

# Book Reviews



## ENVIRONMENT

**BLUE PLANET, BLUE GOD: The Bible and the Sea** by Meric Srokosz and Rebecca Watson. London, UK: SCM Press, 2017. 208 pages. Paperback; \$32.00. ISBN: 9780334056331.

I have been anticipating this book in which two friends, Meric Srokosz and Rebecca Watson, bring part of the results of their “The Sea in Scripture” project together in the book *Blue Planet, Blue God*. You might think it would be a short book. What, after all, does the Bible say about the sea? It turns out, quite a lot!

The aim of the book is straightforward—to examine what the Bible says about the sea. However, in spite of the impression given by their typical British understatement, the authors really want to change our worldview. For most of us, looking out at the sea from a comfortable chair beachside or perhaps eating fine seafood at a quayside restaurant, the ocean appears to be monotonous—much of a muchness. Those who venture out on the ocean know differently, particularly those who don a mask and gaze at the wondrous beauty beneath its surface; the authors want us to share this perspective. They take us on a grand tour examining what scripture and science have to say about the 71% of our planet that is ocean. They challenge us to rethink how we view the ocean, and they show, in great detail and with theological rigor, that the Bible covers a multitude of sea-related topics which are of personal and global relevance. The authors pull no punches in pointing out where humans are to blame for the problems with our ocean. They call to account those unwilling to change comfortable lifestyles that destroy this natural resource. In spite of this, the book’s tone is hopeful, continually pointing to a God who cares for and has declared the oceans, along with all of creation, good.

The book reads more like a sea voyage than an airplane trip. Those hoping to get from point A to point Z quickly, will be frustrated. The authors take readers on a journey that draws from the Bible, science, history, poetry, music, and literature. Lengthy quotes will frustrate some. The authors compel readers to discover for themselves the broad relevance of the sea to the Christian life and the critical role Christians play in caring for our beleaguered seas. Chapter 6, “Coping with Chaos and Uncertainty,” illustrates this nicely. The chapter begins with a discussion of different uses of the word “chaos” in modern times and then explores human vulnerability through a poem and a hymn by Victorian hymn-writer William

Whiting. The science of chaos theory follows, leading from a story about an eleventh-century Viking and the 2004 Asian tsunami, and then to flooding and hurricanes in modern-day Britain and the USA. The authors present a discussion of El Nino weather patterns and impacts. They point out how vulnerable humans and the ocean are to these weather patterns. Srokosz and Watson then return to a biblical analysis of uncertainty among Semitic peoples. At this point, the reader is only halfway through the chapter! Long passages from the Psalms, Isaiah, Jeremiah, and Hosea help the reader to reflect on the fact that “the Bible affirms that God not only stills and confines the sea, but also stirs it up and makes it roar.” God is recognized as the Sovereign of the sea—the One in whom we can put our trust when faced with our own vulnerability and fear. The chapter ends with a stark reminder from Isaiah and Hosea that our sin has consequences both for other humans and for the sea.

Srokosz and Watson consistently challenge our ideas about the sea and perhaps even our faith. They state:

This book, then, touches on some of the most fundamental issues of our time, such as economics, migration, and climate change, but it also offers perspectives on some of the most enduring questions for humanity: those of meaning and purpose, of our place in the world, and the need to allay our fears and seek stability despite threats to the status quo.

Indeed, each chapter ends with a summary of the key messages and then delivers a challenge. Discussion and reflection questions help to unpack and personalize the challenge as well as suggest specific actions, lest the reader not come up with their own.

Returning to Chapter 6 on Chaos, the authors state that “the established order in the world is both dangerous and vulnerable; it cannot be taken for granted, yet through God it is ultimately sustained and overall God’s rule prevails.” They challenge us not only to trust in God’s rule, but also to recognize that much is not in our control. We are indeed vulnerable. We can embrace that vulnerability and even delight in it through experiences in the sea. Reflection and discussion ask us to reflect on the balance of chaos/uncertainty, God’s sovereign rule, and whether or not our own “order” might be another’s oppression. The action section uses Gaelic folklore to help us to understand, how hard action can be in response to what we have learned, before going on to encourage us to be pro-active in disaster planning/response and to curb behaviors which negatively affect the sea.

Some of the themes examined through these various lenses are awe and wonder, anthropocentrism,

human impacts, the need for restraint, the sacredness of the sea, chaos and order, vulnerability, consumerism, and poverty. The book does not attempt to be exhaustive and some problems which are presently a very hot topics, such as plastic pollution, are given little attention. Yet the main effects of humans on the sea – overfishing, climate change, and pollution – are all examined in sufficient detail and clarity for non-scientists to understand.

One of the key themes of the book is summarized in the concluding chapter:

Our exploration of the Bible has revealed that a key aspect of God's perspective on the ocean is his delight in his creation apart from any role we as humans may have in it. It has intrinsic value to him and was not created by him solely for the benefit of humanity.

This is an important truth that needs to be taught to both Christians, who can easily see the created world as the stage on which humans act and which provides for humanity, and to the professional conservation community which is increasingly framing nature conservation in instrumental terms. The ocean has value to God, irrespective of all it provides for us. A Rocha, a Christian conservation organization whose Marine Conservation program I direct, is seeking to live out this truth in caring for the ocean. I look forward to many discussions with volunteers, interns, and other scientists after passing them a copy of this book.

If we have a Blue God, how then are we as Blue People to live? The final pages of the book are an important call to action. In light of the science and the Bible, now what? The authors do not give easy answers, as there are none. As much as we should, except in special circumstances, get rid of plastic straws, this will not solve our ocean's problems. Their approach mirrors that of our work with A Rocha, in which both science and theology inform our praxis. The call is to a radical lifestyle that rejects consumerism, moves forward humbly, and is led by Christ's example of a life of self-sacrifice and love.

We need to live in harmony with God's purposes for his creation, mindful of the "sacredness" of the sea, and seeking not to overstep the limits set for us. It also means recognizing that there is no neutral ground: not making the lifestyle and attitude changes required is an active decision, entailing responsibility (and, yes, guilt), not a passive one. By doing nothing, we are directly contributing to the ruin of God's good earth.

Challenged yet?

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## HISTORY OF SCIENCE

**A HISTORY OF TECHNOSCIENCE: Erasing the Boundaries between Science and Technology** by David F. Channell. New York: Routledge, 2017. 286 pages, index. Hardcover; \$155.00. ISBN: 9781138285545.

This is an important book for anyone who is interested in philosophy of science and technology. Although not an easy book to read, it deals with how technology has changed science in the last 150 years into something quite different from what it was before. David Channell is well qualified to write on this subject. He has a BS degree in physics and a PhD in the history of science and technology from Case Western Reserve University. He has received funding from the NSF for research in this area and two Templeton Foundation grants, including a joint Templeton-ASA lecture grant in 1998. Channell is currently a professor of historical studies at the University of Texas at Dallas.

There have been many different attempts to describe a scientific method, but relatively few attempts to describe an engineering method. Many practicing engineers and practicing scientists view their disciplines as being rather different. One of the aims of *A History of Technoscience* is to understand how engineering and science interact today.

Channell's opening paragraph describes the theme of the book:

In the twenty-first century science and technology are coming to be seen as indistinguishable activities, often referred to by the term technoscience. It is difficult to characterize many of the developments that have come to form the basis of the modern western world as either purely scientific or purely technological. (p. 1)

For someone not familiar with the topic, the most important chapters are Chapter 1: Introduction, and Chapter 11: Epilogue, in which Channell shares his final conclusions. The vast majority of the book is historical, showing how technoscience has developed over the last 150 years. In the introduction he analyzes several different approaches to the relationship between technology and science. These perspectives, in the general order of their historical development include technology as dependent upon science; science and technology as independent; science as dependent upon technology; science and technology as interdependent; and, erasing the boundaries between science and technology.

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Channell considers “technology as dependent upon science” to be the oldest approach. He writes, “Since at least the second half of the nineteenth century there has been the widespread view, particularly among scientists and the public at large, that technology is simply applied science” (p. 7). I do not believe this attitude is common among engineers. A practice-based engineering (based on trial and error) has been around long before modern science was developed. It is fair to state that much of modern engineering is now taught using a strong science base. Channell does comment that

even if one accepts that technology is simply applied science, there is still considerable debate concerning what aspect of science is being applied ... to many engineers, applied science meant not the application of scientific theories, but rather the application of a scientific method to the useful arts. (pp. 8–9)

The approach that technology and science are independent of each other is based on historical observations concerning the differences between the cultures of practicing scientists and practicing engineers. A more modern approach is that science is dependent upon technology. The author expands upon this thesis in his historical chapters, which describe the development of what he calls “big science.” The interdependent approach accepts the idea that both science and technology have affected each other. Channell writes:

While the communities of science and technology share many of the same values, those values are reversed in their rank order. The natural sciences rank abstract, general mathematical theories in the highest position and rank practical applications lower; the engineering communities place practical designs in the highest position and rank theories lower. (p. 18)

He then describes a related perspective, which uses the term “engineering science” and an older meaning of science. “These engineers saw science as generalized facts gained through induction based on observation and experimentation rather than deduction based on abstraction and a priori idealization” (p. 18). This approach is consistent with the approach taken by ABET, which accredits engineering programs. They require each program to have a specific number of science/math classes and a specific number of engineering science classes.

The main thesis of the book is that many of these models of how science and technology interact are now outdated. Thus, “by the second half of the twentieth century the long-held distinctions between science and technology were beginning to disappear and, in the place of two individual disciplines, there emerged the new concept of a single integrated

realm of knowledge that some have labeled technoscience” (p. 21).

The author then develops this thesis through a series of historical chapters, with chapter titles displaying how Channell develops his thesis. The historical part of the book is divided into two parts: part one addresses the roots of technoscience; and part two, the era of technoscience. Chapters included are as follows:

Part 1: The roots of technoscience:

- Chapter 2 – From science-based industry to industry-based science
- Chapter 3 – Setting the stage for the military-industrial-academic complex: World War 1
- Chapter 4 – Setting the stage for big science: the interwar period
- Chapter 5 – The emergence of the military-industrial-academic complex and big science: World War II

Part 2: The era of technoscience

- Chapter 6 – The nuclear arms race
- Chapter 7 – The space program
- Chapter 8 – Electronics
- Chapter 9 – Material science
- Chapter 10 – Biotechnology

The historical chapters are quite detailed, and some portions of them may be difficult for some readers to follow. As a materials scientist, I most enjoyed the historical chapter about the creation of this discipline in the past 70 years. Materials science grew out of a combination of chemistry and metallurgical engineering. Channell makes an important point when he describes how materials science is different from earlier work:

Unlike earlier work in mechanical engineering, which focused on dealing with materials from the macro-level, the new materials science approach dealt with designing materials based on knowledge of behavior at the microscopic level. (p. 225)

I have lived through these changes in my career and agree with this conclusion.

In his epilogue, Channell argues that with the development of what he calls “the military-industrial-academic complex,” science and technology have merged into technoscience. We have moved beyond the traditional perspectives on science and technology.

It also goes beyond the old linear model in which universities provide basic scientific knowledge which is then applied by industry. The new model is an interactive model. An important element ... is



that the intertwining of universities, industry and government leads to situations where each one of the threads can take on aspects of the other threads. This can lead to a major transformation of the university ... At the same time universities are taking on the role of industry by capitalizing research ... the government is taking on the role of both private industry and universities by encouraging certain directions in research through funding and the creating of a regulatory environment conducive to certain types of research needed by industry. (p. 259)

While providing an excellent history of this issue, the author deliberately does not draw any conclusions as to whether

these changes will have positive or negative consequences and whether efforts should be made to encourage or discourage such changes. While the aim of this book has not been to answer such questions, such answers will not be forthcoming without some knowledge of the history of technoscience. Hopefully this book will provide a historical context in which a debate about the consequences of technoscience can take place. (p. 261)

I am disappointed that the author did not provide us with conclusions about whether the development of technoscience is good or bad. However, he has provided the ASA community with excellent background material about this topic. Hopefully future ASA conferences and *PSCF* papers will delve into the many faith-related aspects of the rise of technoscience.

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**THE WARFARE BETWEEN SCIENCE AND RELIGION: The Idea That Wouldn't Die** by Jeff Hardin, Ronald L. Numbers, and Ronald A. Binzley, eds. Baltimore, MD: Johns Hopkins University Press, 2018. 358 pages. Paperback; \$39.95. ISBN: 9781421426181.

As the teacher in Ecclesiastes declares: "Of the making of books there is no end and much study wearies the flesh." This word of wisdom applies doubly to the genre of books describing the interaction of science and religion. Religion and science matter and they seem to matter ever more in our current tribal society. Each month seemingly presents us with a new exemplar. *The Warfare between Science and Religion* is only the latest, but it is one of the more important and timely additions.

This book stems from a three-day conference held in 2015 at the University of Wisconsin, devoted to the so-called warfare thesis that pits religion and science in an interminable conflict. Twenty-two distinguished scholars, mainly historians and sociologists,

contributed to this volume: an introduction by David Livingstone and Mark Noll is followed by seventeen chapters, authored by some of the leading scholars in the religion/science discussions. The book is ably edited by Jeff Hardin, Ronald Numbers, and Ronald Binzley. One reviewer, Edward J. Larson, describes *The Warfare* as the "best single-volume collection of separate-author essays about the history of science and religion in the major modern monotheistic Western traditions" (back cover).

Approaches to this subject have been marred both by polemical intentions surrounding the warfare or conflict thesis and by an inability to grasp and cope with the complexity of the issues involved. What is clear is that a variety of interpretive frameworks have been utilized to depict the historical relations between science and religion. Despite various readings, the conflict model is by far the dominant one, both in the public's mind and for many professional scientists as well. For many hard-nosed proponents, science and religion reflect a tribalism that is set in stone. While fundamentalists cast science as a misguided or even malicious source of information, polemicizing scientists argue that religion is not just wrong or meaningless but also dangerous.

*The Warfare* is centered on the warfare thesis as classically formulated by Andrew Dickson White and John William Draper in the nineteenth century (chap. 1, "The Warfare Thesis," by Lawrence Principe). What follows is a close analysis of the viability of the warfare thesis as an adequate account of the relation of science and religion in many different historical and social-cultural contexts. First, we look back in time to the most celebrated warfare account, "The Galileo Affair" (chap. 2 by Maurice Finocchiaro). This is followed by an analysis of nineteenth-century developments in the United States, "Rumors of War" (chap. 3, Monte Harrell Hampton), by English "Victorians" (chap. 4, Bernard Lightman), and in "Continental Europe" (chap. 5, Frederick Gregory). Then, successive chapters describe the perspectives of different religious communities on the warfare thesis: "Roman Catholics" (David Mislin); "Eastern Orthodox Christians" (Efthymios Nicolaidis); "Liberal Protestants" (Jon Roberts); "Protestant Evangelicals" (Bradley Gundlach); "Jews" (Noah Efron); and "Muslims" (M. Alper Yalçinkaya). The last six chapters (chaps. 12-17) describe more-contemporary events and persons: "New Atheists" (Numbers and Hardin); "Neo-Harmonists" (Peter Harrison); "Historians" (John Brooke); "Scientists" (Elaine Howard Ecklund and Christopher Scheitle); "Social Scientists" (Thomas Aechtner); and "The View on the Street" (John Evans).

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It would take us too far afield to consider each individual chapter. Let me begin with some general comments. Many historians of science have considered the relationships between science and religion. David Livingstone, for example, has identified four relationships: conflict, competition, cooperation, and continuity. John Brooke highlighted three in his insightful book, *Science and Religion: Some Historical Perspectives*: warfare, separation or complementarity, and intimacy. And there are many other descriptions, including Ian Barbour's familiar quartet: conflict, interdependence, dialogue, integration (referenced by Lightman, p. 80). Indeed, there is a broad expanse of relationships on offer: conflict, compatibility, complementarity, harmony (even "discordant harmony"), integrality, and a more holistic model. The first four relationships find expression in one way or another in this book. The latter two are hinted at by Gundlach in his discussion of Bernard Ramm's position regarding the direction of a person's heart in its response to God (p. 179). [For a further delineation describing the gesture of Christian scholarship as complementarity, integrality, and holistic, see Robert Sweetman, *Tracing the Lines: Spiritual Exercise and the Gesture of Christian Scholarship*; Wipf & Stock, 2016, reviewed in *PSCF* 70, no. 2 (2018): 133–34.]

As one examines individual chapters, we encounter increasing complexity in the science/religion relation: The Galileo affair (according to Finocchiaro) "displays various conflicts between science and religion, but also various harmonies between them" (p. 39). English Victorians in Lightman's interpretation often held different conflict theses and frequently opted for a discordant harmony. He also warns us to be sensitive to nuances: John Tyndall pitted theology but not religion against science, a partial philosophical reconciliation not present in Draper's thinking (p. 76). Brooke gives us a superb survey of the past 50 years of historians' accounts of science and religion. Harrison draws on the "neo-harmonists," Rodney Stark, Denis Alexander, and Francis Collins, to display the difficulties in properly describing and understanding a person's take on the science/religion relation. In their chapter, Numbers and Hardin conclude that the new atheists display a remarkable lack of historical analysis in their arguments for the conflict between "organized religion" and science (p. 233). One of the salient contributions of *The Warfare* is to trace what occurred in various communities, including Jewish, Muslim, Eastern Orthodox, Roman Catholic, liberal and evangelical Protestant. In the last chapters in the book, sociologists analyze the response to and perpetuation of the warfare thesis by professional scientists (in different international contexts), by social scientists

(particularly sociologists and anthropologists), and by "people on the street."

A final observation: One needs to be concerned about the conflation of religion, theology, and faith that is present in some of the chapters. Clearly, they are not the same. But that is not always clear in the accounts presented. If one holds that religion is a way of life that people engage in with their full existence and at all times, while faith is one of a number of fundamental modes of being religious, a different way of telling the story follows. The socio-cultural endeavor of science can be religious. But could it ever be irreligious? If not, then the question becomes what religion or religions does scientific activity and practice bear witness to. That manner of relating science and religion is much different than seeing religion solely lived out in theology, ecclesiastical and parachurch organizations, or cultic groups. Perhaps there is an opportunity to go beyond trying to live in two worlds at once?

For readers of *PSCF*, this is a book worthy of reading, digesting, and emulating in its close analysis of science and religion. *The Warfare* will give the reader a trustworthy account of the most recent scholarship about the religion science nexus. As Livingstone and Noll conclude in their introduction, *The Warfare* may help "clear the smoke of a battle that has never really existed so that meaningful work can proceed" (p. 5).

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**THE GENE: From Genetics to Postgenomics** by Hans-Jörg Rheinberger and Staffan Müller-Wille, trans. Adam Bostanci. Chicago, IL: University of Chicago Press, 2017. 147 pages, including contents, acknowledgments, bibliographical references, and index of names. Paperback; \$25.00. ISBN: 9780226510002.

Each year, while preparing to teach a course in genetics, I pause when I reach the definition of "gene" in my lecture notes, wondering if the definition accurately captures the concept of the gene as it is currently understood. In *The Gene: From Genetics to Postgenomics*, science historians Hans-Jörg Rheinberger and Staffan Müller-Wille demonstrate that our understanding and characterization of genes is evolving and, furthermore, that "a simple and universally accepted definition of the gene never existed" (p. 4).

The changing concept of the gene is a common theme in genetics, frequently featured as a thread woven throughout textbooks and serving as a source of vigorous discussion among scientists. As a result, many

have noted the multitude of definitions associated with the term “gene”—a heritable unit factor that determines observable traits, a DNA sequence that carries instructions for making a protein, to name just two. This book is unique in its placement of these shifting concepts in a robust historical context. Readers are challenged to consider the ways that contemporary theories and technologies influenced conclusions drawn about the nature and function of genes at different moments in time.

Rheinberger and Müller-Wille describe their book as “a historical survey of the century of the gene.” Indeed, readers are taken on a chronological journey that begins in the nineteenth century with Charles Darwin’s theories about inheritance and ends in the data-rich postgenomic present. Along the way, the authors summarize the key findings of scientists that have challenged prevailing gene concepts, and they reference prominent science historians and philosophers of science as they consider the context of these findings and their influence on understandings of the gene. Throughout the book, the authors highlight techniques and technologies that were instrumental in advancing the field of genetics. From Mendel’s hybrid crosses, to cloning toolkits, to databases that enable storage and retrieval of entire genomes, technological innovations have made it possible for scientists to interrogate and uncover new aspects of the character of the gene.

In the opening chapter of *The Gene*, Rheinberger and Müller-Wille present the primary aim of their book: to reframe the potentially unsettling lack of clarity that characterizes our current understanding of the gene by examining the history of the gene concept and the dynamism that has surrounded this concept throughout the history of genetics.

Chapter 2 describes the various theories of inheritance proposed by nineteenth-century scientists that laid the foundation for the development of the field of genetics. In the next three chapters (chaps. 3–5), Rheinberger and Müller-Wille turn their attention to classical genetics. They describe Mendel’s elegant experimental system and findings and explore why their significance was not realized until many decades later. A review of the ways that the rediscoverers of Mendel’s work interpreted the result of crossing experiments, indicates that, even among the first generation of geneticists, a uniform gene concept did not exist.

Chapters 6 and 7 describe the transition from classical to molecular genetics and the technological advances that made this shift possible. Biophysical and biochemical techniques were used to identify

the chemical nature of the genetic material, decipher the genetic code, and uncover the cellular processes responsible for gene expression. The authors note that while the “molecularization” of genetics initially simplified the definition of a gene, it ultimately added layers of complexity to the gene concept. These chapters also explore the characterization of genes and technical objects and commodities as a result of the introduction of gene-editing technologies.

Chapter 8 examines the relationship between genetics, development, and evolution. Viewed through the lens of molecular genetics, critical linkages are found among these fields of study. Chapter 9 is devoted to a discussion of the postgenomic gene concept. Rheinberger and Müller-Wille suggest that in an era of epigenetics and complex systems biology, the role of the gene as the sole determinant of inheritance and its status as the fundamental unit of life have been deflated.

The book concludes in chapter 10 with a thoughtful discussion of the value of the gene concept in the postgenomic era. Though highly dynamic and lacking definitional clarity, the gene concept will continue to serve an important role as a device that prompts experimentation and thereby advances knowledge.

The last chapter is followed by a 20-page bibliography of history of science and philosophy of science references that will serve as an excellent resource for readers interested in further study. An index of names, found at the end of the book, enables readers to quickly locate mentions of individual scientists in the text.

The authors of *The Gene* assume that readers are familiar with genetics terminology and have a foundational knowledge of genetic mechanisms. Familiarity with ontological and epistemological considerations as they relate to the life sciences are also assumed. As a result, this book would not be appropriate for a general audience. [For a comprehensive and entertaining review of the history and future of genetics that is suitable for general audience, I recommend Siddhartha Mukherjee’s book, *The Gene: An Intimate History* (New York: Scribner, 2016)].

For those with an interest in the ever-changing field of genetics, Rheinberger and Müller-Wille’s book, *The Gene: From Genetics to Postgenomics*, provides a well-researched account of the history of the gene, and of the scientists and technologies that have continued to challenge and expand our understanding of the term “gene.” This book will also serve to inspire awe as readers have the opportunity to consider the ways



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that “each new meaning of the gene created an additional dimension along which life could be imagined to vary and unfold” (p. 4).

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**THE TANGLED TREE: A Radical New History of Life** by David Quammen. New York: Simon & Schuster, 2018. 461 pages. Hardcover; \$30.00. ISBN: 9781476776620.

Many ASA members have spent years and spilled metaphorical blood over this or that detail of the story of evolution and the origin of life, which we all agree is God’s marvelous creation. Well, wouldn’t it be good to have a book that highlights the debates not among onlookers to the field of biology, but among those actually working and publishing in the field? We now have such a book. *The Tangled Tree* covers humanity’s place in the created order of cellular life forms, stretching from the premolecular days of Ernst Haeckel to modern times, when we can quite literally read the instruction book of any and every kind of cell. David Quammen’s book is of interest to ASA members as it tackles one of the very biggest questions in biology: “What is the shape of the tree of life?” Such trees have been produced over the years, but the central character of this book, Carl Woese, claimed that he had discovered a more correct, truer tree than had been ever produced before, to the surprise of many in the field. Many believe that Woese deserved a Nobel Prize for his discovery, and yet, most people have never heard of him.

Quammen’s skill comes in bringing together key players and voices in the topic at hand and extracting revealing and key quotes in his clear paragraphs and short chapters. We are permitted to go behind the scenes with Quammen as he recollects his own learning experience. The fact that Quammen trained as a writer and not in science helps him render these insights in ways that not only are comprehensible to nonscientists, but are also helpful to biologists (such as me) who have significant background knowledge.

I recall teaching on the relationship between bacteria, archaea, and our own types of nucleated cells, and referencing Carl Woese (pronounced “woes”) and his colleague Norm Pace, who first identified the third branch of life now known as archaea, previously assumed to be bacteria based on appearance. It is no surprise within the life science field to be teaching material that was totally unknown during one’s own training, and this book serves to highlight the

pace of change. The 1970s seem like ancient history, and in a sense they are. However, it is still possible to interview primary players in the field, and so Quammen does a great service in stirring up these waters. As far back as I can remember, I have always emphasized to my students that the group that textbooks call “prokaryotes” is really not a “true” group, being made up of bacteria and archaea; that the archaea are in many key ways more closely related to humans than to bacteria. And so, using “prokaryote” is directly analogous to grouping butterflies, birds, and bats into a single group. Sure, it might at times be useful to have a group called “flyers,” but that name tells nothing of their true relationships, which is what biologists and scientists should strive to ascertain. Further, it creates new problems. Where do penguins fit? What about flying squirrels? Another topic of great interest to my undergraduate students is the concept of endosymbiosis: mitochondria once existed free-living in the bacterial branch of life’s tree; and at a time in the impossibly distant past they became symbiotically, irreversibly associated with another cell. As many biologists know, Lynn Margulis is credited with this big hypothesis, which was quite controversial at the time and was not readily accepted by the mainstream of scientists who favored other explanations.

So, what a pleasure it has been for me to peek behind the curtain and learn that it was not Lynn Margulis who originally had the idea of endosymbiosis, and to learn much more about the central character of the book, Carl Woese, who doggedly pursued the big questions of biology without getting lost in the minute details. Quammen spends the first third of the book setting the stage for Woese’s entry by a concise retelling of the discovery of the gene by Watson and Crick, and of Crick’s prescience in speculating that the sequences of long molecules (DNA, RNA, protein) might provide insights into ancestral relationships among living organisms. Yes, from the earliest days of obtaining sequence information, some forward-thinking scientists realized that the order of subunits within our long molecules, since they are inherited, provide a window on the past—a remarkable insight.

And so Quammen’s book is actually a book about molecular phylogenetics. It is a book about a field which provides, many would argue, a truer picture of how living species are connected to each other, based on inherited sequence information. It relates the story of how Woese and colleagues selected one particular molecule to focus on, and based on that choice, produced what Woese argued was the true tree of life with three ascending branches: bacteria, archaea, eukarya. And yet, this is a scientific

hypothesis, the truth of which will be decided on the evidence. And the evidence is, in some respects, confusing.

There is no doubt that the big tree with three branches is what you get using the large ribosomal RNA (the long molecule Woese selected), but in fact each gene has its own history, and trees do not work with the microbial world very well (that is the confusing part). I do not want to give away too much in this review, but Quammen's discussion of gene sharing among organisms is remarkably well done. Along the way he explores the truly "Lamarckian" aspect of the CRISPR system of bacteria and archaea, wherein they purposefully store part of their environment within their genome as part of a highly advanced (not at all primitive) microbial immune system. The final third of the book focuses on this phenomenon of horizontal gene transfer (HGT). It is hard to deny that such processes have contributed a tremendous amount to the human nuclear genomes we adore so much. But does this diminish our humanness? What does it mean to be human? What is a species? These questions are addressed only from a biological perspective in this book, and while some Christian readers may find this a limitation, Quammen appropriately focuses on scientific questions, not theological ones. The final section of the book is "E. Pluribus Human," which readers should realize is speaking simply of our biological origins, not our spiritual natures as described by scripture.

It is noteworthy that Carl Woese apparently believed in the existence of a personal deity at some level, even kidding his long-time atheist assistant that she might be blessed by "the God you don't believe in." As a working biologist, I am continually amazed at the amount of antievolution material produced by the Christian community. I realize that, for many, the term "evolution" equates with atheism, and I have been asked if I am a "Darwinist" multiple times, whereupon a lengthy discussion usually ensues. But much like the term "prokaryote," we really ought to use more precise language to avoid misunderstanding. Can we start to call this natural process what it is: biological evolution? It is science, neither a worldview nor a philosophy. It is genetic change over time. It is complicated, and we can now read the information as never before. The fact that our very cells record a history of how God has used the atoms and molecules (whose very existence we believe he upholds) to accomplish his ultimate ends, somehow with an openness and freedom, is a truly breathtaking realization.

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## SCIENCE AND RELIGION

**CHRIST AND THE CREATED ORDER, Vol. 2 of Perspectives from Theology, Philosophy, and Science** by Andrew B. Torrance and Thomas H. McCall, eds. Grand Rapids, MI: Zondervan, 2018. 304 pages. Paperback; \$36.99. ISBN: 9780310536086.

*Christ and the Created Order* is the second volume of "perspectives from theology, philosophy, and science." (The first volume was reviewed in the June 2019 issue of this journal.) As the title indicates, this collection of essays brings together distinctively Christian insights on the subjects of creation and science.

The selection was slightly more wide ranging than the first volume, and the quality and relevance of articles oscillated. Three or four seemed overspecialized and out of place for a broader interdisciplinary theological conversation, while others more directly addressed pertinent issues relating to Christology and the doctrine of creation.

Some of the narrow subtopics addressed, however, effectively enlighten readers to reconsider our understanding of "science," the "natural" world, and the nature of religion in general. For example, Murray Rae discusses one of Chopin's symphonies as a case study for the interpretation of real, meaningful phenomena, even though the "utility" of all the details that gave rise to the piece "cannot be proven" (p. 28). Various fields of knowledge, whether religion or otherwise, are providing an interpretation of a slice of our experience. We can debate meaning, but we cannot debate that there is more going on than we may be able to put to words. What we are "hearing" in the symphony of creation is *something* indeed.

The sciences contribute their expertise to examine and explain how the world is ordered; poets and visual artists and musicians help us see in a different light the complex interdependence of things; economists, political theorists, and social scientists give insight into the working of human culture and society, while historians provide a further means of contemplating the realms of human action and discerning the consequences of what we do. All these disciplines and more contribute to our understanding of the world. (p. 28)

Part of the distinctively Christian view of the world is that God in Christ is behind it all. All the above disciplines "go about their business under the assumption, repeatedly confirmed by experience, that the world does have an order and a coherence that is intelligible, at least in part, even if its ultimate basis in Christ



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is not seen or acknowledged by all enquirers" (p. 29). The claim that Christ is behind everything is rejected by many. "It is rejected by some who, for reasons of their own, simply refuse to entertain the possibility that theological explanation might have something to contribute to our understanding of reality" (p. 32). Such skeptics "do not see in Christ's healing of the sick, in his compassion for the despised, in the forgiveness he extends to sinners, or in his feeding of the hungry, any hint of the way creation itself is ordered" (p. 39). In this way, the hegemony of modern science (and scientism) is rightly questioned as not being as pluralist as it should be.

In an equally thoughtful article, Norman Wirzba masterfully connects the life and work of Christ to the big picture of cosmology and human purpose. As scandalous as it has always been to claim such, "... Jesus expresses in his daily, practical mode of life how life should be for all creation because his embodied life is the exact, material imprint of the divine power that daily creates the world" (p. 40). He later discusses the significance of how we might be able to reconceive the world in terms of a "field of verbs" instead of a "collection of nouns" (pp. 51-53), the latter being an outgrowth of Aristotle's immeasurably influential ontology. "A collection of nouns," Wirzba concludes, "much like a container of objects, stresses distinctions between things. A field of verbs stresses the entanglements of lifeways that in their development continually challenge, shift, and penetrate the 'borders' that keep things apart" (p. 51).

In the third chapter, Brian Brock revisits "sin" in light of modern scientific discourse: "Human sin is thus to be defined as moving back into a state of competitive self-promotion that was once nonmoral but now in the postlapsarian state constitutes a self-induced moral and religious deafness" (p. 72). Brian Curry then looks at the meaning of "the powers" in New Testament and theological discourse: "*So by 'powers' Paul means to name structures of the world that were at least to some extent part of a good creation but threaten to ruin our lives and life of the world more generally*" (p. 86, emphasis original). Why is this topic significant? "Without a robust doctrine of the powers, Christians can all too easily think that it is their responsibility to put forward a flat-footed theodicy, defending the status of the present world as really good even though the New Testament does no such thing" (p. 89). Curry then quotes from David Bentley Hart's *The Doors of the Sea* (a work on theodicy) and controversially concludes that "Evil" is not part of "God's good plan" and exercises no necessity upon the divine purposes in creation. It is "wholly parasitic, wholly unnecessary to the flourishing of all things in fellowship with God" (p. 90).

N.T. Wright then examines the cosmic implications of the incarnation. Similar to cases made by others (I am thinking of Daniel Migliore's *Faith Seeking Understanding*), Wright argues that

When the New Testament says that "all things were made through him," we don't start with a view of "how God made the world" and insert Jesus into that. We start with Jesus himself, as I have tried to do in this essay, and we therefore reflect on creation itself not as a mechanistic or rationalistic event, process, or "fact," and not as the blind operation of impersonal forces, but as the wise, generous outpouring of the same creative love that we see throughout Jesus's kingdom-work, and supremely on the cross. (p. 109)

The next few chapters comprise some technical and/or (in my opinion) somewhat off-topic articles (i.e., their relation to the book's theme is indirect or obscure). Then, readers are refreshed with Adams's more straightforward, clear, and realist article, "For Better or Worse Solidarity." As with her previous essay in volume one, a quick journey across provocative and interesting topics, from the process of psychological development at the hands of "neurotic adults" (p. 175) to the ethnic cleansing of Rwanda (pp. 175-76), re-centers questions about the basic nature of creation: "What God wants is for material creation to be as godlike as possible while still being itself" (p. 177). James K. A. Smith's article, likewise, zooms out to assess secularism at large (leaning on the work of Charles Taylor) and the real nature of "conflict" between "science and religion."

In a later chapter, Deb and Loren Haarsma turn the reader's attention toward the stars, themselves being in "Christ and the Cosmos." However one conceives of the Christ-stars relationship, it is clear how we engage the dark and dangerous elements:

Jesus Christ gives us the ultimate example of how we should respond to the wild, destructive aspects of creation when they cause suffering: Jesus calmed the storms and healed the sick. He worked to ease the suffering of others, whatever the cause of their suffering. We are called to do the same. (p. 233)

Greenway and Barrett then discuss the nature of religious belief from a cognitive and evolutionary-psychology perspective, relating Calvin's *sensus divinitatis* to such ideas as agency detection and belief in the supernatural. The book concludes with an article on what it looks like, concretely, for the Christian to practice science.

In my reading, this second volume was not as engaging as the first, and felt as though several contributions were little more than (needless) academic recycling. However, *Christ and the Created Order* does contain thoughtful contributions for the doctrine of

creation and Christology. Readers can expect helpful elaboration on what a first-century Jewish carpenter has to do with the universe, nature, and the meaning of life.

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**THE EMERGENCE OF SIN: The Cosmic Tyrant in Romans** by Matthew Croasmun. New York: Oxford University Press, 2017. 190 pp. + notes, references, and index. Hardcover; \$74.00. ISBN: 9780190277987.

SIN is a person, a being, an entity exercising tyrannical dominion over all human persons since the dawn of humanity's emergence. This is the provocative claim that Matthew Croasmun, Associate Research Scholar, Director of the Life Worth Living Program at the Yale Centre for Faith and Culture, and Lecturer of Divinity and Humanities at Yale University, advances in his book *The Emergence of SIN*. Based on his doctoral dissertation (which won the 2015 Manfred Lautenschläger Award for Theological Promise), Croasmun masterfully weaves together interdisciplinary research from the fields of biblical studies, theology, ancient Greco-Roman culture, and scientific and philosophical contributions to emergence theory. He puts forth a case that is stimulating, enlightening, and, for the most part, clear and convincing, with important implications for theological anthropology, ecclesiology, ethics (social and personal), politics, and the dialogical, mutually enriching relationship between science and Christian faith.

The context giving rise to his thesis is Paul's discussion of sin in Romans 5–8, and more specifically Paul's personification of sin as Sin, a cosmic agent exercising power and control over the human beings it enslaves. His question is whether "Sin as a cosmic agent" has "a basis in fact" for Paul. He then surveys three ways of answering this question in modern theological literature.

The first option, represented by Bultmann and existentialist interpreters, is that personified Sin is a literary device, not to be taken literally but pointing to a deeper truth that confronts the reader with questions about human existence. The claim is not so much that Paul intentionally employs personification in strictly a literary sense, but that modern readers (who know they must separate myth from kerygma) must read Paul this way to read the text responsibly (reasonably). This idea is the result of "Bultmann's assumption that Sin as a cosmic power does not correspond to 'the actual state of affairs'" (p. 8), whether

or not it has a "basis in fact" for Paul. Bultmann is suspicious of mythical interpretations not only for epistemological reasons, but also for ethical reasons. He is concerned to preserve the culpability of the sinner (emphasizing the point of decision), which he believes is compromised by accounts that lean toward cosmic determinism. Thus, Bultmann argues that Paul's position is that sin *came into the world by sinning*; it is inherited socially, not biologically or spiritually. "Original sin" is a pre-Pauline gnostic myth that Paul accommodates.

The second option, represented by Käsemann, is that by personifying Sin, Paul is claiming that human beings are under the dominion of real spiritual powers that transcend human beings ontologically. For Käsemann, Paul's mythological language cannot be fully explained away; it is not "just" metaphor. Quoting Käsemann, a person "is in the grip of forces which seize his existence and determine his will and responsibility at least to the extent that he cannot choose freely but can only grasp what is already there" (p. 11). Thus, for Käsemann, Sin "is a very literal demonic power" (p. 12). Croasmun points out that both Bultmann and Käsemann make legitimate points and that the biblical text has room for elements of both views. Paul makes two claims that seem paradoxical to the modern reader: sin is both something that human beings commit (thus, confirming Bultmann) and yet Sin is a transcendent entity, acting upon humans who are thus enslaved (as per Käsemann).

A third option, represented by various liberation theologians, is that personified Sin refers to social and political structures that perpetuate evil and oppression in human societies. For Oscar Romero, such structures "are sin" because they produce the characteristic fruit of sin, namely death. Elsa Tamaz points out, in light of Romans 7, that "sin needs the law to hide its wickedness with legitimacy." As such, Sin is both "a personified and enslaving power" and a structure "constructed by unjust practices of human beings" (p. 16). Similarly, according to José Ignacio González Faus, "When human beings sin, they create structures of sin, which, in their turn, *make human beings sin*" (p. 16, emphasis original). Juan Segundo likens Paul's language of Sin to the demonic in the gospels, specifically in that sin "is a condition that subdues and enslaves me against my own will" (p. 17). Yet, these powers operate through sinful social and political structures. For Bultmann, Sin is a myth pointing existentially to the culpability of the individual and leading the importance of individual decision, and, for Käsemann, Sin is a spiritual entity influencing individual human beings; for liberation theology, Sin points to the fact that individual human

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sinners participate in corporate structures of sin, not only committing sin but also becoming socially conditioned by such structures to commit sin.

Croasmun touches briefly on two attempts to synthesize individual-corporate and mythical-existential dimensions of Sin (Jerome Murphy-O'Connor and Derek Nelson), but he finds that both lapse back into reducing one side of the duality (e.g., individual or corporate) into the other (pp. 18–20). These attempts at synthesis share the same basic problem of all previous proposals: they all struggle to articulate an adequate ontology of social entities.

From his survey of the three main options, Croasmun argues that each makes important contributions and that all three can fruitfully describe Romans 5–8 and coexist, but only with the addition of an appropriate ontology that they all currently lack. What is needed is not simply a middle ground (an attempted synthesis or compromise), but “a both-and solution, an ontology that permits us to conceive the ‘actual state of affairs’ in a rich enough way to hold the various entities and various agents in Paul’s language together, all at once” (p. 21).

In the next two chapters of the book, Croasmun turns to emergence theory to help him construct an ontology of social entities that can fruitfully make sense of Paul’s personification of Sin in the “both-and” kind of way just described. Thus, for Croasmun, emergentism “provides the framework we need to hold together the multilevel picture of Sin which Paul paints for us” (p. 23).

In chapter 2, Croasmun offers a fairly standard account of emergence theory as it has arisen in several scientific and social-scientific disciplines. As is common, he presents emergence as a theory that opposes various forms of reductionism (ontological, methodological, epistemic) and substance dualism (mental and vital). Regarding the latter, he writes that for emergentists “there is only one kind of stuff in the universe; there are no special ‘mental’ or ‘vital’ substances ... [on] this point, emergentism and reductionism agree” (p. 28). Moreover, he claims that “ontological monism—the belief that the universe consists of only one kind of substance—is scientific (and, to a lesser degree, philosophical) orthodoxy” (p. 27). This naturalism, it seems to me, is overstated. For one thing, while it can accurately be said that monism tends to be popular at the moment, it is quite another thing to claim that it represents a new orthodoxy (Croasmun cites John Searle as a philosophical authority, but there are important philosophers who remain convinced of dualism—for example, Richard Swinburne, Alvin Plantinga, and Eleonore Stump).

In addition, it is not clear to me precisely how emergence theory definitively rules out nonphysical substances as such (i.e., as part of one’s overall worldview, including metaphysical considerations). At the very least, orthodox Christians must affirm that some nonphysical entities exist—most importantly, God, the divine nature of Christ, and angels—and that these nonphysical entities can interact with the physical world (though we do not understand how, given that we have no unmediated access to God’s essence or purely spiritual entities). Perhaps Croasmun only means that human beings, more specifically, are composed of “one kind of stuff.” Well, perhaps. But I do not see how emergence theory can know this so confidently. Of course, it is appropriate that, in the context of scientific study, emergence theory is researched within the confines of methodological naturalism; but it also seems obvious that within these confines, emergence theory will necessarily bracket out non-material factors and explanations such as souls and other immaterial substances or powers. But the outcome here is determined in advance by the method, not by the nature of Reality as such, which is only partially accessible to the methods of science. I find the critical realism of Christian Smith (see his *What Is a Person?*), and the epistemic humility it entails, instructive on this matter: we must hold together as related, but not conflated, what we personally experience through our senses (the empirical), all that happens (the actual), and all that is (material and nonmaterial; the real). “Thus, what we observe (the empirical) is not identical to all that happens (the actual), and neither is identical to what which is (the real).”<sup>1</sup> If we limit our methods of inquiry to the first two domains, philosophically not just scientifically, then we remain open to the charge of reductionism.

Croasmun continues chapter 2 with a survey of the history of emergence theory, including a lucid and helpful discussion of supervenience, downward causation, and “weak” and “strong” forms of emergence. The chapter includes an incisive case study to show how an emergent account of social entities illuminates the insidiousness and complexity of racism in America, thus providing theoretical and scientific substance to the claim that racism can exist without racists.<sup>2</sup> Sound provocative and paradoxical? Let this be a teaser to entice you to read his insightful analysis.

In chapter 3, Croasmun employs emergence theory in order to rethink the meaning of “person” such that it can be capable of describing entities that transcend individuality. He argues that since corporate entities can exercise “agency” and demonstrate the operations of “mind” (superorganisms and group minds—e.g., bee hives, altruism operating at the group level, insti-



tutional persons, multi/many-authored scientific experiments), they can legitimately be considered as “persons” in some sense, from an emergentist perspective. Croasmun’s discussion is fascinating and illuminating in many ways, pushing at the boundaries of individualistic and atomistic notions of personhood. However, questions remain. Croasmun describes complex corporate entities as persons; why then does the evil we experience from corporate entities seem so impersonal? And it is precisely the *impersonal* nature of the evil (whose source we can broadly identify but not specify) that makes it so dehumanizing. I also wonder if superorganisms or group minds that are emergent from individual human beings bear the image of God. Do they possess inherent and inalienable dignity? Human rights? Is the ontology of a social structure as real as human consciousness (or the human “self/soul”)?

In chapter 4, Croasmun seeks to provide an emergent account of Sin in the book of Romans to address the question,

How does this understanding of the self reframe not only our questions about the personal language Paul employs with regard to [Sin], but also our questions about the overlapping agencies at the individual, social, and mythological levels? (p. 103)

He suggests that emergence illuminates what Paul signifies when he describes Sin as entering the world (Rom. 5:12), increasing (5:20), exercising dominion (5:21; 6:12,14), producing desire (7:8), and reviving (7:9) and dwelling in the bodies of sinners (7:17, 20). It does so as an emergent person, specifically a cosmic tyrant that enslaves the human race. This account is emergent, because “Sin not only gains power over people’s lives through their cooperation, but also, Sin depends ontologically on this cooperation, as Sin’s supervenience base consists precisely of this cooperation” (p. 111). Co-opted by Sin, human beings are drawn collectively into constituting the Body of Sin (“in Adam”) that Paul contrasts with the Body of Christ, another emergent entity created by the redemptive and sanctifying work of Christ and the Spirit and constituted by the supervenience base of redeemed human persons. Thus, to summarize the effects of Sin’s emergence: “The primary role Sin plays in the cosmic drama of Romans is that of exercising dominion over the members of its Body” (p. 124). In the final pages of the chapter, Croasmun returns to the issues of race, the law, and the dominion of Sin, as well as a brief discussion of original sin and the transmission of sin. His proposal is that only an emergent approach that accounts for the ontology of Sin at the individual, social, and mythical levels is capable of adequately explaining the mechanism of the transmission of sin in a way which eludes

Augustinian, Liberal/Ritschlian, and scientific/epigenetic proposals.

In the final (and probably, most controversial) chapter, entitled “Sin, Gender, and Empire,” Croasmun seeks to specify in greater detail the identity that Paul attributes to Sin in Romans. In dialogue with first-century Greco-Roman scholarship (especially concerning devotion to the goddess Roma) and gender and post-colonial theory, Croasmun presents Sin, or Hamartia, as a goddess that subjugates and dominates human beings in a way that violates the “natural” order of things (sexual connotations of tribadic penetration are present here, in line with the kind of “unnatural” sexual expression Croasmun thinks Paul has in mind in Romans 1). Thus,

Paul exploits the identification of effeminating conqueror and effeminate conquered in Roman imperial ideology manifest in tribadic Roma (that is, Roma-read-as-tribas). The implication is this: perhaps the imperium of Roman ideology is not the paradigm of an impenetrable masculinity, but rather the natural consequence of greater and greater degrees of enslavement to feminine desire. (p. 165)

In contrast, Paul, through parody and irony, presents Christ (via the cross) and the life of Christ’s Body (the church) as subverting this oppressive vision of (apparently) successful worldly power.

Ironically, it is within this effeminate Body of Christ that true masculine self-mastery is possible ... The effeminate Body of Christ delivers what the tribadic Body of Hamartia could not: mastery of the passions (Rom. 6:12, 13:14), the renewal of mind (12:2), and the establishment of imperium (5:17). Obedience in imitation of the “dominated,” “effeminate” Christ yields everything that the masculine Roman ideology was supposed to deliver. (p. 170)

It is difficult to know what to make of Croasmun’s final chapter. On the one hand, he offers an interesting and creative (too creative?) case that Paul accommodates Roman mythology (combining religious and sexual themes) as a subversion of Roman imperial ideology. On the other hand, he appears to assume a very Roman (not Jewish) audience for Paul’s readership. For example, this reading seems quite disconnected from the rest of the canon generally and the Old Testament and its own ancient context in particular (he seems to interpret Paul as reading the Old Testament exclusively through Philo and other select Hellenistic sources). It also leaves unaddressed the overarching concerns of Romans, especially the relationship between Jews and Gentiles and the resolution of God’s covenant promises given Gentile inclusion. I am left wondering how Croasmun’s arguments on Sin, gender, and empire fit within Paul’s broader purposes and narrative in

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Romans. I raise these concerns tentatively, leaving their adjudication to experts in New Testament and Pauline studies.<sup>3</sup>

Croasmun's aims in *The Emergence of Sin* are ambitious and, by and large, successful. The book invites and stimulates interdisciplinary engagement and discussion from scientists, social scientists, biblical scholars, theologians, and cultural critics. Perhaps most helpful is the clarity, lucidity, and accessibility with which Croasmun presents emergence theory (I plan to assign one of his chapters to my theological anthropology students), both in its own right and as insightful and illuminative in drawing out more fully than past interpreters the full significance of Paul's personification of Sin in Romans. This, in turn, allows for incisive analysis and critique of social evils, such as racism, going beyond approaches that fall into reductionism due to their inadequate (or lacking) ontologies of social entities. While I have reservations about some of the claims Croasmun makes as discussed above, I heartily recommend his book to all *PSCF* readers and look forward to seeing more critical engagement from biblical scholars.

## Notes

<sup>1</sup>Christian Smith, *What Is a Person? Rethinking Humanity, Social Life, and the Moral Good from the Person Up* (Chicago: University of Chicago Press, 2010), 93; cf. 90–98 for the larger discussion.

<sup>2</sup>Eduardo Bonilla-Silva, *Racism Without Racists: Color-Blind Racism and the Persistence of Racial Inequality in America*, 3rd ed. (Lanham, MD: Rowman & Littlefield, 2010).

<sup>3</sup>Scot McKnight, for one, is not convinced by Croasmun's final chapter (especially his presentation of Sin as Roma-tribas), though he is quite impressed with the first four chapters of the book. See his review, posted on his blog on June 11, 2018, <https://www.patheos.com/blogs/jesuscreed/2018/06/11/sin-as-tyrant/>.

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**COSMOLOGY IN THEOLOGICAL PERSPECTIVE: Understanding Our Place in the Universe** by Olli-Pekka Vainio. Grand Rapids, MI: Baker, 2018. 224 pages. Paperback; \$26.99. ISBN: 9780801099434.

There has been a growing market for books that discuss the intersections of science, theology, and philosophy, as evidenced by the popularity of writers such as Paul Davies and John Polkinghorne. Writing about the intersections of these apparently disparate fields is a true challenge that should not be taken lightly, and requires honesty about one's limitations in learning about the fields in which one has not received vigorous training. In *Cosmology in Theological Perspective: Understanding Our Place in the Universe*, Olli-Pekka Vainio makes an attempt to contribute to this rich field. The intention and desire

to understand the study of science from a theological perspective is clear from the onset. However, a careless approach to studying science and the lack of humility in subjects for which he has not deeply studied in the traditional sense results in a jarring and unsatisfying conclusion.

The book begins with an overview of the history of the Western concepts of cosmology. Vainio focuses primarily on the Judeo-Christian perspective that shaped the understanding of the universe in the ancient world. Additional pagan viewpoints are occasionally brought in; however, the main focus is first on Jewish philosophical thought and later on a Christian perspective. Vainio continues this discussion of the philosophical/theological influences on science through the modern era, discussing periods of conflict such as in the time of Galileo and identifying instances such as Newton's discoveries, in which the drive for scientific knowledge has furthered the pursuit of a more complete theological understanding of the universe. These chapters are surprisingly thorough for their length and cover the key points for those who are interested in the history of Western science. It is clear that Vainio has studied scientific history and theological history of the Western world deeply. These chapters could have benefited, however, from more comparisons to other theologies that drove ancient discoveries.

After this history, Vainio abruptly switches to the real purpose of the book, which is to examine theological perspectives on astrobiology and questions of life on other planets. Here his lack of scientific study is evident. Vainio includes a discussion of the multiverse, proposing that in a reality in which every possibility is its own universe, there would be many with and without life. These would include evil universes that are antithetical to the notion of a good God. This discussion is intertwined with discussions of fine-tuning and the Drake equation for the improbability of a space in the universe having the right conditions to sustain life.

After discussing these theories, Vainio questions the Christian theological perspective on astrobiology, primarily using C. S. Lewis's works of fiction to describe the Christian perspective. His insights on the Christian perspective on astrobiology are certainly fascinating, but they are not novel. He is in line with most Christian scientific organizations, Christian philosophers, and theologians, concluding that the existence of alien life does not preclude the existence of the Christian God. Nor does it pose problems for Christology. The primary example given for this comes from C. S. Lewis's space trilogy, with beings at different stages of pre- and post-Fall,

each with a unique revelation of salvation from the one God. Vainio concludes that Christians should approach the study of science and theology with a sense of awe and an awareness of what is not known. This is an unnecessary conclusion as most scientists and theologians in the field, Christian or otherwise, take exactly that approach. His statement reveals his ignorance toward what it means to pursue scientific study. Perhaps this statement was intended for readers lacking in both scientific and theological academic pursuits, but this would not be in line with the book's apparent intended audience.

This book suffers from being mistitled. While it is true that the definition of cosmology in a literary sense includes the human perception of the totality of knowledge, most modern readers will think of the scientific field of physical cosmology. This is the scientific study of the origins and ultimate fate of the universe, which are typically not studied from a life science perspective. On the topic of scientific physical cosmology, Vainio says very little. As a physicist, looking forward to expanding my understanding of philosophy relating to my field, I was disappointed. It is clear that the main purpose of this book is to discuss the philosophical implications of astrobiology, another deeply important and nuanced field. A more accurate title, emphasizing the astrobiology focus, would have set a better perspective and drawn the intended audience.

While there are many minor issues with this book, the most grievous is the author's clear lack of scientific understanding. In analyzing different scientific theories such as the multiverse, Vainio cites primarily science philosophy books that have summarized these papers. There is no sense that Vainio has read the original research or done the equational analysis needed to deeply understand the physics theories that he is attempting to discuss. I am reminded of reading works by William Lane Craig, such as *Theism, Atheism, and Big Bang Cosmology*. In this work Craig has rightly been criticized for having a clumsy grasp of the physics for which he is trying to offer philosophical perspective. The difference is that Craig is deriving his physics knowledge from original scientific sources and makes a valiant attempt to wrestle with the theories and equations. Vainio does no such thing. All of the science Vainio presents in both the fields of physical cosmology and astrobiology is coming from science philosophy or popular science books. This is not an acceptable substitution for learning scientific theories at the level needed to offer insightful analysis. The reader is left with the perception that he does not have a real understanding of the science, and as a result most of Vainio's conclusions are weak.

The book, despite its flaws, does have some redeeming qualities which some readers may find beneficial. The summary of the western perception of universal understanding is surprisingly thorough for its short length. Those who are fans of C. S. Lewis and his writings on theological issues of astrobiology in his fiction works will appreciate how these discussions provide a guiding force in the philosophical analysis of extraterrestrial life in this book. This may be an interesting read for those pondering the implications of life outside of Earth from a somewhat Christian perspective. The discussion on Christology and astrobiology is an effective counter argument for anyone (secular or theistic) who holds the belief that the discovery of extraterrestrial life would compromise Christian belief. These sections alone may make it worth a skim. However, with the wealth of available books on the topics of science and faith as well as on the Christian perspective on astrobiology, this one falls flat.

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**READING GENESIS AND MODERN SCIENCE: A Study Guide** by Frank De Haan and David De Haan. Grand Rapids, MI: Credo, 2018. 112 pages. Paperback; \$9.99. ISBN: 9781625861177.

*Reading Genesis and Modern Science* is a relatively brief work produced by a father-son team of Christian chemists. Both have earned PhDs and have spent their careers teaching, researching, and ministering among college students at major universities. One is now retired from Occidental College in Los Angeles and the other is working at the University of San Diego. The authors confess a biblically based Christian faith, with deep roots in the Reformed tradition, and a confidence that modern conventional science is not at odds with the authority and truth of scripture. A love for the church and for God's natural creation prompted the project.

The book is intended to be used as a study guide for Sunday School classes or small group discussions to introduce scientific topics with which many Christians struggle. The authors acknowledge that there are risks on either side of positions taken on these topics. Taking an overly skeptical approach to science may lead to rejection of good science and loss of benefits that progress in those fields could bring. On the other hand, rejecting parts of the Bible that seem inconvenient may result in an anemic, ineffective, and misdirected faith. With the risks in mind, their position unabashedly favors an embrace of scientific findings related to the age of the earth, evolution of life including humans, and human-induced or exacerbated climate change.



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The book's stated objectives are to appreciate the strength of scientific evidence; critique young-earth creationist methods; utilize alternate ways to understanding Genesis; express why this really matters; understand the causes and seriousness of climate change; and consider how to be stewards of the earth.

The book is divided into eight lessons, with short descriptions or vignettes designed to facilitate discussion. The authors take a novel approach of shifting a significant portion of their own arguments to the back of the book. This final section, "Answers and Comments for Discussion Questions," fills the last one-third of the book.

The strengths of the book, considering its purpose, start with its relatively small size. The book is not an intimidating tome on the subject of science and faith. It is not intended to be a thorough defense of the chosen topics, but to be a starting point for discussions. Participants interested in more-thorough coverage of subjects are directed to other sources. Descriptions of scientific understanding and biblical hermeneutics are generally accurate, though oversimplification in some places is an inevitable artifact of the book's brevity. The tone of the book attempts to draw participants together in discussion rather than to preach, though the authors do make a strong case for their viewpoints.

The brevity is also a drawback, given the complexity of the subjects addressed. Readers or group leaders looking to go deep with a discussion group may find the material falling short of expectation, with some lessons less than two pages in length leading up to the questions. Given the beginning of the book title, *Reading Genesis ...*, readers might also expect more discussion of the Genesis text than is found. Chapters do ask readers to consider the meaning of many Bible verses, though mostly verses outside Genesis. If using the book in a Sunday School setting, leaders will need to forewarn participants that questions dealing with specific verses are saved for lesson three and beyond. Finally, while the questions are good, they are not always obviously tied to the stated subject of the chapter.

Lesson one covers plate tectonics. Readers are provided with a brief history of Wegener's theory of continental drift and its eventual confirmation based on alternating bands of iron-mineral orientation on the ocean floor. The lesson ties in an explanation of how earthquakes happen, and even how human activity can cause smaller earthquakes in some parts of the world. There is no biblical discussion in this lesson, though questions ask participants to think about whether earthquakes started only after sin.

Lesson two focuses on dating. A simple description of radioisotope dating is provided, with a good example of a method scientists use to determine the starting composition of minerals being dated. The lesson does not address the challenges raised by young-earth advocates or how scientists respond to those challenges. Apparent conflicts with biblical ages is saved for later chapters.

Lesson three covers the age and origin of the universe. This is a short chapter, with fewer than two pages of discussion leading into the questions (though the "Answers and Comments" section at the end offers more). One example of a method for estimating the age of the universe is provided, based on the current position of galaxies in the universe and the rate of expansion. Questions begin to draw participants into scripture here, addressing subjects such as the understanding of the original audience and whether God speaks through his natural creation.

Lesson four concentrates on the question, "Where Does the Idea of a Young Earth and Universe Come From?" The authors provide a brief history of modern thought on the age of the cosmos, noting that many conservative theologians of the 1800s did not consider Genesis to constrain the age of creation. Half the lesson is an extended quote from *The Bible, Rocks, and Time* by Davis Young and Ralph Stearley. Questions ask participants to consider whether science and faith have always been in tension and why some scientists try so hard to dismiss God.

"An Alternate Way to Understand Early Genesis, Especially Genesis 1" is the focus of lesson five. This lesson draws largely from John Walton's work in *The Lost World of Genesis One*. A brief case is made that Genesis was effectively a love poem: God telling God's people that they need not fear darkness, or the sea, or monsters, or the unknown, for he has made the creation to function for their benefit. This lesson is the first time participants are asked why some feel the Genesis story must be taken literally and whether there was death before sin.

Lesson six explores "Why This Really Matters." The authors reiterate material from lesson three, reminding participants that insisting on a young earth in spite of overwhelming evidence can place stumbling blocks to faith in the path of Christian youth and adults considering the Bible. They also note that some powerful apologetic arguments are undermined by the young-earth position. Questions range from exploring why people believe in a multiverse to whether God could have created by evolution.

Lessons seven and eight both focus on "Topics for Further Study and Discussion." The seventh chapter

probably should have been titled “Climate Change and Christian Stewardship,” as this is the subject addressed. An overview is provided for the science of human-induced climate change, how the discussion is often derailed by political polarization, and what we should be doing as stewards of God’s creation. Some will argue that the acceptance of human agency in the earth’s warming trend is overstated, though a good case is made for seeing ourselves as caretakers of the earth, rather than simply as users. The final chapter probably should have been wrapped into the previous one, for it continues the subject of stewardship. The lesson is just two questions, both tied to climate change. An appeal is made for churches to be more active in discussing the impact of human activities on the earth’s climate, and recommending active participation in solutions.

I recommend the book for groups already comfortable with the possibility that science may have something to say about our understanding of scripture or earth stewardship. It will not be as useful for groups looking for a strong scriptural defense before giving science an ear.

*Reviewed by Gregg Davidson, Professor and Chair of Geology and Geological Engineering, University of Mississippi, Oxford, MS, 38677.*



## SOCIAL SCIENCE

**MINDS MAKE SOCIETIES: How Cognition Explains the World Humans Create** by Pascal Boyer. New Haven, CT: Yale University Press, 2018. 376 pages. Hardcover: \$30.00. ISBN: 9780300223453.

Encompassing updated research findings from evolutionary anthropology, history, economics, and social psychology, Boyer has embarked on an arduous and audacious task to provide psychological and cognitive underpinnings of a wide range of human social behaviors. Within the framework of evolutionary psychology, Boyer frequently provides comparative as well as historical accounts of human social behaviors to explain how such behaviors have evolved. While doing so, Boyer emphasizes the importance of cognitive underpinnings of social behaviors and explains how cognitive systems played a role in shaping and influencing various social behaviors.

Boyer suggests that at the core of understanding various social behaviors lies the functional capacity of human mind. This implies that we need a set of cognitive capacities or detection systems that enable people to extract information from the social world—termed as the “intuitive inferences systems.” Boyer argues that there exist a plethora of these intuitive inference systems shaping, guiding, and direct-

ing cognitive processes of information pertaining to specific social contexts. These intuitive inference systems share some common properties: (1) they operate outside consciousness; (2) they are specialized; and (3) the operation and function of these systems can be best understood from the evolutionary perspective. Under such assumptions, Boyer presents how these systems operate and function in group formation and conflict (chap. 1), junk culture, including odd belief, rumors, and conspiracy theory (chap. 2), religion (chap. 3), family (chap. 4), societal cooperation and justice (chap. 5), and human society (chap. 6).

In the first chapter, Boyer focuses on the operation and function of the cognitive system in group identity and group formation. He begins the chapter by describing one’s inherent tendency toward group formation and antagonism toward out-group members (group conflict). Coalitional psychology emerged to understand the psychological and cognitive underpinnings of human alliance that enable people to form a group. Cognitive systems shape and reinforce the coalition by playing a vital role in recognizing in-group members in order to build solidarity and identifying out-group members based on accent and phenotype. For example, race is one of the most salient and explicit ways to predict social alliance. Furthermore, the system makes implicit statistical estimations of different out-group members, which have significant impacts on people’s physical health as well as attitude. As such, one’s survival and well-being hinges upon group cohesion and continuity, and cognitive systems play a vital role in group solidity and conflict.

In the second chapter, Boyer focuses on the functional role of cognitive processes involved in seemingly unreasonable and odd belief with little value—termed “junk culture.” In chapter 3, he defines religion as a subset of supernatural concepts systematically structured and codified. In light of evolutionary psychology, religion is adaptive and enhances fitness by promoting one’s commitment to a group and cooperation with others. Boyer proposes three cognitive representations of religion: (1) an interesting fiction; (2) a way to cultivate spiritual self; and (3) a way to promote group solidarity and inter-group hostility.

In chapter 4, Boyer presents the cognitive computation underpinning sexual preference, identity, and behavior. Sexual psychology has heavily relied on the theory of evolution, which is supported by a wealth of evidence. However, according to Boyer, this explanation also poses a challenge because the notion of fitness is difficult to measure and it takes a

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long time to evaluate its effect. As a result, people are more likely to rely on cognitive proxies to observe one's adaptability to the environment. For example, we have specialized learning systems that allow us to compute a kinship index, a measure of relatedness, to avoid incest.

In chapter 5, Boyer examines cognitive capacities involved in cooperation and fairness. Cooperation relies on cognitive capacities to keep track of previous social interactions with different partners for future reference. Such cognitive capacities enable people to remember partners who make fair deals for future reference as well as noncooperators for the purpose of inflicting punishment. In addition, these cognitive systems provide intuitive understanding of fairness, justice, and distribution, which shape people's attitudes and behaviors. Chapter 6 then addresses how people evolved to live in societies without fully understanding the underlying mechanisms of society. Boyer borrows the term "folk society" and expands it to describe the layperson's understanding of how societies work, what constitutes societies, and how these components are related.

The underlying assumption of Boyer's argument is that the human mind is "an efficient learning machine" (p. 67) that is capable of detecting useful information in the environment. Following the framework of the evolutionary theory, Boyer assumes that the human mind is functional and adaptive to enhance fitness. However, Boyer often encountered evidence that suggested otherwise. For example, people readily change their opinion to conform to the group as seen in Asch's experiment. Or, people's memory is malleable, fallible, and easily altered. Thus, Boyer presents selective data to justify his arguments. For example, to provide evidence that the human is not gullible, he provides an example of repressed memory and comments that "they did not show that people's memory was easy to fool—quite the opposite" (p. 73). However, research in cognitive psychology has provided compelling evidence showing that human cognitive function is far from being perfect and is susceptible to errors and failures in various stages of information processing—from perception to memory. For example, there is extensive evidence suggesting that our sensory and perceptual systems are highly susceptible to misperception, measurement errors, or visual illusions.<sup>1</sup> In fact, perceptual illusion occurs so frequently that it has been construed as an unreliable source for knowledge by itself.<sup>2</sup> Other troubling research suggests that our attention system has such limited capacity that we have to pay attention to some aspects of stimuli or environment and ignore or exclude others—termed selective attention.<sup>3</sup> Limited attentional capacity

constrains our ability to perceive objects, stimuli, or changes occurring in environments.

Furthermore, a wealth of evidence in memory research suggests that human memories are easily altered, distorted, or reconstructed by misinformation, beliefs, moral concerns, and stereotypes.<sup>4</sup> The fragility of memory is well illustrated in the misinformation effect, which refers to the phenomenon that exposure to misleading information after an event distorts and changes how an eyewitness describes the event later.<sup>5</sup> Moreover, it is possible to suggest or implant an entirely false memory that had never happened before.<sup>6</sup> The prevalence of memory failure or distortion has been widely recognized and well documented by prominent memory researchers. For example, Daniel Schacter, a famous memory researcher at Harvard University, identified and described common "sins" of memory.<sup>7</sup>

Boyer made significant efforts to justify seemingly dysfunctional cognitive systems by presenting their roles in satisfying another evolutionary goal. For example, Boyer suggests that one's susceptibility to information that feeds "junk culture" can be attributed to negativity bias, which describes one's tendency to readily receive and accept negative information. Negative bias can be explained by a built-in threat response system that operates to detect potential threat. Indeed, negative bias can be adaptive from the evolutionary perspective because accepting precautionary advice against potential danger allows one to identify the source of danger without extensive, yet potentially costly, processes of testing. In particular, when threat information is moralized, it can serve an important role in recruiting in-group members by motivating and persuading people to participate in an action to achieve a collective goal. As such, information that feeds "junk culture" can be functional and adaptive to the social world, though it may not always be philosophically or scientifically true. As a result, human minds are susceptible to such information, thereby enhancing fitness. However, cognitive models of psychopathology posit that negativity bias in information processing may play a critical role in the etiology and maintenance of a wide range of anxiety disorders and depression.<sup>8</sup> It has been well documented that people with anxiety disorders demonstrate prioritized attentional processing favoring emotionally negative information; similarly, people with depression demonstrate memory bias favoring emotionally negative events. Thus, what is defined as functional can be a source of problems that produces aversive results.

On the other hand, Christian worldview has provided some explanations and implications for cognitive



limitations and constraints. God made humankind in His image with an ability to learn and to think. In fact, humankind was created with the superior intellectual capacity to perceive and pay attention, think creatively and logically, use complex language, and govern the physical world.<sup>9</sup> Furthermore, humankind was capable of moral reasoning—an ability to determine right from wrong—by God’s moral standard.<sup>10</sup> Many Christian traditions emphasize the importance of human cognition (mind) in forming and developing the Christian faith. However, the Fall has brought devastating results on the human mind. The “total depravity” of man means that every part of the human constitution, including human mind, has been corrupted. Scripture depicts the human mind as being “darkened”: our thinking becomes “futile” and we become hostile to God and his law. For instance, Mark 8:8 (“You have eyes—can’t you see? You have ears—can’t you hear? Don’t you remember anything at all?” from New Living Translation) truly echoes cognitive limitations that we have. Indeed, a wealth of research in cognitive psychology has provided empirical evidence of functional difficulties and challenges in human cognition.

Such cognitive constraints and limitations significantly interfere with our ability to gain knowledge about the world and may pose serious challenges to psychological and social function. General revelation refers to the knowledge of God’s existence, nature, and moral law through creation, which is bestowed upon every person.<sup>11</sup> However, limited and distorted cognitive capacity prevents people from correctly sensing and interpreting natural laws. For example, Einstein’s groundbreaking work illuminated that time is experienced relatively, and also that time and space depend on each other.<sup>12</sup> However, to this date, we tend to consider space as being immutable and independent from time. As such, we have limited ability to perceive and understand natural law and God himself revealed in nature. Similarly, limited cognitive capacity sometimes hinders our understanding of God revealed in specific revelation. Specific revelation refers to God’s Word, including prophecy, scripture, and the direct communication with the Holy Spirit, given to specific people.<sup>13</sup> Challenges in specific revelation may occur because of cognitive constraints imposed on hermeneutics and exegesis of scripture. For example, people, even theologians, find it difficult to conceptualize the role that human free will plays in the context of traditional predestination within Calvinist theology.<sup>14</sup> In an attempt to interpret and understand difficult concepts, people may rely on their intuition, presuppositions, and prior knowledge to make sense of apparently conflicting concepts, thereby turning

exegesis into eisegesis. This may explain people’s confusion of theological concepts, which confusion is observed in “theological correctness” (p. 107).

Although sin has seriously constrained and distorted cognitive function, it did not irreplacably destroy one’s capacity to exercise cognitive function and to grasp truth. Humankind in the fallen condition is capable of understanding some truth and processing information from the external world. In fact, people are capable of utilizing and processing information to engage in effective social behaviors. Some people have high intelligence and superior reasoning in that they are capable of understanding ideas and theories and making incredible discoveries and inventions.<sup>15</sup> I enthusiastically support Boyer’s idea about the importance of cognitive systems in various social behaviors and their vital role in social function. The cognitive systems are adaptive and functional to a certain extent. However, at the same time, I humbly acknowledge that our limited cognitive capacity misguides psychological processes and poorly directs social behaviors; these unfortunate results contribute to the various individual and societal problems we encounter.

## Notes

<sup>1</sup>E. B. Goldstein, *Cognitive Psychology: Connecting Mind, Research, and Everyday Experience*, 3rd ed. (Belmont, CA: Wadsworth, Cengage Learning, 2011); and R. L. Gregory, “Knowledge in Perception and Illusion,” *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences* 352, no. 1358 (1997): 1121–27.

<sup>2</sup>D. M. McBride, *The Process of Research in Psychology*, 2nd ed. (Thousand Oaks, CA: Sage Publications, 2013).

<sup>3</sup>Goldstein, *Cognitive Psychology*.

<sup>4</sup>For reviews, see D. Davis and E. F. Loftus, “Internal and External Sources of Misinformation in Adult Witness Memory,” in *The Handbook of Eyewitness Psychology: Volume 1: Memory for Events*, ed. M. P. Toglia et al. (Mahwah, NJ: Erlbaum, 2007), 195–237; E. R. Hirt et al., “Expectancies and Memory: Inferring the Past from What Must Have Been,” in *How Expectancies Shape Experience*, ed. I. Kirsch (Washington, DC: American Psychological Association, 1999), 93–124; C. N. Macrae, A. B. Milne, and G. V. Bodenhausen, “Stereotypes as Energy Saving Devices: A Peek inside the Cognitive Toolbox,” *Journal of Personality and Social Psychology* 66 (1994): 37–47; D. A. Pizarro et al., “Ripple Effects in Memory: Judgments of Moral Blame Can Distort Memory for Events,” *Memory and Cognition* 34, no. 3 (2006): 550–55; H. L. Roediger, “Memory Illusions,” *Journal of Memory and Language* 35 (1996): 76–100; M. Ross, “Relation of Implicit Theories to the Construction of Personal Histories,” *Psychological Review* 96, no. 2 (1989): 341–57.

<sup>5</sup>Goldstein, *Cognitive Psychology*.

<sup>6</sup>E. F. Loftus, “Memories of Things Unseen,” *Current Directions in Psychological Science* 13, no. 4 (2004): 145–47.

<sup>7</sup>D. L. Schacter, *The Seven Sins of Memory: How the Mind Forgets and Remembers* (New York: Houghton Mifflin Harcourt, 2002).

<sup>8</sup>See C. M. MacLeod et al., “The Causal Status of Anxiety-Linked Attentional and Interpretive Bias,” in *Cognition, Emotion and Psychopathology: Theoretical, Empirical and Clinical Directions*, ed. J. Yiend (Cambridge, UK: Cambridge University Press, 2004), 172–89; for a review, see E. J. Wilson et al., “The Causal Role of Interpretive Bias in Anxiety Reactivity,” *Journal of Abnormal Psychology* 115 (2006): 103–11.

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<sup>9</sup>W. A. Grudem, *Systematic Theology: An Introduction to Biblical Doctrine* (Grand Rapids, MI: Zondervan, 1994).

<sup>10</sup>Ibid.

<sup>11</sup>Ibid.; N. D. Holsteen and M. J. Svigel, *Exploring Christian Theology, Vol. 1: Creation, Fall, and Salvation* (Grand Rapids, MI: Baker Publishing Group, 2014).

<sup>12</sup>B. Greene, *The Fabric of the Cosmos: Space, Time, and the Texture of Reality* (New York: Vintage, 2007).

<sup>13</sup>Grudem, *Systematic Theology*; and Holsteen and Svigel, *Exploring Christian Theology*.

<sup>14</sup>J. Slone, *Theological Incorrectness: Why Religious People Believe What They Shouldn't* (New York: Oxford University Press, 2007).

<sup>15</sup>Grudem, *Systematic Theology*.

Reviewed by Gewnhi Park, Hope College, MI 49422.



## TECHNOLOGY

**MODERN TECHNOLOGY AND THE HUMAN FUTURE: A Christian Appraisal** by Craig M. Gay. Downers Grove, IL: InterVarsity Press, 2018. 233 pages plus preface and acknowledgments; includes epilogue and author, subject, and scripture indices. Paperback; \$22.50. ISBN: 9780830852208.

If someone asked me what I regard as the seminal works of the last century or so that critique technology and technological thinking, I would point that person to the works of Max Weber, Lewis Mumford, Jacques Ellul, and Joseph Weizenbaum. But if they asked me to point them to a book that made the best thinking about technology accessible to people who are broadly educated and eager to learn but who are not specialists, I would point them to Craig Gay's book, *Modern Technology and the Human Future*.

Gay has written a very helpful book. It is carefully thought out, well organized, thorough, deals with substantive and critically important ideas—and it is readable!

Gay begins by arguing that there are serious problems with the direction in which modern technological development is heading; he does this by treating a number of important and comprehensible examples. He then analyzes the economic dynamics that drive such development and follows with a clear analysis of the historical and philosophical roots of that development, most notably the mechanistic model of the universe commonly associated with Descartes. He then steps aside for a chapter to discuss the Christian view of human nature, especially “embodied human existence,” through the lens of the creation-fall-redemption-consummation model. The argument culminates with a discussion of what Christians can reasonably do in the face of this situation. He concludes with some personal reflections on technology and employs the concept of the eucha-

rist to tie all of his threads together in a coherent and compelling way.

Gay's book is a tale of two views of the universe: as fundamentally personal or impersonal. From a Christian perspective, everything in the universe is created by a personal God. Thus, it is endowed with qualities given by a person, such as meaning, purpose, and value. It is undergirded by a transcendent moral system. Human beings have a purpose and direction, to be shaped into Christlikeness, and this provides a basis for evaluating the worth of all human endeavors. Our bodies are not prisons for our minds, but temples worthy of honor. Our relationship with the created world ought to be characterized by appreciation and, when appropriate, love.

If, however, the universe is an impersonal machine, governed solely by natural laws with no transcendent meaning, humans are free to master those laws and shape nature to their own ends. Nature's only purposes are those that people give it. Our culture seems to have adopted the perspective of an impersonal universe and the consequences are extensive. There are surface problems that flow from this perspective and that have been widely discussed; for example, algorithms that have replaced human judgment in harmful ways, narrow specialization, the confusion of means and ends, and the loss of skills. But there are deeper problems. Gay argues that automated machine technology is pushing society and culture away from ordinary embodied human existence at considerable speed and we are becoming more machine-like. Furthermore, technology seems to be interfering with our ability to enter into “I-Thou” relationships. In short, given its current trajectory, modern automatic machine technology is more likely to detract from our ordinary embodied experience of the world than it is to enhance it.

The author is no technophobe. Following the last chapter, he includes a personal conclusion in which he discusses his enjoyment of high-performance bicycle technology. However, he identifies a significant problem with the direction contemporary technology is heading and asks why we are so unconcerned. His answer is that western culture has thoroughly assimilated the mechanistic worldview.

What can Christians do to respond to a culture that, in its understanding of the nature of the universe, is antithetical to the personal perspective that Christian belief affirms? We intuitively recognize that aspects of our lives—friendship, marriage, family—are not to be surrendered to rationalized techniques based on productivity, efficiency, cost/benefit analysis. Thus, Gay urges taking an inventory of the physical places

where technologies are located in our homes and the roles they play in our lives. He then suggests some practical means we could use to limit those roles appropriately. Moreover, churches, schools, and community organizations—any association whose primary purpose is human formation—should not be surrendered to rationalization. He writes, “... personal ends cannot be achieved through exclusively impersonal means.” On a broader scale, he points out that automated machine technology has developed a momentum of its own that seems immune to critique, driven by powerful economic forces (which Gay discusses with some care). Nevertheless, Gay points to the necessity of a more extensive cultural change, including the need to repent of hubris and the desire for autonomy and to turn from the mechanistic way of enframing the world that reflects that hubris.

Gay is not an alarmist, but he makes a compelling case that modern culture is heading in a dehumanizing direction. He analyzes how that course was set and shows how it needs to change. I heartily recommend this book for perspectival courses on technology in Christian colleges and universities and for anyone whose professional work is in a technological field. But it could be read with profit by anyone concerned with issues of technology and society.

*Reviewed by James Bradley, Professor of Mathematics Emeritus, Calvin University, Grand Rapids, MI 49546.*

**DEEP MEDICINE: How Artificial Intelligence Can Make Healthcare Human Again** by Eric Topol. New York: Basic Books, 2019. 341 pages. Hardcover; \$32.00. ISBN: 9781541644632.

Artificial intelligence (AI) will not be replacing human doctors anytime soon, but it will have profound impacts on the way medicine is practiced. This is according to Eric Topol, MD, the author of *Deep Medicine*. Topol vacillates between the voices of a historian and a prophet as he details the history of AI and its incorporation into the medical field, and then speculates about the future medical roles of AI. This is the author’s third installment in a series of books describing the changing landscape of medicine in a society amid a technological revolution (see also *The Creative Destruction of Medicine* and *The Patient Will See You Now*). As a cardiologist, professor of genetics, and director of the Scripps Translational Science Institute, Topol is well qualified and uniquely positioned to take on the formidable task of translating the fields of AI, genetics, and medicine into prose understandable to the lay reader. He largely succeeds at creating a balance of a comprehensive description

of each topic without overwhelming the reader with too much detail.

In the first two chapters, Topol whets readers’ appetites with anecdotes describing potential ways that AI could improve medicine. He also chronicles some of the shortcomings of “shallow medicine,” which is described as medicine practiced with “insufficient data, insufficient time, insufficient context, and insufficient presence” (p. 31), which he suggests is often the way medicine is currently practiced. Chapter 3 details some of the shortcomings of using AI for diagnoses in the past and describes some of the most promising fields of medicine in which AI is currently improving diagnostic power.

Chapters 4 and 5 take a step back to define what AI is, survey some of the history of its development, and explain how deep-learning algorithms work. Potential problems with AI are also discussed, from designing human bias into learning algorithms to sentient machines turning on humanity. The latter scenario is decidedly unlikely in the near future. Yet AI will undoubtedly change society profoundly, so, Topol cautions, it behooves us to be aware of this and direct its uses to ways that benefit humanity.

The remainder of the book focuses on specific facets of medicine and how AI is being used in each arena. Some of the topics include analyzing images (MRI and X-ray, for example), mental health, drug discovery, personalized diets, and the healthcare system itself. For each of these subjects, Topol offers a realistic description of the current state of AI incorporation and a distinctly optimistic look at how AI will transform that field in the future. However, a common refrain in these chapters is that the use of AI will always be limited by its inability to replace the human and relational aspect of the practice of medicine.

This leads to the last chapter, called “Deep Empathy,” in which Topol offers an impassioned call for a paradigm shift in medicine away from an assembly-line mentality to a focus on developing uniquely human characteristics of medicine for which AI, in his view, will never be a satisfying substitute. He notes that in recent years it is these very characteristics that have been pushed aside as medical professionals are required to spend more time behind a computer screen, care for an increasing number of patients, and spend less time face to face with those in their care. As business interests have taken over medicine, profitability is favored over building relationships with patients. AI, he notes, “could be used in two very different, opposing ways: to make things much better or far worse” (p. 285). We still have the capability



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to control the direction of the evolution of medicine, but it will take intentional effort by medical professionals, the government, and society to reclaim the humanity of medicine.

This is not the first time that society is faced with a technology that has the power to either greatly benefit or greatly harm, depending on its application. Impacts cannot always be reliably predicted. Therefore, Topol urges that these technologies must be closely monitored to mitigate negative impacts.

Christians should be integrally involved in this, both at the societal and policy level, to encourage equitable and ethical use of AI in the medical field. For example, this technology truly could, Topol suggests, increase the time that medical professionals have available to spend with each patient, allowing them to form human connections and develop true empathy. Humans are created as relational beings, so technology that frees time for deeper relationships should find widespread support.

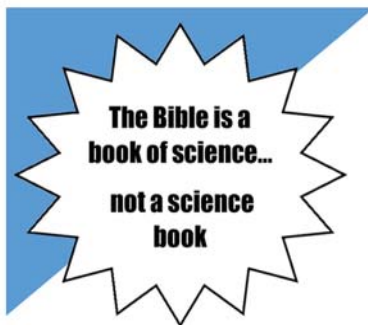
However, equally possible is that business interests will dictate an increase in the number of patients seen, rather than the time spent with each patient.

Similarly, AI may decrease costs associated with medicine, making medical care more accessible to marginalized groups in society who currently experience poor access to medicine. However, it may simply increase profit margins, enable discrimination based on risk factors, and “exaggerate the profound gap that already exists between those who have much and those who have less” (p. x). AI has the potential to narrow in on a diagnosis more rapidly than ever before, decreasing wasted spending on unnecessary tests and leading to better societal stewardship of monetary and medical resources. However, it could also increase spending and waste if individuals demand more tests and continuous medical screening because of their ready availability.

These issues must continue to be carefully considered while AI is being implemented, in order to guide our medical system to become something better, rather than worse, than its current state. In making these matters accessible to lay readers, Topol provides the information required for everyone to join in the discussion.

*Reviewed by Kelly N. DuBois, Professor of Biology, Calvin University, Grand Rapids, MI 49546.* ☀

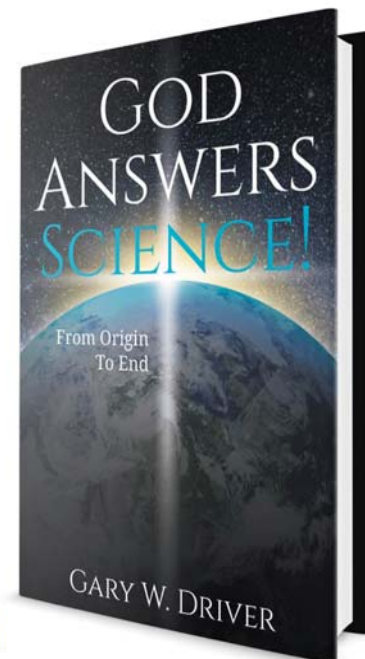
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