

**EARTHKEEPING AND CHARACTER: Exploring a Christian Ecological Virtue Ethic** by Steven Bouma-Prediger. Grand Rapids, MI: Baker Academic, 2020. 208 pages. Paperback; \$24.99. ISBN: 9780801098840.

Steven Bouma-Prediger has provided us with another gem in this accessible, timely, and hospitable exploration of ecological virtue ethics. With gentle prose and storytelling, he invites readers to imagine themselves as the kind of people who are good and do good for the earth-system of which we are a part.

The book begins with a careful exposition of the title and intent of the book. There is a pithy explanation of virtue ethics and their relationship to other ethical approaches (deontological, consequentialist, etc.). He carefully dismantles criticisms of virtue ethics and lays out a framework for understanding ourselves as narrative-driven, imaginative beings. The rest of the book takes this idea seriously by engaging each of the ecological virtues through brief stories from his own life and from the lives of those who he feels embody the virtues, as well as from the larger narrative of scripture.

The book is packed with familiar voices: more-contemporary writers such as John Muir, Aldo Leopold, Wendell Berry, Annie Dillard, Bill McKibben; and those from deeper in our history such as Aquinas, Augustine, Plato, and Aristotle. This book points the reader to many other important thinkers and pulls together a broad swath of relevant ideas and themes from ecology, philosophy, and theology. As a result of reading this book, I have read more volumes from new authors as well as unfamiliar works by familiar authors. The appendices themselves are a useful resource. They include a brief and informative survey of Christian environmental virtue ethics, over twenty pages of notes from the chapters, a fifteen-page bibliography, a scripture index, and a subject/name index.

The virtues are engaged in pairs in chapters 2–5: wonder and humility, self-control and wisdom, justice and love, courage and hope. Each chapter starts with a story, moves into a survey of wisdom from across the ages, dives deeply into scripture and the history of the church, and ends with a description of someone who embodies the virtues addressed in the chapter.

In chapter 2 we are invited to live with "amazement and modesty." The book describes this as "the settled disposition to stand in rapt attention and enthralled amazement in the presence of the awe-inspiring natural world" (p. 43) and to "have a proper sense of who we are and what we know" (p. 45). To help us imagine this deeply, Bouma-Prediger opens a window into the life of John Muir as an embodiment of these virtues. Muir's exhilarating, reverent, and, at times, terrifying life, lived in wild places, is inspiring.

Chapter 3 describes what it means to live with "strength of mind and discernment." The author describes this as developing "the habitual disposition to control our desires when it comes to caring for the natural world" (p. 66). We can learn to say, "I am content; I have enough; I don't need more" (p. 66). We can develop "the disposition to make insightful and discerning judgments about our common home, the earth," to "recognize what the greatest good really is," and to acquire "the practical knowledge needed to attain it" (p. 66). Susan Drake Emmerich is presented to us as someone who has lived out these virtues in her engagement with the Tangier Island community in Chesapeake Bay and the transformation of their local ecosystem.

In chapter 4, Bouma-Prediger speaks of "living with respect and care." He describes this as "the disposition to act equitably" and "the ability to discern when to treat equals equally and unequals differentially ... a kind of practical wisdom" (p. 92). We can live with "the settled disposition to care about our house (*oikos*) and its inhabitants – to promote the flourishing of all creatures" (p. 95). He then offers the example of Wangari Muta Maathai and her work creating the Green Belt Movement in Nairobi, Kenya. The planting of over 51 million trees and the training of over 30,000 women in associated occupations clearly connects the flourishing of people and place.

In chapter 5, we consider what it means to live with "fortitude and expectation." We are asked to imagine ourselves having "moral strength when fearful about real or potential ecological losses and steadfast endurance in the face of seemingly intractable ecological problems" (p. 117) and exhibiting the "settled disposition to yearn for and act to bring about ... God's good future of shalom for all the earth" (p. 119). We are presented here with the work and life of Jane Goodall, who persisted in her ground-breaking, controversial, and illuminating work with chimpanzees despite serious conservation challenges, a skeptical academic community, and the pervasive sexism of the time.

This book is wonderful in that it makes earthkeeping approachable for everyone. Too many people feel overwhelmed by the enormity of the issues we face and do not really know how to proceed. By focusing first on being the kind of people who cultivate wonder, who leave a camp site clean and ready for the next camper, who tend a nest-egg grove, who grieve the violation or loss of beautiful places, we will gravitate toward the kinds of actions and ends that bring hope for our future. Ecological virtues are not sufficient, but they are orienting, shaping, and driving. Bouma-Prediger's book is convincing in this. It is clarifying and invigorating in the stories and examples provided. If you are looking

for a hopeful vision pointing toward a new creation, start here.

Reviewed by Jeff Ploegstra, Associate Professor of Biology, Dordt University, Sioux Center, IA 51250.



SCIENCE WITHOUT GOD? Rethinking the History of Scientific Naturalism by Peter Harrison and Jon H. Roberts, eds. New York: Oxford University Press, 2019. 263 pages. Hardcover; \$90.00. ISBN: 9780198834588. Ebook; \$70.19. ISBN: 0198834586. Audiobook (Narrated by Sean Runnette); \$19.99. ASIN: B07PDNRJHC.

Over the past half century, historians of science have done much to discredit popular myths so that, among other things, it is now clear that medieval Christians did not believe the earth was flat and Galileo was never imprisoned by the Inquisition. Among the more interesting is Ronald Numbers's critique of the thesis that science's success at explaining phenomena in terms of natural causes alone is necessarily corrosive of religious belief. In his 2007 essay "Science without God," Numbers notes that religious belief even motivated the development of naturalism as a scientific investigative tool in the sciences, even though the subsequent relationship between scientific naturalism and belief was not always one of unalloyed harmony. It is therefore fitting that further exploration of the complex relationship between naturalism and belief formed the topic of discussion at the 2013 conference celebrating Numbers's retirement from the University of Wisconsin-Madison. The papers from that conference form the basis for this volume, which bears the same title as Numbers's original essay and is edited by Jon H. Roberts of Boston University and Peter Harrison of the University of Queensland.

Harrison's introductory essay frames the collection, first by suggesting that the historical record problematizes a simplistic "connection between naturalism and human progress," in part, because ideas about what is natural and supernatural are "interdependent" and rest upon "deeper metaphysical or theological assumptions" (p. 6). It then introduces general features of the different views about naturalism and supernaturalism present throughout the volume and how these helped shape understandings of the laws of nature, the human person, and the human sciences (history, biblical criticism, and anthropology).

Harrison concludes his introduction with what may be taken as a fitting summary of the book, namely that the history of science is not one of naturalism supplanting supernaturalism but rather that "a version of naturalism flourished in the Middle Ages, to be replaced during the scientific revolution with a version of supernaturalism" (p. 18). The essays which form the bulk of *Science without God*? collectively document this shift and outline some of its causes and consequences. Daryn

Lehoux explains how Greco-Roman natural philosophy generally presupposed some sort of divinely ordered cosmos with the only exception, Epicureanism, incorporating decidedly a nonnatural arbitrary swerve into its physics. Then, contrary to the claims of those who might think that the church suppressed naturalism in the Middle Ages, Michael Shank shows that "naturalist attitudes were already endemic and widespread and, for the most part uncontroversial in late-medieval learned culture" (p. 39). Next, Peter Harrison explores how early modern understandings of nature as governed by divinely ordained laws (Descartes) or behaving in lawlike ways due to divine consistency (Newton) were susceptible to theologically suspect if not wholly naturalistic interpretations. The latter issue is then further explored by Shank, who describes how Newton's physics could be co-opted by Enlightenment propagandists, to the point where even the pious (if heterodox) Newton was recast as a thoroughgoing naturalist.

The remaining chapters explore interactions between various shades of scientific naturalism and religion. A common theme is that science may be read naturalistically in different ways and often for reasons that have little or nothing to do with the science itself. Matthew Stanley points out that physics was only stripped of its theistic connotations in the Victorian era, due to the efforts of secular naturalists to ensure that physics students (and by implication subsequent generations of physicists) were taught only naturalistic views of the subject. John Hedley Brooke notes that chemistry too served as a locus of reverence for the devout chemists while sustaining the reductionist materialist views of irreligious ones, views that in turn commonly arose through consideration of such nonscientific factors as the problem of evil or clergy misconduct. Even then, when science was understood in naturalistic terms, it was often shaped in ways that reflected the religious context in which it was developed, as Michael Ruse points out in his engaging and lively argument for the existence of Christian undertones in modern evolutionary biology. Other chapters by Michelle Pfeffer, Jon H. Roberts, Nicolaas Rupke, Scott Gerard Prinster, and Constance Clark further illustrate the flexibility of naturalism, specifically in the context of Christian materialist conceptions of the soul, materialistic and reductionist tendencies in psychology, the relationship between the Bible and nineteenth-century geology, biblical criticism, and the development of anthropology as a discipline. These chapters also illustrate how different varieties of naturalism might be used in shaping science's development to reflect particular interests. As Bernard Lightman illustrates in the concluding chapter, even when these interests involved using naturalism as a tool for secularization, religious influences played a role. Thomas Henry Huxley, John Tyndall, and Herbert Spencer "were still thinking in Christian terms" as they crafted secularized natural theologies, theodicies, and eschatologies into what they saw as a "spiritually fulfilling" scientific naturalism (pp. 252–53).

There is much to commend about this volume, although a few weaknesses should be noted. The first is the collection's scope. With very few exceptions, the essays do not consider interactions between naturalism and religion outside a Western Christian context. Second, between the introductory essay's concern with debates over intelligent design and the paucity of references to the recent literature, it seems that the essays have been little updated in the interval between the 2013 conference and the book's 2019 publication.

Overall, however, the essays are characterized by thorough scholarship and present a rich mine of thought for anyone who wishes to think more deeply about naturalism, the relationship between science and religious belief, or the historical trajectories that contributed to how the natural and supernatural are viewed today. Academic libraries and serious scholars will want to add this impressive volume to their collection. Between the overall clarity of the writing and the care taken to clearly document the varieties of naturalism in play in a given historical episode, general readers and discussion groups should also find the volume an accessible source of intellectual enrichment. Although the volume's high price will likely ensure that it does not find wide distribution in ebook or printed form, those readers who do not need to make use of the extensive footnotes and index fortunately have recourse to a pleasantly narrated and modestly priced audiobook version.

#### Note

<sup>1</sup>Ronald L. Numbers, "Science without God: Natural Laws and Christian Beliefs," in *Science and Christianity in Pulpit and Pew* (New York: Oxford University Press, 2007), 39–58.

Reviewed by Stephen Contakes, Department of Chemistry, Westmont College, Santa Barbara, CA 93108.

**SEVEN BRIEF LESSONS ON MAGIC** by Paul Tyson. Eugene, OR: Cascade Books, 2019. x + 84 pages. Paperback; \$13.99. ISBN: 9781532690419. Ebook; \$14.00. ASIN: B081FKFRQC.

"This book is about the reality of magic in an age of science." That is the first sentence of philosopher Paul Tyson's *Seven Brief Lessons on Magic*. A more unpromising beginning for most ASA readers is hard to imagine—but wait, there is something here for us, because magic is not really what Tyson is talking about. What he means by magic is things that science "cannot see": nonscientific realities. His examples are poetry, love, thought, communication, friendship, justice, dignity, hope, purpose, joy, despair, truth, evil, goodness, and others. His message is that these things, while they cannot be measured by science and, thus, are often dismissed by radical secularists, are real. I suppose that practically every Christian scientist would agree with that.

Yet I find Tyson's terminology unfortunate. True, the German word, usually rendered as "disenchantment"

in the extensive literature about secularization, could arguably be translated literally as "de-magicing"; but what an awkward and ugly neologism! Beyond linguistic aesthetics, another misleading aspect of the word magic is that in the past, magic and superstition were arguably primitive forms of technology. They represented the (largely ineffective) attempts by humans to control the seemingly uncontrollable, through the occult. Moreover, magic was explicitly forbidden in the Hebrew scriptures, presumably because of the idolatry that occult practices lead to. These resonances are the opposite of what Tyson wants to evoke. Instead, he hopes that using the word magic can somehow catch the coat tails of currently popular fantasy such as Harry Potter, and thereby gain the ideas a hearing. Maybe it will work; but I cannot bring myself to ignore these infelicities, so here I am going to use more neutral and unambiguous expressions such as "nonscience."

The case Tyson aims to make is that there are four main types of theory about nonscience: (1) animism, (2) Platonism, (3) identifying nonscience with supernatural, and (4) identifying nonscience with nonsense (he calls it the antimagical approach, and means reductive materialism, or more simply scientism). His view is (mercilessly boiled down) that theory 2 is the best theory we have, but that we have ended up with theory 4 becoming predominant in modern culture because science adopted and promoted theory 3.

Lesson One is that "We live in a High Age of Magic," in terms of the popularity of magical fantasy by authors such as Tolkien, Lewis, and Rowling, and that the yearning behind this fact may be a sign of the importance of the nonscientific, the human, etc., and of the poverty of reductive materialism. Lesson Two unpacks the four theories of nonscience, most notably identifying the idea of "natura pura" that is supposed to underlie the scientific revolution, as a move in ideas from animism and Platonism to a division of reality into nature and a separate supernature. Tyson sees that move as the fateful beginning of the slide into materialism, as supernature begins to be seen as superfluous. He regards "supernatural theology and anti-magic scientism" as "Mother and Child," and speaks of magic being "cast out" of nature by the supernatural theology (theory 3) that he asserts accompanies the growth of modern science.

Lesson Three presents the idea of disenchantment (meaning secularization) with reference to a few key authors, and Lesson Four critiques the philosophical incoherence of secularism in a few of its guises, concluding that "mythos and imagination are [still] profoundly active" so the myth of disenchantment is "deeply dishonest." Lesson Five argues for the importance of quality and purpose, neither of which can be discovered within the straight-jacket of scientism. Lessons Six and Seven outline the Platonic alternative, majoring on Plato's idea of Essence. Now I have myself made the case that what I call scientism (the idea that science is all of real knowledge) is a widespread and pernicious philosophical error, frequently adopted unthinkingly by the anti-theists of this century and the last. So I welcome the critiques of scientism that Tyson offers. I also think it is good that a professional philosopher tackles these questions and explains them for a wider audience. Unfortunately, though, I do not think Tyson, in the end, makes a very convincing case.

First, he does not back up his assertions about how one idea follows from another by deep analysis of ideas or by substantial historical investigation. So I remain unpersuaded either that scientists of the sixteenth and seventeenth centuries adopted theory 3 (identifying nonscience with the supernatural), or that doing so led to a natural slide into reductive materialism (theory 4). Tyson seems in this respect to be promoting the slander that, whether Christian or not, scientists practice "methodological naturalism" by which its critics mean "doing science as if there is no God." I don't do that. And I don't think that Christian scientists down the centuries generally did.

Second, Tyson is a metaphysician. He emphasizes the importance of absolute presuppositions. That is all very well and good. But it can miss the point if it supposes that absolute presuppositions (metaphysical commitments) are adopted only for arbitrary or self-interested reasons, or that there is a stark exclusive choice to be made between "epistemological foundationalism" and "metaphysical foundationalism." In fact, there is, in the ideas of a culture and of an individual, a continuing cyclic relationship between metaphysics and epistemology. Events and experiences are interpreted within a framework provided by metaphysical commitments, but also metaphysical commitments are continually being evaluated (in those with an open and inquiring mind) in respect to their ability to make sense of experience and evidence. Modern science is enormously successful in making sense of the reproducible aspects of nature. That is one reason naturalism seems an attractive metaphysical option, because we understand nature much better today than did Plato and his followers up to the sixteenth century. It is also a reason why a full-blown return to Plato or Aristotle seems implausible to most moderns. A more balanced exposition of the strengths of Neoplatonism as well as, perhaps, its weaknesses might be more to the point.

We, Christ's followers who are interested and knowledgeable in science, have a more persuasive set of metaphysical commitments than naturalism. They uphold rather than undermine true science's epistemological persuasiveness, but they also lead us to see that there is more in heaven and earth than is dreamed of in the scientistic world view. In that, we agree with Paul Tyson; but I suspect that we arrive there mostly by different routes than his.

*Reviewed by Ian Hutchinson, Professor of Nuclear Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139.* 



**MATHEMATICS FOR HUMAN FLOURISHING** by Francis Su. New Haven, CT: Yale University Press, 2020. x + 274 pages, with questions for reflection, hints and solutions to puzzles, endnotes, and index. Hardcover; \$26.00. ISBN: 9780300237139.

Mathematics is one of those subjects people unabashedly confess to being no good at, justifying their antipathy by claiming not to have much of a math brain, as if their mindset is caused by flawed genetics. Those of us who locate the origins of math anxiety more in the realm of nurture than nature – due to ill-advised and uninspired influences from parents, teachers, and peers-believe that there are effective ways to attract students (and adults) to explore and enjoy mathematics, even if they don't become mathematicians. For some, this means developing creative ways to present and relate significant mathematical ideas-going beyond worksheets, rote learning, and pedestrian applications-to engage students in imaginative recreational activities (e.g., see my review of Paul Lockhart's trilogy in the March 2019 issue of *PSCF*).

One way to reach out to those disaffected with mathematics is to connect it to their everyday lives and interests. This may involve problems, puzzles, and games, but it can also be done by situating mathematics within a larger social context-humanizing mathematics so that students experience it not as a cut-and-dried collection of rote techniques to be memorized but as a field that has been developed by human beings with desires and interests and roles within their culture. Connections can be made between mathematics and philosophy or astronomy or physics or biology or technology or business-there are many ways to link mathematics to other areas of life, because mathematics is so foundational to today's world. Mathematics can also be humanized by connecting it to literature, linking it to a poem, a song, a story, or even a dramatic presentation of some important mathematical idea or event. Studying relevant historical developments and the biographies of mathematicians provides still other linkages. The ways in which we currently calculate may be compared and contrasted with the methods used at other times and places. The rules and strategies for playing traditional games in different cultures can be analyzed using mathematical ideas.

While each of these ways reveals how mathematics is an integral part of our human experience, *Mathematics for Human Flourishing* takes a somewhat different tack.

Instead of concentrating on mathematical ideas and techniques, and showing how great mathematics is and what it can do (though some of these topics are also explored), Francis Su focuses more broadly on what human skills, habits, and dispositions—he calls them "desires" and "virtues"—are fostered by a wholesome pursuit of mathematics. His answer to the question "Why do mathematics?" is that "mathematics connects to our deepest human desires ... [and so] helps people flourish" (p. 10). Su invites those who find mathematics cold, boring, and lifeless, and/or who have been demoralized and disenchanted by previous encounters with mathematics, to consider how "the proper practice of mathematics cultivates virtues" that enable one to live well, to experience shalom, to be fully human.

Su is an award-winning mathematical educator and writer and a past president of the Mathematical Association of America. He writes in an engaging manner, telling stories, making connections, explaining ideas, and posing thought-provoking puzzles and games in ways that open up new vistas for a broad audience. One might suspect, therefore, that his mathematical training and career were fairly smooth sailing. However, Su confesses that his path to mathematical success was not without considerable obstacles and disappointments. He occasionally had feelings that he didn't really belong, was once told by a professor that he would never be a successful mathematician, at times struggled with self-doubt, and for a while even considered dropping out of his PhD program. Dealing with adversity no doubt made him a stronger mathematician and communicator, and it also made him more sensitive to issues experienced by those who were having difficulty with mathematics and to the importance of addressing the human side of mathematics.

Chris, a federal prison inmate who was determined to learn mathematics on his own, corresponded with Su prior to and during the writing of this book. Excerpts of his letters and conversation are included at the end of each of the thirteen chapters and in the epilogue as illustrations of and responses to the themes and problems being discussed. As Chris is not due to be released for at least another decade, his interest and perseverance in pursuing mathematics was an inspiration for Su, convincing him that "mathematics has something to offer everyone" (p. 19). Su addresses his book, therefore, to a wide audience, especially to those who believe they are not "math people." For the most part, the level of mathematics assumed by the book is not very high, but that doesn't mean Su sticks to mundane topics ordinarily associated with elementary school mathematics. His hope is to expand his readers' idea of what mathematics is and does, "to imagine mathematics in a new way" (p. x). In this he has certainly succeeded, beyond what can be conveyed in a short review.

In advancing the idea that mathematics cultivates virtues, Su underscores that he is not saying that the

pursuit of mathematics makes mathematicians more virtuous than other people. He is using the term "virtue" in the Aristotelian sense of "excellence of character that leads to excellence of conduct" (p. 10). This may not match our normal usage, but it fits into a trend in philosophy over the past half century in which "virtue ethics" has made a strong comeback.

So what are these desires and virtues that Su thinks the proper pursuit of mathematics can help promote? The book's chapters have one-word titles: exploration, meaning, beauty, truth, justice, love, and others meant to conjure up some basic human desires. Each chapter then examines various aspects of mathematics and relates them to particular virtues-for example, the chapter on exploration talks about mathematicians' use of imagination and creativity and their sense of joyful surprise and wonder at what they discover. The chapter on meaning discusses how abstract thinking can isolate and help understand key features of a situation, revealing the essential mathematical elements involved in disparate but similar phenomena; the chapter on truth emphasizes the need to think rigorously, to honestly acknowledge error, and to practice intellectual humility. Many of these virtues may be considered intrinsic structural features grounded in mathematical practice when it is done well – mathematics progresses through interactive exploration, benefits from perseverance when facing difficulties, requires abstract thinking and rigorous argumentation, and so on.

The chapters on power, justice, community, and love point out aspects of mathematical practice that probably come closer to what one would ordinarily associate with human virtues: the need to be humble, to respect human dignity, to have a heart of service, to show concern for the marginalized and oppressed, to be hospitable and loving toward others "through and because of mathematics" (p. 205). Unconditional love for those we interact with as we do mathematics, Su says, "has the promise of changing the practice of mathematics from a self-indulgent pursuit to a force for human flourishing" (p. 207). These virtues are less characteristic of mathematical practice per se and are more-human qualities one would like to see practitioners exhibit as full-orbed persons. While these may (should?) accompany mathematical practice, whether they do depends more on one's deepest commitments and aspirations and outlook on life (worldview) and not so much on one's excellence and competence in doing mathematics. At one point Su exhibits awareness that an underlying driving force must animate the virtues he discusses, saying that "every human longing contains at its core a question of ultimate significance" (p. 97). However, he never breaks out of the framework of mathematics long enough to explore this deeper religious foundation. He notes, for example, that the permanence of mathematical truths is grounded in mathematical reasoning, but does our "trust in reason" (p. 98) stand on its own, absolute, or is it grounded in something more

fundamental? Likewise, he repeatedly emphasizes that we should respect the dignity of all human beings, but he doesn't explicitly base this on humans being created in God's image. Su's decision not to delve into religious matters such as these may allow him to reach a wider audience, many of whom might find religious discussions off-putting.

Readers may still wonder whether Su's crediting mathematics with all the virtues he identifies does not claim too much for mathematics. Su admits that some might think he is making an idol of mathematics, something "to be prized above all other pursuits in life." There is a genuine temptation for someone who recognizes, as a participant, that "mathematics is a marvelous human endeavor" (p. 12) to wrongly make it "an ultimate thing" (p. 204). Su stresses, however, that mathematics is not "a panacea to address every ill. It won't solve every human problem, and it's not a spiritual answer to the ultimate purpose of humankind, [though] it does contribute in important ways to a life well lived" (p. 218). Su's ultimate loyalty as a mathematician and a human being is affirmed in the closing sentence of his acknowledgments: "as a follower of Jesus, I am grateful to the one who defends the dignity of all human beings and sustains my own experience of human flourishing" (p. 227).

In the end, then, Su's thesis is not that mathematics is the source of human flourishing but that it lends itself to being practiced in a way that promotes human flourishing. As he says in one of his public posts, "My book is about the elevation of human dignity, and how we are using math to raise people up or tear people down." At a time when character and virtue seem constantly under attack, a book showing how mathematics can support a lifestyle of love toward one's neighbor is refreshing. My recommendation: pick up a copy of Su's book and read it from cover to cover.

Reviewed by Calvin Jongsma, Professor of Mathematics Emeritus, Dordt University, Sioux Center, IA 51250.



**THE GENEALOGICAL ADAM AND EVE: The Surprising Science of Universal Ancestry** by S. Joshua Swamidass. Downers Grove, IL: IVP Academic, 2019. 264 pages. Hardcover; \$17.00. ISBN: 9780830852635.

Like most things written on the topic of Adam and Eve, the ideas behind *The Genealogical Adam and Eve: The Surprising Science of Universal Ancestry (GAE)* have already proven controversial in a number of online fora and other venues. Happily, the published book presents the first truly complete discussion of the author's ideas regarding Adam and Eve as universal ancestors, including discussions of many of the questions raised prior to its publication. The basic structure of the *GAE* hypothesis is not complicated. It stems from earlier work on the mathematical realities of deep genealogy: because of the exponential nature of ancestry, if we go back far enough in time, everyone who left descendants is the ancestor of everyone alive today.

The same mathematics can be used to demonstrate why we cannot detect genetic markers from ancestors who lived thousands of years ago. The fraction of DNA coming from any particular individual becomes twice as small for every generation back, until it is vanishingly close to zero. Swamidass devotes considerable space to the differences between genetics and genealogy, and stresses the fact that most of our ancestors are "genetic ghosts" as far as finding any trace of them in our own DNA is concerned.

The basic premise of *GAE* is to take these facts of genealogy and apply them to a couple who lived 6,000 years ago. Swamidass makes the case (which is not disputable) that all of us alive today are descendants of all the couples alive 6,000 years ago who had any descendants. If one of those couples were named Adam and Eve, then we are all descended from Adam and Eve (who may or may not have been specially created by God) – as well as from all the other couples alive at that time.

The author suggests that the substitution of genealogy for genetics in the scientific arguments about universal human descent might be useful in crafting a new theological origin story, consistent with biblical tradition. After all, from Genesis to Matthew, scripture is full of genealogies.

The book summarizes the range of interpretations of the Adam and Eve story. One of these, held by youngearth creationists (YECs) and others, is that Adam and Eve were an actual living couple from whom we are all descended. This "sole progenitor" understanding has two parts. First, all humans are descended from a single couple; and second, all people are descended *only* from them.

The book does not postulate this version as a possible scenario, since Swamidass agrees with the scientific consensus (based on modern genetic diversity) that it is not possible that a couple living 6,000–10,000 years ago could have been the first and only people on the planet. Swamidass, a specialist in computational and evolutionary biology, states that he will not put forward any idea that contradicts scientific knowledge. He presents his calculation that a *sole* progenitor couple could not be postulated later than 700,000 years ago, significantly before the dawn of *Homo sapiens*.

The proposed *GAE* hypothesis is that Adam and Eve could have been miraculously, *de novo* created by God in what is generally taken to be the biblical time frame, and that all human beings alive today (and even in AD 1, before the beginning of Christ's ministry on Earth) are

their descendants. We are also the descendants of all the other people who lived outside the Garden, and those people were the product of evolution. Since miracles are, by definition, outside of scientific investigation, nothing here contradicts scientific knowledge.

It is important to understand that Swamidass is more interested in whether this scenario is possible within a scientific world view than whether it is actually correct. Scientifically speaking, there is no point in arguing about the likelihood of the *GAE* hypothesis being true—it is something we can never know.

The author aims to raise questions more than provide answers, and to allow for a dialogue free from the instantaneous blockage produced by theological and scientific presuppositions. This book is not meant to convince skeptics or scientists that Adam and Eve were real people from whom we all descend, nor to prove to YECs that evolution is true, but to show everyone that it is possible to say (and not be scientifically wrong) that the evolution of humanity and the historicity of Adam and Eve can both be simultaneously true, thus addressing one of the apparent contradictions between traditional Christian theology and the scientific consensus on human origins.

However, one is ultimately left wondering: for whom is this new way of looking at Adam and Eve likely to provide a breakthrough and lead to rapprochement with those with divergent views? There have been diverse reactions to the book (and to the *GAE* hypothesis before publication) that suggest both hope and some doubt that Swamidass has succeeded in his goal.

Some who hold to a particular "literal" interpretation of Genesis and Romans reject the notion of people outside the Garden and insist on Adam and Eve's *sole* progenitorship. Some evolutionary creationists find the notion of inserting a miraculous creation of a single couple unnecessary concordism at best, and incoherent at worst. And many are still puzzled by some of the historical, theological, and moral implications of the *GAE* model.

If the objective is simply to rescue the miraculous story from being dismissed out of hand, that is probably worthwhile for many readers. Ultimately, I believe that Swamidass manages to provide Christians with a way to confess a belief in a literal *de-novo*-created Adam and Eve while still affirming evolution. Many nontheologians (including myself) do not need a precise and definitive hermeneutical explanation for the Adam and Eve story.

Of course, there is a danger to this approach. The hypothesis is not likely to be overturned on scientific grounds, but it has sparked a theological debate. That debate, if carried out with mutual respect and empathy, could be a positive force for improved dialogue. Alternatively, we could see a hardening of positions and no real progress. One of the key parts of this book about the origin of humanity addresses the thorny question of what is a human being. Swamidass devotes several chapters to this critical question, from both scientific and theological perspectives. We know that every person alive today is a human being by any scientific definition of the term, and that this has been true for at least 30,000 years. But then questions abound. Were Neanderthals human? Were early *Homo sapiens* human? Are all members of the genus *Homo* humans? Swamidass tells us, correctly, that there is no precise scientific definition of human.

But the critical issue for the GAE hypothesis is the theological definition. In particular, were Adam and Eve and those outside the Garden equivalently human? Were Adam and Eve somehow "better" or more advanced? The author emphasizes that those outside the Garden were biologically equivalent to Adam and Eve. Adam and Eve are different, he argues, in that they (and their descendants) were "textual humans" in addition to being "biological humans." This doesn't really help, since the meaning of a "textual human" is not at all clear. From what I can tell, it simply means that Adam and Eve are mentioned in the text, while Jack and Shirley (who might have been Cain's in-laws) are not. In that case, what makes Adam and Eve special, and why does it matter if we are descended from them or not?

The *GAE* hypothesis holds that from 6,000–10,000 years ago, the number of people who could claim descent from Adam and Eve slowly grew to encompass all of humanity – but not all at the same time. Since this status depended on intermarriage between Adam and Eve's descendants and the descendants of those *others* living outside the Garden, some populations living in remote parts of the planet would have been latecomers to the united family of humankind.

For example, the island of Tasmania is known to have been isolated from the rest of humanity for long periods of time. Swamidass points out that genealogical isolation is quite different from genetic isolation. We know that it takes only one breeding individual from outside a population to rapidly convert it from genealogical isolation to unity with the outside. But this answer does not fully address the many issues that arise from the historical division of humanity into two categories – genealogical descendants of Adam and Eve, and those "not yet" their descendants. Was their birth, life, and death outside of the very theology that we are trying to rescue? Did they not matter to God? The author certainly does not affirm any such thing, but given humankind's experience with colonialism and racism, many have found the implications of this idea problematic.

Swamidass considers the issue of racism in great detail. He points out that human monophylogeny was not universally accepted in the past, and even today there are some who believe that human beings did not arise from a single population but from different geographic locations (polyphylogeny). One of his arguments is that *GAE* is consistent with human monogenesis (all humans descending from a single ancestor) and roundly dismisses racist polyphylogenetic ideas. But since the timing of the "monogenesis point" is not as clear-cut with *GAE* as with the sole progenitor model, this issue may remain controversial for some readers. For those who seek clear, definitive answers to how we can easily reconcile the evolution of *Homo sapiens* with the biblical story of a single miraculously created couple who *alone* gave rise to humanity, this book will be disappointing, since such answers are probably not possible, and this was never the purpose of *GAE*.

I think that the important accomplishment of this book is the weakening of previously unquestioned presuppositions on all sides of the debate. Before publication of *GAE*, Christians could take various noncompatible positions on the origin of humanity, and dialogue was difficult. This book is proposed as a starting point, rather than as an answer. The author writes at the end of the book, "It is however a starting point for an exchange, a place where we might understand and embrace our differences."

Christians with opposing views on Adam and Eve may not come to an agreement, but new spaces for dialogue have indeed been opened up. For this, Swamidass deserves our appreciation, and the book deserves to be read by all.

Reviewed by Sy Garte, a biochemist who taught at New York University, the University of Pittsburgh, and Rutgers University, is the Editor-in-Chief of the ASA's God and Nature, Vice President of the Washington DC ASA Chapter, and a Fellow of the ASA.

ON THE ORIGIN OF CONSCIOUSNESS: An Exploration through the Lens of the Christian Conception of God and Creation by Scott D. G. Ventureyra. Eugene, OR: Wipf & Stock, 2018. 324 pages. Paperback; \$35.00. ISBN: 9781532655173.

As a philosopher with years of research in philosophy of mind and a Christian of many decades, I welcomed the invitation to review this book on the origin of consciousness "through the lens of a Christian conception of God and creation." However, I was also somewhat flummoxed as to what the book was to be about, as its title is less than transparent to any specific meaning. It turns out that this is a book about how theological and scientific research might fruitfully influence one another in the task of understanding the origin of embodied human consciousness.

The space allotted to this review is much too limited to do justice to the immense array of ideas densely packed into this volume. I shall instead offer very minimal summaries of chapters, highlight a few of the book's central themes, and conclude with two criticisms of the book. This, I believe, will be sufficient to give a good sense of what to expect from this book. Ventureyra, in his Introduction, provides an overview of the science and religion dialogue, touching upon big bang cosmology, finely tuned laws of physics and the origins of life, objective morality, freewill, and consciousness, as well as the mind-body problem. He also discusses foundational ideas he will return to in more detail in his later chapters.

In chapter 1, he wrestles with methods and models of the science-religion relation, settling on his preferred model of the science-religion dialogue: a modified version of Robert John Russell's eight pathways of "creative mutual interaction." This model yields five pathways by which scientific research programs can influence theological research programs and three by which the latter can influence the former. The rest of the chapter critically appraises these pathways of bidirectional influences.

Chapter 2 shows that neither science nor theology can get along without philosophy; philosophy is operative in each and, as well, is a mediator between them. This chapter delves into philosophy of science, highlighting both the philosophical shortcomings of scientific materialism and the strengths of critical realism, and laying the theoretical bases for Ventureyra's own proposal of an evolutionary natural theology, what he calls the "cumulative evolutionary natural theological argument from consciousness."

Chapter 3 covers various models of evolution and creation, assessing their potentials of mutual compatibility and their possibilities of accounting for God's actions within his creation. Ventureyra favors "directed evolution," a theistic form of teleological evolution in which God intervenes in his creation throughout its history, not just front-loading initial conditions that over time output his eternal design. Indeed, Ventureyra suspects that God must interact with creation through its informationally porous nature—namely, by constraining/ directing its eventual permutations and emergences at the quantum level.

Chapter 4 dives into the scientific theology of Teilhard de Chardin. According to Ventureyra, Teilhard espouses a "Christocentric panentheism" that entails a mild form of Creator-creation identity and lays the groundwork for a view of consciousness as an emergent property of evolutionary processes. As Teilhard expresses the import of this panentheism, "God does not make: he makes things make themselves" (pp. 127–28).

In chapter 5, Ventureyra explores a number of theistic arguments – from the ancient Kalam cosmological argument to contemporary fine-tuning anthropic and design-information-theoretic arguments. He believes these arguments establish the plausibility of belief in the Christian God "as the source of the origin of human self-consciousness" (p. 180). All of these arguments, in one way or another, contribute to Ventureyra's contention that God's ontological simplicity coupled with his

creation *ex nihilo* make it highly probable that an infinite conscious mind has always existed and is what best accounts for the evolutionary origin of finite human self-consciousness.

Chapter 6 brings systematic theology explicitly into Ventureyra's discussion of human capacities for higher cognitive functions and moral consciousness. These capacities, says Ventureyra, demonstrate the involvement of the Holy Trinity in our creation and brought forth the image of the Creator. This is the shortest chapter of the book, and the least valuable (in my opinion).

Chapter 7 is really the centerpiece of the volume. Here Ventureyra applies Russell's Creative Mutual Interaction framework specifically to the question of the origin of consciousness. As a key example of how theology can helpfully interact with science, Ventureyra contends that God's simple and eternal consciousness is a much better explanatory posit than the so-called "nothingness" out of which quantum cosmologists presume the big bang birthed the universe. Instead of seeking to milk the universe's undeniable rationality, life, and embodied consciousness[es] from an original fluctuation in a quantum vacuum, why not start with God's metaphysically simple "mind/consciousness as the primary candidate for grounding reality" (p. 205). With this small but monumental shift of original posit, the naturalists' utter befuddlement at the origins of these staggering cosmic anomalies gives way to an expectation of "information and consciousness [as] vital aspects of reality" (p. 205): "Consciousness begets consciousness" (p. 206). That is, God, as the eternally conscious Creator, nonphysically interacts at the quantum level with his informationally porous creation to direct its evolutionary contingencies ultimately to evolve finite, embodied, conscious image-bearers who interact with their own bodies nonphysically in accord with some scientific information-based theory of consciousness.

Chapter 8 covers three different views of consciousness expressed in the writings of Christian theists: J.P. Moreland's substance dualism, Bernard Lonergan and Daniel Helminiak's tripartite model, and Philip Clayton's emergent monism. These three views are nonreductive and, according to Ventureyra, "fit well with notions of God interacting through informational processes" (p. 278). Although he finds specific elements of their views problematic, he, nonetheless, identifies aspects of their positions, such that, when they are judiciously joined, demonstrate that "the classical Christian conception of God and creation is not only compatible but provides a plausible explanation for the origin of consciousness" (p. 269).

Ventureyra concludes his book somewhat modestly, admitting that "[m]uch of [his] book has been exploratory and speculative in nature" (p. 275), and that he has provided no answer to the question of "precisely how or by what process consciousness originates or emerges" (p. 271). Nonetheless, he claims that his book not only "plausibly explain[s] *why* [my emphasis] there are such things as self-consciousness, moral aptitudes, volition, etc." (p. 279) but also "plausibly affirms the Christian conception of God and creation" (p. 282). His parting wish is that this book will help to inspire further multidisciplinary "research into the origin of consciousness through the use of the Christian conception of God and creation" (p. 282).

Before closing with a few critical comments, I have collected three central claims that are assumed, asserted, or defended in Ventureyra's book.

1. Regarding the relation of science and religion:

Science and religion are not in conflict; nor are they utterly incommensurable. When their relation is philosophically mediated and situated in the broader context of Christian theism, they can mutually support and constrain each other, such that they synergistically open up new metaphysical horizons for understanding non-empirical and nonphysical realities.

- 2. Regarding God and his relation to creation: God is the God of classical theism: a self-conscious, Trinitarian personal being who is omnified in the transcendentals and power, and whose existence and essence are one. God freely created an informationally porous reality in which he acts through manipulating, nonphysically, its quantum probabilities.
- 3. Regarding consciousness and God's relation to human consciousness:

The emergence of consciousness is inexplicable without the pre-existence of mind. God is the ultimate cause of finite consciousness in all its forms and intensities. Human consciousness is inextricably linked to the image of God. God's simplicity of being is an analogue of the unity of human consciousness's firstperson perspective. Human consciousness cannot be reduced to the physical functions of the brain, as consciousness is the product of the divine originator.

In closing, I will reserve my criticisms of the book to two: one dealing with form; and one, with content. Regarding form, Ventureyra's writing style is less than pleasant to read. It is highly repetitive, self-referential, passive, and vague. Moreover, it is rife with acronyms (41 to be exact) that force the reader to return continually to the abbreviation list at the front of the book. Regarding content, Ventureyra tends too simplistically to gloss over the problematic issues of Creator-creation and mind-body interactions by relying upon a reifying view of information that construes it as an intrinsically transcendent reality, able causally to traverse the ontological gaps he posits between nonphysical and physical realities. The only justification he offers for giving information this transcendent role is the fact that information is susceptible to multiple realization and thus irreducible to physics. However, at best, multiple realization and irreducibility do not bestow upon information the kind of interontic causal agency he ascribes to it. Nor does it address the relevant antirealist readings of information that construe it as a perspective-relative artifact of highly selective abstract descriptions of physical events and relations.

Overall, Venturyra's book is worth reading, if only for further disclosing the failures of human intentions to capture within the a priori structures and functions of finite consciousness, what from outside them originates and sustains them.

Reviewed by Robert Doede, Professor of Philosophy, Trinity Western University, Langley, BC V2Y 1Y1.

**JESUS LOVES YOU AND EVOLUTION IS TRUE: Why Youth Ministry Needs Science** by Sara Sybesma Tolsma and Jason Lief. Minneapolis, MN: Fortress Press, 2019. 227 pages, including title pages and dedications. Paperback; \$32.99. ISBN: 9781506439730.

Despite the best efforts of many scientists, theologians, biblical scholars, and historians, there are still many people in the general public who see science and faith as being at odds with one another. The conflicts that arise from this perspective can have unfortunate consequences. One possibility is that they can lead Christian young people to eschew the findings of modern science, but studies have also shown that these contentions cause some to leave their faith behind altogether. In Jesus Loves You and Evolution Is True: Why Youth Ministry Needs Science, Sara Sybesma Tolsma (a geneticist and cell biologist) and Jason Lief (a practical theologian) team up "to point out the transversal spaces that exist between theology and biology so that the Christian community might see how the science-and-faith issue is not an either/or choice" (p. 3). In alternating chapters, the book's authors elaborate on their areas of expertise, with Tolsma penning chapters on scientific issues and Lief expounding on various theological topics.

In her chapters, Tolsma touches on a wide range of scientific topics that often come up at the faith-science interface. In chapter 1, she discusses evolution, diving into some of the evidence for the evolution of life on Earth, as well as common objections to evolutionary theory. She also introduces evolutionary creationism as a viable position for Christians, a view that seriously considers both modern science and orthodox Christianity. Chapter 3 focuses on human origins specifically, including a genetic primer and expounding on how human genomes speak to human history, thus providing additional evidence for common ancestry. Chapter 5 takes a bit of a different turn, focusing on climate change and racism and revealing how our evolutionary connectedness should lead us to care well for one another and the nonhuman creation. In chapter 7, Tolsma attacks one of the central objections to the acceptance of evolution from a Christian perspective: the roles of death and suffering that are inherent to the process. She discusses the central role of death in the functioning of ecological

systems, as well as the importance of cellular death for the immune system and other molecular processes to function properly.

Throughout her chapters, Tolsma tackles complex topics in ways that are clear, thoughtful, and scientifically accurate. She makes excellent use of analogies at various points, including a language analogy in chapter 3 to help explain the evolutionary inferences we can make from genetic differences. She also highlights excellent examples to illustrate particular topics. For example, a process called autophagy, which can help cells utilize worn-out proteins and organelles from dead cells in new ways, proves to be an excellent illustration of "[sacrifice] and destruction [making] room for us to build something that can flourish" (p. 189). While readers with strong backgrounds in science might be left wanting more details or wishing for a bit more nuance in certain places, Tolsma does an admirable job of unpacking the topics in a way that walks readers through the key points and provides enough details to illustrate why the scientific community has reached a consensus on these topics.

Lief's alternating chapters focus on his expertise: rethinking theology, with the influence of scientific findings, to meet the needs of young people. He begins his sections by indicating the importance of the doctrine of the incarnation, namely Christ as both God and human, to help people better understand the need to live an embodied human experience. He describes this doctrine as "the divine affirmation ... and the embrace of our condition of becoming," citing influential spiritual leaders such as Karl Barth, St. Francis of Assisi, and Bonaventure to indicate that embodied spiritual life is nothing new to Christian thought and theology (p. 55). To Lief, however, the implications of such a way of thinking are more rewarding than what the current state of American Christian teaching offers young people, a topic that he explores in later chapters.

Lief begins with the doctrine of the Fall, the shift of humanity from innocent obedience to guilty disobedience. A modern assessment of the Fall, he writes, is more akin to an ancient Greek worldview of metaphysics, which prioritized the spiritual realm over the material. By contrast, Lief roots the doctrine of sin in the very notion of this disembodied abstraction: "[Sin] is about trying to become more than our material life" (p. 86). The death and resurrection of Christ, then, is the loving correction to the prioritization of the spirit over the body. It is the demonstration of a God whose interest lies in the purposes of salvation, in the laying down of one's finite existence for someone or something greater than oneself. Lief's description of God is of one who suffers alongside creation and, in so doing, demonstrates that love renders the universe meaningful. Throughout his reframing of the theological discourse, Lief consistently brings readers back to the implications of such openness to reinterpretation, namely permitting

young people "to explore how their bodies, their biology and psychology, shape their spirituality and their identity" (p. 101). By Lief's assessment, churches have failed youth by offering a hollow shell of the Christian faith that neither addresses their lived experiences nor equips them with the tools to "cultivate an imagination to make sense of the world" (p. 200).

Throughout the book, both authors hit their stride when they explore complex topics in their respective disciplines, using everyday language and illustrations that make their findings accessible to a broad audience. Furthermore, neither author sacrifices the accuracy of their findings for accessibility to the general public. Together, Tolsma and Lief illustrate how modern science and Christianity need not be at odds, but can instead be integrated with one another to craft a deep and robust faith.

However, they often treat the specific application to youth ministry like the essential glue that connects two disciplines that they have already demonstrated to be deeply interconnected. While their assessments of youth culture and youth ministry are accurate, there are relatively few specific applications of the book for a youth ministry context, especially given what one might expect from the book's title. Lief writes that the very point is to keep the conversation open-ended; however, one cannot help but wonder if setting the foundation with some fundamental action steps would have helped to make the topic of youth ministry feel more like the central focus of the book. However, with all that stated, if the intended audience is people who would like to see the church engage more with science, youth, and different theological perspectives, then Jesus Loves You certainly accomplishes this task.

Reviewed by Ryan M. Bebej, Associate Professor of Biology, Calvin University, Grand Rapids, MI 49546; and Chris Curia, Director of Youth Ministries at Fairway Christian Reformed Church and Young Life Church Partner, Jenison, MI 49428.



**BORED, LONELY, ANGRY, STUPID: Changing Feelings about Technology, from the Telegraph to Twitter** by Luke Fernandez and Susan J. Matt. Cambridge, MA: Harvard University Press, 2019. 464 pages. Hardcover; \$35.00. ISBN: 9780674983700.

Many books and articles have been written about our current love-hate relationship with technology. This book explores this common theme in a novel and very helpful manner. The authors, a husband and wife team, explore the topics by first going back to the early days of America and examining how people wrestled with the new technologies of their time such as photography, the telephone, television, and the car. They proceed to track the varying responses from those early times up to and including the present. Luke Fernandez is Assistant Professor in the School of Computing, and Codirector of the Tech Outreach Center, at Weber State University. Susan J. Matt is Presidential Distinguished Professor of History at Weber State University.

If you are interested in how we arrived at our current conditions, this book gives a rich and extensively documented explanation. The investigation is done in six parallel chapters: "From Vanity to Narcissism," "The Lonely Cloud," "The Flight from Boredom," "Pay Attention," "Awe," and "Anger Rising." About 80 pages of notes follow. The first half of each chapter explores the past and the second half explores our current context. These excerpts encapsulate this approach:

Nineteenth-century Americans often saw virtue and value in solitude ... Solitude is a hard sell—it resists being commercialized or packaged. In contrast, the networks that contemporary Americans often turn to in order to stave off loneliness are commercialized ... (p. 11)

#### The authors suggest

that human nature and emotions are not static categories; instead they change subtly as a result of shifting economic orders, vocabularies, ideologies, theologies, and technologies ... feelings are, at least in part, historical artifacts ... the culturally specific words and categories people use to understand and describe feelings actually affect, shape, and hone them. (pp. 17–19)

I found the historical exposition in each chapter to be the most unique and helpful contribution of this book. Frequent summaries, such as the following excerpt, help the reader clearly track the exposition.

While boredom was now widespread in America, it had not always been. In the eighteenth century, it did not even exist yet as a feeling. In the nineteenth century, it was deemed a rarity in the United States, a feeling that was largely unknown to a nation of hard workers. However, in the twentieth century, with the spread of the word [boredom], and with a declining faith in the redemptive power of both industry and leisure, it had become a problem. Suffering through dull times no longer offered moral gifts; instead, it was a problem emotion in need of a cure. (p. 170)

This summary appears as the writers transition into a discussion of boredom in our age. As that discussion ensues, the reader encounters assertions such as "the class divisions that historically influenced how boredom was experienced and expressed have become amorphous" (p. 172).

The authors not only examined a large collection of printed documents, they also interviewed a substantial number of people from a variety of age, ethnic, and occupational backgrounds. The book contains many

first-person quotes, such as this one by a young woman named Alta, found in the boredom chapter.

I find when I am doing homework I have to go put my phone in a different room and ignore it. Otherwise, if I get bored or I start mind wandering I'll grab it and start checking. So it wastes a lot of time. Not productive time. (p. 177)

The authors do not neglect the role of race, class, and religious faith in America. At the end of an exploration of the changing reactions to the advent of the telegraph (including examples of how views from the pulpit changed over time), the authors present this summary:

Collectively, the dreams that Americans vested in the telegraph revealed deep longings to escape the inherent limitations of being human, of being separate, apart, sometimes lonely, and tragically finite. They optimistically believed that the telegraph, through its invisible but powerful connections, could join people across great distance, create a new community that was unbounded by the constraints of time and space, and break barriers between man and god, living and dead. The awe they felt expressed their belief that there were forces larger then themselves in the universe, forces that might bring true reunion and communion. (pp. 256–57)

They then proceed to note the disillusionment experienced when most people found the telegraph far too expensive to use except in times of crisis, such as a death in the family.

In the chapter on awe, the authors assert, "The awe that twenty-first-century Americans express has been redefined; it is a weaker and far more secular feeling, and therefore less likely to take them outside themselves, for the things that awe them today are their own creations" (p. 271).

The book carefully builds to the ideas that have been highlighted in these representative excerpts. The assortment of ideas explored in the six chapters present a rich collection that I found fascinating. We are told in 1 Corinthians 2:15, "Those who are spiritual discern all things" (NRSV). This book is a great resource to help us discern how we arrived in our current setting; it also provides helpful ideas that can assist us as we choose how to wisely use our technologies.

Reviewed by Eric Gossett, Department of Mathematics and Computer Science, Bethel University, St. Paul, MN 55112.

**TECH-NOL-O-GY: Critical History of a Concept** by Eric Schatzberg. Chicago, IL: University of Chicago Press, 2018. 344 pages including acknowledgments, notes, bibliography, and index. Paperback; \$35.00. ISBN: 9780226583976.

Over three decades ago, I was coordinator of a Calvin Center for Christian Scholarship research team investigating technology [see *Responsible Technology: A*  *Christian Perspective*, Eerdmans, 1986]. What would I have given to have had this book in hand as our team struggled to give definition to technology and map out our research strategy! Eric Schatzberg, the author of *Technology: Critical History of a Concept*, was a long-time faculty member of the History of Science Department at the University of Wisconsin-Madison. When this illustrious department merged with the university's larger Department of History in 2017, Schatzberg became chair of the School of History and Sociology in the Ivan Allen College of Liberal Arts at the Georgia Institute of Technology.

What Schatzberg presents in his book, a book many years in the making, is a detailed conceptual history. Granted that in our lives technology is everywhere. But what in the world is it? And how should we define it and live with it? Are there certain prime realities that categorize it, or must we be satisfied with more pragmatic solutions to technology's character? Schatzberg sets out to clarify that question by recounting technology's long history from the ancient Greeks to modern thinkers and technicians. Complicating matters has been the tension between scholars and practitioners throughout history in understanding technology.

Technology is layered: an introductory chapter and a concluding chapter (complete with a manifesto) sandwich eleven historical chapters, highlighting the shifting meaning of the concept technology. But, admirably, there is more than historical telling going on in Schatzberg's account. The overriding idea (amply reflected in the concluding manifesto) he wishes to advance is the need for a "cultural meaning of technology" in contrast to an "instrumental" meaning. Schatzberg maintains that if we are not clear about the conceptual history of technology and its different contextual meanings, we all too easily fall prey to accepting a reductionist take of technology, too easily seeing it as a deterministic force (or indeterministic force) in our lives. Schatzberg leaves no target untouched, whether it be Thomas Friedman or Jacques Ellul. He is particularly concerned with academic scholars who have a bias for theory over practice or principles over applications.

The eleven intermediate chapters take us on a journey: from Greek *techne* (skilled making of things) and the Latin *ars* (or art, slowly broadened to include all types of learning), to the medieval European conception of mechanical arts (viewed as being subordinate to the liberal arts), and to alliances generated in later centuries which kept privileging head over hand (pp. 48, 50). In the eighteenth and nineteenth centuries, the mechanical sciences were seen as applied science, and the often-intense discussions and debates between natural scientists and engineers ensued. Schatzberg also examines terms such as technologie and technics. The German locution, Technik, in the hands of the American social critic Thorstein Veblen, became determinative for early American reflection on technology. One could

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eventually say technology as technology received its status only in the 1930s.

For our purposes, chapter 13, "Conclusion: Technology as Keyword in the 1960s and Beyond," is perhaps the most relevant. Schatzberg traces the modern senses of technology in the second half of the last century: technology as the industrial arts, technology as applied science, and technology as techniques. Subjects such as technology as innovation, technology and social change, and critiques of technology in the 1960s are briefly explored. Technology taken as an oppressive system of technical knowledge in Jacques Ellul, Herbert Marcuse, and Lewis Mumford is followed by a discussion of "contested technology" by Ralph Nader, Rachel Carson, Barry Commoner, and E.E. Schumacher.

What I found most interesting and valuable in this book, in addition to all the nuanced historical insights, is Schatzberg's effort to speak to the nature and future of technology. He ends with a two-page manifesto entitled "Rehabilitating Technology" that begins as follows:

This book is not a neutral work of scholarship but rather an intervention in the present, a first step in rehabilitating technology as a concept for history and social theory, with an eventual goal of shaping technologies toward more human ends. (p. 235)

Schatzberg wants to rehabilitate technology from scholars who tend to reduce technology to instrumental reason or from determinists who view technology as being driven by its own ends. He wishes to give a cultural face to technology: one that is driven by human agency and choice, interested in reestablishing cultural links between the arts (in the old sense) and technology, open to reclaiming the crafts as an essential element of technology, and careful of the nature of application of science and technology.

Cultural values couched in human agency ride high: technology as the "creative expression of human values and strivings, in all their contradictory complexity" (p. 232). We need, Schatzberg argues, to change our view of technology, to think ethically, and to see it as an expression of human values. But, unfortunately, there is little mention of any normative considerations either in the evaluation of technology or in the design process integral to technology – something *Responsible Technology* attempted to articulate in its halting fashion and discussion of normativity in the design process. That would perhaps have meant writing another book.

Reviewed by Arie Leegwater, Department of Chemistry and Biochemistry, Calvin University, Grand Rapids, MI 49546.

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#### Letters

#### A Greater Degree of Discontinuity

"Rethinking Abiogenesis: Part 1, Continuity of Life through Time," (*PSCF* 72, no 1 [2020]: 25–35) by Emily Boring, J. B. Stump, and Stephen Freeland provides a fascinating and thoughtful view of the nature of evolutionary continuity, especially as related to the origin of life. There seems to be no question that evolutionary continuity (as Darwin originally proposed) is profoundly important and a generally accurate concept for most of the history of life. The authors correctly argue that when probing the details of the emergence of life, ignoring specific cases of continuity (as in the example they give of the appearance of the canonical set of amino acids) runs the risk of missing an opportunity for advancing our knowledge.

The same could be said, however, about ignoring those instances where an apparent discontinuity should lead us to a more in-depth exploration. We know that there are clear examples of discontinuity throughout evolutionary history that have been accepted by the majority of biologists.<sup>1</sup> These include such events as the origin of eukaryotes by endosymbiosis<sup>2</sup> and the origin of vertebrates, which appear to have involved at least one whole-genome duplication event.<sup>3</sup> Gould and Eldredge's theory of punctuated equilibrium is supported by a good deal of evidence for discontinuities in the evolutionary record.<sup>4</sup>

The authors argue that because of the continuity principle, the unequivocal identification of any particular event as the beginning of life is impossible. Extending the general evolutionary paradigm to the big bang, the authors state that "natural selection is not limited to acting only on what we take to be alive" (p. 30). That could be true, but natural selection is not the whole story of evolution. They go on to say that anything that leaves copies of itself can evolve if some of those copies are able to produce more copies than others. While that seems like a logical statement, it ignores a critical feature of biological evolution.

Stated simply, it is not enough to make copies of oneself (with variations). The copies made must be accurate enough so that whatever features natural selection acts upon are copied correctly through generations. If the copying mechanism is 100% perfect, there will be no variations and no possibility for evolution. But if the copies are only 50% accurate, and only half the features of the parent(s) are retained in the offspring, it is quite likely that any phenotypic features recognized by natural selection to be worth selecting will be lost, and evolution of the fittest will not happen. And if the replication accuracy is poor enough, the new cell or organism might not even survive ("error catastrophe").<sup>5</sup>

How accurate must the copying mechanism be? In all modern life, the answer is roughly 99.9999%. In order