Biology

LIFE'S X FACTOR: The Missing Link in Materialism's Science of Living Things by Neil Broom. Wellington, Aotearoa, NZ: Steele Roberts, 2010. 192 pages, notes, index. Paperback; $29.99. ISBN: 978-1877577208.

One is hard pressed to escape the highly public clamoring that says science and religion have been and always will be at war. *PSCF* readers are well aware that the war is a manufactured one and that it is inaccurate to characterize science and religion broadly in this way. Reality reveals a relationship that is much more complex. The absence of war does not imply peace, however, and there are real and potentially heated debates in some areas of science and religion.

One particular realm of heated discussion occurs within philosophy, a potentially fruitful area of mediation between science and religion. On the one hand are atheists who posit Darwinism as the "universal acid" that dissolves all meaning and fuels the fire of their reductionist materialistic philosophy. On the other hand are Christian philosophers who claim that all meaning is grounded in God and (for some) that the Bible specifically dictates antimaterialism (usually, dualism). Ironically, both agree that materialism and meaning are antithetical, but because these Christians are committed to antimaterialism they reject evolution. Although less well known publicly, there is a potentially constructive middle ground composed of both religious and nonreligious persons, who believe that there is an intermediate philosophical position between reductionist materialism and dualism, or that dualism and evolution are not mutually exclusive.

Neil Broom's *Life's X Factor: The Missing Link in Materialism's Science of Living Things* fits into that philosophical arena. Broom is a professor in the Department of Chemical and Materials Engineering at the University of Auckland and a Fellow of the Royal Society of New Zealand. Intellectually, I was very excited to read Broom's book, as its description anticipated a synthetic and forward-looking account of how philosophical principles of purpose, intention, and mind could be wedded with evolution. Furthermore, I sincerely appreciated his motivation in writing the book and his concerns regarding popular-level treatment of evolution. For instance, I agree that the mechanism of natural selection can be overused and misapplied to suit the desires of its employer. Also, science for a general audience is too often written in an oversimplified and too optimistic manner, especially in the area of scientific origins. Last, it is true that the majority of popular-level science writers say that evolution is mindless, pointless, and impersonal and that this truth necessitates assent to atheism and its evangelical promotion. Nevertheless, despite my appreciation of these concerns and my enthusiasm in reading *Life's X Factor*, it is unfortunate that there are serious issues throughout and, as such, I cannot recommend the book.

Broom's thesis is twofold. First, the philosophy of "biological materialism" blinds its proponents to teleological qualities clearly observable in the living world. Second, authors such as Dawkins who believe that evolution is mindless and nonteleological really betray this when they write phrases such as "cells within a developing organism *know* where they are in the embryo" or that "cells *explore their environments*." Broom's solution is to revisit William Paley's natural theology and to revitalize vitalism, an ancient philosophical notion that the/some functions of an organism are due to a principle distinct from biochemical reactions, which is not describable by physical and chemical laws. This antimaterialistic belief was refuted in the nineteenth century with the advent of the germ theory of disease by Robert Koch and others as well as Louis Pasteur's disproval of spontaneous generation. Broom's supporting argument amounts to a vitalism of the gaps, which is not surprising considering his early work promoting intelligent design. Throughout the book, Broom attempts to highlight areas of biology that he says are not explainable by natural mechanisms and thus point to mind behind it. This is a flawed attempt to integrate within biology a long discredited and unnecessary doctrine.

Methodologically, my biggest issue with Broom's book is that he oversimplifies materialism. First, Broom makes no distinction between the methodological naturalism that is required for science and the metaphysical naturalism that *is* materialism. Second, Broom equates materialism with reductionism, ignoring a wealth of work on ideas such as emergence, holism or organicism, and philosophies that maintain high respect for science that address Broom's motivations for writing *Life's X Factor* in the first place. Claiming that materialism is necessarily reductionist is false and thus a straw-man attack. Broom does a disservice to his readers by not engaging with (or even mentioning) Christian philosophers who subscribe to nonreductionist materialism, such as Nancey Murphy and Kevin Corcoran. A better solution would be to engage with current philo-

sophical ideas, especially emergence, which multiple disciplines such as biology, philosophy, psychology, and theology are all finding to be fruitful. Even the textbook that I use in my freshman-level biology class notes the importance of emergence in organisms and how different levels of biological organization interact with each other to produce the emergent properties Broom believes require an immaterial life force.

In addition to his inadequate treatment of materialism, Broom's arguments against it and for vitalism were not convincing. In multiple instances, Broom delves into antievolution rhetoric, which is fine by itself, I suppose, but distracts heavily from the overall argument he is trying to make. It is clear that he has an agenda when he uses terms such as mainstream naturalism, scientific doctrine, orthodox and establishment scientists; I was repeatedly frustrated at the hand grenades that he lobbed at my biologist colleagues and me. Broom's grasp of evolution and natural selection is unclear. He does not seem to understand artificial representation of natural selection in experiments or Dawkins's computer simulations, and he equates survival with teleological purpose. Broom also criticizes evolution by discussing chemical evolution and origin-of-life science, areas that are only peripherally related to biological evolution. It is not enough to make a case for vitalism simply by attacking evolution. One needs to make the argument that materialism (reductionism in particular) fails as a philosophy and that vitalism is a better alternative; Broom has not done this.

In summary, I appreciate Broom's motivations for writing this book. I also found his prose to be lively and fast paced. His use of figures and photos throughout made for an enjoyable read. However, I do not believe Broom's solution is the way forward. Greater engagement with philosophy and a respect for methodological naturalism and evolution is essential, not a revival of vitalism or the natural theology/intelligent design of Paley. Evolution by natural selection has such unifying explanatory power in all of biology. Can it do the same and illuminate other areas of inquiry such as art and aesthetics, philosophy, ethics, psychology, or religion? For those interested in a comparative, better, and more engaging treatment of these ideas by authors sympathetic to Broom's concerns, I recommend Conor Cunningham's *Darwin's Pious Idea* or Alvin Plantinga's *Where the Conflict Really Lies: Science, Religion, and Naturalism*.

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Environment

SONG OF A SCIENTIST: The Harmony of a God-Soaked Creation by Calvin B. DeWitt. Grand Rapids, MI: Square Inch, 2012. 245 pages. Paperback; $15.99. ISBN: 9781592557011.

From the onset, it is important to know that about thirty years ago, Calvin DeWitt changed my life when, as a brand new professor, I attended a CCCU (then CCC) conference on Christians and the environment. A week with Cal changed my focus as a young Christian in science from studying how God created the world to how Christians should care for God's creation. Since then I have had the pleasure of reading, talking, and listening to Cal in numerous venues, and I have always benefitted from those experiences. Therefore, it was with great pleasure that I learned of this, his latest book.

It is a fitting work after three decades of leading the evangelical ecological movement as an author, speaker, director emeritus of Au Sable Institute of Environmental Studies, and professor of environmental studies at the University of Wisconsin-Madison. This book is appropriate reading for anyone from high school age on, from scientist to observant hiker, from pastor to layperson, from liberal to conservative, as long as they come to its reading with an open mind. The experts must not expect a scientific or theological treatise, while the nonexpert in either area needs to be willing to do some careful thinking. The liberal must appreciate its adherence to and use of scripture and tradition, while the conservative needs to be open to its applying scriptural passages in exciting, new, and, I believe, appropriate ways.

Like most of my colleagues, I am fairly confident in both my scientific and theological background. However, I am constantly amazed at DeWitt's ability to meld these two areas of my life in ways that I have never imagined. Nowhere is this better illustrated than in his annotated version of Job 40 where he follows each verse describing "behemoth" with an elaboration of what God may have meant ecologically. Why have I, a Christian for over fifty years and a PhD for over thirty years, never thought of the behemoth as a frolicking hippopotamus in all the times I have tried to get my college students excited about God's creation? DeWitt delights us time after time throughout the book with a range of topics that illustrate the delightfulness of our world.

As the title *Song of a Scientist* would suggest, the major unifying thread DeWitt makes use of in tying these topics together is his life-long love of scripture, particularly the Psalms, and hymns learned as a child. In many of the chapters it works beautifully, even for a dull old left-brained scientist like myself. When he takes us along on his "field trips" and shows how creation, from the Neerlandia farm to the Michigan forest to the Andes of Ecuador worships the Creator, the message resonates deeply. In dealing with other topics, such as the "harmonizing" of science, ethics, and praxis or the "economic antiphony," it seems a bit of a stretch. However, this in no way detracts from the import of what he is saying or the unique way he has of "harmonizing" science and Christianity.

DeWitt does this in different ways in every chapter, making use of his childhood experiences, his work with the Township of Dunn, various conferences and workshops he has attended, and a multitude of other experiences. I found each to be compelling, informative, and thought provoking. However, the incredible diversity of methods, topics, locations, time periods, etc., created a feeling of discontinuity and confusion at times. At several points I found myself thinking that this was more a collection of separate essays that had been bound together, each one interesting and worthwhile, but together lacking sufficient connection. On many occasions, I also felt the need to flip back to a previous chapter as the author picked up a thread he started to follow several chapters before but which I had lost track of.

None of this, however, would stop me from highly recommending this work to any Christian, whether they are particularly interested in creation care or not. The author's love of God, his creation, scripture, and science are obvious on every page and highly infectious. His study of words, be they English, Greek, Hebrew, or Latin, moves me as few others have. It is astonishing that he, as far as I know, is the first to point out that the simple term "fossil fuels" is a misnomer, implying that by their very design and purpose they are meant to be used by humans as fuel rather than left as a carbon sink. Whatever you believe on the topic of global warming, such an idea must make one stop and think about what we believe, what we feel, and how we act toward God's creation. I found myself learning and thinking in this way throughout the reading of the book and plan on using much of the insights I gained from reading it as I teach my ecology courses to Christian students more interested in entering professional schools than learning the songs of the spheres and worshipping their composer.

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HEALTH & MEDICINE

THE CREATIVE DESTRUCTION OF MEDICINE: How the Digital Revolution Will Create Better Health Care by Eric Topol, M.D. New York: Basic Books, 2012. 303 pages, afterword, acknowledgments, notes, index. Hardcover; $27.99. ISBN: 9780465025503.

The current financial and economic climate continues to push healthcare access, cost, and regulation into the spotlight of political debate and legal review. As a result, the medical community at large is feeling the pressure to make radical changes to comply with continuously evolving congressional demands and patient expectations. Such a transformation by means of radical innovation or "creative destruction," as termed by Austrian economist Joseph Schumpeter, is the foundation of Topol's exposé of a not-so-distant future when the frontier of individual genomic data, wireless physiologic biosensors, and personal health records rescue medicine, as we know it, from its current path toward fiscal self-destruction.

Creative Destruction begins with chronicling the major advances (cell phone, computer, internet, gene sequencing, and social networking) that have interconnected to form the current landscape that is poised to set up a "digital disruption of medicine." Following this introduction, Topol navigates through descriptions of the four principal digital arenas: genomics, wireless biosensors, imaging, and health information technology.

In discussing genomics, Topol likens current physicians to priests before the Gutenberg printing press, keepers of societal knowledge. He contends that patients as consumers should advocate for knowing and obtaining their own personal genomic data, and that they need to utilize and exploit this information to transform the "sclerotic" and "paternalistic" medical world from relying on cost-ineffective mass screening and population effect trials to focusing rather on the primacy of the individual. As both a physician and a professor of translational genomics, Topol skillfully steers through the challenging terrain of gene sequencing and pharmacogenomics. However, those without a scientific background may find it difficult to negotiate the forty-five pages

dedicated to explaining the several types of genomic sequencing and their various impacts.

Although the genomic information in *Creative Destruction* may not be as easily digestible for some as found in other books (e.g., *The Language of Life* by Francis Collins), *Creative Destruction* finds strength in explaining the impact of intersection between the different digital domains. The concept of incorporating genomic data and internal nanosensors to detect circulating cancer cells long before they are seen in conventional methods, or the ability to sense a myocardial infarction and relay this to your smart phone, much like a car alerts you when your oil is low, may both seem like science fiction, but Topol creatively uses these and other examples to show that such innovation is well underway.

The final section of *Creative Destruction* is an appeal to reform the current environment of medicine and pharmaceutical industry by incorporating digital practices and open intellectual collaboration. Topol forecasts how physician education must also inevitably change. As more genomic insight is gained, fewer diseases will be labeled idiopathic. The labeling system of diagnoses will have to encounter a complete overhaul when diagnosis becomes more and more individualized with a deeper understanding of interpreting personal genomics, an area that many physicians currently feel unqualified for and perhaps are uncomfortable doing.

While *Creative Destruction* is not able to fully allay all fears and questions regarding (1) how to filter through the overwhelming data generated by genomic sequencing and continuous sensors, (2) how to ensure equal access for all to these resources, (3) the potential of eugenics, (4) protection of genomic data from authorities and corporations, (5) how and when the exorbitant upfront cost will offset current fiscal inefficiency, and (6) preventing the formation of "cyberchondriacs," Topol does validate and recognize these and other controversial topics and makes an attempt to rectify them with the benefits he sees a digital revolution providing.

Whether you agree or disagree that creating a "virtual human being" by knowing the DNA data and viewing multiple continuous physiologic metrics in real time is ethical, moral, or beneficial, *Creative Destruction* is a well-written, systematic assessment for those who desire to understand how digital advancements are currently assisting the medical arena and in what areas industry leaders project them to be assisting in the near and distant future.

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History of Science

SCIENCE AND EASTERN ORTHODOXY: From the Greek Fathers to the Age of Globalization by Efthymios Nicolaidis. Baltimore, MD: The Johns Hopkins University Press, 2011. 288 pages. Hardcover; $55.00. ISBN: 9781421402987.

Judging by its title, *Science and Eastern Orthodoxy* is located in the field of scholarship known as dialogue between science and religion, in this case, science and Eastern Christianity. However, this book better reflects historical research in the interaction between faith and knowledge, theology and science, religion and politics in the ancient Greek-speaking Roman Empire, Byzantium, post-Ottoman Greece, and the modern Greek state.

The research by Efthymios Nicolaidis is very timely because, as is well understood in Orthodox circles and by the author himself (see pp. 197–202), Western historiography, either of the sciences or relations between the sciences and Eastern Christianity, is very poor. In most contemporary Western discussions of science and the early church, the references, in the best case, are made to Patristic sources before the fifth century AD followed by a huge gap until the time of Roger Bacon and Thomas Aquinas, through whose activities (and under the patronage of the Roman Catholic Church) the first universities in Western Europe were established. The obvious question as to why this reduced history completely ignores a nearly thousand-year-long period of Byzantine contributions to the debates on science and theology remains unanswered. This is the reason why this book by Nicolaidis is of paramount importance in our efforts to gain an understanding as to why the impact of Eastern Orthodox thought on science and its debates with theology was different and less articulated when compared to the famous clashes between new scientific ideas and church teaching in the West.

The first ten chapters of the book deal with the problem of appropriation of the sciences and science education in lay and religious institutions in the Greek-speaking part of ancient and Medieval Europe. This, I believe, is the most valuable part of the book, for it gives a detailed and well-documented account of the complicated religious and political stance concerning the sciences in Eastern Christian societies. Particularly, in chapter three, there is an interesting discussion of the role of the iconoclastic debates in terms of their impact on the

perception of the sciences and science education in Byzantium. This is an example of how some religious views (taken to their extreme), devoid of philosophical insights and having a disregard of historical achievements, can reduce the study of nature to a primitive and unscholarly level. On the other hand, the iconoclastic controversy, with its anachronistically narrow perception of nature, gave rise to a new impulse of learning and a certain revival of the meaning of the sciences under the influence of a humanism which reflected Hellenic roots (see chapter four and its expansion in chapters five and six). Nicolaidis masterfully outlines the apogee of the Byzantine polemics about the sciences in chapter seven, which is devoted to the importance of *hesychia* (the practice of silence and quiet contemplation) for all Orthodox debate.

Nicolaidis discusses the thought of St. Gregory Palamas in chapter seven. Palamas is important for historical Orthodoxy, not only because of his defense of acquiring knowledge of God through contemplation and intuition, but also for his teaching on the *divine energies* through which God can be known through creation. He advances an important point, namely, that the ascent to the Divine through creation is possible only if the dimension of the Spirit is taken into account. In modern parlance, this insight gives the study of nature a para-eucharistic dimension, breaking the symmetry between theology and science, which is often assumed in modern discussions. Reading this chapter will give the reader a good idea of the importance and indispensability of historical insight, so necessary for contemporary discussions of science and religion.

On a bit of a critical note: when Nicolaidis (beginning in chapter eleven) turns to realms beyond Greek-speaking Orthodoxy (for example, Russia), the picture he presents seems to be rather brief and incomplete. However, this is understandable, since all the sources describing the polemic between Christianity and the sciences in Russia effectively originated at the end of the eighteenth century and are seldom available to Western scholars. This fact also concerns the broad discussions of Darwinism in the nineteenth century, as well as the numerous debates and publications about faith and knowledge in the beginning of the twentieth century. While this book deals with the contemporary situation in the Greek state, it omits any discussion of the situation in the Soviet and post-Soviet Russia, which is pregnant with events, publications, etc. In no way does this comment intend to create doubt about or diminish the quality of the book under discussion. I merely want to signal the fact that when "Eastern Orthodoxy" appears in the title, one must understand that the book is mainly related to historical and contemporary Greek Orthodoxy. Perhaps a similar book should be written about the Russian Orthodox Church and its dialogue between Christianity and the sciences.

Another point: while Nicolaidis gives a detailed list of references to original and secondary sources, the reader might wonder why a large amount of the literature on the historical interaction between Christianity and ancient Greek culture and science is not mentioned. Certainly more theological references are needed to document the relation between ancient philosophy and specific views of nature on the one hand, and Christian doctrine on the other. Although this was probably not the major aim of the book, the Eastern Orthodox perspective is loath to separate a purely historical account of events from the spiritual contexts and experiences of the fathers of the church and their heirs. I suggest that the book by Nicolaidis is a complement to numerous books on the appropriation of Greek culture and philosophy by Christians, including such particular titles as the rather dated book by D. S. Wallace-Hadrill, *The Greek Patristic View of Nature* (Manchester University Press, 1968) or J. Pelikan's *Christianity and Classical Culture: The Metamorphosis of Natural Theology in the Christian Encounter with Hellenism* (Yale University Press, 1993).

Unfortunately, a purely historical assessment of events related to the sciences during the Patristic period does not take into account the fact that the sciences, considered as knowledge of the natural world, were always treated by the fathers of the church as part of a theological activity, as contemplation of the principles of the created world in order to praise the Creator. This reality suggests that the very definition of "science" (knowledge), as understood nowadays, is quite different from the one understood by Christians more than a thousand years ago. Definitely, an approach to knowing, originating in a deep spiritual attitude to God's creation, did not bring about new experimental advances, but, even for contemporary scholars, it offers hints and a certain methodology: not about how to *do* science, but rather how to *understand* science as a specific type of human activity. This lack of understanding of the proper meaning of science (as Heidegger expressed it, "science does not think"), namely, its *telos*, sometimes obscures the contemporary dialogue with theology. The fathers of the church, in spite of their limited interest in practical applications of knowl-

edge, understood that clear existential purposes are necessary for the application of science, without which science does not make sense or may be potentially harmful for the human spirit.

In view of what has been said, one can point to a figure such as St. Maximus the Confessor, who is considered to be one of the most prolific and synthesizing theologians of the seventh century. For Maximus, knowledge acquired through experience is not valid because of the deception which has its origin in our senses (p. 44). However, in his theological writings, Maximus advocated the view that the contemplation of nature constitutes an indispensable part of the human ascent to God by removing the moral tension between the empirical (which is available through the senses) and the intelligible (which is grasped by the analytical part of the soul). It is obvious that as a monk Maximus did not participate in an empirical study of nature. However, he provides an invaluable insight about nature. Through the contemplation of nature, a person can infer the source of its contingent facticity, namely, the Creator. Maximus was not interested in particular mechanisms of nature and their effects, but it did not mean that he therefore disdained seeing nature as God's creation!

This position suggests that any history of the sciences, related to its interaction with Christianity, must be accompanied by the history of the appropriation of the sciences within nonscientific contexts. The characteristic stance of the Orthodox is that the question is really not about the literal treatment of scientific discoveries and theories, but rather about their appropriation for the sake of Christian ways of life and thought. This makes the contemporary dialogue between science and theology in the Eastern Orthodox perspective different from those purely academic approaches in the West.

In spite of these comments, this book provides the English-speaking reader with invaluable insights and references which cover nearly a continuous two-thousand-year period of interaction between faith and knowledge, science and theology, life and its understanding. This book will certainly make a serious contribution to existing scholarship on the history of the relation between science and Christianity. It fills an essential, and inadmissible, gap in research related to Byzantium, Eastern Europe, and Russia.

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THE CYBERNETIC BRAIN: Sketches of Another Future by Andrew Pickering. Chicago, IL: University of Chicago Press, 2011. 502 pages, index. Paperback; $30.00. ISBN: 9780226667904.

Andrew Pickering discusses cybernetics as "a postwar science of the adaptive brain" (p. 6). Most of the book is not about cybernetics as a system of ideas or as a field that is still alive today, but rather it is an exploration of the work of several early and influential British workers in the field: Grey Walter (1910–1977), Ross Ashby (1903–1972), Stafford Beer (1926–2002), and Gordon Pask (1928–1996), with significant discussion of two other individuals: Gregory Bateson (1904–1980) and R. D. Laing (1927–1989). In the final chapter, Pickering states his purpose in writing:

> The book is an attempt to rescue cybernetics from the margins and launder it into mainstream discourse … By rehearsing the history of cybernetics and reading it in terms of a nonmodern ontology of not knowing and becoming, I have tried to convey my conviction that there is another way of understanding our being in the world, that it makes sense, and that grasping that other way can make a difference in how we go on. (p. 390)

Pickering sees several common characteristics in the work of these individuals. First, their work was characterized by a distinctive ontology—what he calls "ontological theatre"—which did not draw a dualistic distinction between people and things. Of relevance to this, most of the individuals (all but Beer and Pask) came to their interest in cybernetics through psychiatry, rather than by way of engineering and mathematics more commonly associated with the field. Finally, all were interested in the brain, not as an instrument of representation, but as an adaptive, performative instrument. However, their work went far beyond the study of the brain. Walter is famous for building artificial tortoises and for work on "flicker" and on biofeedback. Beer worked on operations research and biological computing, and eventually he applied cybernetic ideas to the Chilean economy as a consultant to Salvador Allende. Pask was involved with research on teaching machines.

One thing that keeps this book from being merely of interest to a student of the history of the field is the connections Pickering draws between the work of these men and ideas outside cybernetics that are still with us today. For example, two important areas of work in nontraditional AI were inspired by the work of early cyberneticists: Rodney Brooks (former director of the AI Lab at MIT and chief technology officer of iRobot Corporation) credits Walter's tor-

toises with inspiring his research with situated robots, and Warren McCulloch (another early cybernetics worker not discussed in the book) was the father of the field that evolved into the study of neural networks. Pickering also draws a connection between Walter's work on flicker and some of the psychedelic interests of the 1960s, and between Ashby's work and that of Christopher Alexander in architecture, Stuart Kauffman in biology, and Stephen Wolfram's "new science" (cellular automata and the study of complex systems). Finally, he draws a connection between the cybernetic work of Beer and Pask and their subsequent interest in Eastern spirituality.

The book also includes thorough references as endnotes, a broad bibliography, and a helpful index.

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Origins & Cosmology

AMONG THE CREATIONISTS: Dispatches from the Anti-Evolutionist Front Line by Jason Rosenhouse. New York: Oxford University Press, 2012. 257 pages. Hardcover; $29.95. ISBN: 9780199744633.

When was the last time you took a good hard look at yourself in the mirror? When was the last time you read a book that reflected an outsider's unflinching view of your faith and your attempt to integrate faith and science? In *Among the Creationists*, Jason Rosenhouse, a self-described atheistic Jew, takes a look at Christian responses to evolution through his experiences at several different conferences dedicated to creationism and intelligent design. He describes in depth the Creation Mega Conference at Liberty University in 2005, the Darwin vs. Design conference in 2007 (Knoxville, TN), and the Sixth International Conference on Creationism in 2008 (Pittsburgh, PA), as well as a trip to the Creation Museum in Petersburg, KY. Other smaller events provide short vignettes to begin the book, and are sprinkled throughout the book as well.

It should be no surprise that Rosenhouse is critical of creationism and intelligent design. However, unlike the "new atheists" who published several books in the middle of the last decade (Richard Dawkins, Sam Harris, Christopher Hitchens, and others), Rosenhouse seems to enjoy his one-on-one interactions with the fellow conference-goers, and his vignettes show him respectfully listening to them and, for the most part, being listened to respectfully in turn. His very attendance at the conferences and his trip to the creation museum illustrates that he is at least open-minded enough to want to know first-hand what he is critiquing. As he writes in the introductory section, "… we still have to live together. Given this simple reality, it cannot be the worst idea in the world to try talking to each other once in awhile" (p. 15). "For all my disagreements with their views, I like being around people who are fired up about big questions" (p. 209). As such, the book produces a very readable description of what "we" look like to scientists who do not have a faith in God; whether "we" are young earth creationists (YEC), intelligent design (ID) proponents, or theistic evolutionists (or anything between).

The descriptions of the conferences and conference-goers rang true to me. I have attended only one YEC conference, more than a decade ago, but the format and atmosphere was similar to what Rosenhouse describes with enthusiastic audiences, relatively simple arguments in the presentations, and extensive bookstore sales. Indeed, the friendly crowd and welcoming attitude toward curious outsiders would also describe the ASA annual meetings—although hopefully not limited to simple rhetorical arguments! However, Rosenhouse makes several less than flattering observations repeatedly in the book. First, he notes in several different places that while conversing with "lay" creationists one-on-one is usually pleasant, the speakers and leaders are aggressively negative toward those who accept evolution.

> One of the least endearing features of creationist discourse is the sheer magnitude of the charges they direct towards evolutionists … They also feel the need to link evolution to every type of nastiness ever to afflict humanity. (p. 60)

Exhibits at the Creation Museum fall in this category, too.

> It is fair to say that many of the exhibits demonize science and scientists. There is a line that is crossed when the desire to instruct your children leads to hostile and dishonest characterizations of large groups of people. (p. 137)

He is equally critical of ID proponents, particularly their inability to "put forth a clear theory of design, deduce its consequences, and then compare those consequences with actual data … there is nothing here remotely helpful to my research" (p. 113). He also notes that ID proponents are equally as willing as YECs to quote scientists out of context and caricature their ideas (p. 91).

Second, Rosenhouse notes frequently and with regret that children and teens attending these confer-

ences are essentially brainwashed into accepting a nonscientific view of the world. He observes,

> … If their children went their whole lives without ever hearing about evolution or about views of morality different from their own, that would be no loss whatsoever. (p. 7)

This criticism is less than compelling, as all parents expose their children to the family's beliefs more favorably than to opposing viewpoints. In several places, he describes his preference to talk with teens rather than their parents, and his feeling that the teens are hungry to explore the standard scientific side of the issue more thoroughly. His feeling in this regard is almost certainly valid, as teenagers in our society generally explore and question family beliefs as they develop independence from their parents.

Leaving behind the atmosphere and rhetoric of the conferences, Rosenhouse takes time in several places to describe his conclusion that the YECs have a valid point in claiming that evolution poses large and potentially intractable problems to Christian belief.

> From Darwin right through to the present, substantial numbers of Christians have had serious reservations about evolution. It is not at all clear their concerns are unreasonable. (p. 81)

He brings up no novel problems that have not been described elsewhere, but in contrast to many other critiques of YEC and ID, the theistic evolutionists do not get a pass in his book. The problem of a loving God as Creator, while evil is a real presence in our world and suffering is a reality in evolutionary history, is front and center here. Rosenhouse sympathizes more with the YEC view of a perfect creation and one human pair who then disobeyed God and caused the introduction of sin, suffering, and evil into the world than he does with other theological and philosophical treatments of theodicity. He notes the difficulty in reconciling evolutionary history with the doctrine of original sin, the weakening of the apologetic argument for God's existence coming from design in nature, and the diminished role of humanity in God's creation as a result of our evolutionary past.

Finally, he spends a reasonable amount of time pointing out common misuses or misinterpretations or misrepresentations of science used particularly by young earth creationists, but also by ID advocates. These critiques are not new, but he illustrates them accurately by reporting his personal experiences at these conferences.

Interestingly, the book shows the greatest respect toward the YEC speakers at the Sixth International Conference on Creationism.

> We should have no doubt regarding the seriousness of the conference participants. We are not talking here about the professional creationists, the ones whose livelihood is spreading propaganda and corrupting school boards. We are talking instead about people who, so far as I can tell, are motivated by entirely the same considerations as mainstream scientists. They are trying to understand nature as best they can. (p. 188)

Because Rosenhouse shows respect to the adherents of these ideas he believes to be faulty at best, altogether false at worst, the book was far more effective in prompting my own thoughts about living as both a Christian and a biologist who regularly uses and teaches evolutionary theory. He backs up his observations with quotations from conference proceedings, and has clearly done extensive background reading in the evolution-and-faith literature as well as in Christian theology.

Several years ago, I participated in a discussion of Sam Harris's "Letter to a Christian Nation" with undergraduate students and science faculty at a Christian college. Rosenhouse's book would be a far better choice for that venue, as it has little vitriol but a significant critique of the worldview of those students and their professors. Nonscientists who are actively involved in these topics would also benefit from reading this true outsider's view of their activities. The respect that Rosenhouse shows for individuals with whom he disagrees is a proper starting point for each of us as we discuss the topic of evolution both within the church and in the world at large.

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PHILOSOPHY & THEOLOGY

TESTING SCRIPTURE: A Scientist Explores the Bible by John Polkinghorne. Grand Rapids, MI: Brazos Press, 2011. 108 pages. Paperback; $17.99. ISBN: 9781587433139.

Formalities can be mystifying. Let's say someone is an ordained priest, an acclaimed professor with multiple earned and honorary doctorates, and is a Knight Commander of the Most Excellent Order of the British Empire. Which of the three associated titles—Rev., Dr., or Sir—would be trumped by the other two?

In the propriety that is all things British, it is the "Sir" that gets bumped. While this surprises American sensibilities, there is fittingness to it in the case

of the Rev. Dr. John Polkinghorne. He was knighted on the basis of his scientific accomplishments in concert with his Christian faith and vocation. Now in his eighties, Polkinghorne has written over thirty books on physics and the relationship between science and religion—works of such substance that he was awarded the 2002 Templeton Prize.

This short volume (just slightly over one hundred pages) contains Polkinghorne's considered reflections upon the Bible as the basis of Christian faith. The title plays upon Polkinghorne's status as scientist and suggests that this will be the crucial lens through which scripture is analyzed. That, however, is slightly misleading. The book really outlines Polkinghorne's pragmatic approach to scripture as he has wrestled with various issues over decades. His identity as scientist is not absent, but neither is it a rigorous matrix through which all of the Bible is analyzed.

Evangelical Christians from the west side of the Atlantic Ocean may find the mix of Polkinghorne's theological orthodoxy with contemporary science and modern historical/literary analysis of scripture somewhat unsettling, but its very pragmatism serves as a gentle tonic for the maladies of rigidity that American evangelicalism tends toward. On the side of orthodoxy, Polkinghorne affirms the two natures of Christ, the factuality of the resurrection, and the likelihood of the virgin birth. On the side of modernity, he considers humanity's evolutionary origins and the basic timeline of physical cosmology to be well established.

For the most part, the book is a set of observations about the way in which Polkinghorne has come to read the scriptures. The very brevity of the book is both its strength and its drawback. Polkinghorne sketches the assumptions and theological principles by which the scientifically literate reader can make sense of scripture as the foundation of the Christian faith. It is a quick survey and helpful in its accessibility. On the other hand, it moves so quickly through landscape known to be dense that one has a sense of being on aerial reconnaissance over tangled terrain. This is especially true of the middle chapters that survey the types of Old and New Testament literature.

Would everything appear so manageable and reasonable were one to get down in the undergrowth? Not if one is lulled by Polkinghorne's quintessentially British voice of eminent reasonability. One loses count of the number of sentences that aver "it is certainly the case that …" or use the word "surely" to suggest irrefutability.

The early chapters address the character of scripture, especially its origins in religious experience. Revelation is progressive and therefore laden with ambiguity. Sacred history and knowledge of the divine unfold slowly over millennia. What in earlier texts is asserted about the ways of God with humankind is in later scripture revised or rejected. The changes, however, are directional, like evolution, and the mature picture of God, especially as we come to understand God in Christ Jesus, is rich and rewarding.

Where does Polkinghorne's identity as a scientist come through? It emerges in bits and snatches. On more technical issues, he frequently references his earlier writings. Sometimes images are drawn from the scientific realm. He suggests, for instance, that scripture is not divine dictation, but rather a lab notebook that contains human observations and reflections on religious experience. The metaphor, however, has little staying power. Indeed, Polkinghorne himself spends a great deal of time addressing the narrative character of scripture even though narrative and lab jottings are largely exclusive forms of writing.

In the last chapter, Polkinghorne highlights three texts that he finds especially profound—the prologue to John, the Christological hymn of Colossians 1, and the Pauline riff on the futility of creation in Romans 8. John's prologue seems to him to strike the perfect harmony between order and chaos, matching spiritual reality with the quantum world. Colossians 1 relates the work of Christ to all of creation, both physically and biologically. Romans 8 resonates scientifically with entropy and the necessary wastefulness of evolutionary process. No Edenic or moral Fall for Polkinghorne, but he certainly sees the felicity of an ontological fall into a world of freedom and possibility. This chapter alone, regardless of whether one agrees with Polkinghorne, makes the book a worthwhile read.

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THE MIND AND THE MACHINE: What It Means to Be Human and Why It Matters by Matthew Dickerson. Grand Rapids, MI: Brazos Press, 2011. xxvi + 230 pages. Paperback; $19.99. ISBN: 978-1587432729.

Frodo Baggins might be said to exemplify the value of virtue precisely because he freely chooses to do right at great cost to himself. Tolkien uses the con-

cept of heroism, Matthew Dickerson argues, to show that free will to strive toward our *telos* differentiates humans from machines and allows the possibility of true reason and virtue. Dickerson, professor of computer science and environmental studies at Middlebury College, has written several laudable books about the truths contained in the fantasies of Tolkien and Lewis. In this work, he argues against naturalism, physicalism, materialism, and reductionism, using a stirring argument from the reality of human creativity, heroism (seen as virtue), art, and environmental concern. While the chronicles of Tolkien and Lewis are used to elucidate these concepts, the integrative dualism of Charles Taliaferro is given as philosophical warrant. These human values are set in contrast to the mechanistic ideology represented by Kurzweil's *The Singularity Is Near* and the *Matrix* films.

In the first section of the book, Dickerson presents the logical conclusions of several physicalist presuppositions and shows how the new atheists disguise these philosophical presuppositions as science. The abolition of creativity and virtue logically follows, along with machine-like life beyond freedom or dignity described by Kurzweil and Skinner. Arguments in this section, largely based on the work of Taliaferro and William Dembski, raise several useful points about the nature and operation of science itself. Science can have no answer for the problem of subjective experience, so although we know beauty and virtue to be true, they are not accessible to science. Dickerson also invokes J. B. S. Haldane's well-known argument about the unreasonableness of using reason.

The second section gives a theistic defense of both reason and science. Reason is not wholly explicable by natural laws and so must have a supernatural source (p. 160). Although our ability to reason is flawed because of our broken relationship to God, Christianity, he says, holds a high view of reason, and ultimately reason can be trusted because the source of reason is a divine Reasoner (p. 163). This appears to me to be a circular argument, although he invokes the miracles of Jesus as supporting evidence for the reasonableness of Christianity.

Taliaferro's interactive dualism is then presented as a more holistic form of dualism than that of Descartes. Rather than explicitly attempting a proof of dualism, Dickerson seeks to confirm its compatibility with the cherished values of creativity and ethical concern for others and for the environment. Although not explicitly stated in the book, Taliaferro believes the soul is cospatial with the body rather than extensible in space; this view allows greater cooperation between soul and body than Cartesian dualism allows. Dickerson avers that Christianity teaches an *immortal spirit*, which is to be distinguished from the *Platonic soul* (pp. 156–7). This biblical teaching gives value to the body not found in Platonic dualism. Because Judeo-Christian dualism fully affirms the close connection between body and spirit, it holds both the physical body and the physical cosmos in high regard. This invalidates any denigration of the body seen in Platonic dualism or disregard for creation held by some Christians. In closing, Dickerson appeals to the reader to listen for the personal voice of this divine Reason.

Mind and the Machine provides a mostly well-crafted and accessible popular-level introduction to some of the naturalistic presuppositions often employed in philosophical arguments against theism. It also includes some useful Christian responses to atheism. I found the relative lack of references from either philosophy or theology and, in particular, none from science striking, even though the book is clearly not aimed at an academic audience.

As a neuroscientist, I expected that at least the chapter titled *Reason, Science, and the Mind as a Physical Brain* would consider some recent findings in neuroscience, but surprisingly neuroscience is not mentioned anywhere in the book. Any evidence for the ever-tightening link between the mind and the brain is omitted, along with the evidence that this interaction works both ways, namely, top-down and bottom-up. Downward causation of the mind on the brain would seem to be a useful addition in support of the antireductionistic argument Dickerson presents. He also fails to distinguish between strict naturalism and other broader forms which allow for the reality of consciousness and mental experience as an emergent from physical reality.

The use of the term *spirit* throughout the entire book in contexts in which most philosophers and theologians would use *soul* left this reviewer confused. Although he mentions the tripartite *soul* (p. xvi) rather than a tripartite person, and refers to the *mind* as being in the middle between *body* and *soul* (p. xvii), I could not decide if Dickerson differentiates between *soul* and *spirit*, or conflates the two. For example, even though Matt. 10:28 and 16:26 use the word *psyche* and not *pneuma*, Dickerson proposes that these verses deal with death of the *spirit*. He also states that the eternal *spirit* is to be reimbodied (p. 200) and that God breathed *spirit* into the dust to create Adam (pp. 130, 200). We are not told if this use of *spirit* is specifically intended to distinguish

his view from Platonic dualism, or if he is merely appealing to a popular evangelical audience.

My major concern is that Dickerson sets up his argument as if the only alternatives are substance dualism or eliminative materialism, necessitating a choice between the Shire and the Matrix. Of course we desire the heroism and beauty of Middle Earth, but is substance dualism the only compatible philosophy? Even among non-Christian philosophers there are other possible positions which might be relevant. For example, some of Chalmers's arguments could have been applicable even if he were not a theist. As a substance dualist, Chalmers holds that consciousness is a given fundamental of the universe, the same as gravity is. Gravity is physical, but its existence is also not fully explainable in physical terms. The only nondualist proposal Dickerson mentions is John Searle's position that consciousness is not ontologically reducible to brain processes even though it is completely caused by and realized in the brain. Dickerson lauds Searle's affirmation of the reality of consciousness, but dismisses Searle's reasoning.

A more relevant addition to the nonreductionistic argument, I believe, would be the concept of emergence, especially as developed by several Christians. Emergence can be either dualistic (e.g., Hasker) or entail development of a real mental reality from the physical brain. Judging by the number of recent articles in *PSCF* and *Science and Christian Belief* as well as recent books and symposia (e.g., http://rsfs.royalsocietypublishing.org/content/2/1.toc), top-down causality and emergence seem worth considering. Numerous Christian neuroscientists (e.g., MacKay, Jeeves, Brown, Newsome), philosophers (e.g., Murphy, O'Conner, Corcoran), and theologians (e.g., Polkinghorne, Green, Markham, Wright) affirm emergence of consciousness and soul without denying God's action in the universe. Jeeves's notion of dualism of aspects, "an intrinsic duality that we have to deal with but this does not need to be seen as dualism of substances," is widely known among Christians who study neuroscience or psychology. Soulishness and spirituality might be seen in terms of the *telos* God calls forth as our entire being in all its facets responds to him.

In speaking of substance dualism, N. T. Wright has compared the "god of the gaps" view of creation with what he calls a "soul of the gaps" view of personhood. Howard Van Till spoke of the "functional integrity of a fully gifted creation" which can freely participate in its own development. Discussion of the mind/body problem is ultimately a continuation of the discussion of how God works in the universe—through direct intervention or through the emergence, by God's action, of creative properties. Both scenarios hold God to be causally effective in the universe. Ultimately, however, both dualist and nondualists among us agree that the Holy Spirit is "everywhere present and filling all things" (as the ancient Trisagion prayer expresses), choosing to work with, in, and through the creation over which he hovers.

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JESUS CHRIST AND THE LIFE OF THE MIND
by Mark A. Noll. Grand Rapids, MI: Eerdmans, 2011. 180 pages. Hardcover; $25.00. ISBN: 9780802866370.

A number of thorny issues confront Christians who wish to pursue serious study. What should we do when scripture seems to disagree with the results of our research? Is serious study compatible with serious commitment to Christ, given that evangelicals in particular have often shown some degree of suspicion toward academia?

University of Notre Dame Historian Mark Noll addresses these issues in his latest book, *Jesus Christ and the Life of the Mind*. Noll has been challenging fellow evangelicals to use their minds ever since his 1994 book *The Scandal of the Evangelical Mind*. In some ways, this latest book is a sequel to *Scandal*. But he goes much further than critiquing and challenging evangelicals in this book, providing a framework for motivating and executing serious study as Christians.

> Since the reality of Jesus Christ sustains the world and all that is in it, so too should the reality of Jesus Christ sustain the most wholehearted, unabashed and unembarrassed efforts to understand the world and all that is in it. (p. 22)

The book finds its theological anchor in the creeds of our faith and in the great Christological texts of John 1, Colossians 1, and Hebrews 1. The first chapter examines the major creeds at length, laying the foundation for the rest of the book. Chapter 2 then looks at how Jesus Christ can provide motivation for serious learning. This chapter continues to build a foundation for the issues to be addressed later. Noll explores a number of scriptural texts on the preeminence of Christ and on various aspects of the Incarnation. On the first reading, I found the connections to academic study too abstract, more like devotional reading than a book about the life of the

mind. I found the chapter much more significant when I returned to it after understanding where the rest of the book was going!

The material becomes more substantial in chapter 3 when Noll begins to offer some guidance for serious learning. This chapter presents four general principles, which are explored in greater detail for three specific disciplines of study in subsequent chapters. The four "stances" or "expectations" Noll presents are doubleness, contingency, particularity, and self-denial. He maintains that "once the nature of Christ's person and work is grasped, and then the centrality of Christ for all things, these four stances should seem noncontroversial" (p. 45).

Doubleness: Through the incarnation, Christ is presented as fully human and fully divine. Our human reason tends to fight the tension of this "doubleness," but it is at the very center of our faith. And "if the center of human history has [this character], why not at least some of the peripheries?" (p. 48). We can see God fully at work in things that are also fully natural or human processes.

Contingency: Most of scripture and most of Christology derived not from an abstract philosophical or speculative approach to truth, but from experiencing what God actually did in the world. Our faith is rooted in historical, experienced realities. In the same way that we know God best through experiencing what God has actually done, we should learn about the natural world primarily by empirical study.

Particularity: "Because God revealed himself most clearly in a particular set of circumstances and at a particular time and place, every other particular set of cultural circumstance takes on a fresh potential importance" (p. 55). The birth of Christ was a local event with universal meaning. Other particular events merit serious study because they too can be broadly meaningful.

Self-denial: Academics are vulnerable to sins such as pride and isolation. Focusing on the One who is gentle and humble in heart, and belonging to his Body will help us to approach study in a more selfless, loving, and modest way.

Three subsequent chapters get down to specifics: how should a scholar approach history, science, or biblical studies in light of the position that Christ is the One in whom all things hold together? Noll begins with historical study, his own field of specialty. By looking at how history is treated in scripture and at the historical event of the Incarnation, he rules out both radical objectivism on the one hand, and postmodernist positions that disavow any meaningful connection to reality on the other hand.

The next chapter concerns approaches to science, and is likely of particular interest to *PSCF* readers. Noll discusses several historical currents that have shaped the assumptions for much of the current science-religion interface. He begins with a debate between Thomas Aquinas and Duns Scotus from the thirteenth century. Scotus argued that many descriptions can be applied to both God and humans "univocally"—with exactly the same meaning—while Aquinas held that the comparisons only held analogical value. Scotus's position ultimately led to an assumption that is widely accepted to this day: that "once something is explained clearly and completely as a natural occurrence, there is no other realm of being that can allow it to be described in any other way" (p. 107). This position and later philosophical assumptions are set in contrast with the theme of doubleness discussed above. In Christ are united the fully divine and the fully human; in the world are united God's sovereign providence and apparently natural processes. The world, "even in its most physical aspects, reflect[s] the wisdom and glory of God" (p. 112). Noll thus urges followers of Christ to be guided by empirical study rather than predetermined ideas when approaching the natural world. Conservative Presbyterian B. B. Warfield is presented as an example of excellence in holding both scripture and empirical science in the highest regard. In the study of biological origins, as in the authorship of scripture, Warfield argued for a *concursus* or coexistence between divine and natural causation, rather than putting them in opposition.

Lastly, Noll takes up the question of how a robust Christology shapes an academic approach to interpreting the scriptures themselves. This chapter is also of relevance to those of us interested in science and faith, because one of the key questions is how to approach passages of scripture that seem to contradict the conclusions of modern science. Following the example of the scriptures themselves, we should focus our study of scripture on Christ. We must also pursue understanding of historical contexts so we can understand the text's original intent as much as possible, self-consciously critiquing our own assumptions in approaching a text. An important case study in this chapter is Peter Enns's book *Inspiration and Incarnation*, which is held up as a good example of serious Christology applied to serious intellectual study of the scriptures (meriting attention even from groups who may disagree with Enns's conclusions).

Jesus Christ and the Life of the Mind is above all a challenge to excellence in study. "For 'Christian scholarship' to mean anything, it must mean intellectual labor rooted in Christ, with both the rooting and the laboring essential" (p. 147). I warmly recommend the guidelines in this small book.

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PHYSICS

LIGHT FROM LIGHT: Scientists and Theologians in Dialogue by Gerald O'Collins, S.J. and Mary Ann Meyers, eds. Grand Rapids, MI: Eerdmans, 2012. 256 pages. Paperback; $35.00. ISBN: 9780802866677.

Light from Light is the fruit of two symposiums sponsored by the John Templeton Foundation in the ancient city of Constantinople (2009) and Oxford (2010). The editors divide the book into two parts with an extensive introduction. Six scientists, Part 1, and seven theologians, Part 2, were invited to explore the physics and metaphysics of light.

Scientific studies of light are based on experimental data that are unified by theories of light constituted by photons. This description presupposes and determines what light is, and so metaphysical questions regarding the nature of light that go beyond the bounds of science are not relevant to the success of such theories. On the other hand, metaphysics and theology are the two domains of the ontological context that delimit what is possible and so play a regulative role vis-à-vis the experimental sciences.

Humans use nonphysical, mental constructs to know and describe the whole of reality as physical/nonphysical/supernatural, and to use language to make sense of the whole of reality and to communicate and store knowledge. Objectivity is obtained in science by defining terms operationally and thus precisely. When dealing with the whole of the human experience, however, language is often cumbersome when expressing basic human thoughts and experiences that deal with other than purely physical concepts, particularly when considering the supernatural aspect of reality.

Part One

John Polkinghorne bases the existence of all on the creative and sustaining power of the infinite Creator, with reference to Gen. 1:3 and 1 John 1:5. He stipulates that a deeper understanding of the notion of light in contemporary physics can serve as a further analogical source in discussions in theology. He reviews relativity, quantum theory, relationality, and cosmic properties. For instance, the quantum superposition principle is contrary to the Aristotelian law of the excluded middle, since one can superpose two states with opposite properties (e.g., spin directions). Similarly, the quantum paradox of the wave/particle duality helps us comprehend the human/divine duality of Jesus Christ. Polkinghorne contrasts the reality of photons established by detection via purely physical detectors, with the unseen reality of God, which is "detected" by humans.

Michael Heller reviews the historical development of the primeval atom hypothesis of priest and scientist Georges Lemaître. The creation of spacetime is a consequence of the role that light plays in the origin of the universe, which Lemaître links to the first verses of Genesis. Nonetheless, Lemaître developed a "separatist" position whereby science and theology "are situated on two different cognitive levels, and even if they use the same words, the meanings attached to them are different." In particular, "the scientific concept of beginning has nothing to do with the religious idea of beginning, understood as the creation of the universe by God."

Andrew Steane discusses quantum entanglement, one of the most bizarre aspects of quantum mechanics. He emphasizes that knowing in the physical world is based on the interaction between (physical) things. A minor misprint in Eq. (2) carries over to the unnumbered equation that follows Eq. (3).

Markus Aspelmeyer and Anton Zeilinger discuss (local) "physical realism" whose failure would imply that the actual outcome of measurements is determined by the measurements themselves and that measurement performed on one physical system can affect the state of another physical system (nonlocality). The former is the measurement problem; the latter, that of quantum entanglement. They argue that these physical results may indicate "a change in our epistemology and our ontology." It is clear that studies of the quantum aspect of light give information of the physical aspect of reality and cannot provide ontological answers that deal with questions of existence. Therefore, the worldview considered by Aspelmeyer and Zeilinger must be a physical worldview rather than a worldview that encompasses the whole of reality.

Robert Boyd presents the effects of nonlinear optics on the question of the speed of light and the principle of causality, which is sacrosanct in science.

The existence of subluminal, superluminal, and even "backward light" does not violate causality, because causality is determined by the information of a wave that is contained in the "front" of a pulse of light and not the associated group velocity. The information velocity determines causality, which is the speed of light in vacuum.

Marco Bersanelli reviews ancient and medieval perspectives on light as essential to human existence. In particular, he discusses Robert Grosseteste (1175–1253) whose cosmology views light as the source of every corporeity in nature, and Dante Alighieri (1265–1321) who described the natural properties of light. Both thinkers used the metaphor of light as the divine presence. It is remarkable how their incisive writings correspond to current knowledge of the cosmos (e.g., the accurate mapping of the cosmic microwave background radiation) and how contemporary knowledge can be used to illuminate further the metaphor of light as the privileged sign of the Creator.

Part Two

Gerald O'Collins brings forth the correspondence of glory and light with God in the Old Testament while in the New Testament one has "the light of the gospel of the glory of Christ, who is the image of God" (2 Cor. 4:4). His concern is how to understand the ultimate mystery of God and the Holy Trinity according to the lesser mystery that is light (i.e., Christ's divinity as "Light from Light.")

Kathryn Tanner considers the physical properties of light as a theological analogy for the Trinity, creation, and the presence of God. This she does via the study of church fathers John of Damascus, Gregory of Nyssa, Athanasius, Gregory of Nazianzus, and St. Augustine, as well as some theologians of the Middle Ages such as Thomas Aquinas.

Metropolitan Kallistos relates the complementary uses of light and darkness, each understood in four levels by the Greek fathers. Light is understood as physical, metaphorical or figurative, inward enlightenment, and spiritual. Darkness is understood as physical, metaphorical or figurative, purgative (passage from the senses to the spirit), and mystical.

David Brown alerts us to the combination of light and darkness for God in scripture, which is the content of Ps. 139:12. John Behr considers the Byzantine theology of light from "Let there be light" to "It is finished" (John 19:30) and the Christocentric rather than photocentric spirituality that it entails. Robert Dodaro concentrates on St. Augustine's writings on the different aspects of light: the spiritual (uncreated light; hence, God is Light), the nonphysical (God's activity in the human mind), and the physical (studied by physicists). George Hunsinger delves into the relationship between created (physical) to uncreated (supernatural, transcendent) light in the thoughts of medieval and modern theologians, especially Aquinas and Barth. Aquinas uses the term "analogy" as a mode of discourse and not a mode of being; Barth emphasizes the miraculous and the mysterious.

This book deals with a rather difficult topic of how the creature, embedded in the creation, can know the Creator who transcends it, and what vocabulary may be used to describe the latter. Part One is much easier to learn and understand owing to the experimental nature of the study of light, whereas the theological discourse in Part Two is rather abstract and hard to follow. I recommend the book to those interested in understanding the Creator in terms of the creation; however, I am sure this will not be the last attempt of bringing together such diverse scholars to answer a question that is truly shrouded in mystery. Only knowledge of Jesus the Christ can give a glimmer of hope of who God is: "For there is one God, and one mediator also between God and men, the man Christ Jesus" (1 Tim. 2:5), and "If you had known Me, you would have known My Father also; from now on you know Him, and have seen Him" (John 14:7).

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Religion & Science

THE WONDER OF THE UNIVERSE: Hints of God in Our Fine-Tuned World by Karl W. Giberson. Downers Grove, IL: InterVarsity Press, 2012. 201 pages, bibliography, notes. Paperback; $16.00. ISBN: 9780830838196.

Karl Giberson is a prolific writer of science and religion and was asked to write a faith-friendly book about science, including its history and philosophy. The intended audiences are Christians with a limited knowledge of science. Science, apart from some philosophical distortions, strongly supports a Christian worldview, and this book presents an accurate, nonthreatening affirmation of this claim. The book excels in two ways. First, this huge subject is pared down to a two-hundred-page nontechnical book. This paring requires Giberson to be very selective in which topics to include. The guiding principles

should be to make the book an easy read with clarity, reasonable completeness, and without prejudicial distortion of the true relationship between science and religion. Giberson has the foresight and experience to make wise choices in accomplishing this task. Secondly, the book excels in its storytelling narrative. Beginning with the ancient Greeks and advancing through modern science, Giberson gives interesting and enlightening short stories of the more humane side of scientists. The stories display the importance of discoveries, showing how science has evolved and developed.

The fine-tuning of the universe (anthropic principle) is not presented until nearly the middle of the book. Giberson discusses many of the varied viewpoints of leading scientists on the significance of fine-tuning and gives an excellent rebuttal of the atheistic multiverse explanation of fine-tuning. He also provides an accurate description of what science is and its limitations, including some philosophy of science.

Giberson's main argument in the chapter on evolution uses evidence to argue that evolution cannot be fully explained by random chance. Near the end of the book he briefly touches on a broader worldview which goes beyond science and includes religion and other human experiences. He expresses the beauty of the natural laws as manifested in mathematics, raises the question of whether or not we live in the best possible world, and addresses the problems of evil, pain, and suffering. One conclusion Giberson comes to is the following:

> If we find the world filled with wonders that move us spiritually or point beyond themselves or inspire us in ways not captured by our explanatory nets, we need not simply shrug our shoulders about why that might be. I think we can reasonably embrace the idea that there must be a transcendent reality in which these experiences are grounded. (p. 195)

There are a few minor blemishes in the book. As mentioned earlier, Giberson skillfully selects a boundary between topics to include and those not to include. For example, he discusses the Big Bang which signifies the beginning of the known universe, but he chooses not to mention that modern cosmological theories, including pre-Big Bang theories, consider the universe to be of infinite extent with no spatial boundary. This was a wise choice because its introduction would be a distraction from the main story. On one occasion Giberson does cross his self-imposed boundary to mention something that should have been avoided. In three separate places Giberson claims "Einstein wouldn't accept quantum mechanics" (pp. 71, 127, 129). This claim is superfluous since Giberson leaves quantum mechanics (QM) out of his story. The only context in which QM enters is that the theory allows, but does not require, the possibility of multiverses. Secondly, this claim is false. QM is the most successful and accurate theory of humankind, and Einstein knew and confirmed this. QM is also the least understood theory; Einstein rejected the most dominant philosophical interpretation of QM and strongly suggested that QM is incomplete. Currently, both the interpretation and possible incompleteness of QM are still open questions involving extensive study.

Another blemish is present in Giberson's discussion of the fine-tuning of the universe. He points out that it is critical that neutrons are more massive than protons in order for atoms, which are essential for life, to exist. Giberson fails to mention that the neutron's mass must be in a very narrow range. If it were even 1% heavier than the proton, it would not be stable inside key nuclei, and multinucleon atoms would not exist. Instead Giberson says, "The decay of neutrons is not a big deal though, and losing them has no consequence for life" (p. 121).

I have one wish for this excellent book. If a second printing is forthcoming, Giberson should include a section on another kind of fine-tuning. Our earth and universe are fine-tuned for us to be able to observe and learn about our universe. No atmosphere known to exist, which is as thick as the earth's atmosphere, is as transparent to light as the earth's is. The earth is also strategically located in our galaxy, which allows us a reasonably good view of our universe. The universe is also fine-tuned to enable us to study it. It is mind boggling that we can observe and study our universe in historical slices all the way back to the Big Bang, billions of years ago. A reasonable conclusion is that God intended us to study and marvel at his creation and glorify him. Science can be considered a God-blessed occupation.

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WAR OF THE WORLDVIEWS: Science vs. Spirituality by Deepak Chopra and Leonard Mlodinow. New York: Harmony Books, 2011. 316 pages. Hardcover; $26.00. ISBN: 9780307886880.

This tome on a struggle presently in progress between two worldviews was written by the physicist Leonard Mlodinow and the physician Deepak Chopra who specializes in mind-body medicine.

The book is a dialogue between the two authors on eighteen topics involving the so-called "war," the cosmos, life, mind/brain, and God. On each of these topics, one of the authors makes some comments and then the other author replies. The result is a lively, entertaining, and informative exchange of ideas.

Mlodinow has a Weltanschauung or worldview typical of a physicist who does not believe in God, so many of his assertions are what one expects him to say. For example, he says, "Many predict the demise of this kingly and personal God as future science produces triumph after triumph" (p. 276). Chopra, on the other hand, has a very unorthodox worldview since he maintains that the source of religion is not God but rather consciousness. He further claims that consciousness is the force that directs evolution, which itself is "the tendency for the universe to unfold along steps of increasing intelligence" (p. 56). Chopra is a leader in the mind-body-spirit movement and is known for his activities and writings on mind-body wellness programs. He has many strong supporters, as well as many critics who find some of his ideas excessively unconventional.

There are discussions of how the universe emerged, and how it has evolved. Mlodinow, of course, presents the standard Big Bang and evolution approach based on natural selection. In contrast to this, Chopra claims that consciousness underlies everything in nature, and is the force that directs evolution. He further claims that the universe is also loving, creating, and evolving through consciousness. Some additional topics for discussion are the nature of life, what make us human, the connection between the mind and the brain, and whether the brain is a computer. God comes in for an extensive examination with the questions, "Is God an illusion?" (p. 245), "What is the future of belief?" (p. 259), and "Is there a fundamental reality?" (p. 277). In the Epilogue, Mlodinow defends science as the proper approach to reality whereas Chopra contends that science is making way for a new paradigm in which consciousness takes center stage. Mlodinow sums up by saying,

> The issue that separates Deepak [Chopra] and me is not whether the universe has design, but whether something designed it, and whether it was designed for a purpose. (p. 108)

In contrast to these two worldviews, Christians look forward to the world eventually adopting a paradigm based on the teachings of Jesus Christ, in which the main purpose of creation is to provide an environment in which human beings can love, worship, and serve God by keeping his commandments.

This book can make available to *PSCF* readers many important insights into what the secular scientific public thinks about God and various other fundamental questions of our existence. In order to campaign to bring the world to Christ, it is important for Christian scientists to understand the motivations and thought processes of their secular scientific colleagues. This book can provide them with that.

It is a very favorable sign that a scientist of Mlodinow's eminence and convictions is willing to have a serious dialogue with a colleague of Chopra's viewpoint on the topic of spirituality. There is no doubt that the world at the present age has been experiencing a war or conflict between atheistic/materialistic secularism versus religion based on belief in and reverence for God. Leonard Mlodinow is certainly an appropriate spokesman for the former point of view, but in my opinion Deepak Chopra is far too unorthodox in his approach to be an appropriate spokesman for the latter point of view. He says, for example, "We must free ourselves from the burden of religious dogma" (p. 261).

A book of the present variety more realistically characterizing this "war" could be a useful thing to have. To be realistic, the defender of the viewpoint based on spirituality should not be someone like Chopra who claims that organized religion has discredited itself, but rather someone who is a firm believer in Christianity. After all, more than 30% of the people now living are Christians! This would provide the opportunity for a Christian scientist to explain the Christian Weltanschauung of how God not only created the material universe, but also made human beings in his image and likeness, sent us Jesus Christ to be our Savior and our Redeemer, and provided us with the scriptures to be our guide to living and worshiping.

In summary, this book provides valuable insight into the thought processes and viewpoints of typical scientists whose ideologies are of a materialistic and secular variety. It could be an important book in the hands of a faithful Christian who has a need to better understand the secular-materialistic viewpoint. However, for most scientists in the Christian tradition, there is no need for this, so reading this volume is not recommended for them. They would find it a rather disheartening experience.

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Technology and Engineering

ENGINEERING EDUCATION AND PRACTICE: Embracing a Catholic Vision by James L. Heft, S.M. and Kevin Hallinan, eds. Notre Dame, IN: University of Notre Dame Press, 2012. xix + 247 pages, index. Paperback; $34.00. ISBN: 9780268031107.

"No one is so naive as to think that there might be a special Catholic insight into thermodynamics …" So states the first paper in this intriguing collection. The statement is surely bolstered by the scarcity of literature treating the integration of Christian faith with the discipline of engineering. Tantalizing bits appear in related discussions exploring the relationship between science and Christianity. More fragments arise when the focus expands to include technology, though authors often skip from scientific knowledge to technology without any consideration of the creativity and design an engineer uses to meld constituent ideas into working technological products. Examples of this conversation include works by Ian Barbour, Jacques Ellul, Egbert Schuurman, and Albert Borgmann. Two books of particular note are *Responsible Technology*, ed. Stephen Monsma, and *Beyond Paradise*, by ASA member Jack Swearengen.

The literature covering the subcategory of Christian engineering education is even slimmer, surprisingly so, given the dozens of Christian colleges and universities that offer engineering. Unfortunately, faculty in these programs have largely limited their scholarly dissemination to secular venues such as publications of the American Society for Engineering Education, only obliquely touching on faith issues by writing about ethics, service-learning, philosophy, and sometimes the liberal arts. Writing that more explicitly considers faith and engineering has found a home in only a few publications favorable to such thinking. The Christian Engineering Education Conference has provided seven peer-reviewed proceedings since 1999, and at least two germane articles in *Christian Scholar's Review* have appeared in the last decade. They are "Towards a Christian Theory of Technological Things," by Lambert Van Poolen (Spring 2004: 367–78) and "The Challenge of Vocation in Engineering Education," by Byron Newberry (Fall 2005: 49–62). The March 2012 theme issue of *PSCF* was also devoted to responsible technology and issues of faith.

Given the dearth of published work on the topic, I was delighted to receive this book featuring ten conference papers that have been edited into chapters and divided into four sections. The editors complement each other. Heft is not an engineer, but a theologian interested in how Catholic faith relates to other intellectual traditions and disciplines. Hallinan is an engineering educator, though his previous publications have been primarily technical, not Christian perspectival pieces. The collection's authors are mainly, but not all, from Catholic traditions. Nevertheless, readers from across a variety of Christian traditions will find the book useful, particularly those who teach engineering in faith-based institutions.

I found much to like in this book. While many secular institutions of higher education have diffusive mission statements, many faith-based institutions couch their institutional goals concretely within the tenets of their faith. However, few engineering educators have articulated how that Christian mission plays out specifically for their discipline. This is the first published book-length treatise to explore the connection of Christian faith from a Catholic perspective within the domain of engineering. It is a serious attempt by these educators to apply the mission of their institution to the teaching of engineering. For the most part, it succeeds. The authors focus on Catholic social teachings as the most relevant part of their faith tradition in carrying out the task of integration. They recognize that engineering provides a number of tools to better pursue the Christian vocations of caring and social justice—vocations that can advance Christian witness. The virtue of humility is evident throughout the collection of papers. The authors do not pretend to have an exclusive hold on the truth, but modestly propose some important directions to explore. Service-learning and vocation are two common themes.

While the book is an excellent beginning, it should have further developed the central issue of integration rather than squandering space on peripheral issues such as the logistics of a seminar or a particular institutional description resembling marketing literature. The authors wade into the water of Christian faith and engineering synthesis, but stay close to shore rather than diving in deep. They go as far as suggesting that the concepts of one discipline can aid in understanding the other by providing a different perspective, but not so far as to suggest that one discipline could fundamentally change the other. The narrowing of vision caused by disciplinary silos is evident here. The authors do identify some boundaries (e.g., between theology and technology), speaking of relationships between them and of their

individual contributions to "issues at their boundaries" (p. 124), but they do not suggest that faith not only laps at the boundaries, but also permeates every discipline. The authors appeal to some relevant literature, such as Catholic social teaching, but they do not look beyond their immediate scholarly neighborhood. Engaging more previous work would have given substance to their stated desire of wanting to establish solidarity with other intellectual traditions (p. x).

Some of the authors see engineering as a neutral tool in service of Christian mission and see its product, technology, as a simple means whose value is judged solely by the end it accomplishes. Schaefer and Heidebrecht, in their chapter, contradict this view: "… particular technologies are far from neutral. Technologies not only embody the values of their human creators; they also encourage the adoption of particular values …" (p. 130). They do not go on to develop this idea, yet this point is crucial. Engineers do make numerous choices in designing technology—choices that are not merely mathematical calculations with singular solutions. In real-world technology design, the product is the result not only of mathematical and scientific considerations, but also of trade-offs between cost, reliability, sustainability, risk, fitness, and more. Thus while most of the papers in the collection recognize the importance of seeing the bigger picture (e.g., advocating for system thinking, or liberal arts, or broad-mindedness), they do not sufficiently recognize that Christian faith speaks directly to the prioritization of decision criteria in the engineering of technology. If design decisions are made with explicit recognition of broader principles, then technological products can serve justice, promote community, and care for creation.

As expected in a collection of papers on a challenging topic, one can find diversity in approach and methods, and even find contradictions. I am grateful that the editors chose to leave in these differences, thus providing us better insights into the richness of the topic. Engineering itself uses the diverse views of teamwork to successfully solve problems. Christian engineers can and do use diverse viewpoints to better understand God's will for how to do their work. One such disagreement embodies the book's central question: to what extent does Christian faith impact engineering? This review began with a quote from the one extreme—Heft writes in the first paper of the collection,

> No one is so naive as to think that there might be a special Catholic insight into thermodynamics or a Marianist take on hydraulics. Statics is statics, whether you are talking about a cathedral or the world headquarters of National Cash Register. (p. 20)

At the other extreme, Hallinan and Pinnell (in a later chapter) offer multiple possibilities of a "Catholic thermodynamics." Their suggestions include the following: to expand interdisciplinary interaction so that other disciplines help flesh out the context of the problem, to deepen understanding through critical thinking and epistemology, and to articulate goals and priorities by formulating definitions of "best."

Let me suggest a few more ideas to add to this good starting point. First, as mentioned earlier, technology is not neutral, and thus we can apply biblical principles directly to the engineering design process—principles such as stewardship, justice, and love. Second, not only is the design of the tool biased, but the use of the tool is also nonneutral. Thus, engineers ought to encourage proper utilization of technology. (Some of the papers in the collection do imply this direction, though a more direct application of scriptural guidelines would be helpful.) Third, as in the natural sciences, we can admire our Creator's fingerprints in his creation. The study of thermodynamics can illustrate some of "God's invisible qualities—his eternal power and divine nature," which the Apostle Paul tells us "have been clearly seen, being understood from what has been made" (Rom. 1:20). Fourth, as a profession, engineering already is guided by codes of conduct and ethics. A fruitful area of further research would be to explore how professional integrity can be connected with the tenets of Christian faith.

A fine start on a needed topic, this book will be helpful to Christian engineers and technologists, particularly for educators at faith-based institutions.

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A Call for Book Reviewers

The readers of *PSCF* have long appreciated the many insightful book reviews published within its covers. If you would be open to being asked to contribute to this interesting and important service of writing a book review, please send a brief email to patrick.franklin @prov.ca that describes your areas of expertise and preferred mailing address. This information will be entered into a database that will bring you to the book review editors' attention when a book of interest to you and *PSCF* readers becomes available for review. Of course, if a book is offered to you, you would still be able to accept or decline the mailing of the book.