the clear point to emerge is that Mersini-Houghton cannot avoid using participatory language and ideas. Thus, she uses strikingly participatory language to describe the common origin of her entangled domains, such as ‘sharing’, ‘traces’, and ‘imprints’.

Indeed, her repeated claim that the mark of the entanglement of our universe with its origin is

²⁰⁶ *Timaeus*, 53b.

²⁰⁷ Here it might be suggested that one difference between Plato’s Receptacle and Mersini-Houghton’s pre-cosmic bath is that the former is receptive, while the latter appears to be more formal in that it is replete with its own dynamism. However, a close reading of Plato’s description belies such a false dichotomy. He observes that the Receptacle, while a natural recipient of all bodies and impressions, is ‘stirred and informed’ by them, and may also be likened to a ‘mother’, all of which suggest a degree of activity and production that complicate the idea of the Receptacle as merely a passive, empty space. See *Timaeus* 50c-d.

preserved in the sky strongly echoes Plato's supposition that 'the created heaven might be as like as possible to the perfect and intelligible animal, by imitation of its eternal nature.'²⁰⁸

This demonstrates that multiverse theorists such as Mersini-Houghton find themselves inescapably operating in the territory of participation. In that sense, they bear witness to the participatory tradition, even while ostensibly engaged in the practice of modern cosmology. In light of this, the discussion of multiverse thought within the theology and science field would profit from acknowledging this dynamic, as well as explicitly considering the salience of participation within this cosmological context.

Without such a participatory framework, Rubenstein construes Mersini-Houghton's connected multiverse through the prism of postmodern relativism. It is, she submits, 'either one or many, depending on how you look at it.'²⁰⁹ In characteristically cryptic language, she concludes that the connected multiverse is 'not one, but neither is it simply many; rather, it is many by virtue of its complex unity and united in its irreducible manyness.'²¹⁰ But Mersini-Houghton's theory is not just another instance of what Rubenstein calls 'the multiple', a term she uses to reflect the unexpected persistence of cosmic multiplicity in the ostensibly singular universe of the *Timaeus*. For Plato, as for Mersini-Houghton, cosmology is not just a vague, perspectival mixing of different parts or perspectives, but lends itself to a participatory account of sharing, imparting, and reception. Thus Platonic participatory metaphysics provides additional depth and proves to be of surprising relevance to the 'multiplicity' identified by Rubenstein and inherent in multiverse theories.

²⁰⁸ *Timaeus*, 39d-e.

²⁰⁹ Rubenstein, *Worlds Without End*, p. 189.

²¹⁰ Rubenstein, *Worlds Without End*, p. 190.

2.4 Max Tegmark on Mathematics

In this section, I will critically evaluate the curious interpretation of Platonism presented within the theoretical physicist and multiverse theorist Max Tegmark's influential multiverse hierarchy, particularly in terms of its implications for his Level IV multiverse.²¹¹ First, I will show that Tegmark's reading of Platonism is mistaken in important ways. He mistakenly believes that his Level IV multiverse embodies a radical form of Platonism, but there are profound differences between his theory and the participatory metaphysics found in the *Timaeus*. He sees mathematics as the highest form of knowledge, whereas for Plato it serves a mediating role in bridging the sensible and intelligible realms. He also controversially invokes Plato to claim that all mathematical structures exist physically, whereas for Plato the physical cosmos is distinct from its intelligible source. Since these (among other) discrepancies serve to further complicate an already contentious model of extreme mathematical realism, I will propose that a more accurate and participatory reading of Plato would ironically strengthen the other levels of Tegmark's hierarchy.

2.4.1 Tegmark on Platonism

Having outlined the first three levels of his multiverse hierarchy (regions beyond our cosmic horizon; other post-inflation bubbles; the many worlds interpretation of quantum mechanics), Tegmark pauses to suggest that, while undoubtedly contentious, the debate over these models of parallel universes and the underlying physics is only 'the tip of an iceberg'.²¹² He believes that a deeper metaphysical question remains, concerning the relationship between mathematics and physical reality, which he traces as far back as Plato and Aristotle, as follows:²¹³

Aristotelian paradigm: The internal perspective is physically real, while the external perspective and all its mathematical language is merely a useful approximation.

²¹¹ For a general overview of Tegmark's multiverse hierarchy, see Chapter 1.1.3.

²¹² Max Tegmark, 'The multiverse hierarchy,' p. 114. Unless otherwise stated, all Tegmark quotations in this section refer to this article.

²¹³ Tegmark, p. 114 (his own wording).

Platonic paradigm: The external perspective (the mathematical structure) is physically real, while the internal perspective and all the human language we use to describe it is merely a useful approximation for describing our subjective perceptions.

Tegmark favours the Platonic paradigm in which mathematical structure is the true reality, and observers perceive it imperfectly. He contends that the influence of the so-called Aristotelian paradigm (with which we are allegedly indoctrinated as children) induces us to dismiss parallel universes as peculiar, particularly the branching universes of Level III. From the external perspective, each decision creates a ‘split’ whereby one person continues to read and another does not. From the internal (Aristotelian) perspective, each person is unaware of this branching and is unable to see their alter ego occupying different quantum branches in infinite-dimensional space. This reflects the difference between viewing a physical theory from the external view of a physicist studying equations and the internal view of an observer living in the world described by the equations. He believes that proponents of the external view should find multiverses natural, since on this view physics is ultimately a mathematics problem, and there exists a Theory of Everything (TOE) whose axioms would be purely mathematical.

In light of his preference for the Platonist paradigm and his acceptance of the possibility of a TOE, Tegmark proposes his controversial Level IV multiverse, often the subject of theological and scientific criticism, and which he regards as ‘a form of radical Platonism’.²¹⁴ The Level IV multiverse involves what he calls ‘complete mathematical democracy’, whereby ‘mathematical existence and physical existence are equivalent, so that *all* mathematical structures exist physically as well.’²¹⁵ This also implies that mathematical structures are ‘out there’ such that they are discovered rather than created by mathematicians. For Tegmark, a mathematical structure is ‘an abstract, immutable entity’ that exists outside of space and time.²¹⁶ All mathematical structures amount to formal systems consisting of ‘abstract symbols and rules for manipulating them’.²¹⁷ In other words, mathematics is not simply about manipulating numbers, but defining the relations between abstract objects such as functions, sets, spaces, and operators. It is precisely because of this distillation of

²¹⁴ Tegmark, p. 118.

²¹⁵ Tegmark, p. 118.

²¹⁶ Tegmark, ‘Parallel Universes’, in *Scientific American*, May 2003, p. 49.

²¹⁷ Tegmark, p. 116.

mathematics to abstract relations that computers can prove geometric theorems without physical intuition of space.

As a way to establish a dilemma that provides the basis for his Level IV multiverse, Tegmark proceeds to consider whether the physical world is a mathematical structure. This part of his argument is not entirely clear or convincing, and has been the subject of considerable criticism among physicists.²¹⁸ If the physical world is, as Tegmark believes, a mathematical structure, then mathematical equations will be able to describe not just limited aspects of it, but *all* aspects.²¹⁹ In this context, some mathematical structure would be equivalent to our universe, with each physical entity corresponding to a part of mathematical structure and vice versa. Tegmark suggests that a mathematical structure has physical existence if ‘any self-aware substructure (SAS) within it subjectively perceives itself as living in a physically real world.’²²⁰ Since we do not yet have a TOE, the mathematical structure isomorphic to our universe has not yet been found, assuming it exists. If, though, our universe really is a mathematical structure, with each person representing an SAS, this means that the structure has both physical and mathematical existence. This, in turn, raises questions about all other possible mathematical structures and whether they are likewise given physical expression. If not, he argues, there would be a ‘fundamental, unexplained ontological asymmetry built into the very heart of reality, splitting mathematical structures into two classes: those with and without physical existence.’²²¹

To escape this dilemma, Tegmark proposes the Level IV multiverse in which all mathematical structures exist physically as well. This would include universes with other mathematical structures and therefore with different fundamental equations of physics and different constants of nature. Unlike Level I universes, which are spatially connected, or even

²¹⁸ For example, Gil Jannes rejects such a form of extreme mathematical realism, arguing that mathematics is at least in part a human construction without its own external reality. See Gil Jannes, ‘Some Comments on the Mathematical Universe’, *Found. Phys.* 39: 397-406, 2009. Brian Greene likewise avers that physical reality exists independently of us and is not therefore dependent on mathematics, which he sees as the product of human creativity. See Brian Greene, *The Hidden Reality* (New York, NY: Random House, 2011), p. 341.

²¹⁹ Tegmark, p. 117. In a provocative aside, he notes that this would leave ‘no freedom for, say, miracles or free will in the traditional sense.’ However, if all possible universes that can exist do exist, this would also seem to imply the existence of universes in which miracles and free will exist. Perhaps Tegmark would respond that such properties would only amount to the subjective perceptions of inhabitants of the universe. So the ‘internal’ perspective of these inhabitants would be such that they might believe they have free will, but the ‘external’ perspective would acknowledge that all such properties amount to mathematical structure that can be derived by the infinitely intelligent mathematician.

²²⁰ Tegmark, p. 117.

²²¹ Tegmark, p. 118.

Level II and III universes which at least have the same fundamental equations of physics (though develop clear demarcations caused by inflation and decoherence, respectively), the Level IV universes are completely disconnected. They exist outside of space and time, and seem virtually impossible to describe. The best we can do, Tegmark admits, is ‘to think of them abstractly, as static sculptures that represent the mathematical structure of the physical laws that govern them.’²²²

In a basic sense, Tegmark’s view of mathematics and Platonism (and its implications for multiverse speculation) is reasonable. As discussed earlier in this chapter, Plato associates true reality with the intelligible realm of the Forms, whereas the sensible world is only derivative and illusory. The Forms of the intelligible realm are eternal, perfect, unchanging, and exist outside of space and time. This concept is often illustrated with the mathematical example of the triangle, whose ideal version is more real than approximate earthly versions. For Plato, mathematics inspires us not just to understand our own world more clearly, but to look beyond and above it, and to begin to ascend to the intelligible realm.²²³ Our ability to abstract numerical quantities from sensible things provides a basis for Plato’s belief in intelligible Forms underlying physical reality: ‘the qualities of number appear to lead to the apprehension of truth.’²²⁴ Thus, mathematics serves as an intermediary between the physical realm and intelligible realm of true being and goodness. In the *Republic*, Socrates recommends that the education of philosophers should include a broad range of mathematical disciplines, including arithmetic, geometry, astronomy, and harmonic theory.²²⁵ Even basic arithmetic and calculation satisfy our need to bring order and coherence to the diversity of the physical cosmos, ultimately moving us to contemplate the divine unity and perfection of the intelligible realm. This is the Platonic context in which Tegmark perceives mathematics to reflect the underlying reality of the world.

²²² Tegmark, ‘Parallel Universes,’ p. 50.

²²³ This is not unlike the impulse to look beyond our own physical realm that motivates cosmologists in the study of multiverses, or what Bernard Carr refers to as the ‘outward journey’. It might also explain Tegmark’s claim that ‘modern theoretical physicists tend to be Platonists, suspecting that mathematics describes the universe so well because the universe is inherently mathematical.’ Tegmark, ‘Parallel Universes’, p. 49.

²²⁴ *Republic*, 525b.

²²⁵ *Republic*, 525b-531d. For a close reading of these mathematical studies and their metaphysical purpose of encouraging a turn to the intelligible realm, see Mitchell Miller, ‘Figure, Ratio, Form: Plato’s Five Mathematical Studies.’ In *Apeiron* 32 (4), 1999, 73-88.

On a more fundamental level, though, Tegmark's invocation of Platonism to describe the Level IV multiverse is highly idiosyncratic and problematic.²²⁶ His understanding of Platonism rests on two significant misapprehensions. First, mathematics does not occupy quite the same exalted position in Plato's epistemological hierarchy as it does in Tegmark's vision in which mathematical knowledge is the most fundamental kind of knowledge or with his expectation that we will eventually find a TOE, from which all other knowledge can be derived. In the classification of knowledge outlined in the *Republic*, mathematical knowledge relates to the Forms, since mathematical objects encourage us to contemplate unchanging and stable objects and thereby prepare us for an encounter with the eternal realm. But mathematicians understand that the objects with which they work are merely 'shadows and images',²²⁷ when what they really seek is the kind of true reality only accessible by reason (*noesis*), a purer, more perfect knowledge of the Forms. By engaging in the dialectical process of reasoning, we can gain direct insight of the Forms, without relying on the subordinate field of mathematics (or any other arts and sciences) 'whose assumptions are arbitrary starting points.'²²⁸ The primacy of mathematics in Tegmark's scheme is therefore not representative of the epistemology of Plato, for whom mathematics was less valuable and indeed less scientific than reasoning, which provides direct knowledge of the Forms.

Second, Tegmark's description of the Forms as existing physically seems to contradict the basic premise of Platonic metaphysics. In the Level IV multiverse, every mathematical structure corresponds to a parallel universe, opening up the full realm of possibility. Tegmark sees this hypothesis as a form of radical Platonism because it asserts that 'the mathematical structures in Plato's *realm of ideas*... exist "out there" in a physical sense'.²²⁹ As discussed, the Forms exist in an intelligible, eternal realm, which is perfectly real precisely because it is *not* physical. It is difficult to see how Tegmark's conferral of physical existence upon the Forms might be reconciled with any conventional reading of the Forms as depicted throughout Plato's dialogues. To complicate matters still further, Tegmark adds that the Level IV universes do not occupy the same space, but somehow exist outside of space and time, and most of them are not even observed. In some inexplicable way, then, it seems that all possible universes enjoy physical existence within a kind of Platonic realm beyond space and time. As

²²⁶ Rubenstein is equally confounded by Tegmark's 'exceedingly strange' interpretation of Platonism. She astutely observes that the principle of plenitude at the heart of Level IV is more consistent with the Atomism of Lucretius than Platonic metaphysics. See Rubenstein, *Worlds Without End*, pp. 203-205.

²²⁷ *Republic*, 510e.

²²⁸ *Republic*, 511c.

²²⁹ Tegmark, p. 118.

such, Tegmark fails to provide the kind of participatory account of the relationship between the sensible and intelligible realms that is of such paramount importance to Plato's metaphysics.

2.4.2 *Participation in the Timaeus*

Ironically, Tegmark's desire to identify his cosmological theories with a Platonic account of the relationship between mathematics and physical reality has produced an unconventional variant of Platonism. For that reason, it would be worthwhile to reconsider his work in light of the *Timaeus*, which articulates a participatory cosmological vision in which mathematics serves to reconcile the sensible and intelligible realms. In Tegmark's Level IV model, mathematical structures exist physically, while mathematics represents the highest form of knowledge. In the *Timaeus*, by contrast, the mathematical infrastructure of the cosmos is separate from the physical universe, while mathematics, through cosmological patterns of participation, plays a mediating role that can help focus our attention beyond the physical. These distinctions will be consequential for Tegmark's own multiverse hierarchy and its mathematical foundation.

As detailed earlier in this chapter, Plato's *Timaeus* depicts a beautiful and orderly universe that is the handiwork of divine rationality and intelligence. Strikingly, the dialogue's cosmology is infused with mathematical language, detailing the ratios, proportions, and harmonies according to which the universe is ordered. The Demiurge, imitating an eternal and unchanging model, imposes mathematical order on a preexistent chaos to produce the ordered cosmos, which is a 'created copy' of its original.²³⁰ By contrast to Tegmark's curious conflation of mathematical and physical structure, in the *Timaeus* the mathematical infrastructure of the cosmos has its own being and intelligibility, distinct from the physical universe. In this creation account, the universe is patterned on and participates in eternal mathematical patterns of number, geometry, and astronomy. Not only do these mathematical patterns provide the model for the world's generation, but imitation of them draws us closer to eternity.

²³⁰ *Timaeus*, 31a.

Of further relevance to the centrality of mathematics, the creative activity of the Demiurge is inherently mathematical. With reference to the Forms, the Demiurge fashions the four elements (earth, water, fire, air) from two types of right-angled triangles (isosceles and scalene, or unequal-sided).²³¹ The precise size and composition of each of the subsequent geometrical solids is determined by divine intelligence working according to mathematical necessity: ‘And the ratios of their numbers, motions, and other properties, everywhere God, as far as necessity allowed or gave consent, has exactly perfected and harmonized in due proportion.’²³² The Demiurge constructs the world’s body out of the four elements, ‘harmonized by proportion’.²³³ The world’s soul is created out of a harmoniously proportionate and complex mixture of the Forms, the physical world, and a third and intermediate kind of being.²³⁴ This mixture is then divided up into composites according to astonishingly precise and complex ratios, which also form the basis for the motions of the soul’s outer and inner circles, the latter of which encompasses the carefully measured orbits of the sun, the moon, and the other planets.²³⁵ The soul is brought into union with the world, ‘interfused everywhere from the center to the circumference of heaven’, bringing about a ‘divine beginning of never-ceasing and rational life enduring throughout all time.’²³⁶

Mathematics does not simply provide the principles according to which the physical universe is generated, but also mediates between the sensible and intelligible realms through cosmological patterns of participation.²³⁷ The dialogue’s famous participatory observation that time is a ‘moving image of eternity’²³⁸ is itself expressed in mathematical terms. The eternal living being, on which our cosmos is based, rests in ‘unity’, while time is also based on eternity, but moves ‘according to number’.²³⁹ Time imitates and participates in eternity and revolves according to numerical law.²⁴⁰ In this sense, mathematics represents a bridge

²³¹ *Timaeus*, 53c-55c.

²³² *Timaeus*, 56c.

²³³ *Timaeus*, 32c.

²³⁴ *Timaeus*, 35a-b.

²³⁵ *Timaeus*, 35b-36d.

²³⁶ *Timaeus*, 36e-37a.

²³⁷ As discussed earlier in Chapter 2.1.4, in the *Philebus* mathematics also serves a mediating function in terms of bridging the gap between the sensible and intelligible realms. The argument is that all things ‘consist of a one and a many, and have in their nature a conjunction of limit and unlimitedness.’ Within every seemingly unlimited or infinite set of things, there exists Limit, by which things can be definitely numbered and ordered. In this sense, number (or mathematics) can be used to bring order and meaning to the multiplicity of creation and to provide the mechanism by which the cosmic many can be reduced to the intelligible One. See *Philebus*, 16c-d.

²³⁸ *Timaeus*, 37d.

²³⁹ *Timaeus*, 37d.

²⁴⁰ *Timaeus*, 38a.

between time and eternity, or the sensible and intelligible realms. Similarly, animals in the natural world ‘participate in number’ by learning arithmetic from the movements of the sun and the earth associated with light and darkness, as well as changing seasons.²⁴¹ Just as animals participate in eternity through number, so humans have been afforded sight through which to observe the astronomical patterns that provide intimations of the world’s intelligible source: ‘But now the sight of day and night, and the months and the revolutions of the years have created number and have given us a conception of time, and the power of inquiring about the nature of the universe.’²⁴² Musical harmony and rhythm may also encourage us to identify and imitate the numerical structure of the cosmos and thereby help to correct any discord within our souls.²⁴³

This metaphysical and participatory reading of the *Timaeus* provides a useful corrective to Tegmark’s misappropriation of Platonism. While eschewing the paramount epistemological status attributed to mathematics by Tegmark, Plato accords mathematics with high metaphysical and indeed moral status. Numerical law provides the model for the creation of a cosmos that is maximally beautiful and good. At the same time, numerical law—as an image and hence participation of the eternal model of the cosmos—mediates between the sensible and intelligible realms. The differences between Tegmark’s Platonism and the Platonic participatory metaphysics described in this chapter are outlined in the table on the following page.

²⁴¹ *Timaeus*, 39b-c.

²⁴² *Timaeus*, 47a.

²⁴³ *Timaeus*, 47d.

Tegmark's Level IV Platonism	Participatory Metaphysics in the <i>Timaeus</i>
Mathematics is the highest form of knowledge; all other knowledge will prove to be subordinate to a mathematical TOE	Mathematics plays an important mediating role, but is subordinate to reason through which intelligible realm is apprehended
Mathematical existence and physical existence are equivalent; all mathematical structures exist physically	Mathematics provides the model for the physical cosmos, but this cosmos is distinct from its non-physical, intelligible source
Level IV multiverse exists outside of space and time	Physical cosmos distinct from intelligible realm, which exists outside of space and time
Level IV universes are completely disconnected	The physical cosmos is manifold, but its many parts share in a single intelligible source
Level IV universes have different fundamental equations of physics	Mathematical structure is consistent across cosmos – also implied by basic participant of the Receptacle and activity of the Demiurge

2.4.3 Implications for Tegmark's Multiverse Hierarchy

Based on the differences outlined above, Tegmark's (supposedly Platonic) Level IV multiverse model appears to be *less* compatible with Platonic participatory metaphysics than his Level I, II, and III models. After all, the three preceding models in his multiverse hierarchy allow for progressively more cosmic diversity, but they all share the same fundamental equations of physics, they are not completely disconnected, and they are not wholly beyond space and time. In each case, the participatory metaphysics of the *Timaeus* could be more easily applied such that the physical cosmos is understood to be patterned on an eternal (and consistent, underlying) mathematical model and that mathematics itself might play a mediating role in focusing our attention beyond different cosmic realms to apprehension of the eternal realm. In particular, the participatory role of the Receptacle—through which all Forms pass as participated perfections—and the participatory role of the Demiurge—who arranges and proportions all things to closely resemble the goodness of the Forms—both strongly imply a cosmos grounded in a common mathematical structure and framework, rather than disconnected realms with different fundamental mathematical laws.

In this way, participatory metaphysics can provide a more fruitful ground for engagement with Tegmark's multiverse hierarchy than other theological approaches taken to date. Instead of focusing on the logical conundrums inherent in the Level IV model as representative of all multiverse theories, which can then be easily dismissed,²⁴⁴ it is more constructive to acknowledge the useful aspects of Tegmark's Platonism, while also identifying its drawbacks, and then to apply a properly metaphysical account of Platonism to his other, less contentious, models. Thus, we might concur with his insight that there is a deeper mathematical structure and reality underlying our physical universe. But we might note that this does not suggest equivalence between mathematical and physical reality that somehow takes shape in disconnected realms beyond space and time. We might then note that the participatory vision in the *Timaeus* suggests a diverse yet interconnected cosmos that operates according to consistent mathematical principles and which is more compatible with Level I, II, or III multiverse models. Ultimately, Tegmark's own Platonism complicates and undermines his most controversial multiverse model, while a participatory reading of Platonism can enrich the other levels of his hierarchy and thereby advance the theology and science dialogue by drawing attention away from unproductive disputes over the more provocative elements of Level IV.

²⁴⁴ See Chapter 1.1.3 for such criticisms of Tegmark's Level IV multiverse.

2.4 Verity Harte on Mereology

Having considered contemporary theological and scientific accounts of the relevance of Plato's thought to multiverse theory, I will now turn to a major recent philosophical contribution to the understanding of Plato's metaphysics of structure, and assess how it might provide useful resources for illuminating some of the conceptual issues arising in multiverse discourse. Verity Harte, a British specialist in ancient philosophy and metaphysics currently based at Yale, has produced the first sustained examination of the issue of composition in Platonic metaphysics.

I will propose a participatory reading of her account of Plato's metaphysics of structure and I will suggest that such a reading would provide fruitful points of contact for multiverse theories. To that end, I will initially provide a brief overview of Harte's project. I will then argue that her project is implicitly participatory in its concepts and language, with specific reference to her reading of the *Timaeus*. Finally, I will argue that this participatory reception of Harte's rich discussion of composition in Plato is of particular value to questions about part-whole relations that often arise within the context of inflationary multiverse theories.

2.4.1 Harte on Plato's Metaphysics of Structure

Harte's *Plato on Parts and Wholes* is an authoritative and influential recent examination of Plato's treatment of the relation between a whole and its parts.²⁴⁵ Since 'mereology' refers to any theory of parthood or composition, her project might be thought of as mereological in nature.²⁴⁶ Within mereology, questions about part-whole relations (with important metaphysical implications) can rapidly proliferate: should we focus on the relation between

²⁴⁵ Harte's work is not only instructive in highlighting connections between Platonic and modern metaphysical discussions of composition, but also for its relevance to contemporary debates in philosophy of science. For example, Harte's work can be regarded as a Platonic form of structural realism, which emphasizes the structural content of scientific theories as a way of explaining scientific continuity and success. For a provocative defence of structural realism as a metaphysical thesis, see James Ladyman, *Every Thing Must Go: Metaphysics Naturalised* (Oxford: Oxford University Press, 2007).

²⁴⁶ Mereology, the theory of parthood relations, has a long history in Western philosophy and theology. Plato's metaphysical dialogues, particularly the *Timaeus* and *Parmenides*, feature momentous discussions of part and whole, which is why they have reemerged as dominant trends in modern multiverse discussions. Mereology also occupies a prominent position in the thought of medieval philosophers, including John Duns Scotus, Aquinas, and William of Ockham. For a comprehensive historical survey of its role in medieval philosophy, see Desmond Paul Henry, *Medieval Mereology* (Amsterdam: Grüner, 1991). For a contemporary theological treatment of part-whole relations and participation in Thomistic metaphysics, see W. Norris Clarke, *The One and the Many: A Contemporary Thomistic Metaphysics* (Notre Dame, IN: University of Notre Dame Press, 2001).

one part and the whole, or on the relation between many parts and the whole? Is a whole the sum of its parts, or somehow greater than the sum? How might it be possible for abstract objects to have parts? As she notes, though, Plato does not set out to develop a formal mereological system with axioms to govern part-whole relations: ‘Plato is doing metaphysics, not logic.’²⁴⁷

Nevertheless, Harte’s central argument is that—at the heart of Plato’s discussions of composition—is the ‘mystery’ of the ‘one-many dimension’—that is, how one thing (a whole) can be made up of many things (its parts).²⁴⁸ To identify one thing (a whole) with many things (its parts) seems to threaten the ‘fundamental distinction’ between the two, since ‘something(s) is/are both one thing—singularly quantified—and many things—plurally quantified.’²⁴⁹ If a whole of parts is both one and many, it might be said to represent both a (complex) individual and a collection. If, on the other hand, composition amounts to a many-*one* relation, it seems important to maintain that the whole is an individual (hence the emphasis on the *one*), rather than a collection. For Harte, this latter concern is central to Plato’s metaphysics of structure, which she believes offers an account of wholes as complex individuals.

While Harte considers composition and structure in dialogues such as the *Parmenides* and *Sophist*, for the purposes of this section it will be sufficient to focus on her reading of the *Timaeus*. She observes that the dialogue offers ‘almost an embarrassment of riches’ for a study of the composition of complex wholes, with its ‘layering of structures within structures’.²⁵⁰ On her reading, the Timaeian cosmos is a ‘whole of wholes, a structure of structures’.²⁵¹ This is because the first part of Plato’s creation account is concerned with the structure of the cosmos as a whole, while the second part is concerned with the structure of its parts (the elements). In this sense, the second creation story (concerned with parts) is itself part of the larger whole of the first creation story (itself concerned with the whole). The

²⁴⁷ Verity Harte, *Plato on Parts and Wholes* (Oxford: Oxford University Press, 2002), p. 13. All Harte quotations in this section refer to this text.

²⁴⁸ Harte, p. 11.

²⁴⁹ Harte, pp. 29-30.

²⁵⁰ Harte, p. 213.

²⁵¹ Harte, p. 226. Here we might note an important parallel with attention to form. The term ‘whole of wholes’ calls to mind the idea that participation is about form, which is what something (in this case the cosmos) adds up to (the whole), and its inner structure that also makes it what it is (wholes). In the *Timaeus*, the form or character of the cosmos is to be found in the eternal Forms before it is evident in the cosmos itself. The form of the cosmos amounts to a whole of wholes, a complex structure that arises through the participation of its constituent parts in eternal patterns.

layering of the cosmos is thus reflected in the layering of the account of its creation: structure is synonymous with substance.

In the first creation story, Timaeus describes the body of the cosmos as a structure, which consists of four elements standing in proportionate relation to each other, in a manner that Harte refers to as ‘structure-laden’.²⁵² This means that the elements can only be understood in the context of the structure they compose: parts owing their meaning to the whole to which they belong. In the second creation story, the construction of the elements themselves is described in terms of likeness to geometrical structures. Given this emphasis on geometrical proportion within the body of the cosmos and within the components of the body of the cosmos, Harte suggests that there is a ‘parallel’ between the macro- and micro-structure of the body of the cosmos, such that geometrical structure is found within the body of the cosmos and within the four elements of which it is composed.²⁵³ In this way, in Harte’s memorable expression, ‘structure may be said to go all the way down.’²⁵⁴

For Harte, then, the Timaeian cosmos is mathematical in nature and the dialogue tells the story of the ‘mathematicization of structure’.²⁵⁵ This structure, patterned on an intelligible source and shaped by the activity of divine intelligence, is inherently good—or, as she puts it, ‘normative’.²⁵⁶ Mathematical concepts such as harmony, proportion, and measure are not only bywords for structure, but also normative terms of value expressing the inherent goodness and coherence of the cosmos. Thus, Plato’s metaphysics of structure is based on the ‘irreducibility, intelligibility, and normativity of structure.’²⁵⁷ To illustrate this point, Harte refers to the role of musical harmony in the *Timaeus*, which ends with the injunction to bring the revolutions of the human soul into line with the harmonious revolutions of the world soul, whose parts were ordered and proportioned according to intervals on the musical scale. According to Plato, to learn ‘the harmonies and revolutions of the universe’ is to attain truth and the ‘best life which the gods have set before mankind’.²⁵⁸ As such, Platonic structure is not just a metaphysical concern, but laden with ethical and epistemological dimensions.

²⁵² Harte, p. 233.

²⁵³ Harte, p. 247.

²⁵⁴ Harte, p. 247.

²⁵⁵ Harte, p. 264. Indeed, Harte interprets the Receptacle mathematically. She argues that the imposition of geometrical configurations upon the Receptacle by the Demiurge enable the instantiation of the elements. As will be discussed in the following section, she describes the Receptacle in clearly participatory terms.

²⁵⁶ Harte, p. 271.

²⁵⁷ Harte, p. 271.

²⁵⁸ *Timaeus*, 90d.

In light of her analysis of composition in Plato's works, and in the *Timaeus* in particular, Harte believes that the emergent picture is of wholes as 'contentful structures'.²⁵⁹ Wholes are not collections of things with 'structure' that can be detached and understood separately from their parts. Instead, structure is fundamental to the composition of the whole such that wholes are instances of structures: 'In Plato's conception of wholes, structure is no less essential to the parts of such a whole than to the whole itself. The parts of such a whole are structure-laden; that is, the identity of the parts is determined only in the context of the whole they compose.'²⁶⁰ This is a top-down approach to composition, in which parts can be understood as such only in reference to the whole: 'Wholes come first; and parts—and the things that are parts—only thereafter.'²⁶¹ The strong claim that the identity of parts is tied to the whole of which they are part implies 'some sort of metaphysical dependence of the parts on the whole.'²⁶² This dependence raises a number of problematic questions (will parts exist only for so long as the whole exists?), and Harte acknowledges that the implications require further clarification.

2.4.2 *Harte and Participatory Metaphysics*

Although Harte briefly refers to participation in the context of her discussion of the *Parmenides*, her specific focus is on mereological theories of composition and parthood understood in isolation from participation. In particular, she has a good sense of what might be thought of as 'horizontal' participation (discussed below), but not necessarily of vertical or transcendental participation. Yet her deeply metaphysical interpretation of Platonic part-whole relations can be brought into line with the participatory approach detailed in general terms in Chapter 1 and in the specific context of the discussion of the *Timaeus* earlier in this chapter.

In general terms, participation is inherently concerned with inter-relation. To claim that things participate in a common intelligible (or divine) source is to imply that they come forth

²⁵⁹ Harte, p. 268.

²⁶⁰ Harte, p. 269.

²⁶¹ Harte, p. 277.

²⁶² Harte, p. 279.

from that source in a state of relation.²⁶³ Things are related to their common origin, but their identity also entails a second kind of relation in terms of their ordering among themselves. To use an example of relevance to the *Timaeus*, this ordering might be akin to the proportionate harmonies of a piece of music, with each part of the arrangement standing in relation to the other parts, adding up to a melodic whole, outside of which the parts would lose their identity. Like Harte's notion that parts can only be understood as part of the 'contentful structure' of the whole, the participatory vision holds that each part of creation participates in and stands in relation to its origin, owes its identity and meaning to its origin, and stands in proportion and relation to all other parts of creation. If parts are 'structure-laden' for Harte, then all parts in the participatory scheme are infused with a broader meaning and intelligibility.

The primacy of *relation* of parts in Harte's theory can also be related to what might be called the 'intra-finite' (or horizontal) aspect of participation, or the participation of things in one another. While the main focus of this thesis is the participation of finite things in an infinite source, there is a related and secondary sense in which finite things share participatory relations among themselves. For example, each creature comes into being and receives its being from other creatures, thereby sharing bonds of participation as parts of a participatory structure that originates in God. Each creature is therefore in some sense metaphysically dependent on other creatures, as well as on the whole participatory structure that can be traced back to its transcendent source. This sense of intra-finite participation is given expression in Harte's insistence that parts stand in relation to each other, owe their identity to their status as parts, and have some sort of metaphysical dependence on each other, as well as the whole of which they are part.²⁶⁴ Harte is keenly attentive to this aspect of participation, but has less to say about vertical or transcendental participation (that is, the participation of sensible things in the intelligible realm), so in the following section I will put her work to use within this more Platonic context.

In the specific context of her reading of the *Timaeus*, Harte's theory and language are distinctly participatory. Whereas Rubenstein identifies the many-layered mixing of the

²⁶³ I am grateful to Andrew Davison for conversations on the idea of inter-relation within participation. See his forthcoming monograph on participation in Christian metaphysics for further discussion.

²⁶⁴ In terms of intra-finite participation, it is worth noting that, in the *Parmenides*, Plato seems to suggest that the Forms participate in each other: 'forms among themselves can be combined with, or separated from, one another.' *Parmenides*, 129e. Similarly, in the *Republic* there is an oblique reference to the multiplicity of the Forms 'by virtue of their communion... with one another.' *Republic*, 476a.

dialogue as an instance of ‘the multiple’, Harte goes one step further by providing the kind of sustained metaphysical analysis that Rubenstein herself concludes is necessary in the context of engagement with multiverse thought (though does not provide herself, as discussed earlier). Harte’s view of the Timaeon cosmos as a structure of structures, with the different parts of the cosmos standing in precise relation to each other and the overall whole as ‘structure-laden’, can be brought into contact a participatory reading. Just as Harte is not content to speak of parts only in themselves, so Plato explains how the Demiurge constructs the physical universe as a participation of the Form of the Living Being, which includes all other Forms as its parts. Just as Harte argues that structure is good and intelligible, so the participation of the cosmos in its eternal source under the direction of divine intelligence and necessity ensures that it is good and beautiful, both as a whole and in terms of each of its parts.

In addition, Harte’s account of the Receptacle is distinctly participatory. While admitting that the nature of the Receptacle is unclear and subject to diverse interpretation, she maintains that the imagery used by Plato characterise it as that in which ‘imitations of forms’ transpire.²⁶⁵ She goes on to argue that the Demiurge imposes geometrical configurations upon the Receptacle, providing the means for the instantiation of the forms of the elements. This geometric construction allows for the Receptacle’s eventual ‘reception’ of forms.²⁶⁶ Whether Harte’s geometric account of the relation between Forms and the Receptacle is accurate, it is striking that her depiction of the Receptacle as that upon which contentful structure is imposed invariably employs participatory terms such as imitation, reception, and traces. For Harte, it has an inextricably participatory role as the medium in which participated perfections of Forms are proportioned and arranged to form a good and beautiful cosmos that reflects its eternal model.

2.4.3 *Inflationary Multiverse Theory*

Having considered Harte’s reading of Plato’s metaphysics of structure, and highlighted aspects of its implicit participatory character, it would now be instructive to demonstrate the relevance of this mereological-participatory account to a contemporary multiverse theory.

²⁶⁵ Harte, p. 257.

²⁶⁶ Harte, p. 262.

Given Harte's focus on part-whole relations, Tegmark's Level II post-inflationary bubble multiverse, with its different parts originating from a common source, might seem apt.

It will be remembered from Chapter 1.1.3 that Level II of Tegmark's hierarchy refers to an infinite set of distinct Level I multiverses, or bubbles. According to Tegmark, the model is predicted by most popular models of inflation, the rapid expansion of the universe. In this model, space generally stretches rapidly and forever, but some regions stop stretching and form distinct bubbles. Infinitely many of these bubbles may be created, each becoming an infinite embryonic Level I multiverse, with different laws of physics, particles, and dimensionality brought about by quantum fluctuations during inflation: 'So the Level II multiverse is likely to be more diverse than the Level I multiverse, containing domains where not only the initial conditions differ, but also the physical constants.'²⁶⁷ The Level II multiverse would appear to address the question of fine-tuning, since the model provides for the possibility of other universes in which the physical constants are inconsistent with human life. As such, the fact of our presence in a universe conducive to life becomes merely coincidental, following from the selection effect that we must find ourselves living in a part of the cosmos that is habitable. In the Level II model, there just happen to be (possibly infinitely) many other parts (or bubble universes), all with their own finely-tuned parameters that if changed modestly would result in qualitatively different universes.

According to Andrei Linde's chaotic inflationary multiverse theory (which may also be considered a version of a Level II multiverse), the inflationary phase of the universe's expansion lasts forever throughout most of the universe. Since different parts of the universe expand exponentially rapidly, most of its parts are inflating, potentially producing infinitely many parts or regions beyond our cosmic horizon: 'Inflation of such domains creates huge homogeneous islands out of the initial chaos, each one being much greater than the size of the observable part of the Universe.'²⁶⁸ The process of the division of the universe into different parts may also be explained by quantum fluctuations, which cause energy and matter density to differ in different parts of space, producing changes in the rate of inflationary expansion. Cosmic regions with higher rates of inflation lead to the production of new inflationary domains which expand even faster, as inflation continues forever: 'This means that the

²⁶⁷ Tegmark, 'The multiverse hierarchy', p. 107.

²⁶⁸ Andre Linde, 'The inflationary multiverse', in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 131.

Universe becomes divided into exponentially large parts with different dimensionality.’²⁶⁹

Linde believes that the process of eternal inflation almost necessarily implies the existence of a multiverse, comprising infinitely many bubbles whose properties vary, though he admits that to understand this idea, we need to ‘compare infinities, which may lead to ambiguities.’²⁷⁰

As such, the Level II multiverse, as described by Tegmark and Linde, provides a fertile ground for consideration of part-whole relations and participation.²⁷¹ The different parts of the multiverse are enormous and may have vastly different properties, but they share a common origin and fundamental connection (even if ultimately inaccessible to us). To adopt Harte’s compositional language, we might think of the different parts of this post-inflationary landscape as ‘structure-laden’, with the parts being what they are only within the context of the cosmic whole they comprise and out of which they originated. By her own admission, her claim that parts exist only for so long as the whole exists is contentious as applied to perishable objects,²⁷² but perhaps within the context of an eternal inflationary multiverse there need not be such a problem of tying the identity of the different parts to the eternal whole of which they are part. The implied existence of infinitely many other universes with different physical constants indicates that our own universe, even with its statistically improbable degree of fine tuning, gets its character (or its form, what it adds up to) only in the context of the cosmic whole of which it is (or could be) part. There is a kind of metaphysical dependence of our own part of the multiverse on the whole multiverse, since without the process of eternal inflation giving rise to all possibilities there would be no such multiverse at all.

²⁶⁹ Linde, p. 134.

²⁷⁰ Linde, p. 139.

²⁷¹ Of additional relevance in terms of participation, Linde refers to the concept of beauty in terms of its role in the selection of cosmic regions. He associates the scientific idea of ‘symmetry’ (the suitability of the physical constants for human life) with beauty; that is, if we can live in a given part of the inflationary multiverse, then this suggests the existence of other similarly inhabitable parts related to each other by symmetry (or beauty). This sense of relation might find expression in a participatory account of beauty, whereby beauty arises by virtue of the ordering and relation that define the different parts of a whole. For example, the beauty of a house might be associated with the ordering and the coherence of its component parts, such that each part of the house is essential to the constitution of the whole and could not be understood without reference to the whole, much as one part of a Level II multiverse might in some sense owe its symmetry or beauty to its metaphysical dependence on the cosmic whole.

²⁷² Harte suggests preserving the spirit of the claim by ‘tying the identity of the parts to a whole of which they are or *could be* part.’ She uses the example of a chair leg, discovered unattached from a chair. Harte, p. 278.

We might also consider how a participatory view of Harte's theory of composition would bear upon the Level II multiverse. The division of the multiverse into an infinite number of exponentially large parts with different values is a vivid instance of cosmic multiplicity arising from a common source, or at least a single cosmic process or canvas. This might call to mind the participatory notion of inter-relation introduced in the previous section and on which Harte is acutely observational. However, where a Platonic (or Christian) participatory metaphysics could deepen her account, we might introduce the issue of participation in a transcendent source by suggesting that different parts of creation share a common origin in participation in God (or some eternal source). This would mean that different inflationary bubbles would emerge (or, to use more participatory language, come forth) already related, drawing their being and identity from their common intelligible origin. They would also, in a more horizontal sense, owe their identity and share in degrees of relation to each other, as Harte suggests. In this way, it is possible to apply a deeper, more 'vertical' (or transcendent) Platonic participatory approach to her emphasis on 'horizontal' or inter-relations between parts.

It is particularly confounding that Harte elects not to pursue a more vertical sense of participation, especially in light of her attribution to Plato's metaphysics of what she calls a 'holist' conception.²⁷³ This means that, instead of working from the bottom up, he proceeds from the top down; that is, the identity of a part of the cosmos is defined only within the context of the whole of which it is part. In his metaphysics, according to Harte, wholes come first, and parts only thereafter. It is clearly possible to situate this insight within his deeper metaphysical framework and to observe that the 'whole' of the cosmos indeed comes first and originates from an intelligible source before the constituent parts are evident within.

Ultimately, the combination of Harte's discussion of composition with a deeper conceptual Platonic framework of vertical participation suggests new ways of thinking and pertinent questions for multiverse theorists. For example, cosmologists are often inclined to examine the different constituent parts of the universe—or potential different realms of the multiverse—with reference to internal features such as physical constants. This is an understandable inclination given that it is more problematic to consider the 'whole' of the universe (or multiverse) as we cannot experience it or measure it from the outside, a dilemma

²⁷³ Harte, p. 277.

that sometimes causes cosmology as a scientific area of study to be viewed skeptically. Yet, in light of the foregoing discussion, it might be worthwhile for multiverse theorists to pay special attention to any multiverse model as a whole, rather than its constituent parts. This suggests a new ontological approach not just for philosophers, but for scientists who study multiverses and the associated issue of whole-part relations. As Harte argues, Plato's metaphysics places structure as a fundamental item, resisting the notion that parts can be easily identified outside of the context of such structures.

Such a focus on the structure or the 'whole' of the cosmos may seem alien to place at the heart of a philosophical or indeed scientific system, but Plato's metaphysics of composition (outlined by Harte) along with his participatory metaphysics strongly indicate that this is a valuable approach. As applied to the Level II multiverse, it would not start with the post-inflationary bubbles or any internal characteristics of the bubbles. Rather, a Platonic participatory approach might recognise that a multiverses are more akin to 'contentful structures whose parts exist and may be identified only in the context of (some) whole of which they are (or could be) part.'²⁷⁴ Further, to complete the participatory picture we might consider that, just as all parts of the Timaeian cosmos stand in proportionate harmony to each other, measured to reflect and participate in the goodness of their eternal model, so we might think of the different Level II bubbles as coming forth from the same source and owing a kind of metaphysical dependence on the cosmic whole of which they are part.

²⁷⁴ Harte, p. 281.

2.5 Summary

In this chapter, I explored the issue of cosmic multiplicity, which is so central both to Plato's creation account in the *Timaeus* and to modern multiverse models, which describe the formation and development of (perhaps infinitely) many different parts of an unimaginably vast cosmic ensemble. The central point of this chapter is that the multiplicity of the universe (or multiverse) is not just a concern for scientific or philosophical accounts of mixture and composition, but is inherent in Plato's participatory vision of the manifold parts of the cosmos participating in their perfect and eternal source. To demonstrate this, I engaged with a diverse range of contemporary thinkers, encompassing new theological, scientific, and philosophical thought, including in relation to Plato and his connection to the multiverse hypothesis (or, in Harte's case, part-whole relations). In each case, I illustrated that a closer attention to the participatory aspect of Platonic metaphysics would not only clarify and strengthen the discussions of each thinker, but also raise new ways of thinking about specific multiverse theories or ideas.

Initially, in response to Rubenstein's compelling exploration of multiverse thought, I demonstrated that her postmodernist account of Plato's cosmology neglected to account for its critical participatory dimension. I argued that, for Plato, cosmic multiplicity is not a matter of an ambiguous and loosely articulated postmodern mixing of different perspectives.²⁷⁵ Rather, the multiplicity in the Platonic cosmos lends itself to a participatory understanding of the many parts of creation sharing in a common and intelligible source. I applied this participatory view to the connected multiverse of Mersini-Houghton, whose own use of participatory language and concepts suggests that scientists engaged in this work are inescapably operating within the participatory tradition.

Next, I presented a participatory critique of Tegmark's highly dubious version of Platonism and how he thinks it relates to his Level IV multiverse. On Tegmark's reading, mathematics is the highest form of knowledge, whereas it is more properly seen in the *Timeaus* as serving an important mediating role in bridging the sensible and intelligible realms. In light of his failure to attend closely to Platonic participatory metaphysics, I concluded that Tegmark's

²⁷⁵ I extend this argument in a related manner in Chapter 4.3, with reference to Catherine Keller's postmodern reading of infinity in Nicholas of Cusa's cosmology.

account of Platonism complicates his Level IV model and would in fact be more tenable in the context of the other, less controversial, levels in his multiverse hierarchy.

Finally, I assessed Harte's mereological account of composition in Plato. Although she also employs implicitly participatory language, and has a useful sense of what might be thought of as 'horizontal' participation, I proposed that a stronger form of 'vertical' participation in a transcendent source, informed by Plato's account of the many parts of the cosmos participating in an eternal model, would be helpful in terms of considering Level II post-inflationary bubbles. As such, I drew on an underdeveloped strand of participatory thinking in her work to highlight new ways in which theologians and scientists might approach parts and wholes within a multiverse context.

Multiplicity is an integral characteristic of multiverse thought, provoking speculation about immense cosmic realms with many parts and features. The parts of a multiverse may be many in number, but they are also generally considered to be many in variety, with a radical diversity of different features. As such, it would now be instructive to consider the extent to which metaphysical participation might be valuable in accounting for or illuminating the extraordinary cosmic diversity evident in multiverse models.

Chapter Three: Diversity (Aquinas)

In this chapter, I will bring the participatory thought of Aquinas into contact with the notion of cosmic diversity as it has been detailed in multiverse theory. As this chapter will indicate, Aquinas is a monumental figure in the history of participatory thought, articulating and significantly developing the Platonic tradition. Aquinas's conception of creation's participation in God is evident throughout his thought, which is marked by distinctly participatory language. As part of this approach, he understands diversity to be an integral characteristic of the cosmos, expressing the diversity of ways in which all parts of creation participate in God, the source of existence on which all of creation is utterly dependent.

Prior to considering the multiverse reflections of three contemporary thinkers, I will provide a detailed outline of Aquinas's enormously rich participatory metaphysics. I will refer to five key participatory texts, with a particular focus on Book I of *Summa Contra Gentiles* and the first article of *Summa Theologiae* I.44, in both of which he describes God's relationship with creation.

In the next three sections, I will apply Aquinas's participatory insights to the work of three scientifically and theologically-minded multiverse theorists. First, I will engage with Robin Collins, who is a prominent philosophical advocate of the plausibility of multiverse theory. I will suggest that he overlooks the importance of diversity in Thomistic metaphysics in his treatment of the multiverse hypothesis. I will then apply this Thomistic notion of diversity to the string theory landscape proposal, a multiverse theory in which diversity is central. Next, I will consider Don Page's multiverse thought, which (in common with Collins) is insufficiently metaphysical and which (also like Collins) regards string theory as expressing the beauty of cosmic multiplicity. I will demonstrate that Aquinas's metaphysical notion of beauty, an important aspect of his participatory thought, would strengthen Page's own concepts of God and creation. Finally, I will provide a response to multiverse theorist Bernard Carr's image of the cosmic uroborus. I will propose that Aquinas's theological circle of being more adequately conveys the unity and purpose of a cosmos that shares in God's existence than Carr's strictly cosmological model.

3.1 Thomistic Participation: General Overview

In this section, I will provide a general overview of the purpose and nature of Aquinas's participatory metaphysics, which he develops to explain the relationship between the diversity of creation and the unity of God's perfect being, or the many and the one.

After introductory comments, I will trace the development of his participatory thought with reference to five key texts, considered in chronological order. First, I will examine the three modes of participation outlined by Aquinas in his exposition on Boethius's *De Hebdomadibus*, with particular focus on the third mode of causal participation, which expresses the God-creation relationship. Second, I will focus on his explication in Book I of *Summa Contra Gentiles* of the causal mode of participation governing God's relationship with creation. Third, I will discuss the role of participation in Aquinas's doctrine of creation, as expressed in the first article of *Summa Theologiae* I.44. Fourth and fifth, I will assess his notions of participation and reception in *De Spiritualibus Creaturis* and *De Substantiis Separatis*, respectively. This will provide a representative illustration of Aquinas's vision of the participatory structure of the cosmos, while also serving as a useful basis from which to engage with multiverse theories in the subsequent sections of this chapter.

For Aquinas, as for Plato, participation represents an attempt to solve the fundamental metaphysical problem of the one and the many. This problem calls for an explanation to the paradox that many and varied beings exist within the cosmos, yet also seem to share in existence and together embody a community or commonality of beings, often referred to as reality. In other words, there is an immense multiplicity and diversity of beings and *at the same time* some kind of bond of unity among them. As such, reality appears to be both one and many. As discussed in the previous chapter, Plato interprets this common attribute as unity or goodness, deriving from an intelligible source (the absolute One or the Good) that exists beyond being. Aquinas, though, is not just concerned with the intelligibility of beings, but the reason for the existence of beings at all.²⁷⁶ In his vision, the unity among created beings arises from their diverse participations in the perfection of God, who is the ultimate

²⁷⁶ For this reason, Sherman distinguishes between the 'formal turn' in Platonic participation (which is concerned with *what* a being is) and the 'existential turn' in Thomistic participation (which is concerned with *why* a being is). See Sherman, 'A Genealogy of Participation', pp. 82-92. Similarly, Clarke refers to the passage in understanding 'from the *fact of existence* to the *act of existence*.' W. Norris Clarke, *The One and The Many*, p. 80.

source and act of existence. Thus, in W. Norris Clarke's excellent formulation, Thomistic participation is 'a structure or order of relationship between beings such that they share in various degrees of fullness in some positive property or perfection common to them all, as received from the same source: all finite beings participate in existence from God.'²⁷⁷

Participation in Aquinas, then, is deeply concerned with creation and its motive and purpose, and may in that sense be distinguished from the Platonic emphasis on the intelligibility and identity of things.

To understand the metaphysical foundation on which Aquinas develops participation as a way of reconciling the one and the many, it is crucial to appreciate his distinction between essence and existence.²⁷⁸ Whereas Plato frequently describes participation in terms of essences, Aquinas focuses on the act of existence as paramount. The question of what something is (its essence) thereby becomes subordinate to the question of why something is (its existence). To consider *what* something is, is not the same (and in fact not as fundamental) as affirming *that* it exists in a given way. The essence (or the 'what') of a thing is distinct from the fact of its existence. For example, the essence of a flower that exists and the essence of one that does not exist are equivalent; the flower's existence is therefore distinct from what kind of a thing it is. There must be something different between these essences or ideas of flowers, and the real flowers that share in the common act of existence. As Aquinas suggests, the question of a thing's essence 'follows on the question of its existence.'²⁷⁹ Existence, then, is prior to essence, and is that which allows essence to be. Aquinas uses the Latin *esse* (to be) to give expression to this act of being.

In the early sections of the *Summa Theologiae*, Aquinas describes the manner in which all created beings are composed of essence and existence, the first of which is the particular manner or mode in which a thing exists, and the second of which is the act by which a thing actually exists. If the essence and existence of a thing are different, its existence must be caused either by its own essential principles, or by some exterior agent. Since a thing (or its essential principles) cannot be the sufficient cause of its own existence, Aquinas argues that its existence must be caused by God. By contrast, God, as the first efficient cause, cannot be

²⁷⁷ Clarke, *The One and The Many*, p. 318.

²⁷⁸ Aquinas inherits (and amends) the essence-existence distinction from the 11th century Islamic philosopher Avicenna. For an account of Avicenna as a source for Aquinas's metaphysics, see John F. Wippel, *Metaphysical Themes in Thomas Aquinas II* (Washington DC: Catholic University of America Press, 2007), pp. 31-64.

²⁷⁹ *ST* I.2.2.

caused by another, and ‘therefore it is impossible that in God His existence should differ from His essence.’²⁸⁰ In God alone, essence and existence are synonymous, and this is what accounts for the difference between creator and creation.²⁸¹

For Aquinas, the link between the essence-existence distinction and participation is vital. He fully integrates this distinction in his participatory metaphysical scheme. All essence-existence composites (that is, all created beings whose cause of existence is external) participate in existence. Each being receives existence through participation in the perfect existence of God. The essence of each being describes the manner in which it receives its existence. In this sense, the cosmos consists of diverse and limited participations of all beings in the central perfection of existence. The question of why we exist (as well as the particular form in which this is expressed) finds its answer in the participatory structure of essence and existence in the universe: ‘just as that which has fire, but is not itself fire, is on fire by participation; so that which has existence but is not existence, is a being by participation.’²⁸² In fact, our existence can be thought of in participatory terms as a gift from, or act of sharing by, God. Existence itself is a gift received from the fullness of God’s existence, according to the diverse limitations and capacities of the recipients. The unity of existence (the ‘oneness’ of reality) in the diverse participations of limited beings (the ‘manyness’ of reality) follows from the fullness of God’s existence that is freely and generously shared throughout creation.

In this sense, Thomistic participation seeks to reconcile the one and the many with a metaphysical structure by which God, the ultimate source of all being, shares the fullness of his existence with many other created beings, according to their own limited degrees (or essences). As a consequence, our very existence (or ‘act of being’) is wholly dependent upon the principle from which it is produced. Creation is therefore ‘a kind of relation’²⁸³ and participation expresses the radical dependence of the created act of being (finite existence) on God (the central perfection of existence). It is by virtue of God’s being that all others come to be a particular mode. The sharing of God’s existence among diverse creaturely participants illustrates how divine unity can produce temporal diversity, and the metaphysical dependence of the many on the one. This view of the creature participating in the creator, entailing the radical dependence of all things on God, will be the aspect of Aquinas’s participatory thought

²⁸⁰ *ST* I.3.4.

²⁸¹ For an extended version of Aquinas’s argument that ‘in God being and essence are the same’, see *SCG* I.22.

²⁸² *ST* I.3.4.

²⁸³ *SCG* II.18.2.

upon which this chapter focuses. However, it is not the only kind of participation described by Aquinas, and it would therefore be useful initially to consider his early threefold classification of participation.

In light of this background, I will now consider five texts from different periods in Aquinas's career to provide a sense of the development of his treatment of metaphysical participation. By examining the texts in chronological order, it will be shown that participation comes to occupy a central place in his thought. Although the idea of participation, in the sense of created effects produced by a first cause, is present early in his writing, it is systematically expressed in the *Summa Contra Gentiles* and *Summa Theologiae*, and continues to be developed thereafter. While he clearly inherits participatory ways of thought from Plato, he develops his own vision of participation to express the dependence of creation on God as its perfect first cause.

3.1 *In De Hebdomadibus*

In his commentary on Boethius's early sixth-century text *De Hebdomadibus*, Aquinas defines participation and provides a threefold classification of different modes of participation. Although there is considerable uncertainty regarding the date of his commentary,²⁸⁴ it is worth focusing on this text as a starting point for assessing the development of Aquinas's participatory thought, since it likely represents his first systematic reflection on the subject.

Boethius is concerned with the relationship between participation and substantiality. In spite of the short length of the discussion, and its somewhat unsatisfactory conclusion, this is a question of profound importance to the Christian participatory account of the distinction between creator and creation. Ostensibly, there might seem to be conflict between participation (the idea that something can be explained by something else) and substantiality (the idea that something is inherently and self-sufficiently intelligible). To illustrate this apparent conflict, Boethius considers the question of whether things are good by participation or by substance. If things are good by participation, 'they are in no wise good in

²⁸⁴ While its composition may have been as late as 1271-72, it is often situated relatively early in Aquinas's career, in the late 1250s. Rudi Te Velde, who dates the commentary in the period of 1256-59, notes that it is 'chronologically the first text in which "participation" becomes a distinct theme of reflection.' Rudi Te Velde, *Participation and Substantiality in Thomas Aquinas* (Leiden: E. J. Brill, 1995), p. 8.

themselves.’²⁸⁵ Yet if things are good by substance, they would be good in themselves and therefore all things would be equivalent to God, which he dismisses as an ‘impious’ notion.²⁸⁶ Instead, he proposes that things are good ‘simply because their existence has derived from the will of the good.’²⁸⁷ Since this is a kind of received being, things can be good while remaining distinct from the first good (God) from which they are derived.

In his commentary on Boethius’s text, Aquinas seeks to demonstrate that participation and substantiality need not be opposites. He begins his discussion of participation with an etymological definition: ‘For “to participate” is, as it were, “to grasp a part.”’²⁸⁸ He explains that participation is when something receives ‘in a particular way that which belongs to another in a universal way.’²⁸⁹ In this sense, something can be said to participate in a given perfection or quality when it possesses that perfection or quality in a partial or specific manner. Since the subject is not identical to the perfection in which it participates, it is possible for other subjects to participate in the same perfection in different ways.

With this preliminary definition in mind, Aquinas proceeds to outline three different modes of participation. First, he describes what is often called ‘logical’ participation, which describes the relationship between species, genus, and individual. He refers to the way in which humans are said to participate in animal because humans do not possess the ‘intelligible structure’ of animal in its ‘total commonality’.²⁹⁰ In a similar way, he notes that Socrates ‘participates’ in human. Thus, there is a participatory relationship between the individual and species (Socrates and man) and between species and genus (man and animal). Socrates, while sharing in what it means to be a man in his own particular way, is not identical with the ‘commonality’ of all other men, just as humans, while sharing in some common nature of animal, do not embody the full extent of animal. Socrates is not strictly identical to human, and human is not strictly identical to animal, and this distinction enables participation to be applied to the logical relations of species, genus, and individual. Given his

²⁸⁵ Boethius, *De Hebdomadibus*, 62. In *Theological Tractates and the Consolation of Philosophy*, trans. H. F. Stewart, Edward Kennard Rand and S. J. Tester (Cambridge, MA: Harvard University Press, 2014).

²⁸⁶ Boethius, *De Hebdomadibus*, 79.

²⁸⁷ Boethius, *De Hebdomadibus*, 124.

²⁸⁸ Aquinas, *An Exposition of the On the Hebdomads of Boethius*, trans. Janice L. Schultz. (Washington, DC: Catholic University of America Press, 2001), 2.71.

²⁸⁹ Aquinas, *On the Hebdomads of Boethius*, 2.72-73.

²⁹⁰ Aquinas, *On the Hebdomads of Boethius*, 2.75.

focus on defining relations between different categories, Aquinas does not seem to be granting ontological weight to this first mode of logical participation.

Second, Aquinas describes the participatory relationship between subject and accident, and matter and form. He notes that subject may participate in accident, and matter in form, ‘because a substantial form, or an accidental one, which is common by virtue of its own intelligible structure, is determined to this or that subject.’²⁹¹ In this mode of participation, the subject receives (and thus participates in) an accidental or substantial form in its own partial and particular way. This means that a form can be shared in by many different subjects, though in each matter-form composite, the participated perfection is restricted according to the way in which it is received. This second mode of participation is often called ‘ontological’ participation, since it is concerned with real composition, whereas the first mode refers only to logical explanation.

Here, it is worth noting that Boethius uses the term ‘participation’ in the sense of this second mode of participation, whereby a subject is said to participate in an accident. He refers to qualities such as whiteness, heaviness, and rotundity, all of which are accidental (or additional) properties that are not the same as the ‘particular substance’ of a subject.²⁹² This view of participation is the basis for his assumption that participation and substantiality are in conflict. Since, as he believes, to participate is to share in accidental properties, the term cannot be applied to the substantial being of a subject. Thus, participation involves the accidental characteristics of a participant, and not its substance. In response, Aquinas applies participation to the being of the substance, such that things are good by participation *and* have being by participation.²⁹³ This implies the essence-existence distinction noted earlier and discussed further below.

Third, and of particular relevance to this chapter, Aquinas describes what might be called ‘causal’ participation, whereby an effect participates in its cause, especially when the effect is not equal to the power of its cause. He illustrates this mode of participation with the image of the air participating in the sun, ‘because it does not receive that light with the brilliance it has

²⁹¹ Aquinas, *On the Hebdomads of Boethius*, 2.78-80.

²⁹² Boethius, *De Hebdomadibus*, 101-105.

²⁹³ ‘And because good is convertible with being, as one is also; [Plato] called God the absolute good, from whom all things are called good by way of participation.’ *ST I.6.4*.

in the sun.’²⁹⁴ By this analogy he means that the sunlight is less present in the air than it is in the sun itself, so we might say that the air receives (or shares in) the light in a diminished or partial way, whereas it would be fully and perfectly present in the sun. This is consistent with Aquinas’s initial definition of participation whereby something (the air) receives in a particular way that which belongs (the light) to another (the sun) in a universal way.

Although this third mode of causal participation is not considered any further in Aquinas’s commentary on Boethius, it is extremely significant for his doctrine of creation. Just as the air receives sunlight to a lesser degree than the sun itself, created beings participate in *esse* in the way in which an effect participates in a higher order cause. Created beings receive (and participate in) *esse*, the act of existence, from the fullness of God’s being. The effect (or created being) receives its being in a partial and limited manner, not in the full and undiminished way of its cause. At the same time, the effect resembles and bears a likeness to its cause, proceeding from the cause according to some intelligible pattern.

With this causal mode of participation, informed by the essence-existence distinction, Aquinas can relate the simplicity and unity of God with the diversity and complexity of creation. Unlike God, in whom essence and existence coincide, all created beings receive their existence by participation in God, so that their essence and existence are distinct.²⁹⁵ Created beings share in or participate in existence from God, not according to Boethius’s unsatisfactory model, but in a fundamental pattern of metaphysical causality in which participation expresses the dependence of all things on God, such that the existence of the cause accounts for the existence (and nature) of all its effects. This is not so much a case of Platonic formal causality, but a sharing of God’s fullness of being throughout the created order, or a ‘communication of being’.²⁹⁶

²⁹⁴ Aquinas, *On the Hebdomads of Boethius*, 2.85.

²⁹⁵ *ST* I.104.1.

²⁹⁶ Joseph W. Koterski, ‘The Doctrine of Participation in Thomistic Metaphysics’, in Joseph W. Koterski (ed.), *Future of Thomism* (Mishawaka, IN: American Maritain Association, 1992), p. 192. He sees Aquinas’s sense of causal participation as leaving ‘no trace... of a “form divided among different subjects” as for Plato.’

3.1.2 *Summa Contra Gentiles*

In his *Summa Contra Gentiles*, likely composed shortly after his commentary on Boethius's *De Hebdomadibus*,²⁹⁷ Aquinas continues to define and develop his participatory metaphysics, particularly in terms of the third mode of causal participation governing the relationship between God and creation. The text is rich with participatory language and gives deeper expression and explication to some of the participatory insights in his relatively brief critique of Boethius. While there are dozens of chapters within the four books of the text that address participation, it will be sufficient for the purposes of this section to consider some representative examples from Book One, in which he considers the sense in which an effect might be said to participate in its cause, and the implications for this mode of causal participation for the relationship between God and creation.

In Book One, Chapter 29, Aquinas considers the likeness of creatures to God in a manner that follows clearly from the third mode of causal participation. As noted earlier, an effect can be said to participate in its cause in the sense that it shares some similarity with the cause that produced it. This similarity expresses the relationship between cause and effect such that the nature of the former can be known with reference to the latter. Aquinas applies this causal participatory framework to the relationship between God and creation, which is an instance of an effect participating in a higher order cause. He explains that, even the case of effects that fall short of their causes, 'some likeness must be found between them' since causes produce similar effects.²⁹⁸ As such, the form of an effect will be found in some measure in a transcending cause (such as God), but 'according to another mode and another way.'²⁹⁹ Whereas Aquinas uses sunlight to illustrate causal participation in his commentary on Boethius, in this chapter he alludes to the heat generated by the sun, which bears some likeness among sublunary bodies to the active power of the sun itself, although not in the same way. The sun is therefore somewhat like the things in which it produces effects, but also unlike these things, which only possess heat in a limited way: 'So, too, God gave things all their perfections and thereby is both like and unlike all of them.'³⁰⁰

²⁹⁷ Wippel dates its composition to 1259-1264/65, which is in line with the general scholarly consensus.

²⁹⁸ *SCG* I.29.2.

²⁹⁹ *SCG* I.29.2. The notion of a cause producing a similar effect is also made in Book Two: 'For every agent that produces an effect in participation of its own form intends to produce its own likeness in that effect. Thus, to produce the creature in participation of His own goodness was becoming to God's will, for by its likeness to Him the creature might show forth His goodness.' *SCG* II.35.8.

³⁰⁰ *SCG* I.29.2.

Aquinas refers to the limited reception of participated perfections as ‘diminished participation’.³⁰¹ The effect receives (or participates in) a perfection that is found perfectly in God. It has, albeit in a partial and diminished way, ‘what belongs to God’ and is thereby like God.³⁰² While we might say that an effect is like its cause (or a creature is like God), the converse is not true, since the perfection belongs to God, not the creature. God is not like the creature, just as we do not suppose that a woman is like her image on a computer screen. In this way, the likeness each creature bears of God is deficient, falling short of what belongs to God, though sufficiently similar for the intelligible connection between God and creature to be identified. Aquinas’s notion of diminished participation not only expresses the deficient way in which creation bears a likeness to its cause, but also the way in which creation is as diverse and manifold as its cause is unified and simple. The (divine) cause is one, but the (creaturely) effects it produces are many.³⁰³

Later in Book One, Aquinas continues to explore the way in which the causal participatory relationship between God and creation results in a created order of enormous diversity and multiplicity. The things made by God, the created participants, receive ‘in a divided and particular way that which in Him is found in a simple and universal way’.³⁰⁴ To the extent that a participant might share in divine goodness or beauty, it is not according to the same ‘mode of being’ as God,³⁰⁵ but only according to the particular mode of the participant, and so the participated perfection is only ‘possessed in a partial way’.³⁰⁶ Given the vast inequality between creation and God, it is only possible for creation, in its totality, to bear a likeness to God through radical diversity. It is precisely *because* created things are imperfect representations of divine being that there are many different such representations, or

³⁰¹ SCG I.29.5.

³⁰² SCG I.29.5.

³⁰³ Te Velde observes that this might suggest that creation could be regarded as ‘ontological fall’. This term is problematic, though, since it suggests something negative or unintended about the multiplicity of creation. Te Velde prefers to interpret Aquinas’s idea of diminished participation in positive terms, such that creation can be seen as like ‘an outpouring of the infinite goodness of God into a multitude of various things each reflecting God’s simple and perfect goodness in its own way.’ Te Velde, *Participation and Substantiality in Thomas Aquinas*, p. 101.

³⁰⁴ SCG I.32.2.

³⁰⁵ SCG I.32.3.

³⁰⁶ SCG I.32.6.

participants.³⁰⁷ Creation, then, is inescapably diverse and varied, and this is a natural consequence of the kind of causal participatory relationship that it shares with God.

3.1.3 *Summa Theologiae*

In his *Summa Theologiae*, composed between 1265 and 1268, Aquinas reiterates and refines many of the participatory ideas outlined in his *Summa Contra Gentiles*. In particular, he presents in I.44.1 what might be considered his participatory account of creation. The concept of participation is fundamental to his account of the relationship between God and creation, as well as the inherent diversity of creation by virtue of the diverse participations of created beings in God's being.

Aquinas's participatory view of creation follows from his understanding of God as 'self-subsisting being', the first cause of all being which subsists by itself and is thereby distinguished from all other beings. To illustrate this, he refers back to an earlier section of the *Summa* in which he presents three arguments for the coincidence of essence and existence in God.³⁰⁸ First, if the essence and existence of a thing are different, its existence must be caused by its own essential principles or some exterior agent. Since God is the 'first efficient cause', his existence cannot be caused by another, and so His essence and existence cannot be different. Second, he argues that existence (which makes every form or nature actual) may be compared to essence as actuality is to potentiality. Since in God there is no potentiality, it follows that his essence and existence are equivalent. Third, he makes the participatory claim that something aflame 'has' fire but is not itself fire and is on fire by participation. Likewise, we 'have' existence from God, but we are not existence itself, and we exist by participation. Since God cannot be participated being, He must be his own existence and not just His own essence.

In addition to being self-subsisting, God is also one. Again, he refers back to an earlier section in which a threefold argument for God's oneness is presented.³⁰⁹ First, God's essence belongs to God alone, and cannot be communicated to many. There cannot be many Gods in the same way that what makes a man a particular man is only communicable to one. Second,

³⁰⁷ Indeed, Aquinas suggests that creation might not just bear a likeness to God in many ways, but in infinite ways: 'Since the divine goodness is infinite, it can be participated in infinite ways'. *SCG* I.81.4.

³⁰⁸ *ST* I.3.4.

³⁰⁹ *ST* I.11.3.

the perfections of all things are in God, whereas if many Gods existed they would be different and thus not each able to contain all such perfections. Third, the unity of creation suggests the prior existence of one ordering being, since ‘many are reduced into one order by one better than by many’.³¹⁰ This first and most perfect cause, which reduces all diverse things into one order, is God.

Having established the self-subsistence and unity of God, Aquinas outlines his argument that all of creation is dependent upon and participates in God:

It must be said that every being in any way existing is from God. For whatever is found in anything by participation, must be caused in it by that to which it belongs essentially, as iron becomes ignited by fire... all beings apart from God are not their own being, but are beings by participation. Therefore it must be that all things which are diversified by the diverse participation of being, so as to be more or less perfect, are caused by one First Being, Who possesses being most perfectly.³¹¹

While stated concisely, this is a complex piece of reasoning, expressing Aquinas’s fundamental participatory conviction. For the purposes of this introductory section, it will be useful to make three general observations. First, this passage contains what might be thought of as Aquinas’s participation principle. If a perfection or characteristic is found in any created thing, it cannot be explained by reference to the thing itself. Instead, it must be caused in it by that to which it belongs essentially, and which *is* the perfection itself, without any need for further explanation. In Aquinas’s somewhat abstruse example, the cause of the characteristic of being aflame is not to be found within the iron, but with reference to fire itself: the iron *has* fire, but is not itself fire. By this principle, all created things *have* being by participation in God, who *is* being.³¹² This principle applies not only to participation in existence, but all other perfections, such as beauty. Thus, when beauty is found in a created thing, its beauty cannot be explained by the thing itself, but must be caused in it by beauty itself, which is God, whose beauty does not require any explanation. The created thing has beauty from God,

³¹⁰ *ST* I.11.3.

³¹¹ *ST* I.44.1.

³¹² This principle is also expressed in Book Two of the *SCG* in which Aquinas argues that God is to all things the cause of being: ‘Everything which is in any way at all must then derive its being from that whose being has no cause. But we have already shown that God is this being whose existence has no cause. Everything which is in any mode whatever, therefore, is from Him.’ *SCG* II.15.2.

and may participate in and embody beauty in its own limited way according to its own essence.

Second, Aquinas's argument illustrates the way in which the perfect unity of self-subsisting divine being produces many created beings. If God is the cause of all things, it follows that such things are different and distinct from God and may therefore be defined as *not* God. If God is the very act of being and all other beings are only beings by participation, this might be thought to imply a negation of being as it relates to creation.³¹³ Yet this would be to overlook the positive force of Aquinas's participatory account of creation. His conception of a self-subsisting, perfectly simple God entails the existence of other created beings who must necessarily be distinct from being itself. This distinction, or division, between the multiplicity of created being and the unity of being itself is a matter of participation: created being participates in being received from God. The ostensibly 'negative' sense in which created being is necessarily not its own being is therefore subordinate to the fundamental and positive participatory insight that beings have being (and perfections and qualities) from God.

Third, Aquinas's creation argument establishes the centrality of participation in terms of creation. He suggests not only that all beings apart from God are not their own being, but also that they are beings by participation. Although he moves quickly from the first idea that things are not identical with their being to the second idea that they participate in divine being, upon reflection it can be seen that the former implies the latter. As distinct from God and without their own being, all created things clearly share something in common: participation in God's being. This participatory condition distinguishes beings from God, but it also distinguishes beings from each other, since this common source of being is participated in diverse ways.

3.1.4 *De Spiritualibus Creaturis*

In Article 1 of this text, composed between 1267 and 1268, Aquinas—in the course of rejecting matter-form composition of purely spiritual creatures—provides additional insight into the nature of participation and reception. He proceeds from the basis that God, as the 'first being' and 'infinite act', contains the entire fullness of being, which is not limited to any

³¹³ For example, Koterski understands Thomistic participation as expressing 'the non-identity of that which is with its being'. Koterski, 'The Doctrine of Participation in Thomistic Metaphysics', p. 193.

specific nature.³¹⁴ God's existence is thus not an existence that is received by some nature which is not its own existence, otherwise it would be limited to that nature. As such, God is identical with his own existence, which cannot be said of any other being. To illustrate that this existence is also self-subsisting and one, Aquinas notes that it would be incoherent for a perfection such as whiteness to exist as many separate whitenesses, and that only one 'whiteness' can be apart from every subject and recipient.

As a consequence, every created being, as distinct from God, is not its own existence but 'has an existence that is received in something, through which the existence is itself contracted.'³¹⁵ This means that a participated perfection is received in a limited way, according to the nature of that which receives it. In terms of participation, Aquinas highlights the consequent distinction between the nature of the thing that participates in existence and the participated existence itself. He makes an analogy between the relation of act to potency and the relation of the participated existence and the nature (or specific thing) participating in it. Again, this underlines the point that there is a distinction between essence and existence in created beings, whereby the essence of each being receives and limits acts of existence in which the being participates.

3.1.5 *De Substantiis Separatis*

In Chapter VIII of this text, composed after 1271, Aquinas responds to Avicenna, an 11th century Jewish philosopher inspired by Neoplatonism. According to Avicenna's doctrine of the universality of matter, all created things are composed of matter and form, including angels. Aquinas, though, contends that spiritual substances are immaterial, though they are still distinct from God, in whose perfect existence they share. In every other being other than the First Being, there is both the act of existence and the specific mode that receives this existence.³¹⁶ Anything that participates in being from the First Being does so in 'a particular way, according to a certain determinate mode of being.'³¹⁷ He adds that spiritual substances participate in God's existence according to their own essence, so that their being is 'not

³¹⁴ Aquinas, *De Spiritibus Creaturis*, trans. Mary C. FitzPatrick (Milwaukee, WI: Marquette University Press, 1949), p. 23.

³¹⁵ *De Spiritibus Creaturis*, p. 23.

³¹⁶ *De Substantiis Separatis*, trans. Francis J. Lescoe (West Hartford, CT: Saint Joseph College, 1959), VIII.42.

³¹⁷ *De Substantiis Separatis*, VIII.43.

infinite but finite.’³¹⁸ All created beings, including spiritual beings, can only participate in God’s being in the way that their own limited essences will allow. The finitude of created essences ensures that creaturely participation will itself be necessarily finite and partial.

3.1.6 Summary

As this section indicates, Aquinas’s metaphysical work is shot through with participatory themes. His central belief is that creation is not self-standing, but exists by virtue of participation in God. Creation participates in God and only exists in relation to God. Everything exists by sharing in God’s existence, just as we might say that things are warm not because of any warmth that is proper to them, but because they participate in the sun’s warming light. Participation defines and governs the diverse ways in which different beings in a complex cosmic order can share in God’s existence, which is graciously and freely donated, and which is the only thing holding everything else in existence.

³¹⁸ *De Substantiis Separatis*, VIII.45.

3.2 Robin Collins on Diversity

In this section, I will examine the American philosopher of religion Robin Collins's work on the compatibility of theism with multiverse thought. While this project represents a welcome alternative to the unease with which theologians often discuss multiverse thought, I will argue that his analytical approach overlooks the metaphysical aspects of the scientific and theological questions with which he is concerned. In addition to his engagement with multiverse theories, Collins has also argued for the plausibility of multiple incarnations in the context of a universe with extraterrestrial intelligent life. I will highlight his tentative treatment of diversity in Thomistic metaphysics in this argument, and I will argue that this vision of a diverse creation should be considered more extensively in terms of engagement with the multiverse hypothesis. Finally, I will suggest that the diversity inherent in Thomistic participatory metaphysics can be brought into mutual constructive interaction with multiverse thought, with specific reference to the diversity of environments entailed in string theory.

3.2.1 *Collins on Multiverses and the Incarnation*

In recent years, Collins has emerged as one of the leading proponents of constructive theological engagement with the multiverse hypothesis. In Bernard Carr's multiverse volume, which is mostly given over to scientific discussions in which theology is largely viewed as irrelevant or simply false, Collins takes an explicitly theological approach to the multiverse hypothesis. Among these contributors and many others, the multiverse hypothesis is often advanced as an alternative to a divinely designed single universe. Against this consensus, Collins argues that not only is the multiverse hypothesis compatible with theism, but that contemporary physics and cosmology could be understood to suggest a theistic explanation of the universe (or multiverse). As such, he contends that theists might be inclined to prefer a multiverse over a single universe.

Collins assumes a standard 'Anselmian' conception of God, whereby God is defined as 'the greatest possible being', although he allows that even a minimal hypothesis of God as some sort of highly powerful and intelligent agent, responsible for the existence of the universe,

would be sufficient for his argument.³¹⁹ Given this basic idea of God of as infinitely powerful and creative, he believes that it would make sense for creation to reflect these attributes such that ‘physical reality might be larger than one universe.’³²⁰ To the extent that Western theology has not stressed the idea that the universe is infinite, he insists that this is due to historical factors (such as the influence of Aristotelian metaphysics) rather than anything intrinsically connected to the idea of God as infinitely creative. Like many other historians of multiverse thought, he identifies Nicholas of Cusa and Giordano Bruno as key figures in the emergence of the ‘positive suggestion’ that space is infinite, ‘with perhaps an infinity of worlds.’³²¹ He believes that this theological justification for a multiverse scenario has been strengthened by recent developments in cosmology and particle physics, which have shown that the visible part of the universe is vastly larger than previously assumed: ‘Thus, it makes sense that this trend will continue and physical reality will be found to be much larger than a single universe.’³²²

Furthermore, Collins argues that an infinitely creative God might create many universes via ‘some sort of universe generator’, since this would be ‘somewhat more elegant and ingenious’ than creating such universes *ex nihilo*.³²³ To the potential objection that this would be an inefficient way to proceed, he offers the conception of God as an artist with a creation motive of expressing infinite creativity and ingenuity, rather than an engineer narrowly concerned with efficiency.³²⁴ With this analogy of God as creative artist, Collins is (perhaps intentionally) echoing the Thomistic depiction of creation as *artificiatum divinae artis*, or an

³¹⁹ Robin Collins, ‘Multiverse hypothesis: a theistic perspective’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 460.

³²⁰ Collins, ‘Multiverse hypothesis: a theistic perspective’, p. 460.

³²¹ Collins, ‘Multiverse hypothesis: a theistic perspective’, p. 461. Cusa’s participatory metaphysics is the subject of Chapter 4.

³²² Collins, ‘Multiverse hypothesis: a theistic perspective’, p. 461. This is similar to Carr’s ‘outward journey’ thesis, in which science progressively reveals new levels of cosmic structure, expanding our view of the size and scope of reality (see Chapter 3.4). Tegmark holds a similarly optimistic view of the likely future direction of cosmology, raising profound questions about how scientific knowledge progresses or the extent to which it might be said to have a certain momentum. On this subject, see Thomas Kuhn’s landmark case that scientific progress is marked by revolutionary paradigm shifts rather than a gradual, cumulative development of facts and theories. Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1996).

³²³ Collins, p. 460. Here we might note Collins’s unorthodox approach to the doctrine of creation *ex nihilo*. The doctrine is essential to preserving the distinction between God and creation, and the total dependency of the latter on the former. It implies that God is the absolute source of all that is not God, and that all of creation would be nothing without God. For Aquinas, creation only exists by participation in God. It is therefore problematic for Collins to, as it were, subcontract the act of creation to a multiverse generator rather than view it in terms of God’s loving donation of existence from nothing. For a stimulating overview of God, participation, and creation *ex nihilo*, see Simon Oliver, *Creation: A Guide for the Perplexed*, pp. 35-60.

³²⁴ Collins, ‘Multiverse hypothesis: a theistic perspective’, pp. 461-62.

artistic product of divine workmanship.³²⁵ Yet invoking a universe generator as an explanation of fine-tuning does not avoid the suggestion of design, since such a process would still need to be designed in such a way as to provide for the creation of life-sustaining domains. At this point, Collins appeals to the beauty and elegance of the laws of nature as an explanation for the fine-tuning disclosed by modern physics. Given his classical conception of God as the greatest possible being, and hence with a perfect aesthetic sense of creativity and ingenuity, he concludes that it is unsurprising that we inhabit a cosmos of ‘great subtlety and beauty at the fundamental level.’³²⁶ Instead of negating the need for God, then, the multiverse hypothesis is *more* explicable in Collins’s model of an infinitely creative artist whose creation motive is expressed in the immensity, beauty, and rationality of the cosmos.

Although Collins describes the way in which an infinitely creative God might produce an infinite and intelligible cosmos, he does not explicitly address the *diversity* of the cosmos that is so central to multiverse theories, nor how this diversity might follow from the nature of God. This is a particularly curious oversight in light of his consideration of cosmic diversity in the context of a related question regarding extraterrestrial intelligence and the incarnation. In Klaas J. Kraay’s recent collection of theological essays on multiverse thought, Collins argues for the plausibility of an ‘enormous number of races’ of embodied conscious agents that are causally isolated from humans in different parts of the universe.³²⁷ God is perfectly good, and wishes to create a reality that realises value. If the existence of humans positively contributes to the value of reality, then presumably other conscious agents would add value, and so Collins concludes that the best of all possible realities would contain an ‘infinite number’ of such races.³²⁸ Given the possibility of so many other races, it is highly likely that a very large number of them would be fallen while highly *unlikely* that ours would be the only one in which God became incarnate. Through the dubious mechanism of the Bayes’s theorem of the probability calculus, Collins estimates that the probability for the human race being the only one in which God became incarnate is ‘about one in a million’, suggesting a vast number of other incarnations.³²⁹

³²⁵ ‘All natural things were produced by the Divine art, and so may be called God’s works of art.’ *ST I*.91.3.

³²⁶ Collins, ‘Multiverse hypothesis: a theistic perspective’, p. 476.

³²⁷ Robin Collins, ‘Extraterrestrial Intelligence and the Incarnation.’ In Klaas J. Kraay (ed.), *God and the Multiverse* (New York, NY: Routledge, 2015), p. 211.

³²⁸ Collins, ‘Extraterrestrial Intelligence and the Incarnation’, p. 212.

³²⁹ Collins, ‘Extraterrestrial Intelligence and the Incarnation’, p. 215. Like other philosophers influenced by the analytical tradition, Collins employs Bayesian probability as a quantitative method for assessing the likelihood of a hypothesis, given specific conditions. In my view, the use of mathematical models to reach theological conclusions confuses different categories of thought. Collins’s approach seeks to introduce mathematical

Apart from his analytical arguments, it is noteworthy that Collins also includes a reference to a distinctly participatory passage on the diversity of creation from Aquinas's *Summa Theologiae*, though he does not specify the part of the text from which he quotes:

For [God] brought things into being in order that His goodness might be communicated to creatures, and be represented by them; and because His goodness could not be adequately represented by one creature alone, He produced many and diverse creatures... For goodness, which in God is simple and uniform, in creatures is manifold and divided and hence the whole universe together participates the divine goodness more perfectly, and represents it better than any single creature whatever.³³⁰

This participatory account of the diversity of creation not only merits further consideration in the immediate context of Collins's argument for multiple incarnations, but it would also be extremely valuable to his theological case for the multiverse hypothesis, particularly in light of the diversity and complexity inherent in multiverse theories. Ironically, the Thomistic metaphysics of diversity identified by Collins in his essay on incarnations would strengthen his argument in his essay on multiverses, in which the relationship between God and creation is considered in a relatively basic manner. His effort to reconcile God and the multiverse would be assisted with a closer attention to Aquinas's participatory metaphysics, specifically as it relates to cosmic diversity, which will be the focus of the next section.

3.2.2 *Aquinas on Cosmic Diversity*

As illustrated by the creation argument in the *Summa Theologiae* (I.44) and discussed earlier in Chapter 3.1.3, Aquinas holds that all created beings are beings by participation. The diversity of creation is a consequence of the diverse participation of beings in God, the First Being who possesses being most perfectly. Participation therefore assumes the primacy and perfection of the One, from which the diversity of all other (less perfect) beings is derived. Given Collins's oblique reference to Thomistic metaphysical diversity, which he elects

precision into a realm that is inherently beyond such quantification. Perhaps the most significant instance of this kind of category error is Richard Swinburne's application of Bayes's theorem to calculate the probability of God's existence. See Richard Swinburne, *The Existence of God* (Oxford: Oxford University Press, 2004).

³³⁰ *ST* I.47.1. In the (unspecified) translation to which Collins refers on p. 211, the universe 'shares and expresses' (rather than participates) the divine goodness.

neither to examine closely nor to apply to his multiverse thesis, it would be worth focusing on Aquinas's claim that reality is diverse by virtue of diverse participation in divine being. This vision of cosmic diversity will then be applied to specific multiverse theories in contemporary cosmology in the following section.

For Aquinas, for beings to be distinguished from God as self-subsisting being implies multiplication of created being. Paradoxically, it is precisely in what things share in common—their participation in divine being—that they may be distinguished from each other as diverse parts of creation. Diversity is part of the metaphysical structure of the cosmos because of each thing's diverse participation in being. The whole universe (or, perhaps, multiverse) can be seen as diverse and limited participations in God's perfect existence. Each being shares in God's being according to its own limited capacity or essence.³³¹ As such, each being is distinct from God in its own diverse way, and may be thought to stand in its own relation to God, according to the extent to which it exemplifies the perfection of God's being.³³² Diversity, then, is a fundamental characteristic of the created order, reflecting the diverse participation of many beings in the same perfect source of existence, on which all of creation depends.

In addition, the diversity of creation is inherent in the specific mode of causal participation described earlier in this chapter. Each created effect participates in its cause, but only in a limited and imperfect fashion, 'by way of a certain assimilation which is far removed and defective'.³³³ This mode of causal participation, by which effects bear a partial likeness to the cause by which they were produced, shows that the perfection, simplicity, and unity of God can only be represented by way of diversity and multiplicity in creation. The diminished or deficient way in which creatures participate in God represents a divided representation of what is undivided in God. In basic terms, creation is diverse while God is unified and simple. Creation is thus a riotous composition of diverse participants, each sharing in the fullness of

³³¹ W. Norris Clarke suggests a helpful analogy to represent the diverse way in which participants share in God's being. Just as a great mathematician can share his wisdom with students, each of whom receive it in their own limited ways, so God shares the fullness of His being, which is 'diversely received according to the distinct capacities of the receivers.' Clarke, *The One and the Many*, p. 87.

³³² To claim that things are distinguished from God in diverse ways might imply that they are located at different distances to God. Although such language of ontological distance is evident in Aquinas's work, it might be taken to mean that there is some kind of gap between God and creation such that they represent two equivalent points on a plane, which would not adequately reflect creaturely dependence on and participation in God. Since everything that exists is either God or creation, E. L. Mascall dismisses the image of a gulf to be bridged as 'thoroughly incoherent'. E. L. Mascall, *Via Media* (London: Longmans, Green and Co, 1956), p. 55.

³³³ *ST* I.6.4.

God's being and distinct from one another according to the degree to which they approximate this perfect being.³³⁴

While the diverse way in which finite beings share in the infinite fullness of being might be regarded as indicative of a cosmos that is unruly and disordered and therefore accidental or unintentional, it should be remembered that Thomistic participation expresses the 'multiplicity of an intelligible order.'³³⁵ In negative terms, we might think that participation expresses the diminished way in which divine similitude is present in created being. The more positive corollary is that the diversity and multiplicity of creation is an intentional and inherent consequence of this metaphysical structure. As First Being, God brings into being a diverse creation with many participants who occupy their own place according to their own being, of which God has full knowledge. This being so, creation should not just be thought of in terms of deficient effects that fall short of the perfection of the cause, but as diverse by necessity, since imperfect effects may only represent God's perfection in a multitude of diverse ways. Aquinas explains that created effects do not imitate God perfectly, but only to the extent that they are able. This imitation may be defective, but that is 'precisely because what is simple and one, can only be represented by diverse things.'³³⁶ This sense of the intentionality and intelligibility of cosmic diversity fits well with Collins's conception of God as the purposive creator of a vast and complex multiverse ensemble.³³⁷

In addition to ascribing purpose and intention to God's infinitely creative power, Collins also describes God as an artist, seeking to maximise value and goodness in creation. In light of Aquinas's participatory metaphysics, we might add that the intelligible diversity in creation is suggestive of a work of art: 'by His wisdom He is the cause of diverse things as known by Him, even as an artificer, by apprehending diverse forms, produces diverse works of art.'³³⁸ Creation, as the product of divine workmanship, embodies the perfection of its cause, albeit in the distinct and diverse participations of its constituent parts. Indeed, Collins's observation

³³⁴ However, to speak of participants sharing diversely in God's being is not to suggest that they are 'parts' of God. As the source and fullness of being, God is not 'divided' up among creatures in the manner that we might divide a building into different rooms. Rather, God may be said to share the fullness of his infinite being with other beings according to their own limited essences.

³³⁵ Te Velde, *Participation and Substantiality in Thomas Aquinas*, p. 97.

³³⁶ *ST* I.3.3.

³³⁷ This participatory insight can serve as a counterweight to multiverse critics who dismiss the idea of an immensely diverse and expansive cosmos as too arbitrary or inexplicable. For example, Keith Ward refers to the proposed existence of a huge number of cosmic realms 'all of which exist for no particular reason'. Keith Ward, *The Big Questions in Science and Religion*, p. 235.

³³⁸ *ST* I.65.3.

that an artist ‘with infinite power and materials available would not necessarily care much about efficiency’³³⁹ is consistent with the kind of cosmic diversity in multiverse thought that might seem wasteful or inefficient but is, properly understood, the only way in which imperfect beings might represent a diminished likeness of what is simple and one in God.

3.2.3 *String Theory Landscape*

Having considered Collins’s argument for the compatibility of God and the multiverse, which would be strengthened by reference to the diversity in Thomistic participatory metaphysics that he mentions elsewhere but does not apply to the multiverse, I will now suggest some ways in which this notion of diversity might be aligned with a multiverse theory in which diversity is paramount, specifically the string theory landscape proposal. This has been the subject of significant scientific attention in recent years, with its development prompting particle physicists to take an interest in the multiverse proposal. Given that string theory implies an immensely diverse landscape of different universes, perhaps as many as 10^{500} , it will be a suitable model to bring into interaction with the notion of cosmic diversity in Collins and Aquinas.³⁴⁰

It will be remembered from Chapter 1 that Tegmark’s multiverse hierarchy constitutes a four-level order of theories of physics, ‘allowing progressively greater diversity’.³⁴¹ So the Level II multiverse will be more diverse than the Level I multiverse, since it not only includes domains with different initial conditions, but also physical constants and dimensionality. Tegmark believes that string theory may offer a ‘specific realization’ of the Level II multiverse.³⁴² In string theory, which is viewed by physicists such as Stephen Hawking to be the closest account to an accurate description of the universe, the fundamental objects that give rise to elementary particles are one-dimensional strings, not the point-like particles of elementary physics. String theory suggests that there are actually ten or eleven dimensions,

³³⁹ Collins, ‘Multiverse hypothesis: a theistic perspective’, p. 462.

³⁴⁰ While increasingly the subject of mainstream scientific study, string theory remains contentious, particularly in light of its description of such a large number of universes. In *Not Even Wrong*—whose title is a withering assessment of science that is apparently not just mistaken, but fundamentally misconceived—Columbia mathematician Peter Woit rejects string theory as a basis for models of particle physics precisely because of the vast cosmic diversity to which it gives rise. In fact, he dismisses the theory as anti-scientific since he does not believe that it predicts anything and is thereby not open to falsifiability. See Peter Woit, *Not Even Wrong: The Failure of String Theory and the Search for Unity in Physical Law* (New York, NY: Basic Books, 2006).

³⁴¹ Tegmark, ‘The multiverse hierarchy’, p. 99.

³⁴² Tegmark, ‘The multiverse hierarchy’, p. 107.

with some of the higher dimensions ‘compactified’ and thus beyond direct human experience. As detailed in Chapter 1, this compactification leads Tegmark to propose four sub-levels of increasing diversity: IIa with the same effective laws but different post-inflationary bubbles; IIb with different laws according to supergravity (a type of quantum theory concerning the interactions of elementary particles); IIc with different ‘fluxes’ (magnetic fields) that stabilise extra dimensions; and IId with different compactifications and dimensionality, different symmetries, and different elementary particles.

According to Leonard Susskind’s influential string landscape model, there is likely to be an immense number of string theory vacuum states, each associated with a different universe within a large multiverse. He believes that the radical cosmic diversity entailed in string theory is, if anything, currently underestimated, as he expects the actual number of string vacua to be ‘astronomical, measured not in millions or billions but in googles or googleplexes.’³⁴³ He concludes that string theory provides a natural explanation of the fine-tuning of our own universe, which becomes much less surprising in the context of such an immense diversity of other universes across the landscape.³⁴⁴ Moreover, he maintains that string theory provides a framework in which the anthropic principle can be studied in a ‘rigorous way’, with quantitative information able to be extracted in terms of determining the number of vacua with given properties, such as the cosmological constant.³⁴⁵ Against string theory critics, he maintains that string theory has provided a robust testing ground for important cosmological ideas, including some of his other radical theories concerning the status of information in black holes.³⁴⁶

At this point, we might observe three ways in which the diversity of string theory might be regarded as a modern scientific expression of the cosmic diversity that is central to Aquinas’s participatory creation account. First, Aquinas’s notion that what is simple and one in God can only be represented by diverse being in creation is given powerful scientific articulation by the immense scale of the many universes associated with string theory landscape. If the fullness of God’s being can only be expressed in diverse participations, then this would be especially true of a landscape in which the scope for such participations is exponentially higher. Such an expansive landscape might provide an even stronger intimation of divine

³⁴³ Susskind, ‘The anthropic landscape of string theory’, p. 248

³⁴⁴ Susskind, ‘The anthropic landscape of string theory’, p. 263.

³⁴⁵ Susskind, ‘The anthropic landscape of string theory’, p. 262.

³⁴⁶ Susskind, ‘The anthropic landscape of string theory’, pp. 262-3.

plenitude. As string theory proponent Brian Greene notes, each elementary particle in the cosmos may consist of a single string. The particles are distinguished because their respective strings undergo different vibrational patterns. Different elementary particles may thus be seen as different ‘notes’ on a fundamental string. To extend the musical imagery, he explains that the universe, composed of an enormous number of vibrating strings is ‘akin to a cosmic symphony’.³⁴⁷ This symphonic metaphor might remind us of Aquinas’s description of creation as an artistic product of divine workmanship, an outpouring of the fullness of God into a variety of created things (or strings), each reflecting God’s fullness in its own way.³⁴⁸

Second, the string theory landscape, in its tremendous diversity, represents the many ways in which created being might imitate and participate in God. Given the necessity for imperfect created things to participate in the perfection of God in diverse ways, it seems that creation is like a vast distribution or communication of the fullness of God’s perfection. In Susskind’s account of the string theory landscape, the outlines of creation are strikingly varied and characterised in ways that would be applicable to the geography of our own world (while acknowledging that these approximations may break down given the complexity of the landscape and the speculative nature of the string theory enterprise). Some parts of the string landscape are, he explains, flat plains, while in others we encounter hills and valleys, domain walls, and mountain passes, such that ‘the landscape in field space is reflected in a complicated terrain in real space.’³⁴⁹ While these are technical physics terms with specific meanings, they can also be taken to convey the sense in which string theory explores the diverse ways in which the cosmos bears a likeness to the fullness of God. The many parts of creation, whether in the hills and valleys of our own planet or their complicated manifestations in the space of string theory landscape, seek to resemble the perfection of God through their diverse forms and movements.

Third, the ordered diversity in creation—akin to the symphony described by Greene or the work of art described by Collins and Aquinas—represents the intention and goodness of its

³⁴⁷ Brian Greene, *The Elegant Universe*, (London: Vintage, 2000), p. 146.

³⁴⁸ In addition, it is interesting to note that Greene’s description of this string theory vision hints at metaphysical and participatory themes. He adds that each elementary particle comprises a string whose vibrational pattern is its ‘fingerprint’. See Greene, p. 146. Of course, the notions of patterning, imprinting, and tracing are vital to a participatory scheme in which parts of the cosmos bear witness to and express divine plenitude through their diverse motions. In Greene’s view, to understand and explain the connections between these ‘fingerprints’ would provide the promise of a TOE, which would itself be profound confirmation of the ontological entanglement of the cosmos.

³⁴⁹ Susskind, ‘The anthropic landscape of string theory’, p. 249.

cause. If creation amounts to a diverse string landscape of vacua corresponding to different domains, this does not suggest that it is unintelligible or contrary to any sense of divine purpose or control. In fact, the notion of an ordered whole, consisting of many distinct but interconnected parts, is central to Aquinas's participatory creation account. The diversity of creation is intentional and is not merely indicative of a brute multiplicity. Since it is caused by one simple and perfect effect, or First Being, the diversity of creation should be seen in the context of unity and order. Here it might be noted that string theory, despite its diversity, offers a unifying framework in which to understand physical events and processes in the universe, since strings leave traces of their patterns of vibration. The task, as Greene observes, is for physicists to extract the information of a structure that is already there, and whose many and diverse patterns might be thought to more fully reflect the perfection of God.

3.3 Don Page on Beauty

In this section, I will assess the Canadian theoretical physicist Don Page's support of a theistic account of the multiverse hypothesis, with a particular focus on his view that string theory represents a beautiful and elegant account of cosmic diversity. Since his notions of God and creation are broadly similar to Robin Collins, this will follow logically from, and in many ways build on, the issues considered in the previous section, particularly in relation to string theory. Page, a quantum cosmologist, former doctoral student of Stephen Hawking, and evangelical Christian, strongly suspects that what we think of as the universe is in fact part of a larger multiverse, whose different parts are governed by different laws of physics. After considering Page's notion of beauty in the context of multiverse theory, I will then examine Aquinas's metaphysical notion of beauty, which is an important part of his participatory thought. I will propose that an account of beauty and order informed by Thomistic participatory metaphysics would strengthen Page's own concepts of God and creation, while also providing a rejoinder to criticisms of multiverse thought made on aesthetic grounds, which I will discuss in the last section.

3.3.1 *Page on Beauty and Elegance in Multiverse Theories*

Initially, Page identifies parallels between the theological response to Darwinian evolution and initial theological appraisals of contemporary multiverse theories. Just as some pre-Darwinian Christians assumed that humans could be understood apart from the rest of creation as separately and individually designed, he argues that it would be equally mistaken for contemporary believers to interpret the fine-tuning of the laws of physics as evidence of separate and individual design by God, and thereby as evidence for God's existence. Like Collins, Page prefers to view the multiverse not as an alternative to God as an explanation of cosmic design, but as indicative of 'an even more grand design of the universe'.³⁵⁰ This is because the basic physical laws and initial conditions responsible for a multiverse would have to be 'special' to produce any life at all, and particularly the kind of intelligent human life capable of observing and understanding its own cosmic habitat.³⁵¹ Page also echoes Collins's claim that since God is infinitely creative, it follows that God's creation would be 'much

³⁵⁰ Don Page, 'Does God So Love the Multiverse?', p. 6.

³⁵¹ Page, 'Does God So Love the Multiverse?', p. 7.

larger than the single visible part of the universe or multiverse that we can observe directly.’³⁵²

Like Bernard Carr’s notion of an ‘outward journey’ (from a geocentric to heliocentric to galactocentric to multiverse view), Page regards the multiverse hypothesis as a ‘natural extension of... accepting a reality beyond one’s immediate conscious perception’.³⁵³ This openness to a diversity of cosmic realms is consistent with his sympathy for the ‘many worlds’ interpretation of quantum mechanics, in which all possible outcomes of a quantum event give rise to new universes. After all, if we can postulate conscious beings in other totally disconnected spacetimes such as other branches of a quantum state, it is not a fundamentally different step to begin to think about other beings in different parts of a multiverse with different physical constants. He suggests that we might even imagine beings in ‘entirely different universes’ with no relation to ours, not connected by any single underlying set of physical laws.³⁵⁴ While this thought experiment might bring to mind Tegmark’s Level IV multiverse, Page specifically dismisses this theory as ‘too general to be plausible’, too chaotic, and unable to account for the order we observe in our own universe.³⁵⁵

Since Level III multiverses (the many-worlds interpretation) do not necessarily give rise to varying constants of physics and Level IV multiverses are too general and chaotic, Page identifies the need for more ‘elegant’ multiverse theories that explain cosmic order and arise out of specific laws of nature.³⁵⁶ He believes that God might prefer string/M-theory, a variant of a Level II multiverse, which he sees as ‘an elegant physical theory... that would lead to a multiverse that nevertheless has been created providentially by God with the purpose of having life and us somewhere within it.’³⁵⁷ As discussed in the previous section, string theory implies an immense (though likely not infinite) multiverse of around 10^{500} different vacua or sets of constants. In Page’s estimation, this would be sufficient for the physical constants we

³⁵² Page, ‘Does God So Love the Multiverse?’, p. 7. Here we might caution that, while our observable universe might not encompass all that exists, this does not necessarily imply the existence of a multiverse, or an infinite universe.

³⁵³ Page, ‘Does God So Love the Multiverse?’, p. 19. As with Carr, Tegmark, and other multiverse proponents, it is worth noting that the force of such expectations will depend on one’s view of the nature of scientific progress.

³⁵⁴ Page, ‘Does God So Love the Multiverse?’, p. 19.

³⁵⁵ Page, ‘Does God So Love the Multiverse?’, p. 9.

³⁵⁶ Page, ‘Does God So Love the Multiverse?’, p. 9.

³⁵⁷ Don Page, ‘Predictions and tests of multiverse theories’, in Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 412.

observe to occur somewhere, perhaps once per 10^{200} vacua or so.³⁵⁸ String theory not only appears to strongly suggest a multiverse, but one that includes the physical parameters that allow the kind of life that exists in our part of the universe.³⁵⁹ In a somewhat anthropocentric move, he thinks that the beauty and elegance of the theory suggest a divine designer acting with the deliberate intent to provide the conditions for human life.

With his support for a multiverse interpretation of string theory, Page places a high priority on the elegance and beauty of such a model, by which he means the elegance of the principles by which God would create a vast multiverse and the apparently elegant structure of our own laws of nature. Against theological critics who fear that a multiverse would provide an alternative to divine design of the physical constants, he insists that God could have designed the whole multiverse, ‘choosing elegant laws of nature by which to create the entire thing.’³⁶⁰ The enormous diversity of the string landscape is not evidence of extravagance or wastefulness, but of an infinitely creative and powerful God who may create many universes if this is consistent with His nature and purposes. On Page’s account, God might prefer elegance in the principles by which a vast multiverse is created, rather than a paucity of universes, or a single universe. This emphasis on ‘economy of principles rather than economy of materials’³⁶¹ fits with Collins’s model of God as infinitely creative and powerful, and operating according to an intentional plan, which is a promising model to begin to bring into contact with multiverse thought. Yet, as with Collins’s tentative account of cosmic diversity, Page only hints at the motive and purpose underlying multiverse creation, without developing a sustained or metaphysical account of the principles according to which God might create a multiverse.

3.3.2 *Aquinas on Beauty*

The beauty and elegance and coherence of the universe play an important role in Aquinas’s account of creation. His vision of a cosmos of ordered beauty also follows directly from the

³⁵⁸ Page, ‘Does God So Love the Multiverse?’, p. 10.

³⁵⁹ However, Page acknowledges that it is not yet certain whether a multiverse is a clear consequence of string/M theory: ‘One first needs to make string/M theory into a precise theory and calculate its consequences, whether single universe or multiverse.’ p. 20. Elsewhere, he argues that multiverse theories may give testable predictions for observable elements if they include a well-defined measure for observations. Page, ‘Predictions and tests of multiverse theories’, p. 428.

³⁶⁰ Page, ‘Does God So Love the Multiverse?’, p. 21.

³⁶¹ Page, ‘Does God So Love the Multiverse?’, p. 20.

discussion of cosmic diversity in the previous section. As discussed, the diversity and multiplicity in created things is an inherent and intentional characteristic of creation: it is only through such diversity that creation might represent the fullness of God's being. In addition, God's intellect, which understands many things, cannot be adequately represented by only one thing, and so it expresses itself more perfectly 'if it produces many creatures of all grades than if it had produced only one.'³⁶² Collectively, all parts of this diverse creation are very good and establish together a good order of the universe, 'which is the ultimate and noblest perfection in things.'³⁶³ So God's perfectly unified and simple goodness may only be expressed in creation in a diverse manner. It is precisely in this cosmic diversity, with its interconnected parts standing in their own relation to God, that an ordered—and beautiful and elegant—whole might be established.

Participation is central to Aquinas's idea of creation as a diverse likeness of God's goodness and beauty. Without diversity in things, the 'highest beauty' would be taken away from things, since things are beautiful to the extent that they participate in and move closer to God.³⁶⁴ As Aquinas explains (with not entirely unproblematic language of 'distance' from God discussed in the previous section), the nearer things are to God, the more they participate in God's likeness, and vice versa. He argues that those that are 'nearest' to God 'most closely approach the likeness of God' while things that are more distant are not always moved in the same way.³⁶⁵ Having outlined this participatory structure of being, with a diversity of things which differ in degrees of participation in God's perfect beauty, he observes that 'beauty is evident in this order.'³⁶⁶

Of particular importance in helping to secure the beauty of order in creation, we might recall Aquinas's notion of causal participation (discussed earlier in this chapter). It is not just that the eternal beauty of the First Cause of creation might be apprehended at least partially in the beauty and order of created effects. It is also that, while God can produce all natural effects, it is not superfluous for some effects to be produced by certain other causes. As a consequence of the fullness of God's existence, His likeness is communicated to things, 'not only so that they might exist, but also that they might be causes for other things... By this, in fact, the

³⁶² *SCG* II.45.7.

³⁶³ *SCG* II.45.10.

³⁶⁴ *SCG* III.71.3.

³⁶⁵ *SCG* III.72.4.

³⁶⁶ *SCG* III.72.4.

beauty of order in created things is evident.³⁶⁷ In this way, God enables created things to attain the divine likeness in two ways, either through the First Cause, or through secondary causes which participate in and communicate His likeness. This underlines the role of interrelation in a participatory account of beauty. Things are beautiful not just by virtue of their participation in God's beauty, but also by their essential relation to one another, as common participants in God's beauty, who might communicate that beauty to one another, and who collectively represent a beautiful, ordered whole.

In his *Summa Theologiae*, Aquinas defines three characteristics of beauty.³⁶⁸ First, he specifies integrity or perfection. This relates to the similitude of God's unity and simplicity in the wholeness and completeness of created things, which receives its highest expression in the Son, 'who has in Himself truly and perfectly the nature of the Father.' Second, he specifies proportion or harmony. Although proportion was typically thought to apply only to composite material things, and thus not spiritual or divine beings, Aquinas shows how it might usefully be applied to God. Though perfectly simple and unified, God is also triune, with a harmony or interrelation between the Three Persons of the Trinity. Thus, he notes that the Son is the image of the Father.³⁶⁹

Third, and most significantly, Aquinas identifies brightness or clarity as a condition of beauty. In an additional point whose metaphysical import might not be clear to modern readers, he notes that beautiful things 'have a bright colour.'³⁷⁰ This brightness refers to the light that shines forth from the beauty of God's being, which is the most perfect and full mode of being that may be contemplated. In this sense, God's perfect existence, in which all things participate in diverse and limited ways, shines forth with perfect brightness and clarity throughout the cosmos. In God, this radiant beauty is 'the unlimited splendor of pure existence beyond all form, pure light too dazzling for us to contemplate directly.'³⁷¹ With the

³⁶⁷ SCG III.70.7. Although Aquinas generally relates this principle to the manifestation of God's goodness, it is equally true that he holds beauty to be one such manifestation of divine goodness.

³⁶⁸ ST I.39.8.

³⁶⁹ On this point, Rubenstein argues that Aquinas's thought is more compatible with the multiverse hypothesis than is often assumed due to his view of God as 'three-in-one, an eternal interrelation of identity and difference... If the number of creation really mirrors the number of God, then wouldn't an entangled multiplicity of worlds reflect God's many-oneness more fully than a single world would?' Rubenstein, *Worlds Without End*, pp. 73-74. While this focus on the implications of God's Trinitarian nature on the multiplicity of creation represents a promising point of contact with multiverse thought, Rubenstein does not examine the metaphysical basis of Aquinas's view of creation as diverse participations in the fullness of God's being.

³⁷⁰ ST I.39.8.

³⁷¹ Clarke, *The One and the Many*, p. 300.

previously considered notion of diminished participation in mind, we might think of God as the full light of existence, while created things shine only to the limited extent to which they participate in this fullness of brightness. To return to another analogy discussed earlier, Aquinas explains that ‘whatever is found in anything by participation, must be caused in it by that to which it belongs essentially, as iron becomes ignited by fire.’³⁷² In the same way, we might consider that the light within us is caused by participation in God, the fullness of light. The light within us is a reflected light from that which is perfect light itself.

3.3.3 *Multiverse Applications*

Having considered the participatory basis of Aquinas’s notions of beauty and order in creation, we might now seek to enhance and extend Page’s somewhat limited conception of God as the loving and purposeful creator of the multiverse, which possibly takes the form of a string landscape with enormous diversity.

First, Page depicts God as preferring string theory as a principle for the creation of a vast multiverse, with the deliberate intention of giving rise to life. As seen in this section and the previous section, Aquinas’s participatory creation account holds that the diversity and order and beauty in creation are fully under divine control, and indeed manifestations of God’s own goodness and beauty. God’s intellect contains many things, such that the fullness of His intellect can be represented only by way of many diverse effects. God preconceives and causes each diverse part of creation, and through His wisdom brings about its order and beauty. The diversity of the cosmos, including the diversity implied in the string landscape, is fully intended by its divine cause, as it proceeds from a common source and is thereby inherently within the unity of an order. As such, Page’s model of God as the intentional designer of a vast and diverse cosmos can be deepened with reference to Thomistic participatory metaphysics. However, Page’s conception of God as the designer of a diverse multiverse perhaps neglects the more strongly providential account of God’s relationship with creation found in Aquinas. It would be truer to a participatory reading of Aquinas to view the diversity of string landscapes as following directly from God’s donation of being, as opposed to Page’s account in which the multiverse is seen more anthropocentrically as a sort of winning lottery ticket (among very many issued by God) allowing human life to exist.

³⁷² ST I.44.1.

Second, Page is evidently impressed by the immense multiverse or landscape of different physical constants that apparently arise from string theory. He repeatedly refers to the ‘elegance’ of the principles (that is, string theory) by which God might create a vast multiverse. Here, we can apply a participatory reading of Aquinas to supplement Page’s approach. While Page focuses on the beauty of the mechanism, Aquinas is concerned with the beauty of being itself. Thus, we might highlight Aquinas’s view that being itself is not just diverse, but also beautiful, as it is conferred by the goodness and beauty of God. The beauty of things in themselves is an image, or a form of reflected beauty, of the fullness of God’s being, which is perfectly bright or clear. God’s existence, in which all created things participate in diverse ways and at different ontological ‘distances’, shines forth throughout creation, and would therefore also be said to shine forth in the dazzling multitude of vacua that give rise to many universes with different constants, of the kind suggested by string theory. These universes might be radically different, but they share a common origin and owe whatever light or harmony or completeness they have to the fullness of light in which they participate.

Third, Page’s idea of the beauty and elegance of string theory, deepened by Aquinas’s account of beauty in creation, might provide a useful rejoinder to criticisms of multiverse theory made on the basis of aesthetics. For example, Keith Ward (focusing primarily on Tegmark’s Level IV multiverse) thinks that the extravagance of the multiverse hypothesis ‘does not have much to offer in the way of economy, simplicity, or plausibility.’³⁷³ He views God as the ‘simpler and more rational hypothesis’ compared to what he sees as the arbitrariness and profligacy of the multiverse.³⁷⁴ Likewise, Rodney Holder maintains that the multiverse is ‘distinctly non-simple and uneconomical in comparison with theism.’³⁷⁵ He also argues that, given a large enough number of potential universes, it seems highly likely that a significant proportion will, in his view, be empty, wasteful, and aesthetically unappealing.³⁷⁶ He analogises those who defend multiverses on aesthetic grounds with those who are untroubled by the apparently excessive waste, death, and destruction inherent in biological

³⁷³ Ward, *The Big Questions in Science and Religion*, p. 233.

³⁷⁴ Ward, *The Big Questions in Science and Religion*, p. 235.

³⁷⁵ Rodney Holder, *God, the Multiverse, and Everything*, p. 126.

³⁷⁶ As Tegmark notes, such criticisms are ultimately aesthetic rather than scientific. On the point of wastefulness, he notes that this can be turned around since the most basic Level I multiverse already contains an infinite amount of space, mass, and atoms, such that it is difficult to object to ‘waste’ in the conventional sense. Tegmark, ‘The multiverse hierarchy,’ pp. 122-23.

evolution that are sometimes explained away as ‘God’s mechanism for producing intelligent life.’³⁷⁷

In response, we might note that these perspectives assume that the vast diversity of creation (such as that implied in string landscape) is an aberration, an unintended, ugly, and inexplicable by-product of the generation of many different cosmic realms. In fact, Aquinas reminds us that it is metaphysically impossible for one single creature or part to represent the full beauty and goodness of God. This perfect beauty cannot be expressed in creation except in a diverse manner, and perhaps this will prove to be evident in the context of a tremendous diversity of cosmic realms. Such an expanded view of creation need not entail waste and a lack of beauty or meaning or order, but rather an intentional distribution of God’s light that shines forth among the many interrelated parts of an elegant and ordered whole.

³⁷⁷ Holder, *God, the Multiverse, and Everything*, p. 102.

3.4 Bernard Carr on Unity

In this section, I will critically evaluate the multiverse thought of Bernard Carr, professor of mathematics and astronomy at Queen Mary University of London, a former doctoral student and colleague of Stephen Hawking, and one of the leading multiverse advocates in contemporary cosmology. Specifically, I will provide a Thomistic participatory response to his image of the cosmic uroborus, in which he associates the historic trajectory of scientific progress toward a progressively more expansive cosmos (perhaps culminating in the multiverse hypothesis) with the apparent unity and interconnectedness of the cosmos. In contrast to many of his multiverse cosmologist colleagues, Carr allows for the significance of human consciousness and acknowledges the theological import of multiverse theories. However, I will argue that he offers a narrow, self-contained vision of immanence and a somewhat vague and metaphysically weak conception of unity, and thereby fails to provide the kind of fundamental account of the multiverse he desires. I will propose that the circular imagery of Carr's uroborus calls to mind (but is comparatively inadequate in comparison to) Aquinas's theological circle of being, which describes the journey to a transcendent source of being. In this vision, the connection of the cosmos to God is expressed in a circular movement of creatures who have received being from God and ultimately return to God, who stands as both source and final end. I will conclude that this circular movement suggests that the purpose of the multiverse can be seen in terms of gift, giving unity and meaning to the cosmos in a way that eludes strictly cosmological accounts such as Carr's.

3.4.1 Carr on the Cosmic Uroborus

Carr situates recent developments in cosmology and particle physics that increase the plausibility of the multiverse hypothesis within the 'tide of history' of scientific progress.³⁷⁸ He observes that, throughout the history of Western science, our understanding of the size, scope, and nature of the universe has progressively shifted, as scientific progress has extended outwards to ever larger cosmic scales and inwards to ever smaller atomic and subatomic scales. In a provocative claim to which he gives expression in his image of the uroborus, this 'triumph' of scientific progress on both the outer and inner fronts is said to

³⁷⁸ Bernard Carr, 'Introduction and overview.' In Bernard Carr (ed.), *Universe or Multiverse?* (Cambridge: Cambridge University Press, 2007), p. 10. Although he attributes resistance to this view to 'more conservative cosmologists', it should be noted that many physicists remain deeply uncomfortable with multiverse thought as indicative of scientific progress, as detailed in Chapter 1.

have ‘revealed a unity about the universe which makes it clear that everything is connected in a way which would have seemed inconceivable a few decades ago.’³⁷⁹ He further contends that the multiverse proposal is ‘just the culmination’ of scientific attempts to understand the physics of the largest and smallest scales.³⁸⁰

In terms of what he refers to as the ‘outward journey’, Carr describes the gradual shift from the geocentric view of early humans, to the heliocentric view suggested in the sixteenth century by Copernicus (and anticipated by Nicholas of Cusa), to the galactocentric view occasioned by Galileo’s telescopic observations, to the cosmocentric view of the early twentieth century, establishing the ‘Big Bang’ picture in which the universe began in a state of great compression approximately 14 billion years ago and has since been rapidly expanding, with other galaxies moving further away from us. More recently, Carr believes that we have moved to the multiverse view, in which studies of background radiation have strengthened the case for inflation, which suggests that our cosmic domain is one part of a much larger multiverse, and provides the basis for the most basic multiverse models, such as Tegmark’s Level I model of an infinite space, as well as the post-inflation bubbles of Level II.

In terms of the ‘inward journey’, he describes changes of perspective brought about by atomic theory in the eighteenth century, subatomic theory in the early twentieth century, and quantum theory shortly thereafter. In his view, this journey has revealed that everything in the cosmos comprises a few fundamental particles interacting through four forces (gravity, electromagnetism, the weak force and the strong force), some or all of whose interactions might ultimately be unified, perhaps with string theory or M-theory (as discussed earlier). Just as he contends that the history of cosmology has been a sequence of expanding our conception of the cosmos, he defines the history of physics as a sequence by which physics has attempted to unify the four known forces of nature.³⁸¹

Together, the outward and inward journeys in science have disclosed what Carr believes to be a cosmic unity in which microphysical and macrophysical domains are inextricably connected. To illustrate this unity, as well as the evolution of our understanding of this

³⁷⁹ Carr, ‘Introduction and overview’, p. 11.

³⁸⁰ Carr, ‘Introduction and overview’, p. 7. Here we might note that ‘culmination’ does not sit easily with his view of the constantly evolving nature of science, with progressively shifting theories and no settled end-point.

³⁸¹ Carr, ‘Introduction and overview’, pp. 10-11.

structure, he uses the image of the uroborus, an ancient Greek symbol of a snake eating its own tail:³⁸²

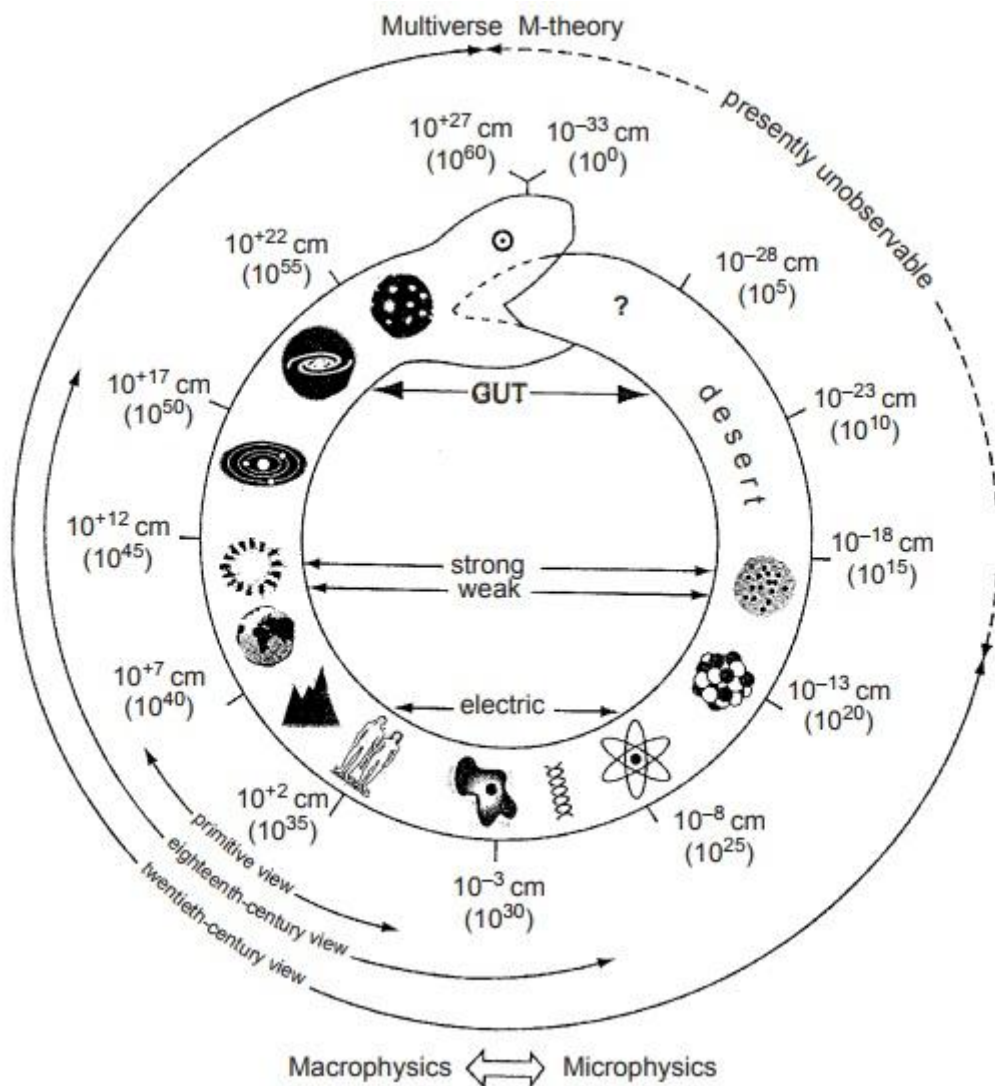


Fig. 1.1 Carr's image of the cosmic uroborus³⁸³

This image is a complex (and in some ways contentious and vaguely articulated) model of reality that is difficult to interpret, with many components and assumptions on which so much rests. To the extent that it reflects Carr's views, it is worth highlighting three important aspects. First, it represents a closed, internal, self-sufficient circle of reality, without any reference to a transcendent source or meaning. The images inside the snake represent

³⁸² Given the Greek origins of this image, as well as the discussion of Plato in Chapter 2, we might note that in the *Timaeus* the universe is described in uroborus-like terms as a living animal, a self-sufficient perfect whole of perfect parts, revolving in a circular movement. *Timaeus* 32d-34a.

³⁸³ Carr, 'Introduction and overview', p. 12. 'GUT' refers to Grand Unified Theory, an experimentally unverified theory which includes the attempt to merge the electroweak force with the strong force.

different types of structure in the universe, moving from objects at the micro level (such as atoms and quarks) on the right-hand side, to successively larger objects at the macro level (such as stars, galaxies, and the universe itself) on the left-hand side. The horizontal lines illustrate the connections between microphysical and macrophysical structures. So the electric line, for example, connects an atom to a planet because the structure of solid object is determined by atomic forces, which are electrical in origin. As a result of these different kinds of structural relations, Carr envisions a cosmos of unity and interconnectedness, though it should be said that this account is metaphysically modest and attenuated in comparison with other scientific models of interconnectivity.³⁸⁴ Given his evident interest in theology and metaphysics, it is surprising that he gives priority to an image of such modest theological or metaphysical import.

Second, the top of the image, with the head of the snake eating its own tail, is intended to convey the notion that the universe was originally compressed to a point of infinite density, such that even the expansive universe (or multiverse) of modern cosmology comes forth from its exponentially smaller origin.³⁸⁵ The top of the image links both inward and outward journeys to ‘higher dimensions’, since string theory on the microscopic side implies the existence of many additional ‘compactified’ dimensions, while some versions of M-theory on the macroscopic side suggest that ‘the universe could be a 4-dimensional “brane” in a higher-dimensional “bulk.”’³⁸⁶ Here it seems that Carr makes a rather nebulous and swift transition from the closed circle of the uroborus to the potential existence of higher dimensions, particularly in light of the fact that there are significant multiverse models which do not include such extra dimensions. Although the uroborus is meant to be a succinct encapsulation of the apparent unity and interconnectedness of the cosmos, some of its key and most striking aspects (such as the reference to multiverses and M-theory) merit further explanation.

³⁸⁴ For example, quantum entanglement suggests that all of physical reality is interconnected at the subatomic level, with groups of particles interacting such that the quantum state of each particle cannot be understood independently of the others. Ernest L. Simmons has recently argued that entanglement provides a framework for his view that panentheism models God’s relationship with creation. See Ernest L. Simmons, *The Entangled Trinity: Quantum Physics and Theology* (Minneapolis, MN: Fortress Press, 2014). For further discussion of cosmic interconnectivity, see John Polkinghorne (ed.), *The Trinity and an Entangled World: Relationality in Physical Science and Theology* (Grand Rapids, MI: Wm. B. Eerdmans Publishing Co., 2010).

³⁸⁵ However, William R. Stoeger reminds us that our laws of physics break down at this initial singularity, such that ‘it does not represent what really occurred, and is not the beginning of the universe.’ New developments in quantum cosmology will be needed to develop a coherent theory of the early universe. See William R. Stoeger, ‘God, physics and the Big Bang’, in Peter Harrison (ed.), *The Cambridge Companion to Science and Religion* (Cambridge: Cambridge University Press, 2010), pp. 175-76.

³⁸⁶ Carr, ‘Introduction and overview’, p. 13.

Third, Carr's image incorporates an historical aspect. In addition to symbolising the different yet fundamentally related levels of structure in the cosmos, the image of the uroborus reflects the historical development of human knowledge at the micro and macro levels, as indicated by the circular arrows surrounding the snake. So primitive humans were aware of a fairly limited range of basic structures such as animals and mountains, eighteenth century humans had a broader conception ranging from bacteria to the solar system, while twentieth century humans had an even wider understanding of reality at the atomic and cosmic levels. Since the image shows the systematic expansion of progressively greater levels of awareness, Carr regards it as a symbol of the 'blossoming' of human consciousness.³⁸⁷

With his idea of the cosmic uroborus, then, Carr provides an entirely closed and cosmological model of the interconnectedness of the largest and smallest levels of reality. Unlike many multiverse proponents who associate our progressively expanding notion of the cosmos with a correspondingly diminished status for humanity, he believes that the human mind—and the story of its continual blossoming in the course of evolution—is fundamental to the cosmos, whose unity and beauty points to some form of guiding intelligence. While he acknowledges that the existence of a multiverse (the latest scientific paradigm shift which may represent the apex of the outward journey), would have 'obvious religious implications', his volume is largely restricted to 'the materialistic issues which are the focus of cosmology.'³⁸⁸ As such, it would be worthwhile to provide a theological response to his image of the cosmic uroborus and his promising yet metaphysically limited ideas of cosmic unity and interconnectedness within the context of multiverse thought, which will be the focus of the next section.

3.4.2 *Aquinas on the Circle of Being*

Carr's cosmic uroborus, in contrast to its historic use as a symbol of eternal return, is a strictly physical and temporal model of internal unity and interconnectedness. It does not make reference to a transcendent source or meaning, as is the case with Aquinas's metaphysically richer circle of being. As such, and to provide a more fundamental basis for the idea of cosmic unity, we might consider Aquinas's participatory creation account, which

³⁸⁷ Carr, 'Introduction and overview', p. 13. This is consistent with his view that the human mind is fundamental to the cosmos, and that physics must be able to account for consciousness. Elsewhere he has argued that the four-dimensional brane embedded in a higher dimensional bulk (mentioned earlier) could be the location of certain psychic phenomena. See Bernard Carr, 'Mind and the Cosmos', in *Science, Consciousness and Ultimate Reality*, ed. David Lorimer (Exeter: Imprint Academic, 2004), pp. 33-64.

³⁸⁸ Carr, 'Introduction and overview', p. 16.

employs the concept of circularity in such a way as to ground the unity and meaning of the cosmos in relation to its transcendent source. In this model, God as origin and end is connected to creation by a circular movement whereby creatures produced by Him ultimately return to Him. Aquinas describes this motion in distinctively participatory terms, such that a creature seeking to bear a true likeness to its source is moved to return to God in its own way to attain its own perfection:

An effect is most perfect when it returns to its source; thus, the circle is the most perfect of all figures, and circular motion the most perfect of all motions, because in their case a return is made to the starting point. It is therefore necessary that creatures return to their principle in order that the universe of creatures may attain its ultimate perfection. Now, each and every creature returns to its source so far as it bears a likeness to its source, according to its being and its nature, wherein it enjoys a certain perfection.³⁸⁹

Whereas Carr's model is an immanent story of production, whereby the vastness of creation comes forth from a point of infinite density, Aquinas's circle connects the production of creation to its transcendent source, in which it participates and to which it is ordered to return: 'God acts for an end inasmuch as He produces an effect so that it may participate in His end.'³⁹⁰ God intends to produce His likeness and goodness in creation, which thereby reflects the 'way in which the transcendent is manifested by that which is transcended.'³⁹¹ This reference to a transcendent source, whose likeness is mediated in the participatory movements of created beings who long to return to their origin, is absent from Carr's entirely cosmological and self-contained uroborus.

Here, it would be worthwhile to consider the two components of Aquinas's circle of being: the journey outward from God and the return, which joins an act of creation to one of ethics and redemption. Early on in the *Summa Theologiae*, Aquinas encapsulates this circle of being with his designation of God as 'the beginning and end' of all things.³⁹² In fact, the structure of the work itself reflects the circular movement in which all creatures return to their

³⁸⁹ SCG II.46.2.

³⁹⁰ SCG II.35.7.

³⁹¹ SCG II.35.8.

³⁹² ST I.1.7.

origin.³⁹³ Since the goal of sacred doctrine is to convey knowledge of God as the beginning and end of all things, God is considered first (*Prima Pars*), then man's movement towards God (*Secunda Pars*), and finally Christ, whose incarnation leads us to God (*Tertia Pars*). Aquinas structures his work according to this circle of being because it constitutes the basic metaphysical structure of the universe whose unity is expressed in the procession and return of created beings to the fullness of being itself.³⁹⁴

Just as Carr's uroborus encompasses outward and inward journeys, so we might divide Aquinas's circle of being into two parts.³⁹⁵ As noted above, in the first part of the *Summa* he is concerned with discussing the characteristics of God (simplicity, goodness, perfection, infinity, and so on) and the nature of the Trinity. He then turns to the nature of creation, which he defines as 'the emanation of all being from the universal cause, which is God.'³⁹⁶ Following Clarke, we might regard this emanation as the 'journey of the many (all finite beings), projected outward from the One, their Infinite Source, by creation.'³⁹⁷ In the context of this dynamic sense of creation, finite beings receive being from God and come into being as diverse participants in the fullness of God's being. This is the 'outward' journey by which all beings share in God's being and thus share something in common with each other, producing a unity and interconnectedness throughout creation.³⁹⁸

In the second and third parts of the *Summa*, we find what might be thought of as the return movement of creatures toward God, which is clearly distinct from and provides a more metaphysical foundation to Carr's idiosyncratic (and non-theological) uroborus. Here, each diverse participant of creation is drawn towards its own good, which is implicitly a search for God, who is the source of all goodness. As an effect produced by the First Cause, each participant desires to know something of its cause, and perfect happiness may only be

³⁹³ On this point, Te Velde has criticized the idea that the structure of the *Summa* reflects the dual scheme of procession and return, since it cannot explain why the consideration of Christ requires a separate third part. See Rudi Te Velde, *Aquinas on God: The 'Divine Science' of the Summa Theologiae* (New York, NY: Routledge, 2006), pp. 11-18.

³⁹⁴ For a concise examination of the structure of the *Summa Theologiae*, see Jean-Pierre Torrell, *Aquinas's Summa: Background, Structure, and Reception* (Washington D.C.: Catholic University of America Press, 2005).

³⁹⁵ Although it is important to note that Carr discusses two journeys *within* creation, while Aquinas attends to the twofold journey of creation, outward from God and back again towards reunion with God.

³⁹⁶ *ST* I.45.1. Elsewhere, Aquinas refers to this emanation, or coming forth of being, as 'the influx of being'. *De Substantiis Separatis*, IX.50.

³⁹⁷ Clarke, *The One and the Many*, p. 303.

³⁹⁸ Clarke associates this turn toward unity with the term 'universe', yet we have seen earlier in this chapter that the diversity of creation, sharing in the common source of divine being, might be of greater salience within the context of a multiverse.

achieved through the intellect reaching the ‘very essence’ of the First Cause, and ‘thus it will have its perfection through union with God as with that object, in which alone man’s happiness consists’.³⁹⁹ With this journey back to God, the principle of being by which the ‘ultimate perfection’ of rational creatures can be found,⁴⁰⁰ God can be viewed as ‘both the *Alpha* and the *Omega*, the Beginning and the End, at once the Source and the Goal of the restless dynamism of all of nature, of all finite beings.’⁴⁰¹ In the third part, Aquinas explains that the circular movement is only completed through Christ, ‘the perfect Mediator of God and men, inasmuch as, by His death, He reconciled the human race to God.’⁴⁰²

Having described Aquinas’s circular movement of emanation and return to God, we might now reflect on how it improves upon and adds metaphysical depth to Carr’s account in two important ways, related to the special status of humans and the role of science. In terms of the former, Aquinas’s account provides a metaphysical basis for the special status of humanity in the cosmos. Contrary to multiverse theorists who believe that a (perhaps infinitely) more expansive cosmos provides conclusive evidence of the insignificance of humanity, Carr insists on the connection between the evolution of mind and the expansion of our cosmic horizon. Yet while he believes that scientific activity has expanded the ‘macroscopic frontier’ as far as possible, his cosmological account necessarily precludes any consideration of whether humans might come to know not just the size and scope of the cosmos, but also its ultimate source and end. On this point, Aquinas agrees with Carr on the centrality of humans, but argues that we play a unique role by virtue of our participatory relationship with God. As rational creatures, we attain our last end by knowing and loving God, but this is not possible for other creatures. Only humans can freely and consciously choose to love and achieve direct union with God, thereby returning to the fullness of being from which they originated: ‘such a return to God cannot be made except by the act of the intellect and will, because God Himself has no other operation in His own regard than these. The greatest perfection of the universe therefore demanded the existence of some intellectual creatures.’⁴⁰³

³⁹⁹ *ST* II.3.8.

⁴⁰⁰ *ST* I.12.1.

⁴⁰¹ Clarke, *The One and the Many*, p. 304. In a similar way, Jean-Pierre Torrell focuses briefly on the idea of God as ‘Alpha and Omega’ within his broader discussion of Aquinas on God and creation. See Jean-Pierre Torrell, *Saint Thomas Aquinas, Volume 2: Spiritual Master* (Washington D.C.: Catholic University of America Press, 2003), pp. 53-58.

⁴⁰² *ST* III.26.1.

⁴⁰³ *SCG* II.46.3.

For Aquinas, though, non-human creatures may also be returned to God as a consequence of the ‘marvelous connection of things’, a cosmic interconnectivity grounded in a transcendent source and therefore distinct from Carr’s closed circle of being.⁴⁰⁴ On Aquinas’s account, humans are microcosms, in which the highest and lowest levels of creation are united. Since we contain within us what Carr would call microscopic and macroscopic aspects of creation (such that we are related, for example, to both atoms and planets), we can (so to speak) bring the physical cosmos with us on our journey back to God. We may ‘touch’ and share in lower levels of being and thereby help such non-human beings to complete their own journeys home: ‘Hence, in order that the imitation of God, in this mode of containing, might not be lacking to creatures, intellectual creatures were made which contain corporeal creatures’.⁴⁰⁵ This Thomistic notion of humans as microcosms of creation places additional emphasis on Carr’s account of our cosmic significance. It is not just that we can use our intellect to investigate the cosmos; as mediators between God and the cosmos, we can ensure that the cosmos completes its circular movement of being and returns to its source.

Second, in terms of the role of science, Aquinas’s circle of being with humans as mediators between the diversity of the physical cosmos and the simplicity of God gives new meaning to the importance of scientific progress, which Carr details in his ‘outward journey’ from early geocentric assumptions to modern multiverse models, but does not ground in any transcendent source. Science might be thought of as a systematic way of taking up the cosmos into our consciousness. By examining the origin and nature of the universe (or multiverse) in which we participate and which emanates from God, we are also coming to know God: ‘Hence, from reflection upon God’s works we are able to infer His wisdom, since, by a certain communication of His likeness, it is spread abroad in the things He has made.’⁴⁰⁶ In this sense, the cosmic uroborus (or circle of being) represents not just (as Carr avers) the blossoming of human consciousness as we attain ever greater knowledge of the physical cosmos, but the union of human consciousness with its divine origin and end: ‘If [consideration of God’s creation is] so alluring to the minds of men, the fountainhead of God’s own goodness, compared with the rivulets of goodness found in creatures, will draw the enkindled minds of men wholly to Itself.’⁴⁰⁷

⁴⁰⁴ *SCG* II.68.6.

⁴⁰⁵ *SCG* II.46.7.

⁴⁰⁶ *SCG* II.2.2.

⁴⁰⁷ *SCG* II.2.4.

This kind of participatory perspective applied to Carr's uroborus thereby deepens the value of our scientific search for (and place in) the multiverse, which is properly seen as a freely given gift from God. Such a model more powerfully conveys the unity and purpose of a cosmos with a transcendent creator than Carr's strictly cosmological vision. While Carr stands out among scientific multiverse theorists in terms of acknowledging the importance of humanity in the cosmos and arguing for the compatibility of God and the multiverse, his approach is at once theologically timid and conceptually ambiguous. With attention to Aquinas's participatory creation account, his notions of cosmic unity and interconnectedness can rest on firmer metaphysical foundations.

3.5 Summary

In this chapter, I considered how Aquinas's metaphysical participation might illuminate the idea of cosmic diversity that is paramount in multiverse thought. According to Aquinas, creation is marked by riotous diversity because this is the only way in which created beings can participate in and bear witness to the fullness of God's perfect unity and simplicity. The key point of this chapter is that such a participatory outlook is not only consistent with the kind of vast cosmic diversity described in multiverse theory, but that it metaphysically accounts for the intelligibility and beauty of this diversity. To illustrate this insight, I evaluated the work of two theologically-minded scientists and one philosopher of religion who is receptive to the multiverse proposal, and in each case I highlighted ways in which Thomistic participation might enrich their treatments of cosmic diversity.

I began with Robin Collins, who is an important thinker working at the intersection of theology and scientific multiverse theory. Although he is mindful of the importance of diversity in Thomistic metaphysics, he does not bring this consideration to the multiverse proposal. As such, I explained that diversity is fundamental to Aquinas's creation account, since it reflects the only way in which diverse beings can approach the perfectly simple God. I proceeded to apply his participatory metaphysics to the string theory landscape proposal in which the notion of vast diversity is central. In this way, I illustrated that string theory can be seen as an example of a multiverse model that gives powerful scientific expression to Aquinas's insistence on cosmic diversity and intelligibility.

I then turned to Don Page's theistic account of the multiverse proposal, which shares with Collins an interest in string theory as an elegant model, as well as an insufficiently metaphysical approach to this sense of beauty and elegance. I argued that Aquinas's metaphysical notion of beauty would strengthen Page's somewhat basic account of God's creative activity. For Aquinas, beauty is evident in the participatory scheme of creation, with diverse beings participating in God's own beauty and goodness in their own ways. I suggested that Aquinas's participatory account of the beauty of the cosmos might supplement Page's more narrow conception of the beauty of the selection mechanism that gives rise to a diversity of cosmic realms in string theory.

Finally, I critiqued Bernard Carr's image of the cosmic uroborus on the basis that it is theologically deficient and conceptually confusing. As an alternative and richer metaphysical model, I offered Aquinas's theological circle of being, which expresses the coming forth and return of creatures to God. This circular image more adequately conveys the unity and purpose of a cosmos grounded in a transcendent creator than Carr's narrow and self-referential cosmological vision. I argued that we can do more justice to his emphasis on cosmic unity and interconnectedness, as well as the special status of human consciousness, with closer attention to Aquinas's depiction of a diverse cosmos that owes its existence to and is ordered towards a transcendent source.

In addition to offering the prospect of enormous multiplicity and diversity, the multiverse hypothesis naturally lends itself to contemplation of cosmic infinity. Tegmark's Level I multiverse might be thought of as an infinite bubble, while he describes the Level II multiverse as an infinite set of Level I bubbles. Just as the idea of cosmic infinity is contentious in modern multiverse debates, it has often been a theological point of dispute in relation to God's infinity. In the following chapter I will examine the remarkable participatory thought of a late medieval figure who explores both kinds of infinity with a distinctively speculative, enigmatic, and provocative style.

Chapter Four: Infinity (Nicholas of Cusa)

In this chapter, I will consider the notion of cosmic infinity in relation to the participatory thought of the late medieval astronomer-theologian Nicholas of Cusa. Since infinity is such a crucial part of both Cusa's work and the conceptual framework of a considerable proportion of multiverse theory, he represents a compelling figure with which to conclude the central passage of this thesis. In spite of the fact that he is widely cited in discussions about the historical antecedents of modern multiverse thought, his unique participatory insights have not formed the basis of any previous theological approach to the multiverse hypothesis.

Initially, I will provide a general overview of Cusa's speculative work concerning metaphysical participation, with particular reference to the development of his participatory thought in his most consequential work, *De Docta Ignorantia*. I will discuss the ways in which, for Cusa, participation occupies a fundamental role in bridging the gap between finite creaturely beings and the infinite God.

In the following three sections, I will draw on Cusa's provocative participatory insights to respond to the concerns of a diverse range of thinkers in the theology and science dialogue. First, I will respond to Rodney Holder's critique of the notion of cosmic infinity, which he develops with reference to Cusa. I will argue that Holder neglects the participatory character of Cusa's metaphysical system, in which the universe is an image whose infinity is of an imitative nature. This approach can help to provide valuable metaphysical resources to respond to some of Holder's misgivings about multiverse theory. Second, I will provide a critique of Catherine Keller's postmodern reading of Cusa, which overlooks the core cosmological and participatory insights of his work. Finally, I will evaluate David Albertson's recent study of Cusa's mathematical theology, consider its strengths and weaknesses, and demonstrate its relevance to Tegmark's controversial version of mathematical multiverse thought.

4.1 *De Docta Ignorantia*

Completed in early 1440, *De Docta Ignorantia* is Cusa's most significant and influential work, offering a systematic yet idiosyncratic synthesis of theological, philosophical, cosmological, and mathematical speculation. The threefold structure of the work (with Book One on God, Book Two on the universe, and Book Three on Christ) reflects the unfolding of creation from God and its ultimate return to God. For Cusa, God is the Absolute Maximum, the universe is a contracted (restricted) maximum, or created image of God, and Christ unites the two as at once divine and human, or absolute and contracted. As Absolute Maximum, God is perfectly simple and infinite, transcending all human understanding. In *De Docta Ignorantia*, Cusa identifies participation as the way to bridge the gap between the infinite simplicity of God and the diversity of creation.

Book One

In Book One, Cusa uses the hypothetical mathematical concept of an infinite line to introduce the idea of God, including participation of finite beings in the infinite God.⁴⁰⁸ Through a series of 'speculative' mathematical considerations, he argues that an infinite line is the essence of a finite line, as well as the measure of all finite lines that participate in it in different ways. He then suggests that these considerations about the infinite line can be 'applied symbolically' to what he refers to as the Maximum, or God.⁴⁰⁹ He identifies three participatory insights about the God-creation relationship that may be illustrated by reflection on the infinite line. First, just as the infinite line is the essence of all lines, so the infinite essence of God is the essence of all finite essences. Second, just as every 'part' of an infinite line is the infinite line, so in God everything is God. Third, just as the infinite line is the

⁴⁰⁸ Although Cusa begins his discussion of an infinite line in the subjective tense ('if there were an infinite line...'), he shifts in the quotation referenced in the following footnote to direct language about what an infinite line 'actually' is. This ambiguous language prompts Cusa's Thomist critic John Wenck to reject the notion of an infinite line as a false assertion, leading to false conclusions about God. In response, Cusa maintains that 'the impossibility of there actually being an infinite line is shown in many ways in *Learned Ignorance*' and that it is meant as a way of helping the reader to approach 'the unqualifiedly Infinite.' See Jasper Hopkins, *Nicholas of Cusa's Debate with John Wenck* (Minneapolis, MN: Arthur J. Banning Press, 1981), pp. 32, 63.

⁴⁰⁹ *DI* I.16 (45). Hopkins, Jasper, *Nicholas of Cusa On Learned Ignorance: A Translation and an Appraisal of De Docta Ignorantia* (Minneapolis, MN: Arthur J. Banning Press, 1981). Cusa's reference to symbolism here (and throughout the text) is significant. Instead of the Thomistic doctrine of analogical language, Cusa prefers to think of his mathematical illustrations (using infinite geometrical figures to illustrate divine infinity) as symbolisms that do not correspond directly to God, but might direct us to reflect on our necessarily limited conception of God's infinite being. This is the process of learned ignorance.

measure of all lines, so God is the measure of all things. It would be worthwhile to discuss each of these points in turn.

In terms of the first point—that God is the essence of all essences—it is striking that Cusa variously refers to God as ‘the Essence of all essences’,⁴¹⁰ ‘the Essence of all things’,⁴¹¹ ‘the Being of all being’,⁴¹² ‘the Being of things’,⁴¹³ and ‘the Form of being’.⁴¹⁴ With these designations, Cusa seeks neither to deny the finite essences of things nor to conflate them with God’s own essence.⁴¹⁵ Rather, he believes that all finite beings are ultimately dependent on God for their being. While finite things have their own form and being, only God—as the Being of all being—has perfect being that is not derived from or dependent on any other being. To depict God as the Being of all being is not to deny the distinction between God and creation, but to express the absolute dependence of all finite being on its infinite source to which it owes its existence and without which it would not exist.⁴¹⁶

To illustrate this point, Cusa draws on the symbolism of the infinite line to express creaturely participation in God. As noted above, he explains that there is only one essence of all lines, which is participated in in different ways. In a similar way, all finite beings participate in different ways in Being, which is God. In light of this, he offers the following argument based on the somewhat abstruse (and thus characteristically Cusan) notion of the removal and negation of participation:

If from all beings participation is removed, there remains most simple Being itself, which is the Essence (*essentia*) of all things. And we see such Being only in most learned ignorance; for when I remove from my mind all the things which participate in Being, it seems that nothing remains.⁴¹⁷

⁴¹⁰ *DI* I.16 (45).

⁴¹¹ *DI* I.17 (47).

⁴¹² *DI* I.23 (73).

⁴¹³ *DI* I.8 (22).

⁴¹⁴ *DI* I.8 (22).

⁴¹⁵ Here, Wenck reads Cusa as endorsing ‘an essential union of all things with God’ and thereby collapsing the metaphysical distinction between God and creation. Hopkins, *Nicholas of Cusa’s Debate with John Wenck*, pp. 26-27.

⁴¹⁶ Indeed, this is the central insight of Cusa’s later work *De Li Non Aliud*, in which God, as Not-other, is seen as the definition of all things, without which nothing else would exist: ‘the positing of Not-other is the positing of all things and its removal is the removal of all things [such that] other neither exists nor is seen apart from Not-other.’ Nicholas of Cusa, *On God as Not Other*, trans. Jasper Hopkins (Minneapolis, MN: University of Minnesota Press, 1979), 7.26.

⁴¹⁷ *DI* I.17 (51).

This argument should be seen not as a problematic reduction of finite being to God's being, but merely as a participatory restatement of the dependence of the finite multiplicity of creation on its absolute and undivided source. To remove creaturely participation in Being is to remove the existence of all finite things that participate in Being. This leaves only God as Being itself, which is not being (in the finite sense), but the underived and undifferentiated Being of all beings. Since this perfect Being cannot be expressed in positive terms, Cusa (echoing Dionysius) concludes that our 'understanding of God draws near to nothing rather than to something.'⁴¹⁸ Ironically, although the argument is advanced in obscure and negative terms, it amounts to an extremely powerful affirmation of the centrality of participation. To remove participation is to remove creation itself, leaving only God.⁴¹⁹

In Cusa's second participatory insight, he claims that just as every 'part' of an infinite line is the infinite line, so in God everything is God. In God, all things of 'past, present, and future' are 'ever and eternally' God in such a way that God is 'all of them together and none of them in particular'.⁴²⁰ Again, this is not to suggest that God is all things, but that *in* God all things are God. The word 'in' signifies participation, and not conflation or direct identification. Cusa, who develops this further in his theology of creation in Book Two (to be discussed below), describes this as the 'enfolding' of all things in God. He refers to God as 'the enfolding of all things'.⁴²¹ In His simplicity, God 'enfolds the totality of all things'⁴²² and His 'infinite foresight enfolds not only the things which will occur but also the things which will not occur but can occur'.⁴²³ In this way, all things are 'enfolded' in God, and the act of creation involves the 'unfolding' of all things from God. In terms of causation, we might say that the effect is enfolded in the cause, rather than thinking of effect and cause as

⁴¹⁸ *DI* I.17 (51).

⁴¹⁹ We might contrast Cusa's move (removing participation from all beings to leave only Being itself) with Boethius's thought experiment in which God (the first good) is removed to demonstrate that things are good only to the extent that their being is produced by the first good. See Section 3.1 for further discussion of Boethius's view of the apparent conflict between participation and substantiality, as well as Aquinas's response. We might also consider Cusa's tendency to approach God through negation and removal in light of the twentieth-century Jewish existentialist Martin Buber's insistence that God 'is not to be found by subtraction and not to be loved by reduction.' While Buber's language is un-Cusan, there is an unmistakably participatory spirit to his idea that God is not just an object among objects, but the Being on which all other objects depend. See Martin Buber, *Between Man and Man*, trans. Ronald Gregor-Smith (London: Routledge, 2002), p. 67.

⁴²⁰ *DI* I.16 (45).

⁴²¹ *DI* I.22 (67).

⁴²² *DI* I.24 (75).

⁴²³ *DI* I.22 (68).

synonymous. Yet Cusa insists that the ‘infinite Oneness’ in which all things are ‘incompositely enfolded in simplicity’ remains beyond human understanding.⁴²⁴

Cusa’s third participatory application of his mathematical considerations is that just as the infinite line is the measure of all lines, so God is the measure of all things. Again, he illustrates this point with the symbolism of the infinite line, whereby a finite straight line is said to participate in it more simply and immediately than a curved line, whose participation would be more ‘mediate and remote’.⁴²⁵ By analogous reasoning, he notes that substances participate more immediately in God than accidents, which participate ‘not through themselves but through the medium of substances’.⁴²⁶ Just as an infinite line is the measure of a straight line and of a curved line, so God is the measure of all things, which participate in Him in different ways. To claim that finite things participate in God is to suggest not only that they owe their existence to God, but also that they are excellent to the extent that they participate in God. Similarly, an accident depends on the substance in which it participates and is said to be more excellent the more it participates in the substance.

In Book One, then, Cusa uses mathematical illustrations and imagery to convey the participatory notions that God is the essence of all things, that all things exist in God, and that God is the measure of all things. In his metaphysical system, all finite things participate in God, to whom they owe their existence and who sustains them within the created order. As the measure of all things, God has carefully ordered all finite things in the cosmos to participate in Him in various ways, which He alone knows precisely and immediately, and by which each thing achieves its degree of perfection.

Book Two

Having considered the *maximum absolutum* (God) in Book One, Cusa turns to the *maximum contractum* (the universe) in Book Two. He begins with additional participatory insights into the nature of creation (or created being), which derives from and participates in God ‘in a way that is not understandable.’⁴²⁷ This finite being, which participates in God’s being, is not understandable because ultimately God’s being is not understandable to the human intellect, a

⁴²⁴ *DI* I.24 (77).

⁴²⁵ *DI* I.18 (52).

⁴²⁶ *DI* I.18 (52).

⁴²⁷ *DI* II.2 (98).

point Cusa illustrates with the analogy that the being of an accident is not understandable if the substance in which it participates is not understood. Without understanding the absolute necessity from which it derives, it seems that creation is somewhere in between God and nothing; that is, it seems neither to be (since it descends from Being), nor not to be (otherwise it would be nothing), nor to be a composite of being and nothing. God's being is not understandable and so neither is creation, whose mysterious nature can be summarised in similarly contradictory terms: 'it cannot be called one, because it descends from Oneness, nor can it be called many, since its being derives from the One; nor can it be called both one and many conjunctively.'⁴²⁸ Cusa's task is to clarify how we might understand that God is the Form of being and yet not 'mingled' with creation.⁴²⁹ He restates this familiar metaphysical dilemma of the one and the many in participatory terms by asking how it is possible for 'the one, infinite Form' to be 'participated in in different ways by different created things'.⁴³⁰

Cusa proposes that creation is a 'reflection' or an 'image' of God.⁴³¹ This might call to mind the image of a face in a mirror, though Cusa means to suggest not a reflection 'received positively in some other thing but a reflection which is contingently different.'⁴³² So the reflection of God is distinct from God, just as the image of the face in the mirror is not itself the reality of that face. To stress this distinction, he invokes the relationship between a craftsman and his artifact. The artifact depends entirely upon the craftsman's idea for its existence and does not therefore have any being other than dependent being. Unlike the analogy of the face in the mirror, which might suggest that creation is a mirror image of God, the craftsman example underlines that creation is distinct from God and more properly seen as a work of God, as a product of divine craftsmanship. This product might help us to understand God, but our understanding will fall radically short of the absolute perfection of God, from which the product is derived and in which it participates.

Moreover, participation describes not only the relationship between God and creation, but the way in which creation receives its goodness and perfection from God. In a crucial passage, Cusa explains that all things can be images of the 'one, infinite Form' *and* exist differently in our contingent realm because 'the Infinite Form is received only finitely, so that every

⁴²⁸ In the context of critics such as Wenck who direct the charge of pantheism at Cusa, it is important to note that in this section of Book Two he explicitly affirms that creation is not God. *DI* II.2 (100).

⁴²⁹ *DI* II.2 (102).

⁴³⁰ *DI* II.2 (103).

⁴³¹ *DI* II.2 (103).

⁴³² *DI* II.2 (103).

created thing is, as it were, a finite infinity or a created god, so that it exists in the way in which this can best occur.⁴³³ To claim that each being is a ‘created god’ is to underline that God imparts being and perfection to all things in a manner in which as much being and perfection could be received. In this way, all things are ‘something as much like God as possible’,⁴³⁴ and as perfect as they could possibly be, even if less perfect in comparison to some other created thing that might exist according to a different degree of participation. Thus, God’s being is received and participated in such a way that it cannot be received otherwise by the recipient, who finds satisfaction in its own perfection as a ‘divine gift from the Maximum’.⁴³⁵

On Cusa’s participatory account, created being is perfect in its own terms, and God is of course absolutely perfect, and the two realms thereby share a kind of perfection in common, though not as a matter of equal resemblance (as in the mirror analogy), but with creation as an image or participant in the divine being from which it descends and on which it is utterly dependent. This depiction of the manner in which finite beings receive the Infinite Form (which, in spite of his speculations, he concedes is fundamentally mysterious) is particularly rich with participatory language of imparting and reception, as well as the idea that participation is a gift, freely and graciously given ‘without difference and envy’ by a loving God.⁴³⁶ As a consequence of this gift, in which God imparts as much being and perfection as possible, each being is something like a ‘created god’, yet always distinct from divine perfection.⁴³⁷

With this participatory foundation of creation established, Cusa introduces his concept of enfolding and unfolding, which expresses his fundamental metaphysical point that creation is not identical with God, but represents an image of, or participation in, God. The infinite God is present in the finite universe and at the same time wholly distinct. In spite of this gulf, Cusa conceives the relationship between God and creation as a relationship between enfolding (*complicatio*) and unfolding (*explicatio*). The infinite God is the enfolding of all things, while the world is unfolding: ‘God is the enfolding of all things in that all things are in Him; and He

⁴³³ *DI* II.2 (104).

⁴³⁴ *DI* II.2 (104).

⁴³⁵ *DI* II.2 (104).

⁴³⁶ *DI* II.2 (104).

⁴³⁷ In a similarly noteworthy term, he claims that, since all things are the image of the Infinite Form and have contingent differences, it is as if each created thing ‘were a god manqué’. *DI* II.2 (104).

is the unfolding of all things in that He is in all things.⁴³⁸ Our contingent realm gives expression in multiplicity to what is enfolded in perfect unity and simplicity in God. Indeed, earlier in Book One he describes God as enfolding all things in His simplicity and oneness,⁴³⁹ as well as all things which will occur and which could occur.⁴⁴⁰

In Book Two, Cusa offers several analogies from our finite world to illustrate the notions of enfolding and unfolding: oneness enfolds number, rest enfolds motion, the present enfolds time, identity enfolds difference, equality enfolds inequality, and simplicity enfolds divisions.⁴⁴¹ By analogy, God as infinite oneness enfolds all things and contradictions: he enfolds the totality of creation within his simplicity and perfection. From this perspective—and as described earlier in Cusa’s second participatory point in Book One—all things exist in God as God, without divisions or distinctions: ‘If you consider a thing as it is in God, it *is* God and Oneness.’⁴⁴² As enfolded in God, things exist as God in the most perfect way, and not as the finite beings of (unfolded) creation: ‘in the Maximum they are most truly the Maximum, though not in accordance with their finitude; rather, they are Maximum Oneness in an enfolded way.’⁴⁴³

In addition to enfolding, Cusa suggests that we can also view created being as unfolded from God. From this perspective, things exist as distinct from God in their own finite ways as part of our contingent and sensible order. Rather than existing in God as God, they exist as themselves in God. So while they remain in some sense in God as unfolded beings, they are distinct from God and exist in God only by virtue of creaturely participation. At the same time, God remains present in unfolded creation, since this creation continues to receive its being from its infinite source. God is the unfolding of all things and the world is unfolded from God without *being* God. Again, Cusa uses the language of negation and removal to express the dependence of the unfolded world on God: ‘If you consider things in their independence from God, they are nothing... For take away God from the creation and nothing remains.’⁴⁴⁴ While Cusa maintains that we cannot truly understand how God is unfolded through the multiplicity of creation, he returns to the analogy of creation as image

⁴³⁸ *DI* II.3 (107).

⁴³⁹ *DI* I.24 (76).

⁴⁴⁰ *DI* I.22 (68).

⁴⁴¹ *DI* II.3 (105-106).

⁴⁴² *DI* II.3 (110).

⁴⁴³ *DI* I.24 (77).

⁴⁴⁴ *DI* II.3 (110).

and suggests that ‘insofar as He is the unfolding, in all things He is that which they are, just as in an image the reality itself (*veritas*) is present.’⁴⁴⁵ As different images might relate to an original, God’s ‘face’ appears ‘differently and manifoldly’ throughout creation in the diverse participations of finite beings. This face gives creation its existence and identity, while ‘remaining incomprehensibly above all the senses and every mind’.⁴⁴⁶

As such, creation is an image (or the ‘face’) of God, but not a true image in the sense that, while it might be indicative of God, it does not resemble or reflect the reality of God. It is only a ‘contracted Maximum’, a finite or ‘concrete’ realm that owes its existence to the Absolute Maximum, to which it bears a likeness and imitates as much as it can.⁴⁴⁷ Just as the Absolute Maximum, is—in Cusa’s provocative language—that which all things are, so the universe, as contracted maximum, is *contractedly* that which all things are. Contraction signifies restriction, such that the characteristics of the contracted universe fall disproportionately short of the corresponding absolute qualities in God. Thus, oneness is contracted through plurality, infinity through finitude, simplicity through composition, and so on.⁴⁴⁸ From this notion of contraction, Cusa infers that God is the ‘Absolute Quiddity’ (or absolute essence) of the universe, existing in it in such a way that He is in all particulars because He is ‘present absolutely in that which is contractedly all things.’⁴⁴⁹ In other words, God is the ultimate essence in which all things are enfolded, so that (for example) Absolute Oneness is free of all plurality in God. To name God as Absolute Quiddity is another way to express the absolute dependence of creation on God, since each part of creation owes its existence to God.⁴⁵⁰ So oneness is given its own contracted status in creation as number.

To illustrate the idea of God as Absolute Quiddity, Cusa uses the example of the sun and the moon. God is not present in them in the ordinary sense of the term, but He is ‘absolutely’ that which they are: He imparts being to the sun and the moon, without which they would not exist. While each part of creation receives being from the Absolute Quiddity of God, it also exists in its own unique way within the contracted quiddity of the universe. Whereas God’s being is absolute and undifferentiated and thus not identical with any finite being, the

⁴⁴⁵ *DI* II.3 (111).

⁴⁴⁶ *DI* II.3 (111).

⁴⁴⁷ *DI* II.4 (112).

⁴⁴⁸ *DI* II.4 (114).

⁴⁴⁹ *DI* II.3 (116).

⁴⁵⁰ Cusa refers to God as the Essence (or Quiddity) of things, along with Form of forms and Being of beings, all of which express this dependence of creation on creator. *DI* II.7 (130).

universe, as contracted being, exists in plurality and difference: ‘Therefore, God, who is one, is in the one universe. But the universe is contractedly in all things.’⁴⁵¹ This contracted being, which constitutes the diversity and multiplicity of creation, participates in the absolute being of God. In this sense, Cusa suggests that we can begin to understand how, through the mediation of the universe, God is in all things and all things are in God.

Whereas Cusa’s outlook in Book One and Book Two is, respectively, mathematical and metaphysical, Book Three represents a mystical turn toward Christ as the Maximum at once absolute and contracted (*maximum simul contractum et absolutum*). The mathematical and metaphysical disquisitions of the preceding books help prepare the mind for its ascent to faith in Christ. In this sense, Book Three prefigures the more devotional tone of his subsequent work, particularly *De Visione Dei*, to be discussed below. Yet there remains a participatory basis to this joyful ascent. Cusa argues that no finite thing can ‘participate precisely’ in the ‘degree of contraction’ of another thing. This means that any given thing is comparatively greater or lesser than anything else: ‘Therefore, all contracted things exist between a maximum and a minimum, so that there can be posited a greater and a lesser degree of contraction than [that of] any given thing.’⁴⁵² Since finite things cannot become infinite or maximum in the unqualified sense, there must be an Absolute Maximum beyond all comparative relation and within which all finite possibilities are contained, which is God. Further, there must be a way the Absolute Maximum can unite itself to the contracted maximum, and this is achieved through Jesus, who is God and man, as the ‘contracted maximum individual’.⁴⁵³

4.2 *De Sapientia*

De Sapientia, composed in 1450, reiterates Cusa’s insight that knowledge is found in recognition of our ignorance. While this work is of a more epistemological nature than *De Docta Ignorantia*, it also further develops his participatory metaphysics, with an emphasis on the paradox that participation is at once an integral and inadequate way of approaching God. As detailed in *De Docta Ignorantia* and reaffirmed in *De Sapientia*, a contracted universe of diversity and multiplicity is the best expression of God’s absolute oneness, which is given

⁴⁵¹ *DI* II.3 (116).

⁴⁵² *DI* III.1 (183).

⁴⁵³ *DI* III.4 (203).

finite expression among a variety of participants. Yet, as Cusa explains in this text, creaturely participation represents a limited way of reaching God, who remains fundamentally transcendent and beyond creaturely understanding.

With strikingly participatory language, Cusa argues in Book One that the infinite wisdom of God is in all forms, like ‘the truth in the image, the example in the thing exemplified, the form in the figure, the precision in the assimilation.’⁴⁵⁴ God, in His infinite goodness, communicates being to all things, which is received in many different ways since ‘non-multiplicable infinity is better explicated in a variety of recipients.’⁴⁵⁵ This means that the reception of God’s being in diverse ways among diverse recipients is the best possible one, though it cannot be received exactly as it is. Instead, every finite thing partakes in divine being and wisdom insofar as it can. Here, Cusa describes a hierarchy of participation, according to which participants receive wisdom in a progressively more meaningful way, ascending from mineral being, to vegetable life, to higher sensible life, to imaginative power, to rational power, and finally to intellectual life, the latter of which is nearest the image of wisdom. In spite of the elevated status of intellectual life in terms of partaking in divine wisdom, Cusa cautions that this wisdom is ultimately not to be found in oratory or great books, ‘but in a withdrawal from these sensible things and in a turning to the most simple and infinite forms.’⁴⁵⁶

In Book Two, Cusa associates the limited way in which we participate in God with his theology of negation. This is based on the idea that God alone represents ‘precision’ and that our knowledge of God is imprecise because only God is precision itself. Thus, he suggests that any answer to a question about God cannot be precise, since ‘precision is nothing other than what is one and infinite and this applies to God alone.’⁴⁵⁷ Every answer participates in ‘the absolute answer which is infinitely precise’, but precision about divine being can only be reached in a limited fashion because it can only be participated in a limited fashion.⁴⁵⁸ As our

⁴⁵⁴ ‘De Sapientia’ in *Unity and Reform: Selected Writings of Nicholas of Cusa*, John Patrick Dolan (ed.) (University of Notre Dame Press, 1962), p. 114.

⁴⁵⁵ *DS*, p. 115.

⁴⁵⁶ *DS*, p. 115.

⁴⁵⁷ *DS*, p. 118.

⁴⁵⁸ *DS*, p. 118. Similarly, in *De Coniecturis*, completed in 1443 between *De Docta Ignorantia* and *De Sapientia*, Cusa refers to the Divine Mind as the ‘most absolute preciseness of all things’ in which created things participate differently and in terms of ‘otherness of variation.’ This is because, as absolute precision, it cannot be partaken of in itself; it is ‘partaken of by something *other* and, hence, is partaken of *otherwise*.’ *De*

participation in God deepens or improves (perhaps according to the hierarchy mentioned above), so our comprehension of God improves, though it remains partial and incomplete. As a consequence of the various ways of participating in God, all of which nevertheless fall short of fully approaching God's perfect truth, it is more truthful to restrict ourselves to negative statements and 'in that way we are not led to a knowledge of what God is, but what He is not.'⁴⁵⁹

Later in this Book, Cusa returns to two important participatory analogies introduced in *De Docta Ignorantia*. First, he compares the image and its original to creation and God. All images of a face are precise, right, and true only to the extent that they 'partake of and imitate' the living image of the original face. God, as absolute Exemplar, is similarly imitated by precision, rightness truth, justice, and goodness, but contains all such imitative things in a much more perfect way than the original face contains elements of its own image.⁴⁶⁰ Second, he revisits the symbol of the infinite line as the most precise exemplar of all geometric figures. Just as a finite straight line participates in an infinite line, so an individual person might be thought of as straightness, truth, measure and perfection existing in a 'contracted' and limited way, who might turn his attention to, and participate in, absolute straightness and truth: 'Thus infinite truth is the precision of finite truth, and, being absolutely infinite, is also the precision, measure, truth, and perfection of everything that is finite.'⁴⁶¹

4.3 *De Visione Dei*

Completed in late 1453 at the request of the monks of the Benedictine abbey at Tegernsee, *De Visione Dei* offers 'an easy path unto mystical theology' wherein we might 'partake' in everlasting bliss according to the measure granted us by God.⁴⁶² As with Cusa's earlier works, this text describes the participatory structure of reality and the ascent into the divine darkness of learned ignorance, beyond which lies the absolute infinity of God. In this

Coniecturis, I.11 (55). See Jasper Hopkins, *De Coniecturis (On Surmises) by Nicholas of Cusa* (Minneapolis, MN: Arthur J. Banning Press, 2000).

⁴⁵⁹ *DS*, p. 119. In fact, Cusa goes on to suggest a theology of neither affirmation nor negation, since God is above both: 'Hence, following the way that is above both the affirmative and the negative, it must be answered that He is neither, namely absolute Entity; neither that He is not, nor simultaneously is and is not, but rather that He is above both of these.'

⁴⁶⁰ *DS*, p. 123.

⁴⁶¹ *DS*, p. 127.

⁴⁶² 'De Visione Dei' in *Unity and Reform: Selected Writings of Nicholas of Cusa*, John Patrick Dolan (ed.) (University of Notre Dame Press, 1962), p. 133.

instance, though, his primary concern (in line with his move in Book Three of *De Docta Ignorantia*) is to bypass philosophical considerations of the paradoxes of learned ignorance to the practical matter of partaking in Christ, who is the final and entirely perfect image of God. The mystery of divine presence is not to be illuminated in abstract metaphysical concepts, but in recognition of the likeness of Jesus to the divine nature, whose presence is therefore more immediate and accessible than might be expected. While many of Cusa's recurring participatory ideas, including the crucial enfolding/unfolding concept, are present in *De Visione Dei*, it is a more personal, devotional, and mystical text, directed to participation in the final perfection of the image of God.

In *De Visione Dei*, the act of seeing—both God's seeing of creation and our seeing of God—is accorded profound metaphysical significance. Cusa begins with reference to 'the icon of God,' which is a picture 'setting forth the figure of an omnivoyant' and by which he proposes to uplift the recipient by a devotional exercise to mystical theology.⁴⁶³ He goes on to declare that we exist by virtue of God's sight. This is described in participatory language, with God's glance associated with supreme goodness that 'cannot fail to communicate itself to all able to receive it.'⁴⁶⁴ Without God's glance, which *is* His being, we would not be able to receive being and we would therefore not exist: 'since Thy look is Thy being, I am because Thou dost look at me, and if Thou didst turn Thy glance from me I should cease to be.'⁴⁶⁵ From our perspective, if we do not 'see' God, we would not receive God's being, since our very being *is* God's seeing.⁴⁶⁶ God communicates being to all able to receive it, and we exist to the extent that we are able to participate in it. This capacity for reception and participation, which should be cultivated whenever possible, is none other than 'likeness'.⁴⁶⁷ We will be able to approach the goodness of God according to our degree of participation in God's likeness.

On this point, Cusa insists that any creaturely attempt to set forth a likeness of God would be inadequate. Any such likeness or resemblance or concept would not exceed the 'wall of Paradise' beyond which the infinite mystery of God exists. This wall, to which Cusa refers throughout *De Visione Dei*, separates God from all that can be possibly said or thought about the 'Absolute Ground.' Since God cannot be attained or comprehended or named or directly

⁴⁶³ DVD, p. 134-35.

⁴⁶⁴ DVD, p. 139.

⁴⁶⁵ DVD, p. 139. Later, Cusa claims that God, as Absolute Beauty itself, gives being to every beautiful form. See p. 144.

⁴⁶⁶ DVD, p. 149.

⁴⁶⁷ DVD, p. 139.

beheld, anyone wishing to approach God must ascend above every limit and end and finite thing, and thereby into a realm that is ‘undefined and confused’.⁴⁶⁸ Here, our intellect may only operate according to ‘ignorance and obscurity’, a kind of instructed or learned ignorance that is ultimately the only way to approach the infinite God.⁴⁶⁹

Given the inadequacy of human models of the divine, Cusa concludes the text with the claim that Jesus is ‘the most approximate image’ of God, as well as the greatest possible union of the divine nature and the human nature.⁴⁷⁰ In Jesus, human intelligence is united with divine intelligence, just as a most perfect image is indicative of the truth of its pattern. Cusa claims that humans only understand things by a likeness, even to the extent that we only understand a stone as an idea or a likeness, and not as in its proper cause or nature.⁴⁷¹ In this way, the appeal to Jesus as the most perfect likeness of God, as the finite image of the absolute idea of all things, also serves to highlight the importance of participation not just as the ground of being and existence, but also of knowledge. We comprehend by participatory concepts, which might help us to move closer to the infinite God in whose being we participate in our own limited ways.

⁴⁶⁸ *DVD*, p. 153.

⁴⁶⁹ *DVD*, p. 153.

⁴⁷⁰ *DVD*, pp. 170-71.

⁴⁷¹ *DVD*, p. 171.

4.2 Rodney Holder on Infinity

In this section, I will examine the British cosmologist-theologian Rodney Holder's critique of multiverse thought. In particular, I will focus on his view of infinity in Cusa's cosmology, which he presents as a noteworthy historical precursor to contemporary multiverse models. Holder's reading of Cusan infinity is worth examining because it is indicative of a wider set of misapprehensions in contemporary theological treatments of Cusa's relevance to multiverse thought. This is particularly evident in Holder's understanding of Cusan infinity, which fails to attend closely to Cusa's participatory metaphysics and instead tends towards univocity; that is, he directly conflates Cusa's notion of divine infinity with cosmic infinity. This conflation, among other considerations, leads him to conceive of multiverse thought in terms of actual infinities, the paradoxes of which he believes undermine the plausibility of multiverse models. Yet Cusa offers a more complex (and, as a consequence of his mystical approach, in some ways confounding) metaphysical vision of *contracted* infinity in which the universe is understood to be an unbounded copy of God's infinity. Cusa's mysticism calls for an *orientation* towards infinity, with the recognition that the universe is *potentially* infinite, as opposed to Holder's emphasis on *actual* infinities (though even actual cosmic infinities would not be the same as God's infinite simplicity). I will propose that this participatory account of Cusan cosmology provides the resources to negotiate Holder's conceptual problems with multiverse thought.

4.2.1 Holder on Multiverse and Infinities

Holder is a prominent theological critic of the multiverse hypothesis, which he sees as the only viable alternative to divine design, yet significantly less plausible by comparison. His examination of the multiverse hypothesis, *God, the, Multiverse, and Everything*, represents one of the most constructive and systematic theological engagements with multiverse thought in recent years. In general, he believes that the idea of multiverses is fraught with scientific and philosophical problems, including lack of testability and observability, lack of simplicity, lack of order and predictability inherent in many multiverse models, the lack of an explanation for the apparent fine-tuning of the generating principle in question (such as inflation), the prevalence of fake universes (as in universes that contain computer simulations

of other universes), and the way in which multiverses provide a ‘catch-all’ type of explanation that could discourage scientific enquiry.⁴⁷²

In his critiques of the multiverse proposal, Holder pays significant attention to the paradoxes of infinity. As part of this, he repeatedly cites Nicholas of Cusa as an example of an important figure in Christian theology who welcomes the notion of cosmic infinity. Given that medieval thinkers are often neglected in the contemporary theology and science dialogue, this reappraisal of Cusan cosmology is apposite, particularly in light of its resonance with themes in multiverse thought. However, Holder’s assessment of Cusa’s role in the development of multiverse thought is mistaken in both historical and philosophical terms. In terms of history, he incorrectly alleges that Cusa’s view of the infinite universe anticipates Giordano Bruno’s and, in terms of philosophy, he offers a reading that is insufficiently attentive to Cusa’s participatory metaphysics, and conflates the distinct notions of divine and cosmic infinity. While this section will focus primarily on Holder, this twofold misreading of Cusa is persistent in theological receptions of the multiverse proposal, and I will consider other representative examples. I will go on to argue that highlighting the importance of Cusa’s participatory metaphysics will provide a corrective to these misapprehensions and address many of the points of contention raised by Holder and other multiverse critics.

In the contemporary theology and science dialogue, the Cusan interplay between divine and cosmic infinity is often highlighted by theologians who wish to suggest that Christian theology could be said to have anticipated and perhaps influenced the gradual scientific turn to thinking in terms of many worlds or universes, or at least of a radically expanded view of the cosmos. For example, Holder follows Robin Collins (the philosopher discussed in Chapter 3.2) in conflating Cusa’s view of the infinite universe with Bruno’s subsequent thinking.⁴⁷³ Likewise, the German theologian Dietrich Bonhoeffer conflates Cusa and Bruno as first movers in the introduction of the ‘heretical’ doctrine of the infinity of the universe: ‘The classical cosmos was finite, like the created world of the Middle Ages... modern physics is not as sure as it was about the infinity of the universe, but it has not gone back to

⁴⁷² For Holder’s full discussion of these points, see *Big Bang Big God*, pp.130-154; *God, the Multiverse, and Everything*, pp. 113-129.

⁴⁷³ Holder, *Big Bang Big God*, p. 127.

the earlier conceptions of its finitude.⁴⁷⁴ Although Cusa's cosmological vision represents a break from the prevailing finite conception of the universe in the late medieval period, it is distinct from Bruno's claim that the infinity of the universe is absolute, and that this cosmic infinity can be identified with God's infinity. As will be discussed in the following section, Cusa presents his own subtly different idea of contracted infinity.

Other theologians have similarly misplaced Cusa's historical role, going so far as to credit Cusa with anticipating Copernicus's replacement of geocentrism with heliocentrism, or Einstein's relativity theory. Stenger claims that Cusa 'set the stage for what became known as the Copernican revolution.'⁴⁷⁵ Rubenstein identifies Cusa not only as the first Christian theologian to 'genuinely' abandon the spatially limited Aristotelian cosmos, but also as a 'surprising forerunner' of modern cosmology who supposedly anticipates the logic of Einstein's theory of special relativity.⁴⁷⁶ While Cusa's model of the universe is more expansive than those of his theological antecedents, it would be mistaken to identify it as a forerunner to Copernicus. Aside from the fact that Cusa's cosmology does not unambiguously reject geocentrism,⁴⁷⁷ it is important to remember that his cosmology is presented in the form of a mystical, prayerful vision—not a systematic and complete scientific theory based on empirical evidence, but an enigmatic and in many ways obscure metaphysic of 'learned ignorance'. This metaphysical outlook might provide the resources to illuminate multiverse theories, but it should not be supposed to have helped bring about subsequent scientific developments.

Of greater significance than the question of Cusa's historical role is Holder's imprecise rendering of Cusa's view of the infinite universe. This follows from a lack of emphasis on the participatory nature of Cusa's metaphysics, which is also evident in other theological multiverse assessments. Holder claims that Cusa postulates an 'infinite universe', which he finds 'interesting' since the notion of infinity is newly relevant in recent disputes within the philosophy of cosmology.⁴⁷⁸ He adds that Cusa sees the infinite universe as 'especially

⁴⁷⁴ Bonhoeffer, *Letters and Papers from Prison* (New York, NY: Touchstone, 1997), p. 359.

⁴⁷⁵ Stenger, *God and the Multiverse*, p. 60.

⁴⁷⁶ Rubenstein, *Worlds Without End*, p. 76-78.

⁴⁷⁷ For Cusa, God is 'everywhere and nowhere' as the 'circumference and center' of the universe. The earth is not its center, although it seems more central to us. *DI* II.12 (162). This is the 'perspectival' character of Cusa's cosmology, to be discussed in the next section in terms of human identity.

⁴⁷⁸ Holder, *Big Bang Big God*, p. 40. Holder makes the same claim in an essay on Georges Lemaître and Fred Hoyle. See Rodney Holder, 'Georges Lemaître and Fred Hoyle: Contrasting Characters in Science and

befitting the perfection of the Creator.⁴⁷⁹ In the closest he comes to acknowledging the participatory aspect of Cusa's thought, with attention to infusion of divine being and imitation on the part of created being, he notes that Cusa's view of the infinite cosmos is based on 'the idea that God infuses the world with as much of his own perfection as is possible while still making the world different from himself. The geometric symbol of God as infinite sphere is transferred to the world as concretely imaging God.'⁴⁸⁰ As Holder observes, this univocal approach, which identifies God too closely with the world, finds an interesting modern scientific echo in the work of cosmologists such as Lawrence Krauss, who 'are happy enough with a concept of God that simply identifies God with the universe or with the laws of nature.'⁴⁸¹

In addition, Holder's somewhat narrow interpretation of Cusan infinity is similar to Collins's argument for the compatibility of the multiverse hypothesis with theism, which is advanced in Cusan terms and cited by Holder as a modern philosophical case for the compatibility of God and the multiverse.⁴⁸² According to Collins, since God is infinite and infinitely creative, 'it makes sense that creation would reflect these attributes, and hence that physical reality might be much larger than one universe.'⁴⁸³ He believes that the Cusan notion of an infinite universe is newly relevant and compelling in light of recent inflationary multiverse models, as well as the general cosmological trajectory towards a progressively more expansive view of the cosmos. He also thinks that the kind of universe-generating mechanism associated with some inflationary models would represent an elegant way for an infinitely creative God to create an infinite universe.

Since Holder interprets Cusa's notion of an infinite universe in such a strict, univocal sense, it is not surprising that he is inclined to identify 'paradoxes of infinity' as one of the problems of multiverse thought.⁴⁸⁴ Following his claim that Cusa postulates an infinite universe, he notes that the problem of the existence of actual infinities in nature is in dispute in recent cosmological debates, observing that cosmologists (such as George Ellis) and philosophers

Religion', in Rodney Holder and Simon Mitton (eds.), *Georges Lemaître: Life, Science and Legacy* (London: Springer, 2013), p. 49.

⁴⁷⁹ Holder, *Big Bang Big God*, p. 126.

⁴⁸⁰ Holder, *Big Bang Big God*, p. 75.

⁴⁸¹ Holder, *Big Bang Big God*, p. 75.

⁴⁸² Collins, 'Multiverse hypothesis: a theistic perspective', p. 460.

⁴⁸³ Collins, 'Multiverse hypothesis: a theistic perspective', p. 460.

⁴⁸⁴ Holder, *Big Bang Big God*, pp. 133-36.

(such as William Lane Craig) ‘have questioned whether an infinite number of physical things... can actually exist.’⁴⁸⁵ On this point, Holder considers the mathematician David Hilbert’s paradox of the hotel with infinitely many rooms. In this hotel, even if all the rooms were full, it would still be possible to accommodate infinitely many more guests by asking the guest in Room 1 to move to Room 2, the guest in Room 2 to move to Room 4, the guest in Room 3 to move to Room 6, and so on, leaving the even numbered rooms full, but all the odd numbered rooms free. This suggests that infinities can be added to but never completed. In fact, Hilbert concludes that the infinite is ‘nowhere to be found in reality, no matter what experiences, observations, and knowledge are appealed to.’⁴⁸⁶ For Holder, Hilbert and likeminded critics, infinity is not specifiable or physically realisable and, in the case of multiverses, is indicative of a corrupted model. If, as Holder believes, Cusa endorses an unambiguously infinite universe, then such a vision (and any multiverse models based on infinity) would founder on the incoherence of the concept of physically realisable infinity.

4.2.2 *Cusa on Contracted Infinity*

Contrary to Holder’s emphasis on actual infinities in nature, Cusa’s universe is *potentially* infinite—not strictly infinite or strictly finite, but boundless in its infinitude of space and quantity, tending always towards its infinite divine source. His vision is not of realised infinities, but of an orientation towards, or a constant desire and restlessness for, infinity. Cusa identifies within the boundlessness of creation the infinity of the creator, such that the potential (or contracted) infinity of the universe is imitative in nature. In his participatory vision, God’s infinity is the archetype of the imitative boundlessness and endlessness of the universe. The absolute infinity of God is not equivalent to the (restricted or contracted) infinity of the universe, but stands as an archetype of perfect infinity that is received only partially throughout creation. The universe is infinite not in the strict sense in which Holder and others seem to interpret Cusa, but in its status as an image that is drawn in its endlessness to imitation of its source.

Before examining Cusa’s concept of privative infinity, it should be kept in mind that the claim itself is, as his most authoritative recent translator Jasper Hopkins admits, ‘difficult to

⁴⁸⁵ Holder, *Big Bang Big God*. p. 40.

⁴⁸⁶ David Hilbert, ‘On the infinite’, in Paul Benacerraf & Hilary Putnam (eds.), *Philosophy of Mathematics: Selected Readings* (Cambridge, Cambridge University Press, 1983), p. 191.

interpret' and the subject of 'a number of statements, which, on the surface, appear contradictory.'⁴⁸⁷ If, as Hopkins contends, Cusa discusses contracted infinity in vague (or even misleading and nonsensical) terms, we might be tempted to dismiss the idea as confused or muddled. Alternatively, we might consider two (more sympathetic) explanations for its obscurity. First, Cusa offers his speculations in a spirit of prayer and devotion, which inherently defies the conceptual clarity often sought in other disciplines such as philosophy or science. As discussed previously, this style is exemplified in Book III of *De Docta Ignorantia*, as well as in *De Visione Dei*. Second, Cusa's work is defined by the impulse to go further, to explore the limits of thought, and to seek to transcend such limits. The scientific search for a multiverse might be seen as a modern instance of this unbounded desire to expand our cosmic horizons. This attitude is given deeper metaphysical meaning in Cusa's exploration of infinity. He seeks not only to expand our (finite) horizons, but to ascend from the finite to the infinite, from our intelligible realm to that which lies beyond. This emphasis on infinity, while perhaps more amenable to non-theological critics than the prayerful character of his work, likewise results in paradoxical and enigmatic statements.

To illustrate what Cusa means by the contracted infinity of the universe, it would be useful to consider what he is and is *not* claiming about the universe itself, before proceeding to consider the universe in relation to God. With regard to the universe, there seem to be three possibilities: first, that the universe is strictly finite; second, that the universe has a finitude of number (or things) but unbounded space; or third, that the universe has an infinitude of number, which may be unbounded or realised (that is, potentially or actually infinite). In terms of the first possibility, given his emphasis on infinity (both cosmic and divine), it is clear that Cusa does not believe the cosmos is finite in any strict or conventional sense. Indeed, the first chapter of Book II of *De Docta Ignorantia* is concerned with inferring an 'infinite universe'.⁴⁸⁸ The second possibility is more promising, since Cusa suggests that the universe, with no 'fixed circumference' is not limited in space by anything outside of its boundaries.⁴⁸⁹ The universe is not limited by any other spatial thing, since it encompasses all spatial things. There is nothing outside of it which might fix its circumference, and to this extent it is spatially unbounded.

⁴⁸⁷ Jasper Hopkins, *A Concise Introduction to the Philosophy of Nicholas of Cusa* (Minneapolis, MN: University of Minnesota Press, 1978), pp. 30-31.

⁴⁸⁸ *DI* II.1 (91).

⁴⁸⁹ *DI* II.11 (156).

However, Cusa's vision of a privatively infinite universe is not just limited to the idea that it is spatially unbounded. This leads to the third possibility of whether, in addition to being spatially unbounded, there exists an infinitude of quantity among things in the universe. Within this possibility, the true meaning of privative infinity rests on the distinction between whether this infinitude of quantity is itself unbounded (and thus potentially infinite) or realised (and thus actually infinite). In terms of quantities of things in the universe, Cusa maintains that it is not possible to reach either the absolute greatest or absolute smallest and thus 'no transition is made to the infinite'.⁴⁹⁰ Although it is always possible to posit a greater and a lesser (whether in terms of quantity, virtue, or perfection) than any finite thing, this progression does not continue into infinity. Since each part of the infinite is infinite, it cannot contain 'more' or 'less', nor can 'more' or 'less' stand in comparative relation to the infinite. To illustrate this, Cusa observes that in 'the infinite' the number two would not be smaller than the number one hundred. As such, it seems that Cusa's privative infinity of quantity, while unbounded insofar as we can always posit more or less, is only *potentially* infinite since it does not extend to an *actual* infinity. According to this third possibility, then, Cusa believes that the universe is not strictly infinite, but potentially (or privatively) infinite, existing 'only in a contracted manner, so that it exists in the best way in which the condition of its nature allows'.⁴⁹¹

The privative infinity of the universe has a participatory character. Although it does not allow for a transition to actual infinity, it is suggestive of what Karl Jaspers refers to as 'another kind of infinity of the finite world... the endlessness of the world... The infinity of the world is an image of God's infinity—it is mere endlessness'.⁴⁹² This is a kind of boundlessness characterised by incompleteness (in contrast to the perfection of God), befitting the restless search for infinity that defines Cusa's work and was discussed earlier. Since the universe encompasses all things apart from God, it can be thought of as unbounded (both in terms of quantity and space) and therefore privatively (if not absolutely) infinite.⁴⁹³ In this sense, the absolute (or maximum) infinity of God is given expression in the contracted or restricted infinity of the universe. The universe, with its contracted infinity, imitates the absolute

⁴⁹⁰ *DI* II.1 (96).

⁴⁹¹ *DI* II.1 (97).

⁴⁹² Karl Jaspers, *The Great Philosophers* (London: Rupert Hart-Davis, 1966), p. 178.

⁴⁹³ *DI* II.1 (97).

infinity of God: 'Because the cosmos is an image, it is infinite, but its infinity is of the imitative kind, which denotes endlessness, the possibility of always going further.'⁴⁹⁴

This kind of privative or contracted infinity is distinct from the infinity of God, who is 'negatively infinite' and includes 'whatever there can at all possibly be.'⁴⁹⁵ Cusa explains that the infinite God had the power to create an infinite universe. God is infinite in the sense that He is 'Infinite Actuality', the actualisation of the infinite variety of possibilities.⁴⁹⁶ This is not possible outside God, and so everything except God is necessarily contracted. As such, the possibility of the universe (or any created thing) is contracted, such that it could not be absolute or 'actually infinite' or greater or other than it is.⁴⁹⁷

Cusa's universe, then, is neither strictly finite nor strictly infinite. In *De Docta Ignorantia*, it is variously (and, it might seem, mystifyingly and self-contradictorily) described as 'neither finite nor infinite',⁴⁹⁸ as 'privatively infinite',⁴⁹⁹ and as having 'infinity contracted through finitude'.⁵⁰⁰ These terms are intended to signify that the universe is not infinite, but potentially (or privatively) infinite. His cosmology is concerned with an orientation toward infinity, an understanding that while there is no limit to the number of things within the universe, true infinitude of number is not actually realised. In contrast to the 'Infinite Actuality' of God, the infinity of the universe is always incomplete, with its very endlessness embodying the partial way in which it receives and participates in God's being: 'For the Infinite Form is received only finitely, so that every created thing is, as it were, a finite infinity'.⁵⁰¹

4.2.3 Mathematical Infinity and Divine Infinity

Cusa's conception of the participatory relationship between mathematical infinity and divine infinity can help navigate some of the conceptual problems with multiverse theory that Holder identifies. In contrast to Holder, Cusa makes a sharper distinction between infinity as

⁴⁹⁴ Jaspers, *The Great Philosophers*, p. 185.

⁴⁹⁵ *DI* II.1 (97).

⁴⁹⁶ *DI* II.8 (137).

⁴⁹⁷ *DI* II.8 (139).

⁴⁹⁸ *DI* II.1 (97).

⁴⁹⁹ *DI* II.1 (97).

⁵⁰⁰ *DI* II.4 (114).

⁵⁰¹ *DI* II.2 (104).

a mathematical problem and infinity as an object of theological or metaphysical speculation. At the same time, he holds that mathematical infinity can serve as a metaphor or an intimation of God's infinity. This participatory account might help to provide a counterweight to Holder's view that any kind of infinite universe would be less 'comprehensible' than a strictly finite universe to 'humans made in the image of God'.⁵⁰²

Holder, reflecting the general theological consensus of Cusa's relevance for multiverse thought, adopts a univocal reading of Cusa's metaphysics of the relation of creation to creator. Contrary to his claim that Cusa's symbol of God as infinite sphere is directly 'transferred' to the universe, it is more properly seen as an illustration of the participatory character of the universe. The (contracted) infinity of the universe is an image and imitation of God's (absolute) infinity. As an image of infinity, the universe cannot be enclosed between a physical center and a circumference, which is why Cusa's metaphor suggests that God alone, as infinite sphere, is the center and circumference of the universe. Although the universe is not strictly infinite, it cannot be seen as finite since it lacks boundaries and its qualities and quantities tend toward infinity. This boundlessness, which can also be seen as a kind of restlessness and incompleteness, points to and imitates the infinity of God.

In response to Holder's doubt that an infinite number of physical things can actually exist, and his observation that 'an infinity can always be added to and is never complete',⁵⁰³ we might note that Cusa, as demonstrated in the previous section, argues that the privative infinitude of quantity in the universe should be understood as a potential infinity, not an actual infinity. Unlike Holder, who is troubled by the idea of actually existing infinities in creation, Cusa depicts a creation that can be seen as a copy of God's infinity, that might prompt us to seek to ascend to God's infinity, but that does not itself contain or embody actually realised infinity. In fact, we might also note that even if there could be a realised infinity of things in the universe, this would still fall radically short of God's infinity. Whether potential or realised, Cusa provides reason to believe that the infinitude of quantity in the universe is not the same as—and indeed subordinate to—God's infinite perfection and simplicity.

⁵⁰² Holder, *Big Bang Big God*, p. 126.

⁵⁰³ Holder, *Big Bang Big God*, p. 40.

While Holder's theological critique of multiverse thought is based to a considerable extent on discussion of the paradoxes of mathematical infinities, Cusa employs mathematical symbolism as a way of approaching God's infinity. His method is threefold: first, we must recognise that all mathematical figures are finite; second, we must apply these figures 'in a transformed way' to corresponding infinite mathematical figures; and third, we must apply the relations of these infinite figures to the simple Infinite, or God.⁵⁰⁴ In this sense, mathematical infinity comes to symbolise divine infinity, though it remains the case that divine infinity is beyond our full understanding. Mathematics provides a way for us to think 'more correctly' about God as 'we grope by means of a symbolism.'⁵⁰⁵ By comparison with Holder's conflation of mathematical and divine infinity, Cusa offers a metaphysics that is at once more constructive and more confounding—constructive in the sense that he illustrates how we might proceed from knowledge of mathematical figures to knowledge of God, yet confounding in the sense that he also accepts the limits to this kind of analogical knowledge.

Holder associates the infinity of God with the infinity of the universe, which in turn prompts him to focus on the implausibility of actual infinities in nature. Cusa, though, depicts a universe of contracted infinity, in which the infinitude of number is unbounded yet not actually realised. The universe is an image of, or participation in, God's infinity, and is thus oriented towards infinity. This outlook is broadly consistent with Tegmark's Level I multiverse model, which is also spatially infinite and whose components seem to be tending towards endlessness. Like Cusa's cosmos, this model appears to be without centre or circumference, a multiverse whose 'perspectival' character is the subject of the next section.

⁵⁰⁴ *DI* I.12 (33).

⁵⁰⁵ *DI* I.12 (33).

4.3 Catherine Keller on Interrelation

In this section, I will provide an alternative participatory reading of Cusa to the American theologian Catherine Keller's reception of his cosmology and negative theology. Keller, a postmodernist and feminist theologian at Drew University, perceives in Cusa's infinite universe an opportunity to develop a new theology of materiality and relationality. Initially, I will outline and evaluate her notion of a 'multiverse of perspectives', in which the entanglements of an immensely vast and crowded cosmos underline the need for political and social change in the material world. I will then argue that, rather than associating Cusa with interrelation and perspectivism (the view that truth is contingent on perspective), he is more properly seen as insisting on the importance of individuality and of transcending one's own finite perspective. In fact, his primary concern is not with Keller's postmodern multiplicity of entangled perspectives and their alleged bodily implications, but with the participatory goal of overcoming perspectival limits to ascend to the infinite God. Finally, I will propose that an emphasis on Cusa's celebration of human uniqueness would be more consistent with the spirit of his work than Keller's conscription of his cosmology to serve her own political ends.

4.3.1 Keller on a Multiverse of Perspectives

Keller's *Cloud of the Impossible: Negative Theology and Planetary Entanglement* is an ambitious, expansive, and elegant project in which traditional philosophy of religion is brought into contact with contemporary debates in theology and science. As the subtitle indicates, Keller is concerned with the relationship between the apophatic and the relational—or, as she puts it, the unknowable and the nonseparable.⁵⁰⁶ She seeks to demonstrate that the interconnectivity of our world—the manifold of social movements, the multiplicity of religious or spiritual identifications, the queering of identities, the tangled planetarity of human and nonhuman bodies⁵⁰⁷—can be understood 'apophatically entangled in and as *theology*.'⁵⁰⁸ By this she means that the negativity of apophatic entanglement ultimately gives way to material and relational differences and possibilities. Her text bears structural and stylistic similarities to Cusa's work. In terms of structure, she follows the example of his metaphor of enfolding/unfolding (*complicatio/explicatio*), dividing her work

⁵⁰⁶ Catherine Keller, *Cloud of the Impossible: Negative Theology and Planetary Entanglement* (New York, NY: Columbia University Press, 2015), p. 6.

⁵⁰⁷ Keller, *Cloud of the Impossible*, p. 5.

⁵⁰⁸ Keller, *Cloud of the Impossible*, p. 7.

in three parts: Complications, in which she offers a genealogy of negative theology with particular reference to Cusa; Explications, in which she draws widely on quantum physics, Alfred North Whitehead's process theology, and Walt Whitman's poetry; and Implications, in which she presents the political and ecological implications of her theology of apophatic entanglement. In terms of style, she often makes Cusan turns to lyricism, poeticism, and ambiguity, and is therefore often elusive and problematic to interpret.

Keller acknowledges that her project depends upon Cusa's negative theology, in which she identifies 'perhaps for the first time in Christian thought, a *theological cosmology of relation*.'⁵⁰⁹ In this manner, her distinctly postmodern enterprise of deconstructive negation and affirmative interrelation rests on Cusa's fifteenth century articulation of the constituent interdependence of the universe, as in his Anaxagorean idea that 'all is in all and each is in each'. She believes that his idea of learned ignorance—the cloud of the impossible—offers 'not just an apophatic panentheism, but the holographic vision of a radically interrelated universe.'⁵¹⁰ On this reading, Cusa's negative theology does not simply amount to subjective mysticism, but provides a relational cosmology suggestive of outward expansion and consistent with our modern intuition of accelerating interconnection. She expresses this insight in the language of modern multiverse theory: 'What unfolds in the cloud-space of the Cusan God is a multiverse of perspectives, proliferating holographically, irresolvable into any fixed proposition.'⁵¹¹ Her reference to holographic imagery implies that this 'cloud-space' defies easy comprehension.

Crucially, Keller understands Cusa to be engaged in an 'experiment in perspective'.⁵¹² The cloud of the impossible (or the practice of learned ignorance) provides a new perspective on the infinite and thereby on the perspective of finite creatures. Thus, negative theology comes to reveal the positive materiality and the infinite potentiality of the universe. To substantiate this claim, she highlights the significance of perspective in *De Visione Dei*, with particular

⁵⁰⁹ Keller, *Cloud of the Impossible*, p. 48.

⁵¹⁰ Keller, *Cloud of the Impossible*, p. 89.

⁵¹¹ Keller, *Cloud of the Impossible*, p. 121.

⁵¹² Keller, *Cloud of the Impossible*, p. 88. To the extent that she sees Cusa as an early instance of what came to known as perspectivism (the view that there are many different perspectives from which knowledge is developed), Keller acknowledges that she is part of a broader modern trend in Cusan interpretation. This includes Michel de Certeau, the French Jesuit who explores the instances of shifting perspectives in Cusa's work, and Karsten Harries, the German philosopher whose recent work on infinity and perspective heavily focuses on Cusa. See Michel de Certeau and Catherine Porter, 'The Gaze: Nicholas of Cusa.' In *Diacritics* 17, 3 (Autumn 1987): 6; Karsten Harries, *Infinity and Perspective* (Boston, MA: MIT Press, 2001).

reference to Cusa's use of the icon, the visible image of the invisible God, whose face seems to gaze upon the observer regardless of their perspective. The observer is thus being observed by the observed, and so the icon represents both God's vision of us and our vision of God—a paradoxical interrelation of seeing and the seen, mirrored in the perspectival ambiguity of the title itself. She then considers the negative theology of *De Docta Ignorantia*, in which God is depicted as infinite and ineffable, most truly spoken of 'through removal and negation'.⁵¹³ To the limited extent that we can apply affirmative names to God, we can do so 'only in relation to creatures'.⁵¹⁴ With his insistence on relationality as necessary for describing God, Keller believes that Cusa 'undoes any claims of theology to transcend its perspective, the sociocreaturely context of its relations.'⁵¹⁵

Indeed, Keller perceives throughout *De Docta Ignorantia* 'a radical relationality' with 'the relativity of perspectivism... gestating in apophatic theology all along.'⁵¹⁶ She notes that a perspective is ultimately a view, one among many, which can only be defined and understood in relation to others. On this account, Cusa's learned ignorance—on which his cosmology depends—is necessarily a perspectival enterprise, through which we recognise the extent to which our knowledge of a subject is limited by our perspectives. For Keller, the infinity of Cusa's God (of which the universe is a boundless copy) underscores the finitude of our own perspectives (which are always relational) and also 'enflames our relation to that very infinity.'⁵¹⁷ She argues that this perspectivism opens an alternative 'third way' to the univocity and equivocity that preoccupy Aquinas, 'that of a participatory ontology indebted to Thomas but radicalized, open-ended, and so precisely infinite.'⁵¹⁸

Curiously, Keller does not pursue this identification of the participatory character of Cusa's metaphysics (or its theological antecedents), opting instead to view him as a key figure in the emergence of modern perspectivism. On this point, it is true that there are two important ways in which Cusa's interest in the problem of perspective accords with modern concerns. First, his insight that perceptual knowledge is inescapably perspectival—that, for example, our experience of observing an icon depends on having a particular body which is itself

⁵¹³ *DI* I.26 (87).

⁵¹⁴ *DI* I.9 (26).

⁵¹⁵ Keller, *Cloud of the Impossible*, p. 94.

⁵¹⁶ Keller, *Cloud of the Impossible*, p. 94.

⁵¹⁷ Keller, *Cloud of the Impossible*, p. 95.

⁵¹⁸ Keller, *Cloud of the Impossible*, p. 95. Regrettably she does not elaborate on this allusion to Aquinas, so the extent to which she recognises the significance of Thomistic participation is uncertain.

situated in a particular environment—finds similar expression in modern theories of embodied cognition.⁵¹⁹ Second, his emphasis on the limits of human knowledge is consistent with the modern scientific worldview.⁵²⁰ Although Keller, reflecting a broad recent consensus, sees Cusa's focus on the limits of knowledge as an anticipation of the epistemological turn (the shift away from classical and medieval metaphysical themes to issues related to human knowledge, exemplified in Descartes and Kant), she largely overlooks the Platonic and participatory outlook that is integral to his thinking. On this view, there is a gap between the sensible and intelligible realms, which can be bridged by participation. As will be discussed below, Cusa's interest is not primarily in line with Keller's celebration of the 'impossible cloud' of 'possibly infinite perspectives',⁵²¹ but with the participatory imperative of transcending our limited perspectives and encountering God.

Keller also highlights the importance of what she sees as Cusa's perspectivism in the specific context of cosmology and multiverse thought.⁵²² Here, she concurs with Mary-Jane Rubenstein's assessment that Cusan cosmology opens up something like a 'perspectival multiverse'.⁵²³ Keller sees this as consistent with her reading that Cusa's negative theology gives rise to an affirmative cosmology—or, 'in the excess that overflows from the negative infinite, a paradigm of radical relationality reveals itself.'⁵²⁴ She infers this 'radical interrelation' from the God-world relationship that Cusa explores through his metaphor of unfolding and enfolding in the first two books of *De Docta Ignorantia*. As discussed earlier in this chapter, Cusa argues that if everything is enfolded in God and if God is also unfolded in everything, then the universe as a whole is present to each creature in the way that God is in each creature. According to Keller, this means that God is not just in a given creature, but

⁵¹⁹ For a useful introduction to this subject, see Lawrence Shapiro, *Embodied Cognition* (New York, NY: Routledge, 2011).

⁵²⁰ For this reason, the German intellectual historian Hans Blumenberg associates Cusa's orientation towards knowledge of one's ignorance with 'the modern idea of science'. Hans Blumenberg, *The Legitimacy of the Modern Age*, trans. Robert M. Wallace (Cambridge, MA: MIT Press, 1985), p. 499. See pp. 483-548 for Blumenberg's full argument that Cusa is a harbinger of modernity.

⁵²¹ Keller, *Cloud of the Impossible*, p. 113.

⁵²² In a 2007 Harvard lecture in which she sketches some of the themes that would later form the basis of *Cloud of the Impossible*, Keller suggests that Cusa's 'theo-cosmology' is 'all the more suggestive now' in light of modern multiverse theory: 'the Cusan boundlessness of a contingent or "contracted" infinity turns out to be more in keeping with the conundrums of cosmic immensity characteristic of contemporary astrophysics, with its speculations on the inflationary universe, the possible multiverse, the mind-busting quantities that comprise various relative infinities.' Catherine Keller, 'The Cloud of the Impossible: Feminist Theology, Cosmology and Cusa.' Lecture at Harvard University, March 22, 2007. See: <https://users.drew.edu/ckeller/essays/Cloud%20of%20Harvard.doc>

⁵²³ Rubenstein, *Worlds Without End*, p. 86. Rubenstein defines this as 'a complex co-implication that shifts according to your vision.'

⁵²⁴ Keller, *Cloud of the Impossible*, p. 114.

in a given creature with the whole universe attached. The universe is thereby contracted or mediated in each creature, such that the universe is what it is ‘only in the perspective of each and all of its creatures... each creature *is* its perspective on its universe.’⁵²⁵

This is Cusa’s intuition of ‘each thing is in each thing’, with each thing representing an image of the collective whole *and* an image of all other things that are interrelated parts of the whole. For Keller, this vision of interrelation implies a boundless multiplicity of perspectives infusing the cosmos ‘not as a mere plurality of worlds but as an intertwined multiverse.’⁵²⁶ Since each thing is in each thing, then God, who is unfolded in the universe, is also in each thing. God is therefore immediately present to each thing, including the universe as a whole, which can itself be seen as an image of God. Here, Keller approvingly cites Rubenstein’s analysis that Cusa is displacing the mirror image view of God and the universe by folding God into the universe which itself is God’s image: the universe does not reflect a distant God, but embodies God in its wholeness and in every one of its constituent parts.⁵²⁷ This is what Rubenstein memorably depicts as a ‘holographic’ multiverse, ‘not a static hierarchy under an extracosmic divinity, [but] a dynamic holography in which God is fully and equally present to everything in creation.’⁵²⁸

Keller believes that this Cusan holographic multiverse of interrelation and entanglement has profound political and social implications. We live in a crowded, interconnected cosmos where each being is, as Cusa puts it, a ‘created god, a finite infinity’.⁵²⁹ It is this presence of (contracted) infinity throughout the cosmos that Keller believes makes possible ‘our potential to actualize’ a different, ‘more convivial’ world.⁵³⁰ Since God is unfolded in the universe, theology cannot unfold or disentangle itself from the material concerns of natural sciences, or politics, economics, and ecology. Keller proposes that this situation calls for something like a ‘new materialism’ which would in turn signal a ‘new relationalism, rigorous in its attention to bodies [that are] sensuous, disabled, queer, vital.’⁵³¹ While this call for a new materialism is expressed forcefully, elsewhere she is notably more circumspect about imposing upon Cusa her distinct form of identity politics. As Keller herself admits later in the text, in spite of the

⁵²⁵ Keller, *Cloud of the Impossible*, p. 115.

⁵²⁶ Keller, *Cloud of the Impossible*, p. 115.

⁵²⁷ Keller, *Cloud of the Impossible*, p. 118.

⁵²⁸ Rubenstein, *Worlds Without End*, p. 82.

⁵²⁹ *DI* II.2 (104).

⁵³⁰ Keller, *Cloud of the Impossible*, p. 120.

⁵³¹ Keller, *Cloud of the Impossible*, pp. 121-22.

postmodern edifice that she has constructed around him, Cusa ‘certainly fails to become a postmodern pluralist’ and instead ‘remains a premodern and Christocentric Christian.’⁵³² This failure is not so much Cusa’s as Keller’s self-confessed anachronistic reading of Cusa. In particular, it follows from her surprising neglect of the participatory character of his metaphysical thought, which will now be considered as a counterweight to her excessive emphasis on interrelation and materiality.

4.3.2 *Cusa on Individuality*

As a corrective to Keller’s disproportionate emphasis on interrelation and perspectivism, it is also important to remember that Cusa’s metaphysics is concerned with securing individuality, as well as the more Neoplatonic project of overcoming perspectival finitude to experience the infinite. In both instances—affirming individuality and transcending finite limits—participation is paramount, and this is precisely the aspect of Cusa’s thought to which Keller fails to attend.

To a significant degree, Keller’s theory of planetary interdependence (the allegedly entangled web of our social, political, and environmental spheres) is informed by Cusa’s idea that all things are in all things. Yet this interrelation must be set in the equally important context of a cosmos in which each thing is different. All things are in all things, but all things are *not* identical, and we should not overlook the necessary particularity that obtains among each thing in the universe. This is because only God’s essence is ‘eternal and immutable’ whereas each thing in creation participates in this infinite essence in its own limited and unique way.⁵³³ To illustrate this point, Cusa uses a mathematical analogy of an infinite line, which is the essence of a finite line. In an infinite line, a line of two feet and a line of three feet do not differ, but considered apart as finite lines they are clearly different. This difference arises because they do not participate equally in the essence of the infinite line: ‘Hence, there is only one essence of all lines, and it is participated in in different ways.’⁵³⁴ Thus, participation explains the individuality of all things in the universe. Each thing participates in the essence of God, yet remains uniquely itself.

⁵³² Keller, *Cloud of the Impossible*, pp. 251-52. Similarly, in her earlier Harvard lecture she admits that her project might entail an ‘un-Cusan preoccupation with the current status of bodies... humiliated as female or disabled, gay or dark; bodies human and nonhuman threatened with mass extinction.’ Keller, Harvard lecture, pp. 10-11.

⁵³³ *DI* I.17 (48).

⁵³⁴ *DI* I.17 (48).

In the opening chapter of Book III of *De Docta Ignorantia*, Cusa elaborates on the necessary individuality of created things. He explains that absolute oneness and equality belong to God alone, whereas the many things in the universe cannot exist or agree in this kind of ‘supreme equality’, or they would cease to be many.⁵³⁵ As such, it is necessary that each thing in the universe differs from every other thing, and this individuality may be expressed in three different ways: ‘either (1) in genus, species, and number or (2) in species and number or (3) in number—so that each thing exists in its own number, weight, and measure.’⁵³⁶ This means that all things are distinguished by degree, with no two things exactly coinciding. Since a given thing cannot ‘participate precisely’ in God in the same way as any other thing, any given thing may be thought of as comparatively greater or lesser than anything else: ‘Hence, there is nothing in the universe which does not enjoy a certain singularity that cannot be found in any other thing, so that no thing excels all others in all respects or excels different things in equal measure.’⁵³⁷ There can never be precise equality between things, nor is it possible for a given thing to be entirely identical with any other thing at any given time. Again, Cusa turns to mathematical symbolism to underline his point, describing the way in which a square inscribed in a circle might pass from being smaller than the circle to larger than the circle without ever being equal to it.⁵³⁸

In this way, even Cusa’s idea of all things in all things (which Keller invokes to stress the interrelation of things) comes to express the individuality of things by virtue of participation (which she overlooks). Each thing is the universe in its own limited form, as an image of or participation in the whole: ‘the universe is in each thing in one way, and each thing is in the universe in another way.’⁵³⁹ Since absolute identity between things is impossible, each thing is in each thing, but cannot actually *be* all things. Instead, each thing, as limited and particular, contracts all things within itself, just as God is in the universe in a contracted way. Each thing is therefore immediate to God, just as God is immediate to the universe as a whole. The icon referred to earlier is not just a device to illustrate the diversity of perspectives, but to express the idea that God sees each thing in its own way, and that each thing can participate in God in its own way. To highlight the significance of the individual in

⁵³⁵ *DI* III.1 (182).

⁵³⁶ *DI* III.1 (182).

⁵³⁷ *DI* III.1 (188).

⁵³⁸ *DI* III.1 (188).

⁵³⁹ *DI* II.5 (118).

Cusa's cosmology is not necessarily to contradict Keller's emphasis on interrelation, but to complicate her narrative of cosmic entanglement and to insist on the participatory possibility of the individual's encounter with God rather than a (vaguely articulated) 'network of social response to the crises of a planetary interdependence'.⁵⁴⁰

In addition to her focus on interrelation, Keller places a strong emphasis on what she takes to be the perspectival and bodily implications of Cusa's thought. She believes that Cusa's infinite God unfolds in a multiverse of perspectives, calling for a new theology of embodiment that 'cultivates a greater inter-creaturely solidarity' and pays attention to what she perceives to be victimised by society, a political perspective that (as noted above) she concedes is un-Cusan.⁵⁴¹ However, Cusa is not concerned with Keller's postmodern celebration of the multiplicity of perspectives or bodies, nor is he concerned with contemporary accounts of alleged bodily differences and injustices that have recently given rise to 'contextual, queer, ecological, postcolonial, counter-imperial theologies'.⁵⁴² Rather, he believes that we should seek to overcome our perspectival and bodily limitations, and to participate in God in our own ways. In his conception of the God-world relationship, the gap between our finite, bodily realm and the infinite perfection of God can be bridged by participation—specifically, by a kind of participation unique to each creature such that 'the one, infinite Form is participated in in different ways by different created things'.⁵⁴³ Everything in existence is drawn to participate in God's 'brightness and blazing splendor'.⁵⁴⁴ With a metaphor that complicates Keller's emphasis on materiality, Cusa specifies that the 'distinguishing and penetrating participated brightness' of God is contracted *immaterially* throughout the cosmos, in the life of intellectual beings.⁵⁴⁵

Furthermore, Keller's postmodern interest in an endless entanglement of perspectives and bodies sits uneasily with Cusa's participatory account of mathematical knowledge as an image of divinity. He argues that spiritual matters are investigated not materially, but symbolically. All perceptible things—including bodies—are inherently unstable because of 'the material possibility abounding in them'.⁵⁴⁶ On the other hand, mathematics is more

⁵⁴⁰ Keller, *Cloud of the Impossible*, p. 121.

⁵⁴¹ Keller, Harvard lecture, p. 12.

⁵⁴² Keller, Harvard lecture, p. 3.

⁵⁴³ *DI* II.2 (103).

⁵⁴⁴ *DI* II.13 (177).

⁵⁴⁵ *DI* II.13 (177).

⁵⁴⁶ *DI* I.11 (31).

abstract than material objects and therefore provides a more reliable and certain kind of knowledge. Mathematical objects are more fixed and stable than material objects, just as a purely mathematical triangle will be fixed and stable in comparison with a triangle perceived by the senses in the material realm. By turning our attention from the sensory to the non-sensory realm, mathematics provides a foundation for transcending our bodily finitude and ascending to the infinite. In this sense, mathematics is a sort of metaphysical practice, with its figures and symbols becoming images or participations in God. With this view of the certainty of non-physical mathematical knowledge as a way of beginning to approach God, Cusa is clearly not operating according to the assumptions of Keller's postmodern theory of embodiment and materiality.

4.3.3 *Human Uniqueness*

For Keller, Cusa offers a multiverse of perspectives, an infinite expanse in which entanglements of histories, bodies, and collectives call for a new materialism, aimed at overcoming perceived social and ecological injustices, such as economic inequality and climate change. This is Keller's way of finding meaning in the context of an infinitely expanded cosmos and of moving from cloud to crowd—from the negative cloud of apophatic theology to the affirmative material possibilities afforded by our planetary entanglement. Keller's perspectivism is forcefully (if at times vaguely) expressed and worthy of attention insofar as it might prompt us to increase our regard for social, political, and environmental concerns. Her sense of deepening planetary interdependence also seems timely, given the economic and technological changes that enable ever more commerce, communication, and migration between and within borders. Yet, as is clear from the foregoing, her use of the term 'multiverse' is more meaningful in relation to these social and political issues rather than as the cosmological model discussed throughout this thesis.

In response to Keller's emphasis on individual perspective, we might note that Cusa offers a different account of human uniqueness, informed by participation, and closer attention to this would be more faithful to his cosmological vision than Keller's unconventional reading. As a consequence of Cusa's stress on individuality—with each thing differing from every other thing while mediating God and every other thing in a limited manner—each thing is perfect in its own way. Again, participation provides the basis for this account of human uniqueness. As outlined earlier, Cusa suggests that God's 'Infinite Form' is received only finitely so that

each thing is a kind of ‘finite infinity or a created god, so that it exists in the way in which this can best occur.’⁵⁴⁷ Every created thing is therefore perfect in its own way, even though it may seem less perfect in comparison with other created things. God imparts being to each thing in creation, according to the manner in which His infinite being can be received by a given thing. The individuality and particularity of each thing means that God’s being is received in a way that it could not be received in any other way or to a greater or lesser degree by the given thing. In this participatory context, every being exists in the best way it can be, finding ‘satisfaction in its own perfection, which it has from the Divine Being freely.’⁵⁴⁸

Unlike some modern cosmologists who believe that a multiverse would imply that humanity occupies an extremely insignificant role in the cosmos, or Keller who sees a perspectival multiverse as an opportunity for social renewal, Cusa sees each being in the infinite universe in its own unique greatness, as a copy of, or participant in, God’s infinity. In his cosmological scheme, we each share in the ground of our boundless cosmos, while remaining fundamentally ourselves. The expansion of the universe—whether contemplated by medieval theology or potentially disclosed by contemporary science—need not threaten and may in fact enhance our understanding of human uniqueness: ‘For the universe is in every individual, each of whom is, as it were, a copy of one of God’s words...with irreplaceable value, a unique essence, a role in life.’⁵⁴⁹

⁵⁴⁷ *DI* II.2 (104).

⁵⁴⁸ *DI* II.2 (104).

⁵⁴⁹ Karl Jaspers, *The Great Philosophers: Volume 2* (London: Rupert Hart-Davis, 1966), p. 192.

4.4 David Albertson on Mathematics

In this section, I will consider the relevance of Cusa's mathematical theology to Tegmark's modern view of a mathematical universe in light of David Albertson's recent landmark study of Cusa, *Mathematical Theologies*. Albertson, a professor of medieval and early modern Christianity at the University of Southern California, provides an ambitious and expansive account of the historical roots of Cusa's mathematised view of the cosmos. By highlighting Cusa's thoroughly mathematical perspective, he shows that medieval theology need not be incompatible with modern mathematisation and that religion therefore need not be in conflict with science. As such, Albertson's project represents a new opportunity to bring Cusa's mathematical theology into contact with Tegmark, who (as we have seen earlier) brings his own distinctive mathematical assumptions to the multiverse proposal. However, I will argue that Albertson's survey, while broad in scope and rich in detail, overlooks the metaphysical purpose of mathematics in Cusa's religious cosmology. Mathematics is not just a way to describe and understand the universe, but serves as a guide for metaphysical speculation and provides a symbolic basis for ascending to, and participating in, the infinite God who sustains the boundless cosmos. With this qualified endorsement of Albertson's reading of Cusa in mind, I will provide a metaphysical response to Tegmark's view that mathematical existence implies physical existence and that there exists some sort of transcendent multiverse structure. Cusa's mathematical theology reminds us that mathematics is not an end in itself, but a way to approach (and not replace) God, just as Albertson shows that science need not be seen as a replacement for religion.

4.4.1 Albertson on Cusa's *Mathematical Theology*

In *Mathematical Theologies*, Albertson highlights the importance of mathematics in Cusa's thought, while also providing a compelling rejoinder to the decoupling in the modern mind of mathematics and theology (and, by implication, science and religion). This decoupling followed the seventeenth-century proliferation of mathematical laws occasioned by figures such as Galileo, Descartes, Newton, and Leibniz, and has continued apace in the information revolution of the twentieth and twenty-first centuries.⁵⁵⁰ Yet mathematics, with its intimations

⁵⁵⁰ On this point, Simon Oliver (following Peter Harrison) argues that the rise in the seventeenth and eighteenth centuries of modern natural science significantly altered and impoverished the traditional Christian doctrine of creation. Instead of an insistence on creation's utter dependence on God, what remains is a God who can be put

of ideal objects and eternal truth, remains theological. The retrieval of this Pythagorean insight, and its profound influence on ancient and medieval Christian theology, lies at the heart of Albertson's reconsideration of twelfth century French philosopher Thierry of Chartres and his significant influence on Cusa. By identifying the roots of Thierry's Pythagoreanism in Cusa's own distinctive mathematical theology, he suggests the possibility of continuity rather than conflict between the medieval and the modern, and science and religion.

Albertson's richly detailed genealogy is divided into three parts. First, he provides an expansive account of Pythagorean philosophy (not simply numerical rules, but the systematic application of mathematical concepts in philosophy and theology) from Plato to Augustine to Nicomachus to Boethius.⁵⁵¹ He suggests that, through a series of historical accidents, Pythagorean thought fell into disuse for the next thousand years of Christian theology. Second, he identifies the reemergence of Christian mathematical theology in Thierry, not only in the notion of the arithmetical Trinity (whereby mathematics mirrors and proceeds from divine self-numeration), but, crucially, in Thierry's modal theory (whereby theology grasps God's enfolded simplicity and mathematics grasps God's unfolded unity in numerical difference). In this system of reciprocal folding, theology and mathematics are seen as intimately connected, each concerned with the same divine subject matter and end. Finally, with the pieces of his careful excavation of Christian Pythagorean theology in place, Albertson convincingly demonstrates the intellectual debt to Thierry owed by Cusa, who sees mathematics as the most reliable way to contemplation of God.

Just as the rise of modernity is often associated with the supremacy of mathematical and scientific models at the expense of religious belief, recent scholarship has tended to perceive in Cusa a shift away from the constraints of medieval Christian doctrine to a modern, mathematical epistemology. Against this prevailing narrative, Albertson shows that Cusa

to one side and defined in terms of a world of scientific explanation. He believes that this unsatisfactory legacy continues to influence and distort theological engagement with science. See Oliver, *Creation: A Guide for the Perplexed*, pp. 91-132.

⁵⁵¹ As part of this narrative (and of relevance to Chapter 2), Albertson explores Plato's philosophy of mathematics and the 'theological possibilities' of its 'modified Pythagoreanism' in which mathematics is reimagined as having a mediating capacity, as providing a stepping stone to the transcendent, intelligible forms underlying physical reality. He aptly observes the mediating role of mathematics in the *Timaeus*, as well as Plato's use in the *Philebus* of metaphysical participation as a way of seeking to bridge the finite and intelligible realms. See David Albertson, *Mathematical Theologies: Nicholas of Cusa and the Legacy of Thierry of Chartres* (New York, NY: Oxford University Press, 2014), pp. 30-35.

offers a unique account of the mutual interaction between mathematics and theology. For Cusa, God is best exemplified by the maximal enfolding of number, of particular things in the world. The Incarnation can be seen in mathematical terms as representing the intersection of the transcendent ground of number and the potentially infinite multiplicity of created numerical difference. Moreover, theological thinking is itself properly seen as an ecstasy of mathematical thinking, a sort of mathematical mysticism in which the vision of God is achieved through the realisation that human and divine self-measurement (or self-understanding) are synonymous. On Albertson's reading of Cusa, God is the ultimate mathematician, and the human mind may ascend to the divine when it understands its own mathematical categories as reflections of God's mathematical nature. Cusa's mathematical account of divinity and humanity thus serves as the mechanism by which they are united. In this sense, Albertson concludes, Cusa's theology fulfils Thierry's vision of an integration of mathematical cosmology with traditional Christian beliefs.

Albertson focuses specifically on what he refers to as 'experiments in Chartrian theology' in Cusa's *De Docta Ignorantia*, including the geometrical and cosmological discussions in Books I and II.⁵⁵² In terms of Book I, he argues that Cusa presents mathematical knowledge as a *via negativa* to God, since it is 'fundamentally an encounter with an absent divine perfection, equality, or precision.'⁵⁵³ This is because finite minds cannot measure anything with precision, and number can only imperfectly capture the infinite degrees of difference in the world. He cites Cusa's claim that just as a polygon could never equal the flawless curvature of a circle even if it were infinitely multiplied, so the limitations of human mathematics fall short of perfect measurement.⁵⁵⁴ God is 'Maximum Equality', coinciding with minima beyond the categories of human (or mathematical) understanding. Mathematical measurement, which seeks (yet ultimately fails to) encompass all of the possible degrees of difference, implies a sense of infinity, just as God's presence within the (privatively) infinite universe is marked by 'the absent trace of equality'.⁵⁵⁵ Albertson therefore stresses the negative terms or descriptions Cusa uses for God, such as Cusa's claim that no image is

⁵⁵² Albertson, *Mathematical Theologies*, p. 180.

⁵⁵³ Albertson, *Mathematical Theologies*, p. 253.

⁵⁵⁴ *DI* I.3 (10): 'the intellect is to truth as polygon is to the inscribing circle.'

⁵⁵⁵ Albertson, *Mathematical Theologies*, p. 182.

‘equal to its exemplar’⁵⁵⁶ or that God is ‘Equality of being of the things which God was able to make, even had He not been going to make them.’⁵⁵⁷

In terms of Book II, Albertson believes that mathematical knowledge as a negative way to approach God continues to frame Cusa’s cosmological discussion. He notes that Cusa’s reflections on the quadrivium (arithmetic, geometry, music, and astronomy) suggest that the mathematical measurements of these disciplines ‘provide a negative index of transcendent Equality.’⁵⁵⁸ In arithmetic, numbers can only be related through proportions and harmonies. In geometry, the perfection of abstract shapes is never reflected in material analogues. In music, no harmony achieves perfection. In astronomy, calculations are imprecise due to the (apparently) unpredictable motions of planetary bodies. While useful forms of knowledge, together the inherent limitations of these disciplines reflect the ‘infinite horizon of human unknowing’, or another instance of Cusa’s notion of learned ignorance.⁵⁵⁹ Since only God embodies the perfect unity and equality sought by each of these mathematical disciplines, Cusa concludes that they were originally divine activities: ‘In creating the world, God used arithmetic, geometry, music, and likewise astronomy.’⁵⁶⁰ Albertson notes that, unlike Plato’s *Timaeus*, in which the experience of mathematical order and harmony of the world points clearly to its intelligible source, Cusa invokes the quadrivium precisely because it *fails* to achieve precision and perfection. Humans only use the quadrivial arts imperfectly, glimpsing negative traces of God in our failure to attain precision, while God alone is ‘the sole mathematician’, capable of fully realising the precision of the quadrivium.⁵⁶¹

Albertson’s achievement is to convincingly demonstrate that Cusa’s ‘powerful recasting of mathematical theology for the fifteenth century... outstripped many Neopythagoreans of the past with its boldness and confidence.’⁵⁶² God, the ‘Infinite Oneness’ and the ‘enfolding of number’ and all things,⁵⁶³ created the universe with the divine arts of arithmetic, geometry, music, and astronomy. That the boundlessness of creation images God’s infinity can be understood with reference to the geometric image of the sphere whose centre is everywhere

⁵⁵⁶ *DI* I.11 (30).

⁵⁵⁷ *DI* I.24 (80).

⁵⁵⁸ Albertson, *Mathematical Theologies*, p. 182.

⁵⁵⁹ Albertson, *Mathematical Theologies*, p. 183.

⁵⁶⁰ *DI* II.13 (175).

⁵⁶¹ Albertson, *Mathematical Theologies*, p. 183. This depiction of God as sole mathematician is complicated by certain aspects of Cusa’s metaphysical thought, which will be discussed in the following section.

⁵⁶² Albertson, *Mathematical Theologies*, p. 254.

⁵⁶³ *DI* I.3 (105).

and whose circumference is nowhere. The Incarnation can also be understood in mathematical terms, with Christ defined as ‘the unique intersection of the Equality of the One and the singularity of numerical series.’⁵⁶⁴ Given God’s mathematical perfection, the human mind (as God’s image) is also mathematical and self-measuring. The pursuit of mathematical knowledge, as represented by the quadrivial arts, ‘seizes the mathematician up into a vision of God: a mysticism not opposed to mathematics but within it.’⁵⁶⁵ While Albertson successfully shows that Cusa’s mathematical theology (drawing heavily on Thierry’s own Pythagorean variant of Christianity) offers a fully integrated religious cosmology, his historical account largely overlooks the metaphysical role of mathematics, an aspect of Cusa’s thought that is crucial to consider in the broader context of cosmological considerations.

4.4.2 Cusa on Mathematics and Participation

For Cusa, mathematics serves a metaphysical purpose. Its measurements and numbers become symbols not merely of mathematical knowledge, but of a metaphysical participation in divine creativity and perfection. Albertson hints at this in his description of mathematical mysticism, but he restricts his consideration of Cusa’s geometrical and cosmological speculations in *DI* to the way in which mathematics is associated with describing God in negative terms. This focus on negative theology, while instructive, does not fully account for Cusa’s metaphysical vision of mathematics as an image or copy of God’s mind. It will be important to draw out this participatory aspect of Cusa’s mathematical theology because it will help to provide the basis of a response to Tegmark’s view of mathematics in the following section.

In Book I of *DI*, Cusa explains that, as the title of Chapter 11 puts it, ‘Mathematics assists us very greatly in apprehending various divine truths.’⁵⁶⁶ While Albertson stresses the uncertainty and limitations of the quadrivium, it is equally important to remember Cusa’s insistence that mathematics captures truth more fully than any other mode of human knowledge. It is because of the ‘incorruptible certainty’⁵⁶⁷ of mathematics that Cusa sees it as

⁵⁶⁴ Albertson, *Mathematical Theologies*, p. 254.

⁵⁶⁵ Albertson, *Mathematical Theologies*, p. 254.

⁵⁶⁶ *DI* I.11 (30).

⁵⁶⁷ *DI* I.11 (32).

a more reliable pathway to God than the ‘continual instability’⁵⁶⁸ of the perceptible objects of other fields, though he accepts that mathematics is not entirely free of material associations. Since mathematics concerns abstract objects, which are ‘very fixed’ and ‘very certain’,⁵⁶⁹ it invites us to turn from the imperfect sensory realm to the non-sensory realm. The practice of contemplating non-sensory mathematical operations represents a valuable preliminary step to ascending further to the intelligible realm of divine perfection. Indeed, as the most certain and reliable form of human knowledge, mathematics is the best (or perhaps, as Albertson’s emphasis on negative theology might suggest, least worst) guide to the divine mind. To underline its importance, Cusa appeals to the authority of previous mathematically-minded philosophers, including Pythagoras, Plato, Aristotle, Augustine, and Boethius, all of whom used mathematics to address the fundamental problems of human existence.

Cusa outlines a threefold process for using mathematical symbolism as a way of ascending to God.⁵⁷⁰ First, we must understand that all mathematical figures are finite. Second, we must apply these relations in a ‘transformed way’ to corresponding infinite mathematical figures. Third, we must (in an even more ‘highly’ transformed way) apply these relations of the infinite figures to the simple Infinite, or God, who is truly independent of all figures. With this symbolic approach, the mathematical attempt to grasp infinity becomes an image of the metaphysical ascent to God’s infinite perfection. Infinity in mathematics points to and serves as a metaphor for a wholly different order of divine infinity. Here, Cusa uses the analogy of an infinite line to illustrate how we can move from contemplation of finite things to infinite mathematical figures and finally to the infinite God. He explains that an infinite line is ‘actually and infinitely all that which is in the possibility of a finite line’.⁵⁷¹ Since it contains all possible parts or varieties of a finite line, an infinite line may be said to be the essence of a finite line, in a similar way as God is the essence of all things. Equally, just as an infinite line is indivisible and hence immutable and eternal, Cusa infers that God, the essence and measure of all things, is immutable and eternal.⁵⁷² Thus, the infinite mathematical figure becomes an image of divine infinity by means of this symbolic reasoning.

⁵⁶⁸ *DI* I.11 (31).

⁵⁶⁹ *DI* I.11 (31).

⁵⁷⁰ *DI* I.12 (33).

⁵⁷¹ *DI* I.16 (42).

⁵⁷² *DI* I.17 (48).

However, there is an additional participatory aspect to this relationship between mathematical infinity and divine infinity which Albertson overlooks in his survey of the historical roots of Cusa's mathematical theology. It is not just that mathematical symbolism provides a way to think about God. It also leads to a deeper understanding of the participation of finite creatures in God's infinite being. Since, as discussed earlier in this chapter, participation is Cusa's way of bridging the gap between the finite and infinite realms, it is not surprising that it features in his account of mathematical and divine infinity. To understand how it is possible to participate in God, Cusa continues his consideration of the infinite line. As the essence of all other finite lines, the infinite line is 'participated in in different ways.'⁵⁷³ Differences of participation occur because there cannot be two things (or lines) that are exactly similar and 'participate precisely and equally in one essence.'⁵⁷⁴ For example, a curved finite line (since it is a deficiency of what is straight) will participate in an infinite line 'according to a mediate and remote participation', whereas a straight finite line will participate according to a more 'simple and immediate participation'.⁵⁷⁵ Similarly, finite beings will participate according to various degrees of immediacy in God, the measure of all things which participate in Him, 'no matter how differently.'⁵⁷⁶

For Cusa, mathematics is 'a symbolism for searching into the works of God.'⁵⁷⁷ As the only precise form of knowledge open to our limited intellects, it provides a 'mirror' or copy of divine knowledge, by virtue of which we might gain some partial knowledge of God's nature. It should be noted that this mirror is not to be found in the mathematical entities themselves, but in the activity of our mind in producing them. On Cusa's account, the human mind constructs mathematical entities such that they are more present within the mind than as they exist outside the mind.⁵⁷⁸ He denies that they have 'another, still truer, supra-intellectual being' that exists beyond the mind.⁵⁷⁹ He rebukes Pythagoreans and Platonists for failing to

⁵⁷³ *DI* I.17 (48).

⁵⁷⁴ *DI* I.17 (49).

⁵⁷⁵ *DI* I.18 (52).

⁵⁷⁶ *DI* I.18 (52). In this passage Cusa divides participants into substances and accidents. Substances participate more immediately in God, while accidents participate in God not through themselves but through the mediation of substances. Just as a curve is more perfect as it participates in straightness, so accidents become more perfect as they participate in a more excellent substance. He adds that it would be possible in an alternative forum to pursue a more extensive inquiry regarding the difference between, and the excellence of, accidents and substances.

⁵⁷⁷ *Triologus de Possest*, 44. Jasper Hopkins, *A Concise Introduction to the Philosophy of Nicholas of Cusa* (Minneapolis, MN: University of Minnesota Press, 1978).

⁵⁷⁸ *De Beryllo* (On Intellectual Eyeglasses), trans. Jasper Hopkins (Minneapolis, MN: The Arthur J. Banning Press, 1998), 55.

⁵⁷⁹ *De Beryllo*, 56.

understand that mathematical entities proceed from our mind, do not represent perceptible things, and ‘are only the beginnings of rational entities of which we are the creators.’⁵⁸⁰

While this striking claim will be of particular significance in the context of Tegmark’s mathematical multiverse theories (to be discussed next), it remains an important participatory insight. Mathematical entities may be the products of human thought, at least insofar as they are rendered and expressed by us, but they are also copies of the divine mind, since the mind itself is a copy of the divine mind. Mathematical entities therefore image and participate in God’s own self-numbering, which is the ultimate source of number—and of the universe, as described earlier in God’s use of mathematics to create the universe.⁵⁸¹

4.4.3 Tegmark on the Mathematical Universe

Albertson’s reassertion of the robust mathematical foundations of Cusa’s religious cosmology is particularly relevant in a modern context in which the intensifying mathematisation and expansion of the cosmos might appear to be proceeding without the need for theological explanation. He shows that medieval theologians such as Cusa embrace a mathematised view of the cosmos in the name and the categories of their own religious beliefs. His genealogy therefore argues for greater continuity between medieval and modern thought, as well as religion and science. As such, it would be instructive to bring Cusa’s highly mathematised theology into dialogue with the modern cosmological work of Max Tegmark, who—as discussed earlier in this thesis—sees the (possibly infinite) cosmos in vividly mathematical terms. While Albertson’s reappraisal of the mathematical themes in Cusa’s cosmology is timely and constructive, the metaphysical dimensions discussed in the previous section also merit consideration, since they provide a necessary corrective to some of Tegmark’s philosophical assumptions.

Central to Tegmark’s understanding of reality (on which his multiverse hierarchy is based) is the claim that ‘reality isn’t just described by mathematics—it *is* mathematics.’⁵⁸² As evidence of this, he refers to space, which he regards as a purely mathematical object in the sense that its properties (such as dimensionality and topology) are mathematical. He sees things in the

⁵⁸⁰ *De Beryllo*, 56.

⁵⁸¹ Cusa’s account of mathematics proceeding from the human mind in this manner need not complicate Albertson’s depiction of God as the ultimate or sole mathematician. While mathematics is a human enterprise, it mirrors and is suggestive of divine creativity and perfection, which ultimately lie beyond human understanding.

⁵⁸² Tegmark, *Our Mathematical Universe* (New York, NY: Vintage Books, 2015), p. 254. As discussed earlier, this is a radical and controversial view of mathematical realism, widely disputed in physics and mathematics.

physical world in similar terms, since they comprise elementary particles whose properties (charge, spin) are mathematical. He notes that most (but not all) physicists subscribe to the theory that there exists an external physical reality independent of humans. With a broad definition of mathematical structure (to mean an abstract set of entities with relations between them), he believes that this theory implies that our external physical reality is a mathematical structure. This is because such mathematical entities have no ‘baggage’—no intrinsic human-defined properties other than mathematical relations—such that they could be understood without reference to humans and therefore satisfy the notion of an external reality completely independent of humans. If so, this means that we live in an immense mathematical object and that everything in existence is purely mathematical.

Moreover, if mathematical existence implies physical existence, then all mathematical structures exist physically, which forms the Level IV multiverse. Curiously, Tegmark sees this as a ‘form of radical Platonism, asserting that all the mathematical structures in Plato’s “realm of ideas” exist “out there” in a physical sense.’⁵⁸³ Whereas all the Level I, II, and III parallel universes obey the same fundamental mathematical equations, Level IV universes correspond to different mathematical structures and so any parameters ‘could in principle be derived by an infinitely intelligent mathematician.’⁵⁸⁴ Tegmark quickly dispels any notion that this might be equated to a creator or first mover: ‘You can’t make a mathematical structure—it simply exists. It doesn’t exist in space and time—space and time may exist in it.’⁵⁸⁵ Since all mathematical structures have the same ontological status (that is, they all exist, in a condition that Tegmark calls ‘complete mathematical democracy’), he claims that the most interesting question is not about which structures exist physically, but about which structures contain life. Given that mathematical structures lack the complexity to support self-aware substructures, he thinks it is likely that the Level IV multiverse ‘resembles a vast and mostly uninhabitable desert, with life confined to rare oases, bio-friendly mathematical structures such as the one we inhabit.’⁵⁸⁶ Ultimately, he believes that such mathematical structures (along with formal systems and computations) are different aspects of ‘one underlying transcendent structure whose nature we still don’t fully understand.’⁵⁸⁷

⁵⁸³ Tegmark, *Our Mathematical Universe*, p. 321.

⁵⁸⁴ Tegmark, *Our Mathematical Universe*, pp. 321-22.

⁵⁸⁵ Tegmark, *Our Mathematical Universe*, p. 323.

⁵⁸⁶ Tegmark, *Our Mathematical Universe*, p. 323.

⁵⁸⁷ Tegmark, *Our Mathematical Universe*, p. 336.

Certainly, Tegmark's conception of a mathematical universe is fertile scientific territory for Cusa's highly mathematised religious cosmology. In light of Albertson's account of the extent to which Cusa draws heavily on Thierry's Pythagorean reception of Christian theology, it is worth noting that Tegmark himself notes that the idea that our universe is in some sense mathematical 'goes back at least to the Pythagoreans' of ancient Greek philosophy.⁵⁸⁸ Tegmark also concurs with Plato's cosmological account in the *Timaeus* that the building blocks of the universe are mathematical, though of course he goes on to claim that the universe is itself part of a single mathematical object. Although he does not specifically mention Cusa, there are some clear parallels between the medieval theologian's mathematical theology and Tegmark's mathematical universe. First, they both believe that the cosmos has a self-evident character of mathematical relations and harmony. Second, they both believe that mathematics is a remarkably precise and exact form of human knowledge, that it provides insight into our finite world, and that this insight has a certain beauty and majesty—in short, and to use physicist Eugene Wigner's term, they are convinced by the 'unreasonable effectiveness of mathematics'.⁵⁸⁹ Third, they both view mathematics as a means of turning beyond our immediate cosmic realm and rising to an intimation of infinity (although Cusa is ultimately concerned with divine and not only cosmic infinity).

However, there are also crucial differences between Cusa's mathematical theology and Tegmark's mathematical views. These differences arise from the fact that Cusa's project is fundamentally metaphysical, not mathematical. Contrary to Tegmark's view that mathematical insights can provide an explanation for the whole universe, Cusa understands that these insights serve only as an image or likeness of divine infinity, on which the whole universe depends and in which we participate to different degrees. Since the human mind is a copy of the divine mind, mathematical knowledge is merely a copy of divine knowledge. Though providing intimations of divine creativity, mathematical entities are inescapably products of human thought and, as noted earlier, Cusa denies that such entities have any real being outside of the activity of the mind that produced them. This contradicts Tegmark's view that mathematical structures correspond to physical structure in the universe. Tegmark equates mathematics with no human 'baggage' (or concepts or language), whereas Cusa believes that mathematical thought is inescapably human, even if it is ordered toward and in

⁵⁸⁸ Tegmark, *Our Mathematical Universe*, p. 247.

⁵⁸⁹ Eugene Wigner, 'The Unreasonable Effectiveness of Mathematics in the Natural Sciences', in *Communications in Pure and Applied Mathematics*, Vol. 13, No. I (February 1960).

some sense originates in the divine realm. If we somehow discovered a Tegmarkian ideal realm of mathematical objects, it would by definition not be self-subsistent, but a construction of human thought.

In addition, Tegmark attributes the mathematical structure of the universe to a ‘transcendent structure’ that we do not yet (and may never) fully understand. As the totality of both mathematical and physical existence, this structure seems to serve as a replacement for God (or some kind of divine designer) within Tegmark’s system. Instead of replacing divine infinity with mathematical infinity, Cusa believes that mathematical symbolism provides an intimation of God’s infinity. The example of the infinite line shows that mathematical symbolism can help guide us from finite things to infinite concepts and finally to knowledge of, and participation, in the infinite God. The infinite line thus images and exemplifies divine infinity. It is not, as Tegmark might suppose, thought to exist in physical reality or beyond physical reality as a transcendent structure—it is just the means by which we can improve our understanding of creaturely participation in God’s infinite being. In Cusa’s cosmology, God is transcendent, absolutely perfect and infinite, and mathematical operations serve as metaphors or images of His infinity—they are not themselves, and never could be, the transcendent underlying structure of the universe.

As Albertson demonstrates, Cusa’s mathematical theology is increasingly relevant in a world that is ever more mathematised and a cosmos whose horizons are ever more expansive. Instead of Tegmark’s Level IV insistence on mathematical democracy and mysterious transcendent super structures, we might conclude with the reflection that a more promising way to reconcile God and the multiverse (and thereby theology and science) would be to imagine a more straightforward Level I multiverse realm in which the infinity of the cosmos and the mathematical figures used for its description are seen as expressions of God’s infinity. Since Level I multiverses obey the same laws of physics with which we are familiar, this is perhaps a less controversial way to relate Cusa’s mathematical theology with Tegmark’s expansive cosmology. It also stands as another example, following our consideration of Tegmark and Plato in Chapter 2.4, of the way in which Tegmark’s focus on the Level IV model raises so many complications and ambiguities that it deters positive theological engagement. With that, Cusa’s mathematical theology reminds us that mathematics is not an end in itself, regardless of whether it describes a Level I or Level IV cosmos, but serves ultimately as a way to approach (and not replace) God.

4.5 Summary

In this third chapter on a key participatory thinker, I explored the speculative and enigmatic metaphysical thought of Nicholas of Cusa. In his mystical theology, which is at once prayerful, playful, and profound, he views participation as a way to bridge the gulf between finite creaturely being and the infinite being of God. He explains that the infinite God has ordered all finite things in the cosmos to participate in Him in different ways. The cosmos itself, in Cusa's powerful cosmological vision is infinite, but in a contracted or limited way, standing as an image of divine infinity. The distinction between cosmic and divine infinity, and its basis in participatory metaphysics, is the central concern of this chapter in which I evaluated a diverse range of contemporary thinkers. This included a scientist-theologian, a postmodern theologian, and a historian of religion, all of whom offer accounts of infinity in Cusa that do not attend sufficiently closely to his participatory outlook.

First, I critically engaged with Rodney Holder's reading of cosmic infinity in Cusa. Holder is a multiverse sceptic in part because he is troubled by the notion of cosmic infinity, with which he associates Cusa. In response, I suggested that Cusa's cosmology in fact offers an orientation towards infinity, standing as potentially (or contractedly) infinite in likeness to God's absolute infinity. I further argued that this participatory account of Cusa can provide a counterweight to some of Holder's objections to multiverse concepts.

Second, I considered Catherine Keller's rendering of Cusan cosmology. Like Rubenstein in Chapter 2, Keller is particularly interested in what she takes to be the 'perspectival' aspect of the Cusan multiverse; that is, the postmodern emphasis on the multitude of entangled perspectives in a vast cosmos, and its apparent social and political implications. I argued that, instead of the anachronistic attribution of postmodern concepts to Cusa's metaphysics, he is more properly seen as insisting on the importance of participation as a way of transcending one's own finite perspective and coming to know the infinite God. I also proposed that a careful account of Cusa's understanding of human uniqueness would be more consistent with his metaphysical approach than Keller's conscription of his cosmology to serve her own political ends.

Finally, I offered a critical reading of David Albertson's genealogical study of the roots of Cusa's mathematical theology as a means of re-engaging with Max Tegmark's idiosyncratic conception of mathematics. I observed that Albertson overlooks the role of participatory metaphysics in Cusa's conception of mathematics; specifically, that mathematics plays a participatory role in enabling us to know and ascend to the infinite God. I argued that Albertson's oversight is of relevance to Tegmark's multiverse thought, which similarly neglects the transcendental participatory scheme in which Cusa situates mathematics.

Having extensively examined the participatory thought of Plato, Aquinas, and Nicholas of Cusa within the specific multiverse contexts of, respectively, cosmic multiplicity, diversity, and infinity, it would now be beneficial to turn to the concluding chapter in which I will provide a general summary and closing reflections on the participatory enterprise of this thesis.

Conclusion

In this thesis, I have shown that participatory metaphysics represents fertile theological ground on which to engage with scientific multiverse theory. The approach I have set out in this thesis, the first of its kind in the field of theology and science, involved bringing the metaphysical insights of key participatory thinkers into dialogue with multiverse advocates and ideas. To that end, I have constructively and critically engaged with contemporary theologians, philosophers, and scientists and in each case I have demonstrated that their approach to thinking about multiverse theory could be enriched with reference to metaphysical participation. In that sense, I have attempted to advance beyond the hitherto somewhat sterile theological preoccupation with design arguments and offered a new and substantive way in which theologians might reevaluate the multiverse hypothesis, which continues to be an important research area in modern physics and cosmology.

In this concluding chapter, I will briefly revisit and summarise the central thematic concerns and arguments of the three preceding chapters. I will then outline what I believe to be the overall value of my project and how it represents a new approach to engaging theologically with multiverse thought and thereby offers an original contribution to the broader contemporary theology and science dialogue. Finally, I will propose ways in which both theologians and scientists might draw on this research to continue to advance the theology and science dialogue in a productive direction.

Multiplicity in Plato

I began my exploration of participatory thinkers with consideration of the dialogues of Plato, who may be regarded as the foundational exponent of explicitly participatory thinking as it has developed in the history of Christian theology and philosophy. As part of his participatory approach, he is preoccupied with the complex structures of the universe, their interrelations, and their source and intelligibility. His *Timaeus* dialogue depicts a beautiful and orderly universe that is the handiwork of divine rationality and intelligence. This work lends itself to thinking about multiverses, since the idea that our cosmos includes an enormous multiplicity of parts or regions is central to multiverse theory. The core argument of this chapter is that the recognition that there are many more parts to the universe than

previously imagined is not just a question for scientific or philosophical accounts of mixture, but is central to Plato's participatory vision of the manifold parts of the cosmos participating in their perfect and eternal source. To demonstrate how Platonic participatory metaphysics might illuminate our understanding of cosmic multiplicity, specifically as described in multiverse models, I engaged with a theologian, a cosmologist, and a philosopher, all of whom are deeply interested in multiplicity in Plato and cosmic structures and yet all of whose work overlooks the critical participatory character of his metaphysical approach.

First, I considered Mary-Jane Rubenstein's treatment of multiplicity in Plato's cosmology. The decision to focus on Rubenstein as my first interlocutor was not accidental—not only does my project itself serve as a response to the 'unscientific postscript' with which her multiverse survey ends,⁵⁹⁰ but she is also attentive to the metaphysical dimensions of both multiverse thought and Plato's cosmology, though I believe that her attention is misdirected in a postmodern relativistic direction rather than informed by a theological emphasis on participation. This is an ironic oversight given her insistence that theological receptions of multiverse thought have been insufficiently metaphysical. I argued that an explicitly participatory account of the cosmological vision in the *Timaeus* in general, and of the Receptacle in particular, would in fact be more in keeping with her own demand for deeper metaphysical scrutiny of cosmic multiplicity. As befitting her postmodernist style influenced by Derrida, she too often lapses into language about 'mixing the multiple' by which she means that the cosmos comprises many-layered mixing, emerging 'as a mixture of itself and what is not itself, of different and same, of 'both/and' and 'neither/nor.'⁵⁹¹

In response, I argued that Plato's cosmology is not just a matter of mixing things together like the ingredients in a cake, but lends itself to a participatory understanding of sharing, imparting, and reception. This is embodied by the Receptacle, the mysterious yet fundamental place which receives the likenesses of eternal Forms. I applied this participatory understanding to Laura Mersini-Houghton's concept of a connected multiverse, which she describes in strikingly participatory language. Crucially, I noted that multiverse theorists like Mersini-Houghton cannot avoid using participatory concepts and so inescapably find themselves in this territory and bearing witness to the participatory tradition. As a

⁵⁹⁰ Rubenstein, *Worlds Without End*, pp. 235-36. Again, this is her insight that theological engagement with multiverse thought should move beyond narrow questions about design and give more weight to metaphysical considerations.

⁵⁹¹ Rubenstein, *Worlds Without End*, p. 26.

consequence, theologians (and perhaps scientists) should recognise this dynamic and make it an explicit part of the interdisciplinary discourse on theology and multiverse thought.

Second, I critically evaluated Max Tegmark's idiosyncratic (and mistaken) interpretation of Platonism and its implications for Level IV of his multiverse hierarchy. On Tegmark's reading of Plato, mathematics is the highest form of knowledge, whereas it is more properly seen in the *Timeaus* as serving an important mediating role in bridging the sensible and intelligible realms. In describing his Level IV multiverse, Tegmark invokes Plato to claim that all mathematical structures exist physically, though in the *Timeaus* mathematics provides the model for the physical cosmos, but this cosmos is distinct from its non-physical, intelligible source. Tegmark also believes that Level IV universes are disconnected and have different fundamental equations of physics, yet Plato's cosmos of multiplicity shares a single eternal source and operates according to a single mathematical structure. In light of these discrepancies, I concluded that Tegmark's account of Platonism complicates and undermines his Level IV multiverse, which is in any event the most needlessly provocative level of his hierarchy and whose controversial nature provides a rich target for theologians seeking to reject multiverse thinking. To advance the theology/multiverse dialogue more constructively, I proposed that a participatory reading of Platonism is more consistent with and can enrich the other levels of his hierarchy, suggesting as it does a diverse yet interconnected cosmos, which shares in a common ground and operates according to consistent mathematical principles.

Third, I considered Verity Harte's mereological project, not least because it represents one of the most systematic and sophisticated recent accounts of the cosmological and metaphysical aspects of Plato's *Timaieus*. I observed that, as with Mersini-Houghton's scientific model of connected multiverses, Harte's account of Plato's metaphysics of structure is implicitly participatory in its concepts and language. In particular, her depiction of the Receptacle as that upon which contentful structure is imposed consistently makes use of participatory terms, such as imitation, reception, and traces. While Harte has a useful sense of what might be called 'intra-finite' participation—the participation of parts in one another—I argued that we should consider how participation in a transcendent source, informed by Plato's account of the manifold parts of the cosmos participating in an eternal model, would be of relevance to the Level II multiverse of inflationary bubbles coming forth from the same source. In that

sense, I drew on an underdeveloped strand of participatory thinking in her work in order to highlight new ways of thinking about a multiverse model from a theological perspective.

Diversity in Aquinas

Following Plato, I turned in Chapter 3 to consideration of metaphysical participation in Aquinas, one of the pivotal exponents of the participatory tradition in Western theology. For Aquinas, creation is necessarily diverse since it is only as such that it can participate in God's unity and simplicity in a riotous diversity of ways. Each diverse part of creation shares in the fullness of God's being according to its own nature, and is thereby utterly dependent on God for its existence. The core argument of this chapter is that such a participatory vision is not only consistent with the kind of vast cosmic diversity evident in multiverse theory, but also provides a strong metaphysical basis for the intelligibility, order, and beauty of this diversity. To develop this argument, I considered the work of three important thinkers working at the intersection of theology, philosophy, and science, and whose multiverse reflections can be enhanced with a closer attention to Thomistic participation.

First, I engaged with the work of Robin Collins, who is one of the leading theological advocates of the plausibility of multiverse theory. Given this, it is perhaps surprising that his awareness of the importance of diversity in Thomistic metaphysics is evident in his discussion of multiple incarnations, but not in the context of his consideration of the multiverse hypothesis. I highlighted that, for Aquinas, diversity is a fundamental characteristic of the cosmos, reflecting the diverse ways in which all parts of creation participate in God, the source of existence on which all of creation is utterly dependent. I also stressed that, in Aquinas's view, creation is diverse by necessity, since imperfect created beings can only approach and participate in God in a multitude of diverse ways. This participatory insight can serve as a counterweight to theological multiverse critics who dismiss the idea of an immensely diverse and expansive cosmos as too arbitrary or inexplicable. I then applied the notion of diversity in Thomistic participatory metaphysics to the string theory landscape proposal, a multiverse theory in which diversity is paramount. I observed that string theory gives powerful scientific expression to the cosmic diversity and intelligibility that are such crucial elements of participation in Aquinas.

Second, I critiqued Don Page's theistic account of the multiverse hypothesis, which (like Collins) is insufficiently metaphysical and which (also like Collins) regards string theory as expressing the beauty of cosmic multiplicity. I demonstrated that Aquinas's metaphysical notion of beauty, an important aspect of his participatory thought, would strengthen Page's own concepts of God and creation. For Aquinas, beauty is evident in the participatory order of being, with a diversity of beings participating in God's being in their own ways. I proposed that Aquinas's participatory account of the beauty of the created order offers a supplement to Page's more narrow conception of the beauty of the selection mechanism that gives rise to a diversity of cosmic realms in string theory. This emphasis on the inherent beauty and goodness of God's creation may also provide a rejoinder to criticisms of multiverse theory on aesthetic grounds, enabling us to maintain that a vastly expanded view of cosmic diversity need not preclude notions of beauty, elegance, and goodness.

Third, I challenged Bernard Carr's problematic image of the cosmic uroboros on the basis that it presents a vague and metaphysically weak conception of unity, thereby failing to provide the kind of fundamental model for the multiverse that he desires. Instead, I offered Aquinas's theological circle of being, which expresses the movement of creatures who have received being from God and ultimately return to God, as a superior alternative model that more adequately conveys the unity and purpose of a cosmos grounded in a transcendent creator than Carr's strictly cosmological vision. While Carr stands out among scientific multiverse theorists in terms of acknowledging the importance of humanity in the cosmos and arguing for the compatibility of God and the multiverse, his approach is at once theologically timid and conceptually ambiguous. With attention to Aquinas's participatory creation account, I highlighted a way to situate his notions of cosmic unity and interconnectedness on firmer metaphysical foundations.

Cosmic Infinity in Nicholas of Cusa

Finally, in Chapter 4 I examined the profound and at times mystifying metaphysical and cosmological thought of Nicholas of Cusa, a key participatory thinker often overlooked in contemporary theology and science discourse. Cusa's prayerful contemplation of the participatory relationship between cosmic infinity and divine infinity is of clear relevance to the multiverse debate, with its intimations of infinite or infinitely many cosmic regions. The core argument of this chapter is that, for Cusa, the infinity of the universe stands as an image

or a participation in the infinity of God, and that this more qualified form of infinity and its dependence on the divine ground of perfect infinity is important to remember when considering cosmic infinity. Here I engaged with a theologically-informed scientist, a theologian, and a philosopher, who each share an interest in Cusa's cosmology, as well as misapprehensions about the metaphysical and participatory basis of his idea of infinity (and its potential application to multiverse thought).

First, I provided a response to Rodney Holder's view of infinity in Cusa's cosmology, which Holder identifies as a notable historical precursor to modern multiverse models. In common with other theological multiverse critics, and perhaps understandably as a result of Cusa's distinctively enigmatic, opaque, and prayerful mode of expression, Holder neglects the participatory character of Cusa's metaphysical system, in which the universe is an image whose infinity is of an imitative nature. Against Holder's reading of Cusa that the universe is infinite in the conventionally understood sense, I noted that Cusa's universe is *potentially* infinite; his mystical approach, to the extent it can be interpreted, is more concerned with an orientation towards infinity, rather than actual infinity. The cosmos is unbounded in the sense of the possibility of spatial or numerical endlessness, but this is distinct from God's perfect simplicity and infinity. As such, I argued that Cusa should not be regarded as an example of the (alleged) problem of infinity in multiverse thought, but as offering some useful metaphysical resources to negotiate the kind of conceptual concerns that Holder himself puts forward.

Second, I presented an alternative participatory reading of Cusa to Catherine Keller's reception of his cosmology, which (in line with Rubenstein) is preoccupied with its apparent relevance to a postmodern multiplicity of entangled perspectives. Rather than associating Cusa with postmodern notions of interrelation and perspectivism to help advance her own vision of political and social renewal, I highlighted the importance of his participatory imperative of transcending our limited perspectives within a vastly expanded cosmos and ultimately coming to know and love God. Cusa sees each being in the boundless cosmos in its own unique goodness, as an image and participant in God's infinity. This is a rich cosmological vision in which we each share in the ground of the universe while remaining fundamentally ourselves. Keller's attempt to impose a postmodern construction on Cusa's cosmology (an attempt which she herself admits is anachronistic) follows directly from her neglect of the participatory character of his metaphysical thought.

Third, I critically engaged with David Albertson, whose broad and detailed recent account of the historical roots of Cusa's mathematical theology is masterful in demonstrating Cusa's continued relevance to a world that is ever more mathematised. However, I noted that Albertson overlooks the role of participatory metaphysics in Cusa's conception of mathematics; it is not merely a descriptive practice, but also a guide for metaphysical speculation and ascent to the infinite God. I argued that Albertson's neglect of the metaphysical role of mathematics in Cusa is also of relevance to Tegmark's multiverse thought, which (as discussed earlier) is based on a curious understanding of mathematics. Against Tegmark's Level IV insistence on mathematical democracy, I proposed that a properly Cusan approach would be to imagine a Level I universe in which the infinity of the cosmos and the infinite mathematical figures used for its description are seen as expressions of God's infinity.

Value

I believe that the value of this thesis to the theology and science debate is threefold. First, I have outlined a new pathway to move the (currently unproductive) multiverse debate in contemporary science and theology beyond its narrow preoccupation with design. If (as is increasingly believed by cosmologists) there *is* a multiverse of the kind depicted by any of the current cosmological models, then this raises profound metaphysical issues about the relationship between other universes and ours, as well as between these universes and God. Such considerations are surely more urgent and indeed paramount than simply reducing debates about the multiverse to an updated version of the familiar dispute over whether the cosmos is or is not divinely designed.

Second, I have demonstrated a new way in which the theology and science dialogue can be enriched by ancient and medieval theological resources. It is a regrettable feature of much contemporary science and theology discourse that it tends only to make cursory references to central figures in Christian theology, despite the fact that such figures have often considered issues of direct relevance to current scientific debates. The recent and growing theological interest in the multiverse (discussed in Chapter 1) is itself evidence of the urgent need for theological depth, yet multiverse treatments in contemporary theology and analytical philosophy invariably focus on design or similarly marginal issues. This thesis is part of a

new theological shift towards considering the multiverse in a more constructive manner and it seeks to accelerate and deepen this shift by contributing a new metaphysical perspective that has hitherto been missing. I hope that this thesis helps encourage theology to engage confidently and constructively with the multiverse hypothesis, creating a new wave of positive interaction after the initial negative reaction to the concept.

Third, I have highlighted the value of the metaphysical tradition of participation and demonstrated how it might be newly relevant, not just theologically but also scientifically. As discussed in Chapter 1, participation had until recent years fallen into relative disuse even among theologians and philosophers. Yet its inextricable link with issues such as multiplicity, diversity, and part-whole relations means that it is surprisingly pertinent to multiverse thought. By underlining the centrality of participation to a productive theological engagement with multiverse theory, my project could help to introduce an unfamiliar and potentially valuable theological idea to the theology and science field, while also prompting theologians to reconsider the history and meaning of participation so that it might be used to help further elucidate the relationship between God and creation.

Future Directions for Theology and Science

Though the first sustained theological effort to bring a participatory perspective to multiverse thought, there remain many ways in which the ideas in this thesis can be developed in new research directions. Together, I believe that the weight of evidence, much of it considered here, shows that Plato, Aquinas, and Nicholas of Cusa are three of the most remarkable participatory thinkers in Western theology. Yet there are other enormously significant figures whose participatory insights may be pertinent to the key themes of cosmic multiplicity, diversity, and infinity. For example, the idea of participation is critical to the thought of the late fifth or early sixth century Christian Neoplatonist theologian Pseudo-Dionysius the Areopagite⁵⁹² and one of the most important Church Fathers in Western Christianity, Augustine of Hippo,⁵⁹³ as well as medieval theologians such as Anselm of Canterbury⁵⁹⁴ and

⁵⁹² Pseudo-Dionysius, *The Complete Works*, trans. Colm Luibheid (Mahwah, NJ: Paulist Press, 1987). For a collection of new theories and interpretations of Dionysius, including extensive discussion of his participatory ideas, see Sarah Coakley and Charles Stang (eds.), *Re-thinking Dionysius the Areopagite* (Chichester, West Sussex: Wiley-Blackwell, 2009).

⁵⁹³ Augustine, *Confessions*, trans. Henry Chadwick (Oxford: Oxford University Press, 2008).

⁵⁹⁴ Anselm, *Monologion and Proslogion*, trans. Thomas Williams (Indianapolis, IN: Hackett Publishing Company, 1996).

Bonaventure.⁵⁹⁵ Given the recent renewal in theological interest in participation (discussed in Chapter 1), it would be worthwhile to explore the extent to which these figures can be brought into dialogue with contemporary multiverse models.

Furthermore, it is important that this recent participatory turn should be applied to other topics in the theology and science dialogue. While the focus of this thesis is multiverse thought, it would be possible to imagine a similar project in which participatory insights were brought into contact with evolutionary biology. Perhaps, for example, the change in characteristics of species over successive generations through evolutionary processes might be understood as a dynamic process, indicative of the necessity for a diverse creation to approach and share in God in a multitude of ways over time.⁵⁹⁶ Alternatively, we might apply participatory insights to artificial intelligence, particularly the ‘value learning problem’, which refers to the idea that AIs must be designed to learn, adopt, and retain our goals.⁵⁹⁷ Here, it would be possible to adopt a distinctive theological approach in which values are understood not as self-standing systems, but as entwined with the natural (and perhaps artificial) order as a consequence of their common, participatory origin in God. This would put AI in a deeper context than the somewhat narrow focus on value systems (such as utilitarianism) that often prevails in AI discourse. Just as participation has been shown here to be a surprisingly effective way of showing continuity between theology and the multiverse proposal, perhaps it might also emerge as one way in which theology and science more broadly can interact constructively.

From a scientific viewpoint, this thesis has demonstrated that notions of cosmic multiplicity, diversity, and infinity are not new in the history of Western thought and have indeed preoccupied pivotal ancient and medieval thinkers. In particular, we have also discovered the remarkable extent to which the language, categories, and ideas in multiverse discourse are explicitly or implicitly participatory, with scientists often employing participatory terms such as traces, intimations, sharing, and mixing. This might add to the growing understanding that the boundaries between multiverse thought and metaphysics are not strictly separate and that scientists are therefore well advised to give due concern to metaphysical issues raised in

⁵⁹⁵ Bonaventure, *Breviloquium* (Works of St. Bonaventure, Vol. 9), Dominic V. Monti (ed.), (St. Bonaventure, NY: The Franciscan Institute, 2005).

⁵⁹⁶ In his forthcoming monograph on participation in Christian metaphysics, Andrew Davison introduces this thought experiment and sketches other ways in which participation might be related to evolution.

⁵⁹⁷ For an illuminating discussion of the scientific and ethical basis of goals in AI, see Max Tegmark, *Life 3.0: Being Human in the Age of Artificial Intelligence* (New York, NY: Alfred A. Knopf, 2017), pp. 249-80.

theology and philosophy, or at least to acknowledge that multiverse thought inescapably encompasses such issues.

In addition, I believe that important questions or opportunities for new scientific ways of thinking about the multiverse have been raised throughout this study. For example, scientists might reflect on what precisely it means to believe that there are different ‘parts’ of a multiverse, or different cosmic realms that might originate from a common source, particularly in light of the participatory idea that different parts stand in relation to each other and ultimately in relation to God, the source and origin of being. They might also give renewed consideration to what it means to speak of cosmic diversity in relation to Level II bubbles or string theory landscapes, if that diversity is understood to be a necessary part of how an imperfect creation approaches a perfect God. This, in turn, might have implications for scientific views on the necessity, the aesthetic value, and the selection principles underlying multiverse models. Furthermore, scientists might further reflect on what cosmic infinity might mean in relation to divine infinity, especially on a participatory view that our (potentially) infinite cosmic realm might stand as an image or participation in the perfect simplicity of an infinite creator.

The central argument of this thesis is that a participatory account of the relationship between God and creation argues for greater continuity between theology and the multiverse proposal. Earlier in Chapter 1, we saw Bernard Carr respond to the apparent fine-tuning of our own universe by appealing to the multiverse as a scientific solution to the unwelcome intrusion of theology: ‘If you don’t want God, you’d better have a multiverse.’ In fact, the multiverse proposal cannot be so easily disentangled from theology. In light of the participatory vision outlined in this thesis, in which cosmic multiplicity, diversity, and infinity are seen as intelligible expressions of the manner in which creation relates to God, perhaps it would be more apt to conclude that ‘if you want a multiverse, you’d better have God.’

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