at play. Why do things this way? Well, it appears to work, and functionality alone is relatively strong evidence for its practical application as the way of doing science. It isn't that MN disproves anything supernatural. It is simply that supernatural explanations appear to be irrelevant.

There is, of course, plenty of room for disagreement about MN, and BioLogos and RTB are no exceptions. Obviously, as both are Christian groups, neither is comfortable with pure MN as the only way of viewing the universe, but they do have differences of opinion regarding its utility. J. B. Stump, writing for BioLogos, suggests that "... understanding of natural theology needs MN. It is another question, though, whether theological conclusions can be derived from purely scientific premises" (p. 111). This claim, however, is at odds with a belief that "[methodological naturalism] is not a necessary part of science" (p. 109), a view that is directly at odds with the current understanding of science as a process. What does a scientific process that incorporates the ineffable, unpredictable actions of nonnatural entities look like? Jeff Zweerink (RTB) argues that "For practical purposes, scientists must operate largely from a standpoint of methodological naturalism … however, that does not completely exclude theological considerations" (p. 113). In RTB's view, the Bible is a source of testable scientific claims that can be assessed to reveal or support theological truths. Curiously, the two groups seem to agree on the utility of MN, but BioLogos sees it as a means of correcting their incomplete interpretations of faith while RTB sees it as a way to buttress their existing interpretations.

What is our take on the debates found in the book? It should be clear by now that we prefer BioLogos's approach to that of RTB's. But that's not to say that we agree completely with BioLogos, or indeed, with each other. One thing we do agree upon, however, is the value of intellectual humility in approaching these issues. And that also leads us to favor the approach of BioLogos. Indeed, with respect to the approaches to the integration of the science surrounding human origins and Christian faith as outlined by BioLogos and RTB, it is clear that the former is more readily able to accept their intellectual limits—or rather, accept that perhaps some of their prescientific beliefs and biblical interpretations might be mistaken or in need of revision. For some, this admission might be seen as a sign of weakness of faith and lacking in conviction. For others, this is a sign of a faith that is wholly human, an admission that no one has a perfect understanding of the revelations found in either of the "two books," and a presumption that one's position is destined to be readjusted as the two interplay.

Should you read this book? We commend the groups involved in the work (BioLogos, RTB, and the SBC) for their demonstration of vigorous intellectual engagement. It is a testament to their pursuit of knowledge that they are able to engage in good-faith argument on these contentious topics. Reading through this work will provide believers with a wide variety of positions regarding human origins and Christianity while also covering the scientific support underpinning our understanding of human evolution. For nonbelievers, this work might be of interest to provide perspective on how believers view the topics of debate. However, it contains much material about issues along the lines of "how many angels can fit on the head of a pin"-type Christian esoterica that are typically uninteresting and unconvincing to outsiders. In this regard, the debate presented here clearly targets the faithful. If you are a Christian who is interested in challenging your perspectives on what it might mean to think deeply about human origins and faith, this book is an excellent and rigorous starting point.

Notes

[1]BioLogos, "What We Believe," accessed February 18, 2019. https://biologos.org/about-us/what-we-believe/.
[2]Reasons to Believe, "Mission and Beliefs," accessed May 4, 2020, https://reasons.org/about.
[3]Kenneth Keathley, J. B. Stump, and Joe Aguirre, *Old-Earth or Evolutionary Creation? Discussing Origins with Reasons to Believe and BioLogos* (Downers Grove, IL: InterVarsity Press, 2017), 12.

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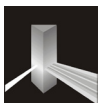

Physics

AMAZING GRACE OF QUANTUM PHYSICS by Dillard W. Faries. Eugene, OR: Pickwick Publications, 2017. 268 pages. Paperback; $33.55. ISBN: 9781532614217.

What if beneath the world of everyday experience things were not as they seem? If all things did not really have predictable locations or follow predictable trajectories but instead only appear to because they are large enough that their true behavior is undetectable to our senses? If the cosmos did not consist of discrete particles acting independently of all others; that everything was somehow connected with everything else? Strange as these possibilities may seem, these are not "what-ifs"; according to quantum physics, they are in all likelihood how the real world actually behaves. How physics arrived at this quantum mechanical understanding—if, indeed, it may legitimately be so called—forms a major theme of Dillard Faries's *Amazing Grace of Quantum Physics*, which also seeks to unpack some of the philosophical and theological implications of the quantum mechanics (QM) shockingly counterintuitive picture of reality.

Amazing Grace of Quantum Physics consists of an introduction, 18 chapters, an epilogue, and two appendices, but is perhaps better thought of as involving three main somewhat loosely overlapping parts. The first involves introductory material and consists of the introduction

and first chapter. The former introduces the main themes and offers a précis of the book. The latter surveys the main categories of classical physics that were radically challenged by QM, such as determinism and locality.

The second section roughly comprises chapters 2–10 and unpacks the main historical episodes that culminated in the development of QM, beginning with the discovery of radioactivity and culminating in competing equivalent mathematical formulations of quantum phenomena and the Copenhagen interpretation in the 1920s. Unlike other books on QM, this account focuses on how physicists, ranging from Benjamin Thompson, Michael Faraday, and James Maxwell to Max Planck, Albert Einstein, Louis de Broglie, Wolfgang Pauli, Erwin Schrödinger, Werner Heisenberg, Niels Bohr, and others, offered new understandings of reality that developed, problematized, and ultimately challenged classical Newtonian physics. This is central to Faries's narrative since the classical physics that was overthrown both arose from and misinformed Western theology before it descended into a sterile deism in the wake of Humean skepticism. Thus a theme of this section is that the overthrow of classical physics by QM is good news for Christian theism.

The final section comprises chapters 11–18 and the epilogue; it carries forward the story of QM to the present day. These chapters seek to explain QM's counterintuitive and somewhat paradoxical picture of reality, suggesting a number of implications for Christian thought along the way. This section focuses on a number of issues. These include the difficulty of relating the mathematical results of QM to physical reality so that they can be interpreted in the Copenhagen sense as probabilities or, less commonly, more deterministically in de Broglie-Bohm interpretation. Other issues include indeterminacy and the EPR paradox, Bell's inequality and the impossibility of agreement between QM and local reality, and the observer effect. Along with Fermat's principle of least time, which suggests that waves somehow know the shortest path to take, Faries argues that these open up possibilities to interpret reality as purposeful and consistent with Christian theism, which Faries demonstrates by offering his own tentative interpretation of QM. He ends by inviting the reader to do the same.

On one level *Amazing Grace of Quantum Physics* is a serious book in the sense of offering the quantum physics as consistent with a theology of mystery in which there is room for meaningful free will and divine action. However, as Faries himself explains, he is neither a theologian nor a philosopher. This shows, in that he does little to systematically develop a theology of mystery and does not interact with the extensive recent work in the history and philosophy of physics or with the science and religion literature on quantum indeterminacy and divine action (or issues such as the scope and limits of natural theology). Instead, he prefers to offer his own sweeping suggestions and, in the case of divine action, build directly from the insights of William Pollard that have formed the backdrop to such discussions since the 1950s. So, in the end, *Amazing Grace of Quantum Physics* is perhaps best taken as a physicist who is a Christian explaining that he sees room for consonance between Christianity and science in the world of quantum physics.

Amazing Grace of Quantum Physics suffers from a number of flaws. The most flagrant is Faries's tendency to skip key details and insert entertaining but distracting tangents in the midst of otherwise cogent explanations. This, coupled with his tendency to allow loose analogies or hints to stand in for arguments, tends to obscure rather than illuminate what Faries is trying to convey. I often found myself having to insert key details or connections from my own knowledge, make assumptions about what exactly he was referring to, and, in a few cases, supply a missing argument. Nevertheless, between my own understanding of QM and because Faries ultimately gets around to explaining everything by the end of the book, both the physics he was trying to explain and the shape of his argument had become clear.

The book will be of value mainly to professional physicists and teachers of physics. In contrast those who are unversed in the basics of quantum physics or have little prior knowledge about its history are likely to find some parts impossible to follow (or, worse, acquire a superficial and incorrect understanding). Instead, these readers should start by reading a more accessible introduction. Some readers might also be alienated by Faries's casual jabs at Calvinism or his unnecessary use of an offensive racial slur to vivify the personality of Werner Heisenberg (which may have been done in ignorance as the slur is not a common one).

Nevertheless, those who are able to overlook the limitations of *Amazing Grace of Quantum Physics* will find value in its pages. It is one of the few works that seeks to offer a fairly robust overview of quantum physics along with nuggets of encouragement and pregnant hints. Here I offer two of particular note. The first is Faries's invocation of mystery as a useful but largely unexplored category in science-faith discourse, at least in the evangelical circles of which Faries is a part. The second is akin to John Polkinghorne's earlier and more theologically and philosophically sophisticated exploration of the similarities between theology and physics in his *Quantum Physics and Theology: An Unexpected Kinship* (Yale University Press, 2007), in which Polkinghorne demonstrates consonance between the search for reality through physics and theology. Faries does something similar at one point in this section, offering that Christians should not feel overly anxious in the absence of a complete and unassailable understanding of how to relate science and Christian theology. In Christianity,

as in quantum physics, for the time being, we can be confident resting in what we know, even when there appear to be paradoxes or explanations that seem partial, tentative, and generative of new questions as well as answers.

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THE WORLD ACCORDING TO PHYSICS by Jim Al-Khalili. Princeton, NJ: Princeton University Press, 2020. 336 pages. Hardcover; $16.95. ISBN: 9780691182308.

The World According to Physics is Jim Al-Khalili's "ode to physics" (p. vii). While Al-Khalili has been publishing popular science for over twenty years, this is his first attempt to provide the layperson a cohesive overview of physics as a whole, linking together relativity, quantum mechanics, and thermodynamics into one unified (or rather, not yet unified) picture of the cosmos. "Ode" is appropriate, for the author's unrelenting adoration of his subject is apparent throughout; this is a child's dream fulfilled, and in many ways is a broader summa of the world according to the mature Al-Khalili, bringing together not only physics, but also his views on truth, society, and our future.

Khalili opens with a discussion of how the human mind craves narrative. Yet science has displaced much of the old myths and religions:

> Contrary to what some people might argue, the scientific method is not just another way of looking at the world, nor is it just another cultural ideology or belief system. It is the way we learn about nature through trial and error, through experimentation and observation, through being prepared to replace ideas that turn out to be wrong or incomplete with better ones, and through seeing patterns in nature and beauty in the mathematical equations that describe these patterns. All the while we deepen our understanding and get closer to that "truth"—the way the world really is. (p. 2)

While physics is not just another "story," it does have a cosmic scale that gives it a captivating wonder of its own, providing the basis for chapter 2 ("Scale"). Physics encompasses the infinitely small (e.g., subatomic particles) as well as the infinitely large (e.g., the expansion of spacetime at the farthest reaches of existence). Further, its scope is not merely all of space but all of time as well, getting within decimal points of the first instant after the big bang, while providing prophetic approximations of how the cosmos might end. While Al-Khalili does not play his cards this early, his later chapters (pp. 242–43 in particular) will reveal that this extensive scope establishes physics as the most fundamental discipline, the reigning queen of the sciences.

The deeper project begins in chapter 3 ("Space and Time"). Al-Khalili wishes to display the underlying skeleton that comprise the unification project of physics, charting each merger until the final matchup is made (similar to a playoff line-up, where 16 teams soon become 8, then 4, then 2, then 1). Just as Newton wedded heaven and Earth through gravity, Einstein wedded space and time, explaining a diversity of phenomena with ever-simpler equations. While Al-Khalili's popular explanations of special and general relativity are merely adequate, his grasp of the broader narrative of unification in which these theories stand is incredibly useful, helping the layman see the trajectory of the book and physics as a whole, even when they cannot understand each individual step.

While chapter 3 unified space and time, chapter 4 ("Energy and Matter") unifies the energy and mass which warp said spacetime. Yet the unifications of relativity hit a snag when they come to "The Quantum World" (chapter 5) and to "Thermodynamics and the Arrow of Time" (chapter 6). While Einstein seems to rule over the kingdom of all things great, quantum mechanics rules over all things small, and no one has managed to negotiate a treaty just yet. Things do not work "down there" as they do "up here"; the laws of the macro are not the laws of the micro. Further, thermodynamics suggests that there is a directionality to time—for things move toward greater entropy—yet it is unclear how this can be made consistent with relativistic time or the conceptual reversibility of time in the quantum world.

Al-Khalili then moves in chapter 7 ("Unification") to possible reconciliations of these issues. He does an admirable job of explaining how the electromagnetic and weak nuclear forces were unified into the electroweak force, as well as explaining the ongoing attempt to unify the strong force with the electroweak force in a grand unified theory. This would leave only the holy grail: the attempt to unify gravity with the other three forces. String theory attempted such a unification by appealing to ten dimensions, yet by the 1990s there were five different string theories, which themselves needed to be unified, spawning M Theory (which required an additional eleventh dimension). An opposing contender soon arrived in loop quantum gravity. While string theory posits a quantum particle (the graviton) that exists within spacetime, loop quantum gravity inverts the order, making space more fundamental than a quantized particle within space, and so quantizing spacetime itself. These quanta of space are then "looped" together, determining the shape of spacetime.

Having unveiled the best approximations at a unified theory in physics today, Al-Khalili then ventures in chapter 8 to evaluate the subsequent state of the subject. He expresses frustration that no definitive proof has adjudicated between possible theories of everything, and that such unification seems further away now than it did thirty years ago. Even major discoveries, such as the Higgs boson, have mostly confirmed what we already suspected for decades, rather than