



BIOLOGY

THE RISE OF MARINE MAMMALS: 50 Million Years of Evolution by Annalisa Berta. Baltimore, MD: Johns Hopkins University Press, 2017. 212 pages, including contents, preface, acknowledgments, and index. Hardcover; \$75.00. ISBN: 9781421423258.

Evolutionary transitions between terrestrial and aquatic environments have long fascinated evolutionary theorists. Going back to Darwin, biologists have recognized that evolution by common descent implies that all aquatic mammals—including modern whales, seals, manatees, and otters—must have descended from mammalian ancestors that were terrestrial. Such a situation poses a challenge for evolutionary theory, due to the fact that creatures living on land are under very different constraints and pressures than creatures living in the water. Thus, any proposed evolutionary transition between terrestrial and aquatic environments would necessitate a virtual overhaul in anatomy to accommodate such a profound shift in ecology.

For many years, these large-scale evolutionary transitions were poorly understood. However, in recent decades, the fossil record has allowed us to achieve a much greater understanding of how various groups of mammals have taken to life at sea. The evolution of cetaceans—including whales, dolphins, and porpoises—from terrestrial hooved mammals has become a sort of poster child for this type of evolutionary change, and rightly so. The fossil record documenting the origins of these creatures has exploded since the late 1970s, allowing paleontologists to reconstruct at high levels of detail how the earliest four-legged cetaceans adapted in various ways for life in water. But as much as this fascinating case study deserves the attention it has received, it is also important to recognize that cetaceans are only one of at least seven different groups of mammals who have returned to the sea from whence their ancient tetrapod ancestors came.

In *The Rise of Marine Mammals: 50 Million Years of Evolution*, paleontologist Annalisa Berta details the wide variety of mammals that have made a living in the world's oceans. Berta, who is emerita professor of biology at San Diego State University and former president of the Society of Vertebrate Paleontology, has spent her career studying the evolution of marine mammals, particularly pinnipeds—including seals, sea lions, and walruses—and cetaceans. She has written or cowritten multiple books about marine mammal history and biology. First and foremost, she is coauthor of the popular *Marine Mammals:*

Evolutionary Biology textbook, now in its third edition, which is aimed at upper-level undergraduate students, graduate students, and professionals studying marine mammals. She has also written *Whales, Dolphins, and Porpoises: A Natural History and Species Guide*, which provides a comprehensive overview of the most diverse marine mammals in our oceans today. In 2012, she published *Return to the Sea: The Life and Evolutionary Times of Marine Mammals*, a book aimed at nonscientists that serves as a primer on many aspects of marine mammal evolution and ecology. *Return to the Sea* is full of wonderful gray-scale photos and illustrations that nicely supplement the well-written prose. However, given the intended audience for this book, citations and references to primary literature are conspicuously absent, and the list of resources for further reading is very short. With *The Rise of Marine Mammals*, Berta takes a different approach, filling in the gap between her exhaustive academic textbook and her nontechnical treatise with an easy-to-read, lavishly illustrated book that provides ample details and resources for further exploration about the fossil record of marine mammals.

What the reader immediately notices when flipping through the book for the first time is all of the beautiful, full-color photos and illustrations. Many of these illustrations are life reconstructions of key fossils from noted artists, while others are figures from the primary scientific literature. There are also many photos of researchers excavating fossils in the field and working with them in museums. In a sense, given the quality and abundance of images on virtually every glossy page, this could be considered a coffee table book.

However, this assessment would sell the book short, as there is also so much valuable scientific information that is summarized clearly and concisely in the text. In the opening chapter, Berta sets the stage for the rest of the book, discussing how she aimed to present the fossil record of marine mammals in the context of major events in Earth history, while highlighting how advances in scientific research capabilities have enhanced the study of marine mammal evolution. She covers some of the basics of naming, classifying, and describing species; how fossils are discovered, collected, and prepared; and some basic geological principles that are necessary for providing important context for fossils, using helpful examples to clarify each of these concepts along the way.

The next five chapters focus on the fossil records of every group of marine mammals. Beginning chronologically with the oldest fossils, chapter 2 discusses the origins of cetaceans and sirenians, which include

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modern manatees and dugongs, during the early Eocene epoch around 50 million years ago, mostly focusing on ancient, four-legged cetaceans called archaeocetes. Here, Berta deftly weaves historical narratives and the work of specific researchers into descriptions of key fossils and their characteristics. This pattern, which continues in subsequent chapters, effectively integrates the scientific process of discovery into the encyclopedic knowledge of marine mammal history. Chapter 3, the longest chapter in the book at 56 pages, continues to focus on cetaceans, discussing many of the trends that arose after cetaceans were living full time in the water, and elucidating the details of every group of cetaceans that has existed, including both toothed whales and baleen whales. In chapter 4, Berta moves on to discuss her other main area of expertise: the evolution of pinnipeds. She discusses all major groups of pinnipeds, both living and extinct, in a fair amount of detail, as well as highlighting different hypotheses for how all of these different groups are related to one another. Chapter 5 discusses later sirenians, which were first introduced in chapter 2, along with a completely extinct group of marine mammals called desmostylians, which were plant-eating, hippo-sized mammals that were restricted to the northern Pacific Ocean during the late Oligocene to middle Miocene epochs about 10–30 million years ago. Chapter 6 rounds out the roster of marine mammals, including discussion of polar bears, sea otters, and a radiation of extinct marine sloths from South America.

Berta concludes the book in chapter 7 with a discussion of how climate and human activity have affected the diversity of marine mammals through time. Topics include climate-related shifts in geographic distribution, the effects of habitat loss, and changing food webs. She also discusses the impetus for studying the dynamics of marine mammal evolution through time, as this work provides valuable information for helping us to evaluate the ecological changes we see happening in the world's oceans today. Following this concluding chapter, there are 20 pages that provide an exhaustive list of marine mammal taxa, a three-page glossary, 14 pages of references to the primary literature (sorted by the chapter in which they were cited), and a six-page index.

Throughout the book, Berta's expertise is on display, showing an excellent grasp of both older and newer literature for all groups of marine mammals. There are a few minor errors in figures related to labeling phylogenetic trees, but most of the summaries are accurate, fair, and up-to-date. However, the way this book handles contentious issues among marine mammal paleontologists is a bit uneven. For instance,

her discussions of pinniped relationships do a nice job of describing competing hypotheses and areas of uncertainty, whereas interpretations of swimming behavior in some key early cetaceans are presented uncritically despite the fact that there is some debate in the literature.

But these minor quibbles do little to detract from this book's strengths. *The Rise of Marine Mammals* covers the breadth of marine mammal evolution while highlighting the key details. It discusses what we can learn from the fossils within a context that makes the reader feel as if he or she is part of making these discoveries. In exploring the changing ecologies of marine mammals over the past 50 million years, Berta provides insights into the dynamics of our world's oceans, both past and present. This visually stunning, yet informative, book should serve to inspire its readers—not only to give them a sense of awe and wonder at the marvelous diversity of marine mammals in eons gone by, but also to push them to preserve and steward the remarkable creatures that live in our seas today.

Reviewed by Ryan M. Bebej, Calvin College, Grand Rapids, MI 49546.



ENVIRONMENT

THE CARBON CODE: How You Can Become a Climate Change Hero by Brett Favaro. Baltimore, MD: Johns Hopkins University Press, 2017. 220 pages. Hardcover; \$22.95. ISBN: 9781421422534.

The Carbon Code is a manual for action. Chapter 1, "The Cost of Carbon," gives a quick overview of the indisputable reality of human-caused climate change and its various effects on planet Earth. The rest of the book focuses on what we, mainly as individuals, can do to solve the problem. Chapter 2, "Solutions Start with You," defends the idea that the cumulative impact of many individuals is significant. The middle section covers personal electricity use (chap. 4), transportation (chap. 5), diet (chap. 6), and long-distance travel (chap. 7), with practical tips for reducing one's carbon footprint. The last section is "Sharing the Carbon Code." In "Winning the Conversation" (chap. 8), Favaro gives tips for communicating with friends, family, coworkers, and community members about climate change and what we can do about it, culminating with a case for running for public office in order to advance the cause. Chapter 9, "Policies for a Pro-climate Future," outlines nine policies that climate change heroes should advocate: (1) a carbon tax or cap and trade price on carbon; (2) tougher regulations and the elimination of coal; (3) making climate change a priority in public policy; (4) eliminate fossil

fuel subsidies; (5) subsidize clean energy; (6) divest from the fossil fuel industry; (7) develop infrastructure for bicyclists; (8) promote electric vehicle (EV) infrastructure; and (9) worker retraining for the fossil fuel industry.

Brett Favaro is the academic director of the Fisheries Science graduate programs at the Fisheries and Marine Institute of Memorial University of Newfoundland. Favaro received his PhD in biology from Simon Fraser University in 2013, and was a 2013 Liber Ero conservation fellow at the University of Victoria. His research focuses on designing and implementing sustainable fishing technology to reduce commercial fishing's impact on the world's oceans. He is also interested in science policy. His research puts him face-to-face with the effects of climate change on the oceans.

There are few surprises in *The Carbon Code*. Favaro gives the environmentalist/conservationist party line on every issue, whether it be coal, EVs, nuclear energy, public transportation, reduced red meat/vegan diet, LED lights, less AC use, sweaters instead of the furnace, or cycling (and many more). This is not to disparage the book. It is, unapologetically, an advocacy book. As such it is a useful compendium of state-of-the-art actions that just about anyone can take to reduce one's carbon footprint. If you are a climate change skeptic, denier, or luke-warmist, you will not find any new arguments, but you will find a concise statement of the arguments for human-caused climate change and its impacts. Perhaps reading Favaro's version will convince you. At the same time, the actions that are outlined have benefits other than solving climate change. Some of these will save you money and launch you into a global economy that is embracing renewable energy, public transportation, and electric vehicles. Favaro's tips and policies can give you a head start in this new world even if you do not accept the main arguments for its existence.

Chapter 3, "The Carbon Code of Conduct," is perhaps the most novel. Favaro adapts moral guidelines from live animal research to provide guidelines for managing our carbon use. These guidelines were initially spelled out in 1959 by W. M. S. Russell and R. L. Burch in *The Principles of Humane Experimental Technique*. The four R's are reduce, replace, refine, and rehabilitate. The fourth R (rehabilitate) was added in 1999 as a result of the Indian government implementing policies to guarantee humane and ethical use of animals in research. The idea is that using animals in research is a necessary evil, of sorts, for human well-being. That being the case, we should adopt practices that minimize the suf-

fering of those animals used for such purposes. The comparison with carbon use is, at best, an analogy since the notion of suffering does not really transfer. However, the notion of damage does. If carbon use is damaging the planet, but is necessary for human well-being, we should adopt practices that minimize that damage. As applied to carbon use, the four R's are as follows: "Reduce your carbon use as much as possible"; "Replace carbon-intensive activities with those that use less carbon to achieve the same outcome"; "Refine the activity to get the most benefit for each unit of carbon emitted"; "Rehabilitate the atmosphere by offsetting carbon usage." If you have to use carbon, pay someone, somewhere, to do something to undo your use. Favaro calls us to make the following pledge:

I, ____, am making a personal commitment to solving climate change. I commit to applying the carbon code of conduct to my daily life and will reduce, replace, refine, and rehabilitate my use of carbon. I commit to convincing others to follow this code as well. I do this because of my love for the biosphere, my love for humanity, and my desire to live a healthy and sustainable life.

As we make this pledge, he argues that it will streamline our decisions in the same way that athletes' training and diet regimen streamlines theirs. Going to the gym for regular training is not a daily decision that must be made. You just do it. The carbon code of conduct becomes part of our personal ethic.

Each chapter of *The Carbon Code* has an excellent and very useful summary, usually 5–10 bullet points. *The Carbon Code* contains no graphs or charts. This seems to have been the publisher's decision. If there ever is a second edition, I would heartily recommend that some be included. The 2012 book *Cooler Smarter: Practical Steps for Low-Carbon Living* by the Union of Concerned Scientists, a book with a similar message, was full of helpful charts and graphics. I think such charts and graphs would have significantly enhanced the message of *The Carbon Code*. The copyright date of the book is 2017, but it seems a bit out of date already, especially with the change in the political climate.

While there was some discussion about nuclear energy, it seems that Favaro is ignoring the recognition by some environmentalists—for example, those represented in the 2013 Robert Stone documentary *Pandora's Promise*—that nuclear is a necessary component to a low-carbon future. Problems with solar and wind, such as intermittency, were mentioned but barely acknowledged. Storage and a smarter grid are recognized as solutions but there is little admission of the difficulty of developing these solutions to

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the point where we can move to 100% renewables. Issues of mining are mentioned as disadvantages of renewables, but renewables' dirty secret of toxic manufacturing and the tonnes of ensuing e-waste that will be upon us in a few decades is not mentioned. The problems of nuclear seem fewer and fewer when the big picture is considered. I would have liked to see more discussion of carbon capture, utilization, and sequestration (CCUS) technologies as a way forward. CCUS will allow the continued use of carbon at some level, but eventually will pave the way to a zero net carbon use. CCUS is going to be necessary to undo some of the damage that has already been done; namely, we must not only reduce carbon emissions, but we must also remove some of the carbon already in the atmosphere. And lastly, I think some mention of geo-engineering as a possible way forward would have been helpful.

One technical error worth mentioning is in chapter 2, where it is stated that the average person's carbon footprint globally is 4 tonnes per person. Of course, these numbers are hard to nail down, but with estimates of greenhouse gas levels at 50–55 Gigatonnes of CO₂ equivalents and 7.4 billion people on the planet, you get 6–7 tonnes per person. This makes the US footprint only three times the global average not four (still a disturbingly disproportionate amount).

While Favaro says there is still time to take care of climate change if we act soon, his general message was too apocalyptic for me. I am not sure that falling sky arguments are the best way to motivate the target audience to action. One memorable line from chapter 8 still rings in my head. "We need to be unafraid to react with disgust when someone denies climate change." Such language conveys his passion about the issue. It does little, I think, to move the conversation (and action) forward in a productive way.

Reviewed by Terry M. Gray, Colorado State University; Front Range Community College; ASA Executive Council.



HISTORY OF SCIENCE

THE GENE: An Intimate History by Siddhartha Mukherjee. New York: Scribner, 2016. xi + 592 pages, including glossary, notes, selected bibliography, and index. Hardcover; \$32.00. ISBN: 9781476733500.

By now most enthusiasts of science history have at least heard of Siddhartha Mukherjee, whose initial venture into authorship, *The Emperor of All Maladies*, earned him the 2011 Pulitzer Prize for general non-fiction. While in his residency training in oncology, Mukherjee wrote his so-called "biography of cancer" with a voice of authenticity that only seems possible

for someone who is personally immersed in the story he is telling. But as Mukherjee himself admits, the exhausting experience of composing such a vast and personal story seemed to rule out the possibility that he would write another book on the history of scientific discovery. Thankfully, this turned out not to be the case.

Now a practicing oncologist and assistant professor at Columbia University Medical Center, Mukherjee has recently tackled another topic close to his heart, the development of modern genetics. Many of the best aspects of Mukherjee's second book, *The Gene: An Intimate History* (2016), reflect qualities that made his initial work an international best seller. Mukherjee excels at relaying fine detail without losing the broader context of his narrative, masterfully weaving his explanation of complex scientific concepts together with the stories of the people involved in their discovery. As one might expect, prominent figures such as James Watson and Francis Crick feature in this book, but so also do less famous individuals such as Theodosius Dobzhansky, who also contributed key pieces to the puzzle of modern genetics. One cannot separate the history of science from the actors that achieved the discovery, and in this respect the "biography of the gene" that we have today is inseparably connected to the idiosyncrasies of those who studied it over the past two centuries.

This is not to say, however, that Mukherjee's story is simply a celebration of human achievement through the power of science. *The Gene* is punctuated with frequent examples of scientific achievement placed side-by-side with miserable human failure, particularly when the emerging science of genetics was used as a tool to understand—or even engineer—society at large. Mukherjee carefully and honestly acknowledges the incredible evil that emerged alongside genetic science during the twentieth century, linking racism, Nazism, and the eugenics movement to errant interpretations of legitimate scientific discovery.¹ Human depravity is writ large in the history of genetic discovery, serving as a caution to those who want to see only this field as the panacea for humanity's ills.

In between the triumph of scientific discovery and the disaster of social engineering lies a significantly grayer area in which genetics intersects with behavioral psychology. Here the going gets a bit tougher—and more subjective—as the comfortable certainty of Mendelian genetics is blurred by the influence of environmental factors that are much more difficult to quantify. Mukherjee is especially engaging in this context and does not shy away from some of the more controversial aspects of genetics,

including those that touch on gender, gender identity and sexuality.² While readers may differ—even significantly—with Mukherjee’s essentially secular worldview regarding these issues, he remains well balanced and apolitical in his approach to interpreting the role of genetics in complex social behaviors. Absent from the book is any suggestion that the role of biology in behavior allows for abdication of human responsibility regarding the choices we make.

This is a tenuous balance to strike. How is it that we are bound to our genetics, but at the same time responsible for the outcomes in our lives? Mukherjee’s unique answer to this paradox is perhaps the most insightful of his comments regarding the connection between heredity and complex social behavior. Rather than using the somewhat worn-out nature/nurture dichotomy, Mukherjee instead turns to mathematics for an appropriate analogy to explain how genes contribute to who we are or might become. Our inherited genetic makeup, he suggests, is very much like “the first derivative of a point [which] is not its position in space, but its propensity to change its position” (p. 355). Or to put it more succinctly, our genes are directive, not determinative. While our heredity may indeed limit the scope of possible outcomes, both experience and environment—not to mention a stiff dose of providential serendipity—play equally important roles in who we become.

Our understanding of precisely how our inherited genetic composition interacts with the experiences and environment that flavor our life is still in its infancy. Mukherjee touches on these issues throughout the latter third of his book, providing a few prime examples of how our experiences in the world can alter the effect of our genes in ways that early geneticists would never have imagined.³ This field of study, known as epigenetics, offers at least a partial insight into the remarkable flexibility and adaptability of our genome. Mukherjee states this elegantly:

It is a testament to the unsettling beauty of the genome that it can make the real world “stick.” Our genes do not keep spitting out stereotypical responses to idiosyncratic environments: if they did, we too would devolve into windup automatons. (p. 390)

And this conclusion that we are not merely products of our genes offers some degree of hope for individuals who fear their own inheritance. This is certainly the case for Mukherjee, as clarified by the medical history of his own family interposed within the narrative of scientific discovery in *The Gene*. Each section of the book begins with a brief glimpse into the story of mental illness that has plagued his family for two generations, culminating in the lives of two of his

paternal uncles who struggled with schizophrenia. Mukherjee’s personal grief and anxiety regarding the genetic blight on his family is what makes *The Gene* truly “an intimate history” for him. The biography of the gene is his story—and our story.

Notes

¹See especially, the foresight of Bateson, 63; Francis Galton, *Pride & Davenport*, 120; rise of Nazism and its “applied biology” approach to genetics, 119–32.

²See especially, gender determination, 355–69; research on the “gay gene,” 371–79.

³See especially, effects of the Dutch Hongerwinter, 392–413; cellular reprogramming, 404–7.

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PHILOSOPHY

NEUROEXISTENTIALISM: Meaning, Morals, & Purpose in the Age of Neuroscience by Gregg D. Caruso and Owen Flanagan, eds. New York: Oxford University Press, 2018. xviii + 372 pages. Paperback; \$35.00. ISBN: 9780190460730.

Is humankind no more than a “victim of neuronal circumstances,” “just a pack of neurons”? In other words, is humankind naïve in denying epiphenomenalism, the notion that all mental processes can be reduced without remainder to brain-biology? Is existentialism’s “self,” a self-making born of radical commitment with its inescapable risk, finally no self at all, and the anguish pertaining to such risk no more than a neurological twitch? Is the freedom essential to existentialism (the capacity for choice that issues in self-determination) as indefensible—and ridiculous—as a denial of the law of gravity? Despite the prevalence and force of assorted determinisms that bear upon the human, has neuroscience eliminated that self-determination apart from which human agency disappears, guilt is impossible, and the criminal justice system replaced by a social engineering that reprograms those heretofore deemed deviant?

In its exploration of and, for the most part, affinities with the above, the book identifies three kinds of existentialism. In two or three sentences it speaks of first-wave existentialism, found in Kierkegaard, Dostoevsky, and Nietzsche and probing human selfhood in light of God (or, in the case of Nietzsche, of God’s absence). Again, briefly, second-wave existentialism, represented by Sartre, Camus, and de Beauvoir, is said to be a post-Holocaust attempt at creating a human authenticity (contrasted with the inauthenticity of Sartre’s “bad faith” or Heidegger’s “the herd” or even Nietzsche’s “the they”) with

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respect to social transformation. Third-wave existentialism, neuroexistentialism, the book's dominating concern, avers that while neuroscience affords scientific truth concerning the brain and its functioning, it simultaneously disenchantments in that it eliminates that self necessary for self-transcendence, deliberation, assessment, judgment, and uncoerced commitment.

This third wave maintains that the good, the true, and the beautiful have no meaning inasmuch as the human entity has no capacity for discerning, accessing, or discussing such: the foregoing is an illusion in that all that remains is a neuroplexiform item whose biological complexity may be greater than that of simpler life-forms, but whose personhood is no more than seeming even as theirs is never suggested.

The book consists of four major divisions: I—Morality, Love and Emotion; II—Autonomy, Consciousness and the Self; III—Free Will, Moral Responsibility and Meaning; and IV—Neuroscience and the Law.

Given the general tenor of the book, the reader is surprised initially at Maureen Sie's chapter, "All You Need Is Love(s): Exploring the Biological Platform of Morality." Here she maintains that our nature as loving beings can explain our nature as moral beings. Throughout she borrows overtly from C. S. Lewis's *The Four Loves*, electing to change his "charity" (*agape*) to "kindness" on account of her unbelief. Departing from Lewis (and from the trajectory of her argument), she introduces a discussion of oxytocin and vasopressin, hormones whose neurochemical properties foster attachment narrowly and sociability broadly. In light of her adducing that oxytocin can be administered through nasal spray, her argument, strong to this point on account of her use of Lewis, is weakened: the thesis she began with, our loving nature as the ground of our moral nature, is now no more than "appealing."

Other chapters invite a profound Christian response. Jesse Prinz explores "Moral Sedimentation," the "phenomenon of experiencing the world and acting in through the filter of the past, without necessarily realizing it." While his proposal that sedimentation may move from mind to brain remains speculative, his chapter calls forth Christian comment on the place of spiritual formation, the place of a faith-facilitated "deposit" in one's unconscious mind that continues to assert itself even when we aren't aware of it. Not least, his discussion of sedimentation should elicit a discussion of tradition, the manner in which the church's tradition can be beneficent teacher or brutal tyrant, and the peril of amnesia on the part of individual, congregation, or denomination; namely, those beset with amnesia (i.e., the absence of

Christian memory) lack an identity; and lacking an identity, they can never be trusted.

Oddly, in a book that largely dismisses everything that existentialism has upheld, and denies self, agency, responsibility, culpability, and desert, the last chapter, "The Neuroscientific Non-Challenge to Meaning, Morals, and Purpose" by jurist Stephen J. Morse, argues compellingly so as to overturn much of the book. Morse maintains that neuroscience has not brought forward scientific grounds for a reductionism that reduces meaning, morals, and purpose to mere chimera. In addition, Morse argues that the denial of self, agency, responsibility, and desert collapses human dignity, undercuts justice, and fuels social coercion. Ironically, the last sentence of the book rebukes much of the book: "As C.S. Lewis recognized long ago (1953: 'The humanitarian theory of punishment'), a system that treats people as responsible agents is ultimately more humane and respectful."

Readers with expertise in existentialist philosophy will be disappointed to find little recognition of, and less exploration of, features essential to this philosophy. While the book purports to be an attempt at relating existentialism's major tenets to neuroscience's discoveries, the book is largely a reductionist dismissal of all that existentialism regards as decisive. It remains puzzling that readers are told repeatedly that self, agency, assessment, and related notions have been rendered groundless because reducible to neurological processes, when readers, on every page, are asked tacitly to assess the evidence presented, weigh the arguments adduced, evaluate the proposals for social restructuring, and articulate consent or disagreement. What are these activities except those of a self, an agent—anything but mere synaptic firings? The title, *Neuroexistentialism*, appears to be a misnomer in that existentialism is mentioned only to be set aside; that is, neurology has rendered existentialism a phantasm.

Related to the above is the book's omission of the distinction between consciousness and self-consciousness. While it is indubitable that increasingly complex neural structures and mechanisms support increasing levels of consciousness, it is also recognized that increasingly complex neural structures are quantitative, while the shift from consciousness to self-consciousness is qualitative. There is no acknowledgment of this crucial matter on the part of those contributors who are most adamant about neurodeterminism (or near neurodeterminism). There is no suggestion of any acquaintance with, for instance, Roger Penrose's insistence that his book, *The Emperor's New Mind: Concerning Computers,*

Minds, and the Laws of Physics, cried out to be followed by his *Shadows of the Mind: A Search for the Missing Science of Consciousness* (by which he meant “self-consciousness”), which search remains “missing” for reasons that frustrate those wedded to naturalism but not those possessed of biblical faith. The latter are aware that human beings are human, ultimately, in that they are the recipients of God’s address. According to scripture, the characteristic of God is that God speaks. Humans, then, are characteristically those who hear (and from whom God both invites and mandates a response). God is person par excellence; humans are person inasmuch as they are “personned” by the Person. Finite human self-consciousness, on this understanding, is an aspect of the image of that God who is possessed of infinite self-transcendence, and who therein allows us to know him truly and adequately yet never exhaustively.

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SCIENCE AND RELIGION

PARANOID SCIENCE: The Christian Right’s War on Reality by Antony Alumkal. New York: New York University Press, 2017. 256 pages. Hardcover; \$35.00. ISBN: 9781479827138.

I was visiting Harvard University and could not resist the temptation to peruse the Harvard bookstore. After an hour or so of browsing science titles, I picked up some classic books on science, and this one caught my attention. Now that I have finished reading it, I have mixed feelings. First, I feel bad for this group of siblings in Christ (called here the Christian right) who are claiming to do apologetics by misusing science. Second, I am worried that several “normal” Christians are now paranoid.

Alumkal, Associate Professor of Sociology of Religion at the Iliff School of Theology in Denver, Colorado, writes with a strongly critical tone (as the book subtitle suggests) against the Christian right. But several of his critical affirmations could also be applied to mainstream Christianity. The book’s thesis is that the Christian right in the United States, which he defines as a political movement of conservative evangelicals, uses a manipulative technique to influence society. This technique is defined as “Paranoid science.” As a sociologist, the author describes how the Christian right misuses, fabricates, and misrepresents current science concerning origins, sexuality, bioethics, and environmentalism to fit its agenda, which is political control based in conservative Christianity. The Christian right’s main point is to keep the Bible, or

their interpretation of the Bible, as the rule for these topics. Any scientific affirmation against their view is considered a product of conspiracy, fraud, or an attack on moral values. Herein lies the paranoia.

The book is divided into four chapters, each one describing and criticizing the groups affiliated with the Christian right and concluding that they are paranoid and seek to spread their paranoia to the public to maintain political control. In the introduction, the author explains his approach and analysis. In chapter one, he critiques the intelligent design (ID) movement, particularly the views of Phillip Johnson. According to Alumkal, this movement considers its members to be loyal supporters of the truth and its critics to be biased due to their hatred of God. He concludes that ID is not just a pseudoscientific movement, it is a paranoid movement of neo-creationists.

In the second chapter, the discussion is on human sexuality and about the ex-gay movement, which considers homosexuality not only a sin, but also an aberration of human nature. They want to justify that affirmation not with the Bible alone, but also with science. After explaining the origin of this movement, he provides data that describes their wrongdoing by misusing the results of psychological studies. For Alumkal, it is impossible to change sexual orientations, and the movement’s arguments to the contrary cause much damage to the LGBT community. Alumkal points out that some former leaders of the ex-gay movement are now detractors.

The third chapter is about bioethics. Alumkal muses on the discussion concerning the humanity of the embryo and the ethics of euthanasia. He argues that the claim that human life starts at conception, and the opposition to stem cell research, are based upon inaccurate data. While well-known evangelicals Charles Colson and Joni Eareckson Tada have argued that allowing abortion and euthanasia would collapse American society, Alumkal dismisses their beliefs as unfounded, just paranoia.

The fourth chapter deals with anti-environmentalism. Here Alumkal’s focus is on the Cornwall Alliance and its leader, Calvin Beisner, with their aggressive campaign of “resisting the green dragon.” For Alumkal, the efforts of moderate evangelicals, such as those in the Evangelical Environmental Network, to convince their fellows to become conservationists, have failed. He portrays Beisner and his association as hypocritical for accepting money from big industries to push a Christian right agenda on the environment. The opposition to climate change is not really scientific in nature, so they incited paranoia by calling on evangelicals to oppose those who put nature above God.

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The dominion rule to subdue the earth should be “business as usual” for the Christian right.

In the conclusion, I was perplexed that Alumkal criticized Rick Warren’s book *The Purpose-Driven Life* as a supporter of the false science of the Christian right. I read that book and also studied it in my congregation without noticing anything related to science or the Christian right. His criticism focuses on Warren’s affirmation that the Bible is inerrant, which (to Alumkal) implies denying human reason. Furthermore, Alumkal quoted Mark Noll’s books on the evangelical mind and affirmed that not much progress has been made. In conclusion, the Christian right is backing its affirmations with false science, promoting paranoia, and thus is highly detrimental to American society.

Christian readers (not just those sympathetic to the right-wing) will find some of the claims made in this book impossible to digest. Any conservative Christian who holds to the Bible as authoritative should note Alumkal’s more liberal presuppositions about God, the Bible, and moral issues related to human sexuality. Sadly, Alumkal omits the moderate evangelical scholars who actively contribute to the conversations about these issues. After reading this book, anybody who is not familiar with Francis Collins, D. Gareth Jones, Mark Yarhouse, or Katharine Hayhoe would consider all evangelicals who comment on science as paranoid supporters of the Christian right. One wonders whether the author himself is, ironically, promoting an unfounded paranoia concerning evangelical Christians.

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TECHNOLOGY

TO BE A MACHINE: Adventures among Cyborgs, Utopians, Hackers, and the Futurists Solving the Modest Problem of Death by Mark O’Connell. New York: Anchor Books, 2017. 256 pages. Paperback; \$16.95. ISBN: 9781101911594.

Mark O’Connell has produced a folksy account of his interaction with numerous leaders in transhumanism, “a liberation movement advocating nothing less than a total emancipation from biology itself” (p. 6).

Most of the book consists of accounts of visits with individuals and organizations representative of various emphases within this movement. The Alcor Life Extension Foundation is the world leader in cryonic preservation of a person’s body (or just the head) after death, in anticipation of a time in the future

when technology will exist to “resurrect” the person by uploading the pattern of neural connections in the cryonically preserved brain. (At the time of O’Connell’s visit, it was preserving 117 “patients,” including the head of baseball legend Ted Williams.) Carboncopies is representative of those seeking to develop “substrate-independent” minds, a technology that seeks to upload a person’s mind into an emulation running on a computer. Grindhouse Wetware is representative of groups developing implantable technologies to enhance human sensory and other capabilities. (Even DARPA—the Defense Advanced Research Projects Agency of the Department of Defense—is supporting development of technologies to enhance the natural abilities of soldiers, such as exoskeletons.) Aubrey de Grey is representative of those working on radical life extension strategies that regard aging as a curable disease, making four-digit lifespans possible. The author also briefly discusses the idea of “the Singularity,” an anticipated time when artificial intelligence will have surpassed human intelligence (somewhere around 2045 in the predictions of its most vocal proponent, Ray Kurzweil).

Though the emphases of those identifying with transhumanism are diverse, all look to technology to deliver them from the limitations associated with our physical bodies, including (but not limited to) aging and death, and hold “a conviction that we can and should use technology to control the future evolution of our species” (p. 2). Many view human beings as information currently encoded in a biological substrate that is a product of the vagaries of evolution, but which can (and should) be replaced by a superior version that is the product of technological design. Virtually all are devout atheists, looking to science rather than God for deliverance. As one put it, “Science is the new God ... Science is the new hope” (p. 208).

O’Connell makes it clear that he is not a transhumanist, stating this explicitly at both the beginning and the end of the book. But he acknowledges a fascination with the ideas and aims of the movement, arising “out of a basic sympathy with its premise: that human existence, as it has been given, is a sub-optimal system” (p. 2). While his basic approach is objective, there are numerous places where his sense of the strangeness of it all comes through.

Why should a reader of *PSCF* be interested in this subject? I admit that, as a reviewer, I approached reviewing this book with something of a sense of “why am I doing this?” Clearly, the foundational beliefs of the movement are directly antithetical to fundamental Christian beliefs about God, the good-

ness of his creation, and eschatology. (In fact, the author notes the affinity between the transhumanist aversion to the physical body and the ancient heresy of Gnosticism.) However, many of transhumanism's underlying ideas are part of the mental undercurrents of our time, such as the way we speak of ourselves in information-processing terms (for example, "I can't compute this"). Transhumanists take this perception of humanity to its limit. At the end of the book, the author sums up his experience this way: "I am not now, nor have I ever been, a transhumanist. I am certain I would not want to live in their future. But I am not always certain I don't live in their present" (p. 234).

Moreover, as the author notes throughout the book, the concerns that drive transhumanism (e.g., the reality of death) are similar to those addressed by religion and have a broad influence in society. For example, he notes that "Life extension [is] a long-term preoccupation for Google's founders Larry Page and Sergey Brin [and has] gradually become a part of the company's 'moonshot' culture" (p. 186). Additionally, Google's Vice President for Engineering, Ray Kurzweil, is the leading proponent of an upcoming technological Singularity. It is easy for Christians to forget the existential relevance of the fact that Christ has delivered "all those who through fear of death were subject to lifelong slavery" (Heb. 2:15 ESV).

This book was well written and enjoyable to read. It can serve as a helpful introduction to the subject for those desiring to know more about it.

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ALGORITHMS OF OPPRESSION: How Search Engines Reinforce Racism by Safiya Umoja Noble. New York: New York University Press, 2018. 256 pages. Paperback; \$28.00. ISBN: 9781479837243.

Algorithms of Oppression is author Safiya Umoja Noble's polemic against the international search company, Google. Subtitled "How Search Engines Reinforce Racism," her book seeks to enlighten the reader on the impact that search results have upon the world, and how these search results commonly skew toward negative racial and social stereotypes. Her contention is that Google could change its algorithm to balance the results but refuses to do so, a contention which this reviewer questions.

The book of 186 pages, plus introduction and thirty-one pages of references, is divided into six chapters: (1) A Society, Searching; (2) Search for Black Girls; (3) Search for People and Communities; (4) Search

for Protections from Search Engines; (5) The Future of Knowledge in the Public; and (5) The Future of Information Culture. It ends with a concluding chapter: (6) Algorithms of Oppression.

The author's points are as follows: First, the world relies on Google search results to gather, collate, filter, and deliver information, and the top 10 or 20 results are of utmost importance. Second, in the search space, Google is essentially a monopoly. Third, Google is not a public resource, but a company whose goal is to make money for its stockholders, not to deliver unbiased results. Fourth, Google's results are biased, although how their search algorithm works is private intellectual property. Fifth, the effects of biased results are far-reaching and destructive. Finally, Google could remove this bias from its algorithm but refuses, claiming that it is unable to do so.

Points 1, 2, and 3 are incontrovertible, and well supported by the author's references, anecdotes, and arguments. Points 4, 5, and 6 are not as well supported, yet they are the crux of the author's argument. The author certainly demonstrates that at the time of her writing, certain searches, for example, "black girls," provided top results that were primarily links to websites that were pornographic or hypersexualized advertising. Similar results are seen for "latina girls," "asian girls," and "hispanic girls." However, a search for "white girls," while producing some top-10 results that refer to pornographic sites, provided a much more balanced result.

The author produces a few examples of how Google seems to have "fixed" search results when some searches produced clearly racist results. One example is how Google responded to French and German laws stating that it is illegal to advertise or sell materials that deny the existence of the holocaust. When these governments informed Google that its search results provided links to such sites, Google responded by filtering the results to comply with the laws.

The author's contention from this example is that Google can alter its algorithm to produce unbiased results for *any* kind of search that may produce racist results. Google claims that its results are based on the well-known and well-published PageRank algorithm, and simply reflect what the public is searching for, what websites exist, and how they link to each other.

The book includes little proof that Google deliberately biases its results or can manipulate the results of any and all search queries that might produce socially and/or racially biased results. The author infers from news articles, interviews, research, and

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anecdotes that the results could be manipulated to prevent the biases, but she has no proof, yet this is the *raison d'être* for the book.

Algorithms of Oppression is a difficult read. The book is full of long, convoluted sentences, and often reads like a PhD dissertation (and a cursory inspection online of the author's PhD dissertation seems to indicate that most of the thoughts, if not the actual text, are borrowed from her dissertation). For example, one part of a paragraph reads as follows:

In this effort to try and make sense of how to think through the complexities of race and gender in the US, I resist the notion of essentializing the racial and gender binaries; however, I do acknowledge that the discursive existence of these categories, "Black" and "women/girls," is shaped in part by power relations in the United States that tend to essentialize and reify such categories. (p. 70)

Finally, the book, being essentially a polemic against Google, offers little in the way of solutions to the problem. We could protest against Google, and this might have an impact. Or we could take our business elsewhere. But, there are few alternative search engines to use that have the scope and depth of Google search. The author does highlight a few search engines designed to collect and curate references to more balanced and positive websites regarding African-American culture and racial issues. Yet, these search engines have little impact on the greater general public.

This book does offer important lessons: be cognizant of the issues, skeptical of search results, and thoughtful about the impact of search results. These are important lessons for users, including Christians, to remember. Google search is value-laden and Google is essentially a monopoly. Google generates revenue by promoting some companies' websites over others. Google's algorithm naturally promotes websites cross-referenced by other websites, and not all races, cultures, and subcultures are equally represented online.

As Christians, we should be informed about the factors that influence search results. Question what you find. Practice going deep into the results. Do not simply accept what you find in the first or second page. Scan lower-ordered results for alternative opinions and voices. Thoughtfully consider the impact the results may have on your decision making. Simply following the top results may lead you to have an incomplete understanding of important issues.

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THEOLOGY

EVOLUTION AND THE FALL by William T. Cavanaugh and James K. A. Smith, eds. Grand Rapids, MI: Eerdmans, 2017. xxix + 231 pages. Paperback; \$26.00. ISBN: 9780802873798.

Books on the historical Adam and the Fall (into original sin) are multiplying in the current decade, particularly when considered against the backdrop of the ongoing dialogue of theology with the natural sciences. This book was sponsored by the Colossian Forum, an organization devoted to developing resources for churches to navigate cultural conflicts, funded by a grant from the John Templeton Foundation and mediated through the BioLogos Foundation's Evolution and Christian Faith project. As such, the ten chapters gathered together in this volume developed from a three-year initiative that took up the following question:

If humanity emerged from nonhuman primates (as genetic, biological, and archaeological evidence seems to suggest), then what are the implications for Christian theology's traditional account of origins, including both the origin of humanity and the origin of sin? (p. viii)

The cumulative results are distinctive along the following lines when compared to the extant literature at this interdisciplinary intersection.

First, the conversation is ecumenically broad. The lead editors are a Roman Catholic systematician (Cavanaugh) and a Reformed charismatic and continental philosopher cum public intellectual (Smith), and contributors derive from confessions across the spectrum of Catholic-Anglican on the episcopal side to Wesleyan-Methodist on the more free church side, with others staked out all along the way in between. Although the various confessional identities are not conspicuous in every chapter, they are surely not absent, and, in a few cases, these are overtly factored into the analysis. The point is that the ecclesial dimensions of the discussion are neither muted nor marginalized, and when they are foregrounded, they provide windows into how to navigate the challenging questions at this interface in ways that involve, invite, and engage the richness and thickness of the church and its affirmations and even practices (see below) with the conversation.

Second, given the commitments of the BioLogos Foundation to foster Christian discussion about and openness to evolutionary understandings of the world and humanity's place in it, readers ought not to be surprised if the general scientific consensus

structures the discussion (the first two chapters in Part I on human origins and the biological sciences both presume and also establish the basic contours of the debate within an evolutionary environment). Hence, a first consideration of the book gives the impression that the authors have by and large accepted the evolutionary model and therefore sought to fit their work as biblical scholars, theologians, and cultural critics into that theoretical frame. Yet the essayists are also (mostly) established scholars in their respective fields and, when read carefully, can also be seen as working to clarify what the real issues are from their respective disciplinary perspectives, and to show how scriptural and theological commitments may foreclose certain understandings of evolutionary science but not all. In other words, there are nuances introduced, certainly, about how to understand the fall into sin, but there are also explanations of the scientific data as well as implications for ongoing and further scientific exploration informed by theological (broadly considered) perspectives.

Last but not least, consistent with the Colossian Forum's mission to engage the ecclesial world, the project was infused from the beginning with a kind of liturgical flavor creatively adapted for the group meetings, and attentive readers might be invited to think about how some of the chapters of the book have been shaped by these Christian practices, providing the matrix from which theological theory emerges. In fact, this is the key feature of this text and its contribution to the theology-and-science (or religions-and-science) literature: that it is possible to engage the philosophical, scientific, and theological issues, not by avoiding, but by precisely situating in the context of practicing the faith.

So, for instance, one of the chapters ponders how ascetic practices are conducive for the formation of a more distinctively Christian way of looking at the world, so that we are attentive to cosmic fallenness on the one hand, but also imbued with eschatological hope for creaturely flourishing on the other hand. Or think about Eucharistic participation as initiation into the deepest mysteries of the Christian faith, and how such might prompt a poetically and aesthetically shaped vision of reality that then orients us toward the dark chaos of the so-called "first" Adam as well as to the luminosity of the "second" one. What is made explicit in these two essays may be less prominent in the rest of the book, but there are many other instances in which confessional practices and resources can be recognized as in play once the reader is primed to their presuppositional role in this project. As the editors put it in their introductory chapter, a substantively Christian imagination is honed through and fueled by liturgical and other

forms of practices, so how might such practices be cultivated for perspective on these thorny questions of the present era? Put alternatively, specifically Christian thinking about science and faith, even about evolution vis-à-vis a fallen world, cannot but pass through the liturgical moments of faithful devotion.

Those for whom adjudication of the "evolution question" ought to be navigated empirically and scientifically may not appreciate the Colossian Forum's theological commitments and how such impinge on engaging even the scientific sides of such questions. On the theological side, the ecumenical breadth of the contributors ensures that however "the Fall" (in the book's title) is understood, such is irreducible to any dogmatic or confessional position, thus assuring that there is plenty of leeway for the various perspectives to comprehend such a fallenness within an evolutionary frame. It is perhaps also precisely in this vein that advocates of a more Augustinian or especially Calvinist notion of the Fall might object that theological sensibilities are hereby subordinated under currently popular scientific ideas that may turn out to be no more than fads in the long run. Or, of course, the scientific consensus could hold, in which case, the efforts to re-situate theological rethinking in relationship to such developments will continue to pay dividends to the faithful in that longer run.

Those looking for resources to inform faithful Christian engagement with the pressing questions posed by the evolutionary sciences in the contemporary context will come away with a broader sense for how matters are not merely theoretical but involve communities of faith. These can promote authentic Christian worship with and amidst, rather than silencing or purporting to definitively domesticate, such issues. *Evolution and the Fall* can be considered a success, although its use in ecclesial communities will need facilitators who can lay out the broader landscape and invite the group to consider that a variety of strategies are always needed to more adequately engage these complex matters.

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Letters

The Fine Tuning of Life

In his article titled "The Fine Tuning of the Universe: Evidence for the Existence of God?" in the September 2018 issue of *PSCF*, Walter Bradley describes the extraordinary precision of the foundations of our universe that makes life possible. The amazing facts