Book Reviews

Environment

WHO RULES THE EARTH?: How Social Rules Shape Our Planet and Our Lives by Paul F. Steinberg. New York: Oxford University Press, 2015. 352 pages. Hardcover; $29.95. ISBN: 9780199896615.

In *Who Rules the Earth?,* political scientist Paul F. Steinberg argues that achieving environmental sustainability requires more than individual lifestyle changes; instead, people must work together to change the rules that govern societies. Written in a popular style and drawing on numerous real-life examples, this book offers an accessible, engaging introduction to the literature on institutions and what it can teach us about addressing today's environmental crisis.

The book is divided into four parts. In Part One, Steinberg establishes the meaning and importance of social rules. Such rules shape interactions between people by defining roles, rights, and responsibilities, and can be formal or unwritten. By this definition, social rules are ubiquitous, ranging from the operating manual of a private company to unwritten social customs to national laws and international treaties. Steinberg also discusses the barriers to creating good rules, countering one of the key objections to his argument: the idea that if better rules were possible, they would already have been created.

Part Two delves into three types of social rules that play key roles in environmental issues: property rights, rules around markets (including market-based incentives for environmental protection), and national environmental laws. In each of these chapters, Steinberg uses concrete examples to show how rules vary over place and time. While acknowledging the complexities of designing effective rules, this approach also reinforces the idea that rules are contingent and changeable.

Part Three discusses two contemporary trends in environmental regulation: increased international coordination, exemplified by the European Union's *acquis communautaire*, and decentralization of power, evident in initiatives such as community-based resource management. Both trends offer examples of innovative change and emphasize the importance of thinking strategically about new rules.

Finally, Part Four addresses strategies for achieving social change. Steinberg argues that positive change will not happen automatically through technological progress, economic growth, free markets, or individual lifestyle changes; instead, new ideas must be deliberately anchored and formalized as social rules in order to endure. At times, this involves changing the "super rules"—rules that determine how other rules are made. The book closes with several practical principles for action.

Who Rules the Earth? is a welcome addition to the environmental literature. Steinberg's argument is clear, convincing, and timely. He draws together theoretical and empirical research and a wealth of examples to reinforce two key points that may offer hope for today's ecological crisis: humans created the rules that have permitted, and even caused, so much damage to natural systems, and humans are capable of changing those rules. In learning about the progress that has been made in many countries over the past several decades, readers frustrated by stalled international negotiations and government heel dragging may see possibilities for future progress as well.

It is often tempting for Christians to limit our attempts at creation care to individual actions such as recycling, rather than getting involved in the messy and frustrating business of building coalitions and pushing for policy change. We know that isolated actions are insufficient to address the problem, but, we reason, are we not called to be faithful rather than successful? This book is a reminder to us that being faithful often does mean diving into complicated problems together, making our voice heard in the public square, and being an example—not only of individuals trying to do the right thing, but also of a whole community living a different way of life.

Unfortunately, Steinberg makes no mention of the role that faith or faith communities can play in influencing social rules. Given that the past few decades have seen Christian churches and organizations increasingly educating their members about creation care and engaging environmental issues in the public square—advocating for policy change, issuing public statements, joining the divestment movement—this may be a disappointing omission for readers of *PSCF*. On the other hand, it may also serve as a call to action, encouraging further efforts that are broad and effective enough to draw the attention and perhaps even cooperation of our secular colleagues.

The book is pitched at a level that will serve nonexperts and students well as an introduction to the literature on institutions from a variety of fields, including politics, economics, sociology, and business. While not offering new theories or data, Steinberg does an excellent job of drawing together existing research to offer a coherent, accessible argument about how it applies to the current ecological problem. Despite a few clunky metaphors, the book is well written and avoids jargon and dense academic prose. Numerous contemporary and historical examples, drawn from a range of industrialized countries and the Global South, keep the text interesting and engaging.

One topic that could have been discussed more extensively is the unwritten social norms, values, and attitudes that shape people's willingness to create and obey social rules. Steinberg certainly acknowledges the importance of these factors, especially in chapter 9. However, he only briefly discusses some factors that cause attitudes to change, before moving on to strategies for entrenching new ideas as formal rules. Given that changes in attitudes and rules must go hand in hand, more discussion of the literature from psychology, sociology, and other fields could have offered additional insight here.

Overall, *Who Rules the Earth?* offers a clear argument, firm grounding in research, and practical guidance for those who want to have a voice in shaping the rules that we live by. It will certainly be of value to Christians as we learn to work together to help our society achieve greater sustainability.

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CREATION IN CRISIS: Science, Ethics, Theology by Joshtrom Isaac Kureethadam. Maryknoll, NY: Orbis Books, 2014. xii + 388 pages. Paperback; $50.00. ISBN: 9781626981003.

King David was enjoying his relationship with his wife Bathsheba and their infant son, when Nathan the prophet came over and told him a story of a rich man, who, for his own convenience, had taken away his poor neighbor's one resource, a valued lamb. Angered, David declared, "The man who did this deserves to die!" only to be told by Nathan, "You are the man!" (2 Sam. 12:5, 7). Now Joshtrom Kureethadam declares that the one resource of many poor in the tropics, productivity of the land, has been taken away because of climate change. We in the wealthy countries are to blame: our affluent, sinful lifestyle has caused an ecological crisis, an injustice with physical, moral, and spiritual aspects, and we must repent through an ecological conversion. The author is a Roman Catholic priest, born in Kerala, India, in 1966, who defended his doctoral thesis, *René Descartes and the Philosophical Roots of the Ecological Crisis,* in 2007, and is now secretary and lecturer in the Faculty of Philosophy of the Salesian Pontifical University in Rome.

A brief introduction outlines the book's message. Then, Part I, "Are We Tearing Down Our Home?," traces the formation of Earth and its biosphere—home to humanity—from the Big Bang, through the accretion of the solar system, to the origin and evolution of life, culminating in modern humans. Over millennia, agriculture and industrialization shaped civilization, and "some of the major world religions were born: the great mystical religions of the East like Hinduism and Buddhism, and the great religions of revelation like Judaism, Christianity and Islam in the Middle East …" (p. 45). All this occurred on Earth, "a unique home for life in the infinitely vast universe" (p. 46). But now our home is evidently in peril: the scientific community has confirmed the ecological crisis, with global climate change its worst feature. Humans are deliberately destroying our common home.

In Parts II, III, and IV of the book, Kureethadam describes the ecological crisis as "a triple cry—of the earth, of the poor, and of the gods" (p. 78). The earth cries out: Your greenhouse gases have made my climate intolerable for present-day life, with the rising oceans inundating the best land, and with droughts, extinctions, pollution, and waste. The poor cry out: Insecure food supply, scarce fresh water, and bad sanitation are driving us from our homes as ecological migrants. Growth in our population is not the problem, but injustice is: you rich consume and destroy the earth's productivity, while we poor suffer the worst consequences. The gods cry out: You fail "to look at the physical world as God's creation and abode, and to treat God's home with the due reverence" (p. 293). You have lost sight of how the whole of creation is "destined to be redeemed and transformed in Christ" (p. 324). The ecological crisis is a "sin against God, humanity, and the world" (p. 340). Kureethadam's conclusion is then a call to respond to the ecological crisis. Following the example of Francis of Assisi, "we need to embrace the poor with the same love" shown by him, and to "adopt a lifestyle that is sober and frugal, remembering the words of Jesus that it is only the meek who will inherit the earth" (p. 372).

Kureethadam thoroughly documents his statements with numerous citations from the Intergovernmental Panel on Climate Change (IPCC), of journals including *Nature, Science*, and *Philosophical Transactions*, and references to related books for nontechnical audiences (but not to environmental textbooks). The moral and theological aspects are supported by quotations from scriptural texts, mostly biblical but a few Islamic and Hindu, by declarations of several modern Popes, and by writings by Roman Catholics and other Christians. Calvin DeWitt, John Houghton, Alister McGrath, John Polkinghorne, and Fred Van Dyke are among those cited. The book has a 14-page index but no illustrations other than a devastated landscape on the cover designed by Valentín Concha-Núñez.

Kureethadam's *Creation in Crisis* is a deeply troubling account of the ecological crisis, with a clear explanation for those without a background in science, and with an original discussion of the morality and theology that challenges all readers. However, Kureethadam implies that the emission of greenhouse gases is a wanton

destructive act, rather than the by-product of development of energy resources which has greatly increased the quality of life for many. There is no mention of much progress in environmental stewardship, for example, by closing coal-fired power plants, by lessening runoff of nutrients into water bodies, or by curbing industrial and vehicular air pollution. Nevertheless, the book's importance is confirmed by its parallels with the May 2015 encyclical of Pope Francis, *Laudato si' Care for Our Common Home*, http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html. This relatively brief encyclical has better advice than *Creation in Crisis* on practical actions to take to lessen the ecological crisis, but it has to summarize much, whereas Kureethadam provides a good resource for those wanting more details. ASA members need to pay attention to the message of this book, although its liberal and Roman Catholic theology will be an obstacle for some evangelicals.

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Ethics

COSMIC COMMONS: Spirit, Science, and Space by John Hart. Eugene, OR: Cascade, 2013. xi + 415 pages. Paperback; $40.00. ISBN: 9781610973182.

John Hart is professor of Christian ethics at Boston University's School of Theology (2004 to present). For two decades before, he was a professor, theology department chair, and founding director of the Environmental Studies Program at Carroll College, a Roman Catholic liberal arts college in Helena, Montana. Hart has three graduate degrees, including the PhD from Union Theological Seminary in New York City, and has worked as principal writer of various pastoral letters for the Midwestern Catholic, the Western US, and the Canadian Catholic bishops regional groups. In addition, he has participated in native spiritual leaders and human rights initiatives, which involved being a member of the delegation of the International Indian Treaty Council (an NGO) to the United Nations International Human Rights Commission, Geneva, Switzerland (1987, 1990), and as an invited observer at the World Conference of Indigenous Peoples, Rio de Janeiro, Brazil, which was connected with the UN Earth Summit (1992). Hart is widely published as an academic theologian, including four books prior to the one under review: *The Spirit of the Earth—A Theology of the Land* (Paulist Press, 1984); *Ethics and Technology: Innovation and Transformation in Community Contexts* (Pilgrim Press, 1997); *What Are They Saying about … Environmental Theology?* (Paulist Press, 2004); and *Sacramental Commons: Christian Ecological Ethics* (Rowman & Littlefield's Nature's Meaning Series, 2006).

These credentials need to be emphasized so that readers do not dismiss out of hand—as most academics and scientists have been instinctively trained to do—the thought experiment that is at the heart of *Cosmic Commons*: how might human beings prepare themselves for meeting and interacting with extraterrestrial intelligent (ETI) beings should they exist in the universe? Hart's pilgrimage to this topic began with formal training in social ethics, developed through engagements with environmental theologies, and has been honed over prolonged conversation with native, indigenous, and Amerindian conversation partners. Amid growing discussions of the need for humankind to attempt space travel, and perhaps even to colonize and inhabit other planetary environments, Hart is particularly concerned that we will be propelled by morally deficient and behaviorally destructive models of exploration and conquest such as those encoded in what scholars have called the "Discovery Doctrine." He argues that we should be guided by more recent ethically cogent and ecologically friendly guidelines such as those produced by the United Nations on Earth and outer space, rather than by a doctrine which facilitated European genocide in the Americas over the past five hundred years. Encounters with ETI premised on "Discovery" mentality and attitudes could be tragic, not only for alien creatures but surely for the human species, particularly if these "others" are more technologically advanced in their destructive capacities than we are.

There are four steps to Hart's thought-experiment, each (part) of which includes three chapters. *Terra Firma*, Part I, uncovers both the economic and political roots of Earth's socioecological crisis, the latter especially as unfolded in the history of the Americas, and overviews initial steps that humanity has taken toward restoration of the Earth's socioecological commons. Part 2, *Terra Conscientia*, follows through on the trajectory charted by deployment of "Discovery" commitments as applied to possible ETI "contact," retrieves voices, specifically from the Christian theological tradition, that are suggestive of alternative postures and convictions for considering the possibility of ETI, and outlines an overarching socio-eco-ethical framework for such "contact" between *Homo sapiens* and others. *Terra Incognita*, Part 3, presses forward into imaginative construals of "contact" along three lines: (1) theoretically through the filling out of Hart's proposed "cosmosocioecological praxis ethics"; (2) documentarily through analytical assessment of internationally developed and agreed upon space documents and principles developed in the last generation; and (3) historically through scholarly assessment of alleged prior encounters with ETI, including in Roswell, New Mexico, in 1947, and in the Hudson River Valley, New York region, in the early 1980s—topics taken up at greater length in Hart's companion *Encountering ETI: Aliens in* Avatar *and the Americas* (Cascade Books, 2014).

The final section of the book details Hart's normative proposals toward envisioning "cosmic coexistence" (on cosmic consciousness and cohesion), articulating a "cosmic charter" (on constructive consultation and consociation), and building a "cosmic commons" (on celestial cohabitation, conservation, and compassion).

Pascal's "wager" seems apropos at this juncture: even if there were no ETI elsewhere in the cosmos, Hart's work would be helpful at least for thinking about how our approach to outer space would be ethically responsible, environmentally sustainable, and theologically informed. But if we neglected such offerings, and "contact" were to occur, it would be confrontational rather than productive of commonality, and in that case, no second chance may exist for us to retrace our steps. Beyond such possibilities, however, I suggest that at least for religious persons and others who are uninclined to think that intelligent life is reducible to terrestriality or materiality, this volume invites consideration of how we might interact with creatures that "have a different form of existence," what some have called "Extra-Dimensional Intelligence" (pp. 286, 295). This would require perhaps another book, but the seeds reorienting human values toward such possibilities are sown here. Academics and theologically oriented readers can be assured that *Cosmic Commons* is well worth the investment of time (it is not a short book) and money (nor is it cheap, relatively speaking) since its "fictional" character builds concretely on what we know and seeks to anticipate, at least ethically, how we might further understand and better orient ourselves toward what otherwise "now we see in a mirror, dimly" (1 Cor. 13:12, NRVS).

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History of Science

DARWIN'S DICE: The Idea of CHANCE in the Thought of Charles Darwin by Curtis Johnson. New York: Oxford University Press, 2015. xxxii + 253 pages, endnotes with each chapter, appendix on primary sources, bibliography, index nominum. Hardcover; $31.95. ISBN: 9780199361410.

In the 1920s, quantum physicists proposed that indeterminacy was part of the nature of elementary particles. In 1953, James Watson and Francis Crick announced their discovery of the structure of the DNA molecule, thereby providing a mechanism that can account for mutations—the random modification of a single nucleotide. Following upon these discoveries, the phrase "we live in a chance-governed world" has today become cliché. Charles Darwin knew none of this and yet chance variation was a critical factor in his theory of evolution. Thus Darwin is often linked to the chance-governed-world notion. So what did Darwin actually understand by "chance"?

Darwin was a nineteenth-century scientist who shared the Enlightenment perspective that the natural world was governed by deterministic laws; "chance" for Darwin was shorthand for "cause unknown." Nevertheless, Darwin viewed chance events as gratuitous and "accidental." Darwin reconciled this apparent inconsistency by defining "chance" as meaning that variations among offspring were independent of the adaptive needs or opportunities of species; this is the definition of "chance" that distinguishes the way randomness is used in biology today from other sciences. That is, variations could be deterministically produced by unknown causes acting according to unknown laws but still be gratuitous from the perspective of the species' needs.

However, "chance" for Darwin also had other aspects—sometimes Darwin used "chance" in the sense of probability—what is the chance that a particular offspring will survive? He also used it in a deeper sense. "Cause unknown" at times conveyed the additional meaning of "cause unknowable." That is, he saw many chance variations as unknowable because they were not guided by a directing rational agency; he came to this conclusion because

> there seems to me too much misery in the world … I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance. (p. xviii)

This was the heart of the problem with Darwin's theory for his contemporaries; no one could object to "unknown causes"; however, causes that were not designed and irrational posed a serious obstacle. Nevertheless, while these concepts are clearly presented, this book could have benefitted from a more systematic analysis of Darwin's concept of chance. While Johnson attempts this in the first chapter, new meanings and nuances on meanings pop up in subsequent chapters making it difficult to nail down exactly what chance meant to Darwin.

Darwin's Dice is not a book about Darwinism. It is a book about Darwin's views of chance. However, Johnson does briefly discuss Darwinism; in particular, he suggests that for Darwin, the most important feature of his theory was not natural selection but variation among offspring. Without variation, natural selection would not have alternatives to select among. Darwin thought a lot about the causes of variation—he pioneered the study—but he never succeeded in discovering them. This is not surprising given that Mendel's work on

inheritance and the concepts of the DNA molecule and mutations were unavailable to him. He believed that the causes were real, deterministic forces. He accepted the Lamarckian idea of use-inheritance and the notion that external circumstances could exert influence on the reproductive organs; however, later in his career, he came to believe that the nature of the organism was a more significant cause of variation than the nature of the conditions surrounding the organism. That is, he moved closer to the contemporary idea of random variations acted upon by natural selection.

Johnson forcefully argues that Darwin's understanding of the role of chance in his theory of evolution never changed. However, Darwin's ways of expressing this role changed enormously. By the sixth edition of the *The Origin of Species*, the word "chance" had almost dropped out of the book. This theme is Johnson's main focus and he spends four of his ten chapters on it, tracing a path that began with the word "chance" and ended with the phrase "spontaneous variation," using a number of other terms along the way. This evolution of terminology was Darwin's way of responding to criticism and making his theory more palatable to his contemporaries without changing the theory. Johnson also discusses two major examples Darwin used to communicate his theory. The first illustrates how order can arise from chance: an architect picks up random pieces of stone that have fallen from a precipice and fashions them into a beautiful building. The architect in Darwin's metaphor is not an intelligent designer but laws of nature. The second example is giraffes, used by some of his critics to argue for use-inheritance. Darwin did not dismiss use-inheritance but used this example to argue that chance variation plus natural selection were more important.

Johnson addresses Darwin's religious views at several points; however, from my point of view, he is too heavy-handed in revealing his preference for atheism and applauding Darwin whenever he seems to move closer to it. Darwin saw no role for an active God in nature; early in his career, he wrote that he saw no problems with the deistic notion that God had created the laws that governed nature. Later in his career he doubted this perspective, although he never embraced atheism in his public or private writings. An 1860 letter to Asa Gray articulates his ambiguity:

> I see a bird which I want for food, take my gun and kill it, I do this *designedly*. —An innocent & good man stands under a tree and is killed by a flash of lightning. Do you believe … that God *designedly* killed that man? Many or most persons do believe this; I can't and don't. If you believe so, do you believe that when a swallow snaps up a gnat that God designed that that particular sparrow shd. [sic] snap up that particular gnat at that particular instant? I believe that the man and the gnat are in the same predicament. If the death of neither man nor gnat are designed, I see no reason to believe that the *first* birth or production should be necessarily designed. Yet I cannot persuade myself that electricity acts, that the tree grows, that man aspires to the loftiest conceptions all from blind, brute force. (p. xix)

Darwin never settled his uncertainty about God. He also never wavered in his faithfulness to Enlightenment science, but, as far as we can tell, he never could bring himself to fully embrace materialism.

The book concludes with two chapters exploring some of Darwin's philosophical reflections. One examines Darwin's denial of the existence of human free will on grounds that the world is governed by deterministic laws; in this sense, he regarded free will and chance as the same. The other discusses Darwin's view of human morality in light of his denial of free will. In brief, Darwin argued that humans make moral choices based on seeking pleasure; he also believed in an inborn moral sense that made certain states of affairs more pleasurable than others.

I would recommend this book but only to a somewhat specialized audience—readers who want to look carefully into this aspect of Darwin's thought, scholars who want to explore how biology acquired its unique definition of randomness, and anyone interested in exploring the way contemporary culture understands chance.

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Origins

HUMAN EVOLUTION: Genes, Genealogies and Phylogenies by Graeme Finlay. New York: Cambridge University Press, 2013. 359 pages. Hardcover; $79.99. ISBN: 9781107040120.

Human Evolution is an interesting read that will appeal to a broad scientific audience and anyone interested in evolutionary biology. The author's purpose is to persuade the reader that humans and primates (namely chimps) diverged from a common ancestor. In the prologue, the author makes it clear that his intent is not to dance between genetic evidence and theology to explain human origins, but simply to relay scientific facts. He proceeds to do so by presenting the reader with various examples of genetic mechanisms and accompanying diagrams. True to his word, there is no mention of God, a creator, or any reflection on Christian beliefs or principles in these examples.

The book is arranged into four sections, each section a collection of a distinct type of genetic evidence in

support of our common ancestry with primates. The discussion shifts from the study of retroviruses to transposons (genes that actually "copy and paste" or "cut and paste" themselves throughout the genome) to pseudogenes (genes that do not code for functional protein), to the phenomenon of gene formation. The author keenly describes these various pieces of evidence as "very compelling." Christian or not, the supposed evolution of humans from a common primate ancestor has received attention for years, but only relatively recently have we had the necessary tools to investigate questions regarding the human and nonhuman primate genomes.

The similarity of the human genome to the chimp genome is reported to be anywhere from 96–99%. The author capitalizes on this similarity and not only provides the reader with details in support of this point, but also attempts to convince us that this likeness is the result of a common evolutionary lineage. He believes that the most convincing piece of information in support of this argument lies within the shared mutated regions of the chimp and human genomes. Mutations can exist in many forms: a change in a single building block of DNA, the insertion of a stretch of DNA into a gene, or even the deletion of part of a gene, to name a few. The basis for the author's argument that humans share a common ancestor with primates goes something like this: humans share genes with other mammalian species. Some of these shared genes are functional in certain species, but nonfunctional in others. For a species with a nonfunctional copy, a mutation must have occurred within the gene at some point, rendering it nonfunctional. When two species share the same mutation within the same gene, it is then believed that the species diverged from a common ancestor.

While I understand that the aim of this book was not to relate genetic evidence to the biblical account of creation, the book almost seemed incomplete without some mention of how all of this genetic evidence might coexist with faith. The closest that the author gets to this is in the epilogue, where he acknowledges that although humans and primates are similar genetically, many differences in cognition, intelligence, and spirituality separate us as species.

An additional critique is that the author's argument seemed to ignore the potential for new technologies to lead us to conclusions that challenge present understanding. For instance, the analysis of high-throughput genomic data is a relatively new area of science. As much faith as I place in the potential power of genomic data, I am equally aware of the assumptions, caveats, and potential errors that accompany such analyses. Unfortunately, the author fails to draw attention to this. He mentions that sophisticated algorithms and statistical analyses are performed to conduct the types of phylogenetic analyses that he spotlights, but he does not inform the reader of the potential biases or assumptions that accompany them. Numerous methods and software packages exist to sequence DNA, call genetic variants, and align DNA to a reference genome—each method with its associated error rates and inconsistencies. In fact, there is still much debate within the genetics, bioinformatics, and statistics communities regarding which software and methods are best for analyzing these data. This is a clear indication that there is still much to learn in this field of study. I was both surprised and a little disappointed that the author did not acknowledge these potential problems and shortcomings.

Lastly, I also think it important for the author to mention the *differences* between the human and chimp genomes. For example, what about the striking dissimilarity of the human Y chromosome to that of the chimp Y chromosome?

Human Evolution is a good read for anyone interested in phylogenetics, molecular genetics, or evolutionary biology, but will disappoint those looking for a theological perspective or discussion.

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Philosophy & Theology

CREATOR GOD, EVOLVING WORLD by Cynthia Crysdale and Neil Ormerod. Minneapolis, MN: Fortress Press, 2013. 168 pages. Paperback; $18.00. ISBN: 9780800698775.

Crysdale and Ormerod have written an excellent and accessible book for "those in the middle" of the culture wars on the issue of evolution and Christian faith. They argue that science and faith are complementary pursuits and do so assisted by the groundbreaking methodology of the late Jesuit philosopher and theologian Bernard Lonergan.

First, the authors furnish a brief overview of the emergence of modern science and the legacy of the problem of God's relation to nature bequeathed to us by the interaction of Newton and Laplace. Newton's system was deterministic, but it required "intermittent divine interventions" (p. 5) to keep things running smoothly. The central theological question here is, "Is God not only a primary cause but also a secondary cause, intervening occasionally to ensure God's order in the universe?" (p. 5). Newton's invocation of God as a secondary cause maintaining the solar system's stability, with Laplace's famous retort, has set the mold for the unfortunate "God of the gaps" pattern that science and faith have pursued for hundreds of years. Newton's

deterministic worldview was rather recently shattered with the introduction of Darwin's statistical model of science and the advent of quantum mechanics. This was a revolution in thinking, since, for the first time, probability was viewed as a valid way of doing science. Thus, with Newton, we have a model of science that focuses on regularities, while with Darwin (and quantum physicists), we have a model of science that admits of the random. A question for theology and ethics is whether the universe is, at bottom, purposeful or chance-driven.

The authors introduce readers to Lonergan's way of characterizing the progress of the physical sciences as a function of the nature of the inquiries we make. Newton's approach to the physical world led to an emphasis on its regularities, and classical science was its result. Darwin's approach emphasized the contingent or conditional nature of such regularities, and its result was statistical science. Classical science heads toward regularities that hold "all things being equal," that is, if certain contingent conditions are met. Statistical science heads toward ideal frequencies with respect to which actual frequencies are expected to diverge in a nonsystematic way, that is, in a random fashion. Each kind of science grasps a different sort of intelligibility, "Classical science seeks the *intelligibility of system* while statistical science seeks the *intelligibility of probability*" (p. 24). These two "models" are not, Lonergan insists, separate endeavors, but interweave when giving an account of the natural world.

The authors have a very helpful clarification of the meaning of random. They argue that there is no such thing as "a random event," since randomness can only be determined relative to a patterned aggregate (ideal frequency) from which that event diverges nonsystematically. Such a nonsystematic divergence cannot be determined by a single instance. Conversely, the claim that the universe is absolutely random would require virtually omniscient knowledge since it "would require a grasp of some intelligible pattern … from which all events diverge nonsystematically" (p. 31).

Lonergan argues that the interweaving of classical regularities and statistical probabilities yields the world process of "emergent probability." This is Lonergan's umbrella concept referring to nature as a self-assembling, hierarchically structured reality. Such a structured reality emerges as a result of certain "schemes of recurrence." The latter are any cyclical series "in which the occurrence of any one of these events sets off a recurrent scheme" (p. 32). The authors use examples such as Earth's water cycle and the Krebs cycle for the production of energy in the cells of our bodies. The basic idea is that as such schemes assemble and repeat themselves they become intertwined in such a way that new orders and structures emerge and flourish. The emergence of these new structures makes further, more complex interdependencies more likely, that is, it "shifts the probabilities of certain further events occurring" (p. 35). This point is employed to challenge "intelligent design's" account of certain biological structures as "irreducibly complex." The authors summarize, stating that (1) natural selection is not a random process, (2) it pertains to populations and not individuals, and (3) it occurs as a result of the interaction of random and nonrandom processes in accord with Lonergan's notion of "emergent probability" (p. 39).

Crysdale and Ormerod go on to defend the classical conception of God as eternal (beyond time and space), unchanging, omniscient, omnipotent, and so forth, from certain charges of process theologians. Since they believe that the classical conception makes God too remote, process theologians have wished to bring God closer to the evolving world. They wish to introduce change, limitation, and contingency into the divine essence. Thus, God's nature, in the process view, would be "dipolar": one pole having the classical attributes; another possessing more limited, conditioned traits. In short, God would be both a necessary and a contingent being (p. 44). The authors reject this proposal on the grounds that it is unnecessary and bad theology.

The central issue is how the eternal God is related to the contingent process of the world. If all things are willed by divine providence, how can there be free will or contingency? Everything would already be determined. If, on the other hand, free will and contingency are real, then how can God be sovereign over creation? According to the classical tradition, God's providence can only be effective if God has created all things *ex nihilo* "with no preconditions or constraints" (p. 45). God can only be God, if the Creator is not subject to creation and its contingencies. God has ordained, says Aquinas, certain things to happen necessarily and other things to happen contingently. This schema is transposed into primary and secondary modes of causality (pp. 45–46). God is the primary cause of existence; the rest of creation belongs to the realm of secondary causality and is the purview of scientific investigation. Scientists are free to pursue an investigation into the intelligibilities of the causal mechanisms of the natural world (whether or not they acknowledge God) and God, the one who "breathes fire" into the equations of physicists, is the sole necessary cause of the contingent universe.

The authors take a page from the physicists in their critique of process theology. It is the consensus of contemporary physics that time and space are not separate "things" but comprise one reality, "space-time." Against process theology, they argue that if a temporal element is introduced into God's nature, then a spatial one will also have to be introduced. In short, God will

have to have a body. This is unacceptable to the authors since this makes the Creator too much in the likeness of a creature.

The issue of purpose and meaning in relation to evolution is examined. Building upon emergent probability, they refer to Lonergan's notion of "finality" to characterize the dynamic, "upwardly directed" but "indeterminate" nature of the evolutionary epic. Recall that Lonergan views natural process as having an inbuilt capacity for self-assembly in which schemes of recurrence pyramid and yield ever greater systems of complexity and intricacy. While nature possesses this dynamic tendency, it is "open ended," that is, it does not have a predetermined goal and does not imply "automatic progress" (pp. 71–73). Thus, finality implies direction and flexibility.

In the final chapters, the authors consider theodicy and related questions of suffering, evil, and ethics. God wills the entire universe of emergent probability and it is governed by God's providence, but such providence does not sequester us from suffering. Furthermore, our sufferings may lead us to develop virtues that the absence of suffering may never have called forth. God has created us free, and the good of freedom is so great that God "risked" making the sort of beings who could abuse their freedom by sinning.

Emergent probabilities for human beings do not pertain solely to the physical constituents of survival, but also to the survival of meaning and purpose. They contrast an "ethic of control" with an "ethic of risk" (p. 110). An ethic of control implies a belief in the sovereignty of the agent and his ability to achieve "clear results" (p. 110). An ethic of risk accepts a more limited, situated agency and is "committed to the struggle over the long haul" (p. 111). The authors endorse the ethic of risk as more effective in "shifting probabilities for change" (p. 110) and as more respectful of others and God's creation.

Crysdale and Ormerod conclude their book by reiterating their claim that the eternal, transcendent God of classical theism is a personal God and that this conception of God, alone, can do full justice to the Christian conception of creation, salvation, and redemption. Throughout the work, excellent examples are provided to clarify and illustrate. The book is highly recommended for undergraduate courses in science and religion.

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As space permits, *PSCF* plans to list recently published books and peer-reviewed articles related to science and Christian faith that are written by our members and brought to our attention. To let us know of such works, please write to patrick.franklin@prov.ca.

Science & Biblical Studies

THE LOST WORLD OF ADAM AND EVE: Genesis 2–3 and the Human Origins Debate by John H. Walton. Downers Grove, IL: InterVarsity Press, 2015. 255 pages. Paperback; $17.00. ISBN: 9780830824618.

Walton approaches the creation accounts in Genesis theologically. It is his belief that these chapters are not giving a description of the actual origins of the universe. His interpretive method is characterized by perspectives found in the literature of the ancient Near East, for the simple reason that human language can only function within the perspectives and presuppositions of its culture. The account of origins therefore has to do with order, function, and roles rather than the material universe. The order that God created inaugurated sacred space in the cosmos. God intended a place for people created in his image where he would be in relationship with them and present among them.

Genesis 2 is the establishment of a terrestrial center of sacred space in what is identified as a garden. Adam and Eve are commissioned as priests in this sacred space, mediating revelation of God and access to God. This is in keeping with biblical theological themes. Walton developed the concept of the Genesis account describing a cosmic temple in his *NIV Application Commentary: Genesis* (Zondervan, 2001). Temples in ancient Canaan were images of creation, so it is natural that the creation story of Genesis be told in temple terms with temple functions. In "Equilibrium and the Sacred Compass" (*Bulletin for Biblical Research* 11, no. 2 [2001]: 293–304), Walton develops this concept from the book of Leviticus. The temple is a reminder that creation is God's sacred space. The objects of the Hebrew verb "atone" (*kāpar*) are those of the sanctuary, not the people. Leviticus ritual is focused on sacred space; individuals are the beneficiaries in that their status is restored because of the cleansing that has taken place on their behalf. Walton's hermeneutics of Genesis has a solid basis, not only in its cultural setting, but especially in biblical theology. The confessional rituals of Israel make the functional interpretation of the creation accounts the only one that is biblically justifiable.

The narrative of Genesis 2 presents the formation of Adam and Eve as archetypes, in keeping with other ancient Near Eastern accounts. They are representatives of a group. All members of the group participate in the actions of the representative archetype. This concept is defended in an interpretation of Romans by N. T. Wright (pp. 170–80). Paul's treatment of Adam has to do with the kingdom of God and the whole creation project rather than salvation from sins. For Paul, the parallels between vocations (functions) of Adam and Israel are

more important than questions of human origins or the origin and transmission of sin. Drawing on Psalm 8, Paul sees the glory that God intended for humanity as already fulfilled in Jesus and shared with those that are one with the Messiah. Unfortunately, the question of cosmic and human origins has become completely muddled with the *soteriological* question as to whether an "original Adam" is necessary for the biblical doctrine of salvation. In biblical theology, the promise to Abraham in Genesis 12:1–3 is the answer to the plight of humanity depicted in Genesis 3–11. The divine answer to the problem of Adam (as explained in Rom. 1:18–3:20) is found in the fulfilment of the covenant with Abraham in the saving work of Christ. Romans 5:12–21 is a summary of how the promise to Abraham deals with the sin of Adam and its effects. Paul is focused on the glory the Creator intended to give his human creatures, their dominion over the world.

While the biblical account has similarities with others of the ancient Near East, there are also significant differences. Other accounts consider the creation of humanity to be *en masse* in order to supply the needs of the gods. The Hebrews had no such concepts of deity. Instead, Genesis emphasizes that humans have mortal bodies empowered to serve in sacred space. Humans serve in the relationship of families. It is for this fundamental reason that their bodies are created as male and female. As an archetypal account, questions of chronology or material origins are not addressed by the narrative in any sense.

Walton distinguishes between concepts conveyed by cultural analogies of language and the theology which they articulate. It is typical in the ancient world to depict the heart (*lēb*) as the center of intellect and emotion. Though biblical writers may have actually believed that to be the case, it has no theological relevance. Translators must decide whether *lēb* should be rendered as mind or emotion in modern terms, but it has no bearing on the biblical understanding of the human person. In the same way, it is not necessary to treat Adam as the sole progenitor from whom the whole human race descended (p. 204). This is no more necessary than a requirement that mental activities must be associated with the human heart. In dealing with theological questions such as that of human origins, language has a greater context than what may be perceived as immediate literary implications. To use a parallel example (pp. 96–101), Melchizedek had human progenitors, a fact certainly believed by the biblical author. But progeny was irrelevant to him serving as a priest. Such a priesthood, in complete contrast to the Levitical priesthood, serves as an analogy for the priesthood of Jesus. The theology of priesthood is critical, not a knowledge of the human ancestors of Melchizedek.

The book is divided into twenty-one propositions which address various modern questions of human origins or interpretation of ancient accounts. The last proposition asserts that humans may be a special creation of God even if there is material continuity with the rest of biological creation. But proposition 11 asserts that Adam and Eve are real people, though their names are representative, in part because Adam is listed in genealogies. This need not require that they be the first human beings (p. 103), but they are the humans that serve as the archetype of all humans.

The book is a concerted attempt to avoid any use of science as a means to interpret the Genesis account. Science is simply unreliable as a guide to absolute or inerrant truth. Science is constantly in process and there is no certainty as to where it may lead. For example, Rajat Bhaduri of McMaster University has joined a growing group of scientists challenging the general theory of relativity which requires that the universe begin with a "big bang." Their model attempts to answer the gravitational question and account for dark matter by a theory in which the universe is retained at a finite size which therefore gives it an infinite age. Biblical accounts simply do not address such questions. Biblical writers are not trying to reconstruct the world that was; they are providing a theology which explains the world that is.

The book is written in a nontechnical style, making it comprehensible to any nonprofessional reader. It does lead the reader to consider Genesis as part of a biblical theology which is surely the purpose and intent of its author. As a complement to Walton's work, I would recommend Mark S. Smith, *The Priestly Vision of Genesis 1* (Fortress, 2010). Smith develops the linguistic significance of the terminology of Genesis which shows the priestly vision of time and space, humanity and divinity.

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THE BOOK OF *GENESIS*: A Biography by Ronald Hendel. Princeton, NJ: Princeton University Press, 2013. 287 pages. Hardcover; $29.95. ISBN: 9780691140124.

Ronald Hendel is a well-respected Jewish biblical scholar who became even more well known in 2010 for writing an essay in the *Biblical Archaeology Review* entitled "Farewell to SBL: Faith and Reason in Biblical Studies" (SBL in his title refers to the Society of Biblical Literature). In his essay, Hendel lamented that this esteemed scholarly society, numbering many thousands of members and devoted to the critical study of the Bible, was now welcoming explicitly religious/ideological points of view. As a result of this change, he withdrew his membership.

Hendel's negative appraisal of the role of faith in biblical studies should not lead us to prejudge *The Book of* Genesis*: A Biography*, since it is a delightful read that both informs and engages the reader through its fascinating retelling of selected aspects of the history of interpretation of Genesis, from the beginning up to the modern period. Indeed, I had only a vague memory of Hendel's 2010 position statement while I was reading the book; it was only after completing it that I went back and re-read his earlier statement about faith and reason. In the end, I will suggest that Hendel's overall argument in *The Book of Genesis: A Biography*, and even the structure of the book, aligns with his position in the 2010 article.

The book contains seven chapters, an introduction that surveys Hendel's approach, and a very brief (and, I judge, quite weak) afterword that reflects on living with the book of Genesis in the contemporary world. Of the seven main chapters, the first, "The Genesis of Genesis," sketches Hendel's modern, scholarly understanding of the origin and meaning of the book of Genesis, while chapters 2–4 trace the premodern history of interpretation and chapters 5–7 address Genesis in the modern period. Although it might seem that Hendel's account is evenly divided between premodern and modern eras with three chapters on each, the chapters on premodern interpretation add up to only 62 pages, in contrast to the 165 pages devoted to the modern period. If we combine this with the first chapter, which clearly draws on modern critical scholarship to understand the origin of Genesis, we find that fully 196 pages are devoted to a modern interpretation of Genesis.

The dividing point for Hendel is between a "literal" or "realist" interpretation of Genesis and a "figural" (nonliteral) interpretation. According to Hendel, the book of Genesis

> envisions a single, God-created universe in which human life is limited by the boundaries of knowledge and death. We are earth-bound, intermittently wise, often immoral, mortal creatures. There is a harsh realism in the Genesis accounts of human life. (p. 9)

This realism of Genesis, which Hendel attributes to the original meaning of the text in ancient times, and which he unpacks in often illuminating ways in chapter 1, was compromised by two nonliteral approaches to the world, both of which became lenses for interpreting Genesis. In chapter 2, "The Rise of the Figural Sense," Hendel draws on James Kugel's famous analysis of four assumptions in *The Bible as It Was* that had become standard by the first century of the Common Era, namely that the Bible was *cryptic*, *relevant*, *perfect*, and *divine*. Hendel explains how these assumptions led interpreters to go beyond the surface meaning of Genesis—in one of two directions, which he names the *apocalyptic* and the *Platonic*.

In chapter 3, "Apocalyptic Secrets," Hendel gives a selective, but nonetheless interesting, introduction to the rise of apocalyptic interpretation of the Bible in, or soon after, the Babylonian exile, beginning with Ezekiel's integration of aspects of the Eden narrative into his vision of a renovated Jerusalem. He cites speculation about the restoration of Eden and the glorious renewal of humanity at the "end of days" (a favored phrase of Hendel's) in the Dead Sea Scrolls and the Targums (later Aramaic paraphrases of the Old Testament), and ultimately in Paul's writings in the New Testament.

Where the chapter falters, however, is in Hendel's reading of Paul as an "apocalyptic" theologian. He claims (against the grain of almost all NT scholars) that Paul's mysterious experience in the "third heaven" (2 Cor. 12:2–4) was formative for his theology, and then uses these few verses as the basis of reading an "esoteric" Paul. He also misunderstands completely the nature of the resurrection in 1 Corinthians 15, taking the "spiritual body" as a body composed of spirit (*pneuma*) or ethereal "stuff" so that it is fit for living in heaven. James Ware's recent article, "Paul's Understanding of the Resurrection in 1 Corinthians 15:36–54," in the *Journal of Biblical Literature* (which is sponsored by SBL), addresses Paul's argument in 1 Corinthians 15, and should permanently lay this interpretation to rest. Underlying these misreadings of Paul is Hendel's equivocation on the meaning of "apocalyptic." Whereas he initially defines the term as having to do with the revelation of mysteries and secrets, he later uses it as equivalent to eschatological; then on the basis of Paul being an "apocalyptic" (read: *eschatological*) thinker, he imports esoterism into Paul.

In chapter 4, "Platonic Worlds," Hendel traces the rise of figural (specifically, allegorical) interpretation of the Bible back to Plato's allegory of the cave, which Philo of Alexandria, the great Jewish theologian of the first century AD, used as a hermeneutical lens. Just as the Platonic philosopher must emerge from the darkened cave of physical illusion to view the spiritual/intellectual reality of the sun, so the biblical interpreter must go beyond the literal meaning of the text to its hidden, spiritual meaning. Thus the call of Abraham to leave his *land*, *kindred*, and *father's house* (Gen. 12:1) is taken by Philo to mean the purification of the soul from earthly matter, specifically, *the body*, *sense perception*, and *speech*. Then follows a fascinating sketch of the desire to ascend from Earth to heaven in Paul (a clear misreading), the Gnostic gospels, and the desert fathers. Part of the problem with this chapter is that Hendel takes the presence of Greek (the language) to imply a Platonic interpretation (p. 90), which is a non sequitur.

Chapter 5, "Between the Figure and the Real," then recounts the recovery of literal/realist interpretation of

Genesis, and the problems that came with this recovery. Hendel begins with Rashi, the twelfth-century Jewish rabbi, who often criticized previous Midrashic interpretations of the Bible and advocated a pesher approach, which corresponds in many ways with what we would call grammatical-historical interpretation. This approach was taken up by Luther, who confessed that in the past he used to allegorize "even a chamber pot," but then came to disdain anything but the plain sense of the text. Hendel quotes Luther on his perception of ludicrous or fictitious aspects of Genesis (such as Eve being created from Adam's rib) and on the genealogies of Genesis 10, as being "full of dead words." Hendel's point is that Luther began to see problems with taking the plain sense of the Bible as obvious truth, which was immediately relevant to the life of the faithful. After Luther, we find the learned Catholic Rabelais parodying the Genesis stories in the hilarious bestseller *Gargantua and Pantagruel*; then we have the Jewish Spinoza's literal/realist interpretation of the Bible that led to his questioning its divine origin and authority.

Chapter 6, "Genesis and Science: From the Beginning to Fundamentalism," traces the rise of the modern scientific picture of the cosmos, which initially seems to be congruent with the biblical "realist" picture. Indeed, a literal interpretation of Genesis contributed to the "disenchantment" of nature, which allowed it to be studied scientifically. Yet what science subsequently discovered about the cosmos, particularly the question of heliocentrism, seemed to contradict a plain-sense reading of Genesis; thus we have the famous conflict between Galileo and the church authorities. Here Hendel cites Augustine, who claimed that allegorical/figural interpretation was allowable only when a literal reading of the biblical text seemed false. The problem, as Hendel portrays it, is that in the modern era, with the decline of allegorical reading, interpreters were in a quandary when they discerned contradictions between the Bible and science. The long and short of this chapter is to suggest that there were three modern approaches to the seeming contradiction between science and scripture, particularly with respect to Genesis.

One approach was Galileo's limited acceptance of figural interpretation when the Bible seemed to contradict what he was discovering about the universe; this approach is encapsulated in the famous statement that "the intention of the Holy Spirit is to teach us how one goes to heaven and not how heaven goes." This distinction surfaces in the later position of Pope John Paul II, who reversed the Catholic Church's judgment against Galileo and affirmed that reason and revelation were two distinct, noncontradictory realms of knowledge.

But there were two other approaches to the seeming contradiction between science and scripture that arose from the decline of figural readings. One was the approach of Spinoza, who was upfront about the contradictions between science and Genesis, and who developed the rudiments of what later became higher biblical criticism, including Pentateuchal source theory (JEDP). Hendel's glee in sketching Spinoza's approach to the Bible is palpable, and one can see that he understands this approach to have led to the later formation of the SBL, and thus to his disappointment with that Society.

The only alternative to Spinoza and to biblical criticism, generally, is, according to Hendel, the doctrine of inerrancy, which became the favored approach of conservative Christians, including those who penned *The Fundamentals*. In the wake of New World exploration which led many to wonder about pre-Adamite races, the challenges of deep geological time, which did not fit the six days of creation, and the growing awareness of biological evolution which contradicted human uniqueness, more and more Christians who rejected figural readings of the Bible, and thus the separation of faith from science, attempted to harmonize a literal understanding of Genesis with a realist understanding of the world, which resulted, according to Hendel, in compromising the truth of both.

While there is much to ponder in this chapter, Hendel is confused about the meaning of inerrancy, treating it as equivalent to a focus on the "plain sense" of the text. Yet he goes on to claim that the idea of inerrant autographs means that evangelicals cannot establish any point of doctrine from the Bible unless they have access to these autographs, since the present Bible we have is "an incorrigibly corrupted text, unreliable in its details, unstable in its support of any interpretation of its meanings" (p. 191). Thus, for Hendel, inerrancy is a modern, historicized variant of the Bible's cryptic meaning (as delineated by Kugel).

Hendel's final chapter, "Modern Times," begins by tracing how Genesis was used in nineteenth-century debates about slavery and the status of women. But then the chapter shifts to an evocative portrayal of Emily Dickinson's "slant" telling of the Genesis stories and Franz Kafka's parabolic engagement with the text, concluding with Erich Auerbach's *Mimesis* and his profound analysis of the literary realism of Genesis, in contrast to Homer's epics. Not only does Hendel take Auerbach's analysis as returning us to the original meaning of Genesis, but he understands Auerbach's approach as presenting us with the choice of either submitting to this ancient text in its literal meaning or resisting its authority in the light of what we "know" as moderns. While Hendel chooses the second option, he does not intend to simply jettison Genesis (or the Bible as a whole), evident in his joyous lingering over the poetics of Dickinson and Kafka.

I have to be honest: I could not put this book down. I was hooked from the start and enthralled the whole way through, partially through Hendel's lucid writing, partially by wrestling with aspects of Hendel's portrayal that did not make sense to me. In the end, I came to realize that the primary focus of the book is on the modern recovery, not only of Genesis but also of the entire Bible, as a literal/realist text, which results in the reader necessarily discerning tensions between the text and the world. For Hendel, this leads to something like Stephen Jay Gould's "Non-Overlapping Magisteria" (NOMA), in which faith and science, including biblical studies, are viewed as entirely separate domains of knowledge, which should never interfere with each other. This, I discern, is what led him to critique, and then leave, the SBL in 2010.

Although I am sympathetic to NOMA, since it allows scientists who are Christians to get on with their scientific work without forcing the results of scientific inquiry to conform to our theological assumptions, I wonder if there is not more to be said on the intrinsic relationship of theology and scripture to science. Tom McLeish's amazing book *Faith and Wisdom in Science* (Oxford University Press, 2014) is perhaps a start at overcoming NOMA without reverting to the old program of harmonization.

All in all, however, Hendel's volume is a selective, nontechnical, thoughtful introduction to the history of interpretation of Genesis. Despite disagreements with aspects of Hendel's argument, I judge that *The Book of Genesis: A Biography* is worthwhile reading for anyone interested in this subject.

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Technology

RECODING GENDER: Women's Changing Participation in Computing by Janet Abbate. Cambridge, MA: MIT Press, 2012. 247 pages, notes, bibliography, index. Hardcover; $34.00. ISBN: 9780262018067.

Recoding Gender is a thoroughly researched book that uses interviews and primary documents to illustrate women's contributions to the history of computing. It is an engaging read that carefully provides context for facts and stories, without vilifying any of the players involved. Though there are certainly unfair practices, stereotypes, and biases mentioned, Abbate chooses to focus on the champions, with just enough background on the prevailing social constructs to make it clear why these were formidable successes. But this is also a weakness of the book. By choosing to only include the success stories, a rosier picture of the past is created than other sources would suggest is accurate. However, when read as an addition to existing male-dominated histories, this book provides a necessary understanding of how gender has impacted the relatively new field of computer science.

Abbate begins her book by explaining the role of women in two key computing projects of World War II: the British Colossus projects and the US ENIAC project. Though computer hardware was considered a male enterprise even during war times, programming, as a new and as yet undefined activity, was open to women. In fact, early in computing history, women were encouraged in software roles, since some saw programming as an extension of the role of women as "computers" who performed calculations by hand in clerical roles. Abbate uses interviews with women of each project to understand the appeal of the work (engaging, challenging, exciting) as well as the gender roles that were implicitly or explicitly associated with this new field. She also sheds light on the very limited understanding that society at large had of the new machines, and the skills that both men and women were able to use in programming.

Abbate moves forward from the war to consider the role of women in the developing computing industry of the early 1950s. At this time, hardware was still the primary selling point of a system, but custom software was often needed and so a programmer might be sent by the hardware company if required. Here, the opportunities for women were more varied, depending on how programming fit into the structure of the organization. In particular, in business application areas (as opposed to scientific areas), women often encountered a glass ceiling. To understand the context of these organizations, the author spends time exploring the ways in which programmers were recruited and assessed (e.g., college degrees of any kind showing an ability to learn, or specially formulated aptitude tests) and considers the implications of each from a gender perspective (e.g., far fewer women were able to pursue degrees than men at this time, but women were just as likely to do well on an aptitude test). She then looks at the various ways computing was put into context with other disciplines such as math, engineering, business, and considers the gendered implication of those associations.

As programming evolved in the 1960s, new terminology like "software engineering" and a greater understanding of the inherent complexity of programming also advanced. Abbate explores the factors that caused people to talk about the "software crisis" and the myriad approaches that were used in trying to overcome it, keeping each approach in the context of its gendered implications. For example, "automatic programming" and its related "structured programming" were highly influenced by women such as Grace Hopper who

sought to move programming away from mundane tasks and instead allow the programmer to work at a higher level. Women were allowed to be champions in these areas as they often had the requisite skills to develop language improvements and the experience to recognize which process improvements would be most beneficial. On the other hand, associating programming with the term "software engineering" had the unfortunate consequence of making programming seem like a masculine endeavor, given the disproportionate number of men in engineering fields.

The last two chapters of the book contrast the role of women in computing from first a business perspective and then an academic perspective. In the business-focused chapter, Abbate relays the experiences of two women who got around glass ceilings. They created work-family balance in their lives by building software companies that predominately hired mothers of young children who wished to work part time. In this way, Abbate shows that the field could be supportive of families, while at the same time showing the myriad challenges faced by these entrepreneurs. In the last chapter, Abbate highlights the impact of having very few role models for female academics, while giving several examples of nonlinear paths through academic ranks. She highlights the resourcefulness of women, but also points out that "women's narratives reveal the daunting level of hard work and persistence" required for advancement (p. 153).

Abbate ends her book by reviewing the ways in which women in computer science have created community for themselves, communities that are distinctly not masculine. While some women found that professional societies were a way to gain recognition in an otherwise male-dominated field, there were too few women at any one conference for there to be any sense of camaraderie. In this context, she explores the roles of the Systers and TechTalk mailing lists, and then the evolving role of the Grace Hopper Celebration of Women in Computing conference.

The lack of women in computing today is not a specifically Christian problem, but it is certainly a societal one. Women have different experiences with, preferences for, and insights into technology, and yet the vast majority of today's technology is written by men. God has created men and women to complement one another, and the Creator's endowed gifts to women in this field have gone vastly untapped for many years. With a better understanding of the role that gender has played in the history of computing, perhaps we can better imagine the ways in which all can contribute to the future of technology.

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