Animal Science

GOD'S FUTURE FOR ANIMALS: From Creation to New Creation by Raymond R. Hausoul. Eugene, OR: Wipf & Stock, 2021. 284 pages. Paperback; $34.00. ISBN: 9781666703405.

Raymond Hausoul's new book, *God's Future for Animals*, argues that the place of animals as part of God's intention for the world has not received enough attention as it pertains to how animals have fit into creation in the present time or as a part of the eschaton. It is derived from the author's doctoral dissertation and, as such, it is scholarly in tone and well sourced, at least from the standpoint of theology and church history. Hausoul takes the reader on a journey from the creation as described in Genesis and through biblical history: the consideration of animals by the early church fathers, modern society's relationship with animals, and on to how animals will be viewed during the end times. This is an ambitious task and it makes for very dense reading. The book is about animals but there are lengthy sections in which animals are hardly mentioned, primarily because the author takes considerable time to include details (outlined in a previous book) about the new heaven and new earth. Hausoul also takes a lot of time expanding on the creation story.

At this point in the review, I think that it is fair to be transparent about myself so my biases are clear. I have spent the last 42 years teaching, doing research, and assisting livestock producers in the ways that genetics can be used to improve the efficiency of producing animal products that can benefit humans. With few exceptions, my experience was with livestock producers who took impeccable care of their animals because to do otherwise would compromise the economics of their farm or ranch. I also witnessed producers who cared deeply about the welfare of the animals in their charge. I offer this background because the reader should know why I take considerable issue with the way that the author makes assertions about food that comes from animals, the production methods that are used to produce it, and the people who are involved in the production.

Unlike the detailed literature references concerning theology and church history, Hausoul makes numerous declarations about animals with little or no reference to the literature and, at times, with little or no reference to the reality I experienced and observed. His description of the foot-and-mouth outbreak of 2001 is a case in point (pp. 214–15). This is a very debilitating disease which is highly transmissible. The United States has taken extreme care to ensure that the disease does not enter the country since the last outbreak in 1929. Hausoul implies that it is not very severe and dismisses the need for dramatic measures to eradicate it. He is confused about whether horses are cloven-hoofed (they aren't) and seems puzzled by the fact that horses were not included in the eradication measures (they do not contract foot-and-mouth disease). He also suggests that the cattle producers saw the eradication measures only in economic terms because "they had no emotional bond with their animals" (p. 214). This assertion differs from nearly all of my observations of livestock producers. A simple search of the literature would reveal the considerable evidence of the mental health problems suffered by livestock producers following the outbreak. Unfortunately, there were no references to any outside literature in the paragraph describing the foot-and-mouth disease.

Hausoul's enthusiasm for a vegetarian diet is clear. The entire last chapter is devoted to the topic of vegetarianism. There are certainly ways to have a healthful diet without using animal products but the author takes that argument in directions which strain credulity. He writes extensively about efforts to assert that Jesus was a vegetarian and seems to lament the idea that the evidence does not support that conclusion (pp. 211–13). It is argued that vegetarian diets were becoming more popular in the first half of the twentieth century but the fact that Hitler was a vegan turned people against such diets (p. 210). It is asserted that "eating meat can evoke immoral lusts in a human being" (p. 209) without supporting evidence. It is implied that the extreme ages of the Patriarchs were due to their vegetarian diets and that the human life span reduced rapidly as soon as they started eating meat (p. 213). Proverbs 15:17 is quoted as support for a vegetarian diet (p. 210), although it would appear that the more important point of the verse is that any meal eaten in love is better than even an elaborate meal eaten in hate.

The author expresses views about scripture that are consistent with young-earth creationism. However, there is very limited reference to that literature and, for the most part, the writing does not resemble the young-earth literature I have read. It may be that he simply accepts all of the scripture at face value or that it is more straightforward, theologically, to describe events in the Bible exactly as written. I have already mentioned his acceptance of the extreme ages of the patriarchs (p. 213). Hausoul appears to accept

as factual the six-day timeline outlined in Genesis 1 and goes to considerable detail in describing some of the busier days. There is acceptance of the idea that there was no death in the original creation and that means that some of the original animals had to go through considerable change in order to start eating meat. There is in some, though not total, sense that whether animals (including humans) are herbivores or carnivores is simply a matter of choice. The topic in which this book most resembles the literature of young-earth creationism is in its consideration of the Genesis flood. There is considerable discussion (including tables) about how the ark could accommodate all of the necessary animals (pp. 93–96).

I will move toward closing this review with a sentence from the book which, frankly, stopped me in my tracks: "After having tried sex with all animals, Adam finally found his partner and extinguished his sexual urge" (p. 41). Hausoul goes on to suggest that the originators of that idea may have been referring to "intellectual or spiritual sex" (p. 41), as if that provides clarity about the idea or why it is a necessary addition to the book.

Overall, my conclusion about the book is that it edges very close to being an agenda that is searching for a theology. The theological discussion is quite deep but it is hard to avoid the notion that many theological points are driven to agree with preconceived conclusions about animals and the products they produce. Assessing this notion is not aided by the fact that almost all of the contemporary observations about animals are made as declarations without support from pertinent literature. This is, by far, my most significant criticism, especially for a book that is obviously presented as a scholarly contribution. Nonetheless, a reader with an interest in a theology of animals could benefit considerably from an examination of the sources discussed in the book.

Reviewed by David S. Buchanan, Professor of Animal Sciences, North Dakota State University, Fargo, ND 58108.

Evolutionary Science

THE HOURS OF THE UNIVERSE: Reflections on God, Science, and the Human Journey by Ilia Delio. Maryknoll, NY: Orbis Books, 2021. 242 pages, index. Paperback; $25.00. ISBN: 9781626984035.

In this exquisitely constructed book, Delio reveals the current state of her reflections on the central concern of her life and work: the relationship of God, humanity, and the universe in the context of the evolutionary process. Her unscripted career leading to this publication, narrated in her memoir *Birth of a Dancing Star: My Journey from Cradle Catholic to Cyborg Christian*, has exhibited the same sort of development and diversity that she finds woven into the fabric of the universe. A Franciscan sister who began her religious life as a cloistered member of the Carmelite order, Delio earned doctorates in pharmacology and historical theology and has taught at Trinity College, Washington Theological Union, Georgetown University, and Villanova University. Today, she is an award-winning author, best known for her Center for Christogenesis, which seeks to promote dialogue between faith and reason and stimulate a Christian spirituality fully infused with evolutionary consciousness.

Communicating the urgent need and prospects for that kind of spirituality is the burden of this, Delio's twentieth, book. A theology whose starting point is not evolution and the story of the universe, she insists, is a "useless fabrication" (p. xvi). Her work is rich in scriptural references, but the call to restore the book of nature to its primacy as the true first testament in Christianity's sacred canon is one of her signature themes. Though she displays no interest in apologetics or polemics, her basic assumption is the distinctively Catholic principle of the revelatory character of creation, a conviction at odds with the Protestant Reformers' suspicion of natural theology. A robust sacramental imagination permeates the entire book and provides its organizational design. Portraying the universe as the "new monastery" (p. xvii), Delio orders her reflections according to the liturgy of the hours that has structured daily prayer in Christian monastic communities for centuries: Matins, Lauds, Prime, Terce, Sext, None, Vespers, and Compline. Delio clusters her chapters—along with prologues of original poetry—around these times of contemplation and guides the reader through the prayers of one rotation of the earth and toward what she calls a new synthesis of faith and science.

Delio's thirty-two brief chapters, each a free-standing essay, cover a broad spectrum of topics from the cosmic to the autobiographical—from quantum physics, gravitational waves, and artificial intelligence to the Eucharist during the coronavirus pandemic and the death of her beloved cat Mango. Delio addresses a number of social issues such as racism, consumerism, and homophobia and sets the full scope of her reflections against the backdrop of the threat of climate change. Her main objective is the nurturing of a Christianity mature enough to match the

achievements and insights of contemporary science. In this effort, her primary dialogue partners include interfaith scholar Beatrice Bruteau, Passionist priest and self-styled geologian Thomas Berry, Hindu-Catholic mystic Raimon Panikkar, and luminaries from her elected Franciscan tradition such as Saint Francis, Bonaventure, and the contemporary spiritual writer and retreat leader Richard Rohr. Pope Francis's unprecedented encyclical on creation care, *Laudato Si'*, is a constant touchstone for Delio, but pride of place in her personal communion of saints is granted to the Jesuit paleontologist Pierre Teilhard de Chardin, whose transposition of Catholic Christianity into an evolutionary key animates virtually every page of the book.

Delio's essays orbit this Teilhardian view of things like planets in an intellectual galaxy characterized by both order and chaos. The overall effect is a prophetic warning regarding the irrelevance and near-obsolescence of any Christian system fixated on the categories of Aristotelian or Newtonian worldviews. Like her monastic and mendicant forebears, Delio calls for church reform and creative thinking. The dominant mood of the book, though, is a blend of hope and awe, even audacity. Delio's conclusion equates the rise of a "new species with a new God consciousness" (p. 240) with the second coming of Christ.

Delio's engaging book is limited by its scant attention to the menacing side of science and technology, its failure to reckon seriously with the dramatic rise of nonreligion that calls her privileging of Christian myth into question, its overestimation of the general reader's science literacy, and its tendency to align scholarly and homiletic modes of communication too closely and too uncritically. Readers seeking linear arguments for theistic evolution or Christian pantheism will have to look elsewhere. Clergy, advanced students, and believing specialists in theology and the natural sciences will find a provocative and prayerful statement of a unique Christian cosmology that informs and inspires.

Reviewed by Peter A. Huff, Professor of Religious Studies and Director of the Center for Benedictine Values, Benedictine University, Lisle, IL 60532.

Book Reviewers Welcome

If you would be open to being asked to write a book review, please send a brief email that describes your areas of expertise and preferred mailing address to Stephen Contakes at scontakes@westmont.edu.

Psychology

THRIVING WITH STONE AGE MINDS: Evolutionary Psychology, Christian Faith, and the Quest for Human Flourishing by Justin L. Barrett with Pamela Ebstyne King. Downers Grove, IL: IVP Academic, 2021. 160 pages, index. Paperback; $20.00. ISBN: 9780830852932.

I was looking forward to reviewing this book for several reasons. Firstly, I have been following the work of Justin Barrett for some time. As a clinical psychologist working in academia in the UK, I taught for several years an undergraduate module in psychology of religion in which I dedicated several hours to his work in cognitive science and developmental psychology of religion. Barrett, formerly director of the Thrive Center for Human Development at Fuller Theological Seminary and, prior to that, director of the Centre for Anthropology and Mind at the University of Oxford, has forged an unlikely career for a person of faith in a subdiscipline of psychology popularly considered the sole preserve of skeptics and nonbelievers.

Secondly, if I carry a bugbear about the empirical psychology of religion, it is that at times it tends to avoid application, a sense of the implications of its findings for human living. In this respect, Barrett's collaboration with Pamela Ebstyne King is a welcome addition to this project. Currently based at Fuller Theological Seminary as executive director of the Thrive Center and Professor of Applied and Developmental Science, King adds applied nuance and some succinct epigrams that bring home the implications of evolutionary psychology in everyday life.

Thirdly, it seems very important to me that people of faith generally, and Christians particularly, continue to explore and write about the field of evolutionary psychology, not least because it is often presented as a competing narrative of even nonliteral readings of the Genesis account, in direct opposition to a benevolent creator and a universe that could be considered in any way purposeful. I have lost count of the number of young adults I have encountered who refuse to consider the possibility of there being a creator, or who have lost faith in God, as a result of reading secular or atheistic accounts of human evolution.

Barrett and King have produced a short and well-informed book designed for any interested intelligent reader. No prior knowledge of evolutionary

psychology (EP) is required to follow their train of thought. In the early chapters of the volume, they state clearly the basic principles of EP and how the EP account of what it means to be human is remarkably consistent with the biblical understanding of the hallmarks of human life designed in the image of God. They focus on three overlapping domains of competency that are notably human—sociality, expertise acquisition, and self-control—or, as King pithily summarizes: the human capacities to relate, learn, and regulate (p. 46). The early chapters of the book convincingly argue that there is nothing incompatible with these elements of human nature, properly understood, and the Christian anthropology presented in the Bible. Barrett and King successfully side-step contention or sides of the evolution-creation debate. Their point about the compatibility of evolutionary and theological perspectives is well made, and will be of interest for those who are open to it from any faith or nonfaith perspective.

From there, the authors go on to outline their understanding of flourishing from this evolutionary psychology perspective. They note that human nature, with its social, intellectual, and regulatory capacities, has a dual aspect. On the one hand, these capabilities were forged in response to particular niches in evolutionary history; on the other hand, they offer human beings the possibility of redesigning the very niches which formed us. And therein lies the central dilemma of evolutionary psychology referred to in the title of the book. As a species we find ourselves facing the demands of twenty-first-century industrial life with minds designed to deal with the challenges of living in the stone age. Much of the failure in human thriving can therefore be attributed, the authors argue, to the gap that can open up between the social, intellectual, and regulatory capacities of human nature, and the requirements of the contemporary cultural landscape.

Each of the three capacities of human nature is treated to an entire chapter, examining how they can be inadequate to the demands placed upon them in our current context. Examples include the stretching of our social brain ability to breaking point by large populations, the failure of traditional pedagogies to utilize well-established cognitive biases and heuristics, and the overwhelming of our regulatory ability in the face of relentless advertising. We fail to thrive when the gap between human nature and human niche becomes too great, but human flourishing is promoted when we find ways of closing the gap between how we are designed and how we currently live. Barrett and King offer a raft of practical examples of how Christian faith and practice can contribute to this, such as network closure for socializing young people, age-appropriate education strategies for learning, and religious practices for building self-regulation. With these and many other evidence-based examples, the authors add evolutionary justification and theological depth to a common formulation in various forms of applied psychology, whether in clinical practice or the workplace, namely, that we flourish most when we fit our environment best.

The final two chapters take this proposition to its logical conclusion. Firstly, by querying what all this means for our status as bearers of the divine image, functionally commissioned to love God and one another, and to care for creation as God's representatives on Earth. And secondly, by giving space to a consideration of human purpose and telos. While Barrett and King avoid the suggestion that their book is aimed at those attempting to discern their vocation, the final chapter draws together the threads of their survey of human nature and its implications for flourishing with purpose and calling in life.

The book presents a convincing picture of consilience between evolutionary psychology and Christian theology applied in the real world. However, to my mind, it does leave a crucial question hanging. It is one thing to argue that the *outcome* of the evolutionary process is compatible with a Christian view of humanity, but what remains unaddressed, in this volume at least, is whether the evolutionary *process* is compatible with a Christian view of God. After all, this is what bothered Darwin. He was not wary of publication for fear of contradicting a literal reading of Genesis, but because his view of the origins of human life based on industrial-scale bloodshed was difficult to square with the existence of a benevolent creator. Once the conceptual problem of evolutionary creation is settled, the emotional problem of evolutionary creation emerges; the question of evolution morphs into the question of pain and evil. Personally, it would have helped this reviewer to more easily assimilate the message of the book if it had addressed this issue even briefly. But be that as it may, Barrett and King offer a coherent and elegant account of the confluence of evolutionary psychology and Christian faith in the quest for human flourishing, which is well worth reading.

Reviewed by Roger Bretherton, Associate Professor of Psychology, University of Lincoln, UK, and Chair of the British Association of Christians in Psychology.

THE SCIENCE OF CHILDREN'S RELIGIOUS AND SPIRITUAL DEVELOPMENT by Annette Mahoney. Cambridge, UK: Cambridge University Press, 2021. 86 pages. Paperback; $20.00. ISBN: 9781108812771.

The Science of Children's Religious and Spiritual Development by Annette Mahoney is a recent addition to the Cambridge Elements Child Development series. Between an introduction and conclusion, Mahoney has five sections to guide her summary. Overall, her approach is well conceived, approachable, and highly informative. Having taught undergraduate courses on child development for fifteen years at Christian liberal arts institutions, I found Mahoney's volume to be a thorough yet concise resource on religious and spiritual development from which I can draw resources as well as enrich discourse with engaged students.

In her introduction, Mahoney quickly sets the stage for the importance of religious and spiritual development in children. She notes how parents around the world desire to raise "good" (prosocial) children. Religion is frequently cited as influencing their parenting practices. The emphasis in research is on adolescence and adulthood for the specific study of religious and spiritual development, leaving a large gap when it comes to how these issues pertain to children's development.

Mahoney draws from Harold Koenig, Michael McCullough, and David Larson to define Religious/Religion (R) and Spiritual/Spirituality (S).[1] She acknowledges that this is not an agreed upon straightforward process, and that often R and S are not substantively different in the social science literature. With children, perceptions of God are commonly examined, though this only begins to scratch the surface of what's beneath their RS development.

After a quick historical look at RS, Mahoney offers a brief overview of Fowler's faith development theory, citing his 1981 book, *Stages of Faith: The Psychology of Human Development and the Quest for Meaning*.[2] She concludes that his "assumptions perhaps helped to dampen interest by mainstream developmental scientists in investigating children's RS" (p. 6). Here I wanted to better understand her conclusion and felt that more explanation would be beneficial for her argument.

Mahoney frequently reminds the reader that most of the research, both historically and currently, occurs in Western societies. There have been a handful of measures developed, which she presents in a table with the name, authors, definitions of R and S, subscales, and example items (pp. 11–19). This is followed by a helpful narrative of each measure and a comparison of four models that emerge. The reader quickly observes the murky state of measuring RS. Prosocial behaviors and positive psychology concepts are intertwined with RS, and Mahoney calls for clearer communication and increased transparency.

Due to the lack of studies with children, Mahoney reviews adolescents' RS and related psychosocial adjustment. RS appears to influence the views and choices of adolescents in areas such as risk taking, self-esteem, and depression. Mahoney presents a well-articulated description of the "muddled middle" (p. 28). Adolescents with either a high or a low state of RS are best adjusted. It appears that RS ambivalence places adolescents at greatest risk. Factors such as cognitive dissonance and moral inconsistencies appear to be at play.

The few studies on children's psychosocial adjustment and RS seem to suggest that children with significant life stressors (e.g., family conflict) may benefit from RS. The reciprocal nature of the parent-child relationship has relevance, as greater parental RS shows both positive and negative outcomes. On the upside, parents with higher levels of RS are more efficacious and warm, which in turn increases children's social and academic functioning. On the downside, greater parental RS predicts greater parental behavioral control and less autonomy in children. This in turn can be linked to more emotional problems in children, both internalizing (e.g., depression, anxiety) and externalizing (e.g., acting out, delinquency). It is important to note that these levels of problems are typically subclinical.

Mahoney also reviews the relationship between corporal punishment and parental RS. The research is clear on physical punishment (e.g., spanking) being ineffective, resulting in greater negative outcomes. The findings are mixed with regard to RS. Parents with higher RS, particularly those with lower education, implement harsher parenting strategies; however, greater attendance of religious services has been linked to less use of such strategies. Furthermore, higher religious attendance has been found to be a protective factor when it comes to child maltreatment (i.e., abuse and neglect).

When parents are asked specifically about their parenting goals, it becomes evident that not many place fostering a high level of RS to their children at the top of the list. Goals that surpass it include nurturing high self-esteem and interpersonal skills,

contributing to the larger society, carrying on family and cultural traditions, and providing the necessary education for a good future. Again, these are primarily Western reports and Mahoney reminds the reader that other countries' perspectives are needed. Like non-Western studies, studies of nontraditional parenting units, such as single parents, same-sex parents, and economically disadvantaged parents, are underrepresented. Furthermore, the type of theistic schema provides another area of diversity that is lacking, as children can be reared in polytheistic, nontheistic, atheist, or agnostic environments.

Mahoney's final section looks at social and cognitive-developmental research. Concepts such as theory of mind and attachment enter the scene. The primary area that has been studied in children's RS development is their concept of God. Preliminary findings suggest that children's perceptions of God mirror how they are being parented (e.g., punishing parents → punishing God, nurturing parents → nurturing God, powerful parents → powerful God, etc.). Examining children's prayers also sheds some light on RS development, though again findings are mixed and limited. There is more work to be done.

Mahoney calls on social scientists to take the lead in providing guidance to parents to uphold the United Nations' *1989 Convention on the Rights of the Child* Article 14, 1–2 that states: "States Parties shall respect the right of the child to freedom of thought, conscience and religion; States Parties shall respect the rights and duties of the parents and, when applicable, legal guardians, to provide direction to the child in the exercise of his or her right in a manner consistent with the evolving capacities of the child."[3] More intentional investigation of children around the globe can help parents directly but also inform policy makers. Mahoney states that "one central observation is that this literature is in its infancy stage" (p. 62).

Overall, Mahoney's review of children's RS development in this volume is thorough yet concise, troubling yet hopeful, vague yet nuanced. She concludes with six key areas and related findings to recap how the scientific study of children's RS development can be improved in the years to come. Thankfully, RS has begun to attract significant attention in the field, including from the Templeton Foundation's attempt to build a more global community of social scientists.[4] After reading this book, I feel much better equipped to elucidate what is known and what is yet to be discovered. This is important, not only in academic communities of colleagues and students, but also in the broader communities of church and society and in our personal communities.

Notes

[1]Harold G. Koenig, Michael E. McCullough, and David B. Larson, *Handbook of Religion and Health* (New York: Oxford University Press, 2001).

[2]James W. Fowler, *Stages of Faith: The Psychology of Human Development and the Quest for Meaning* (New York: HarperSanFrancisco, 1981).

[3]United Nations Human Rights, "Convention on the Rights of the Child," *Treaty Series* 1577, no. 3 (1989): 1–23, https://www.ohchr.org/en/professionalinterest/pages/crc.aspx.

[4]J. D. Warren, "$10 Million Grant Will Study Children's Religious Views," University of California, Riverside, February 19, 2020, https://news.ucr.edu/articles/2020/02/19/10-million-grant-will-study-childrens-religious-views.

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TECHNOLOGY

GENIUS MAKERS: The Mavericks Who Brought AI to Google, Facebook, and the World by Cade Metz. New York: Dutton, 2021. 371 pages including notes, references, and index. Hardcover; $28.00. ISBN: 9781524742676.

As Cade Metz says in the acknowledgments section, this is a book "not about the technology [of AI] but about the people building it … I was lucky that the people I wanted to write about were so interesting and so eloquent and so completely different from one [an]other" (p. 314).

And, that's what this book is about. It is about people such as Geoff Hinton, founder of DNNresearch, who, once he reached his late fifties, never sat down because of his bad back. It is about others who came after him, including Yann LeCun, Ian Goodfellow, Andrew Ng, Yoshua Bengio, Jeff Dean, Jürgen Schmidhuber, Li Deng, Ilya Sutskever, Alex Krizhevsky, Demis Hassabis, and Shane Legg, each of whom had their strengths, weaknesses, and quirks.

The book also follows the development of interest in AI by companies like Google, Microsoft, Facebook, DeepMind, and OpenAI. DeepMind is perhaps the least known of these. It is the company, led by Demis Hassabis, that first made headlines by training a neural network to play old Atari games such as Space Invaders, Pong, and Breakout, using a new technique called reinforcement learning. It attracted a lot of attention from investors such as Elon Musk, Peter Thiel, and Google's Larry Page.

While most companies were interested in the application of AI to improve their products, DeepMind's goal was AGI, "Artificial General Intelligence"—technology that could do anything the human brain could do, only better. DeepMind was also the first company to take a stand on two issues: if the company was bought out (which it was, by Google), (1) their technology would not be used for military purposes, and (2) an independent ethics board would oversee the use of DeepMind's AGI technology, whenever that would arrive (p. 116).

Part One of the book, "A New Kind of Machine," follows the early players in the field as they navigate the early "AI winters," experiment with various new algorithms and technologies, and have breakthroughs and disappointments. From the beginning, there were clashes between personalities, collaboration and competition, and promises kept and broken.

Part Two of the book, titled "Who Owns Intelligence?," explores how many of the people named above were wooed by the different companies, and moved back and forth between them, sometimes working together and sometimes competing with each other. The companies understood the power of neural networks and deep learning, but they could not develop the technologies without the direction of the leading researchers, who were in limited supply. To woo the best researchers, the companies competed to develop exciting and show-stopping technology, such as self-driving cars and an AI to play (and beat) the best in Chess and Go.

In Part Three, "Turmoil," the author explores how the players began to realize the shortcomings and potentially dangerous effects of the AI systems. AI systems were becoming more and more capable in a variety of tasks. "Deep fakes" of celebrities and the auto-generation of fake news (often on Facebook) led many to question the direction AI was going. Ian Goodfellow said, "There's a lot of other areas where AI is opening doors that we've never opened before. And we don't really know what's on the other side" (p. 211). One surprising figure taking a stand on the side of caution was Elon Musk, giving repeated warnings of the possible rise of superintelligent actors. Further, it was discovered that the Chinese government was already using AI to do facial recognition and track its citizens as they moved about.

Other concerns dampened the community: it was discovered that small and unexpected flaws in training could have significant effects on the ability of an AI system to do its job. For example, "by slapping a few Post-it notes on a stop sign, [researchers] could fool a car into thinking it wasn't there" (p. 212).

Additionally, the biases in training data were being exposed, leading some to believe that AI systems would not equally benefit minority groups, and could even discriminate against them. Furthermore, Google was being approached by the US government to assist in the development of programs which could be used in warfare. Finally, Facebook was struggling to contain fake news and finding that even AIs could not effectively be used to combat it.

In the final sections of the book, the author explores the AI researchers' attitudes toward the future and the big questions. Will AI systems be able to eventually take over all work, even physical labor? Can the AI juggernaut be controlled and directed? Will AGI be fully realized?

This last question is explored in the chapter titled "Religion." "Belief in AGI required a leap of faith. But it drove some researchers forward in a very real way. It was something like a religion," said roboticist Sergey Levine (p. 290). The question of the feasibility of AGI continues to generate much debate, with one camp claiming that it is inevitable, while the other camp insisting that AI systems will excel only in limited tasks and environments.

As a Christian, I found the debates about the proper role of AI to be intriguing. Is the development of AGI inevitable? Should we as Christians petition companies and governments to have debates on the pursuit of AGI? Should we enact laws to limit or prohibit the use of AI in warfare? Should independent evaluators be required to review AI systems regarding discrimination? Should Christians participate in the further development of AGI?

Learning the histories and attitudes of the leading individuals in the development of AI also intrigued me. Many of the individuals seem to have very little concern for the potentially negative impact of their work. Their only motivation seems to be fame and fortune. It makes me wonder if the field of computer science should require all its practitioners to take ethics training like professional engineers are required to do. This book certainly confirms the importance of ethics in the field of computer science and the need for its practitioners to be people of virtue.

In summary, this was a different kind of book from many others in the field of technology. It was fascinating that so much of what I was reading about had

happened in just the last ten years. Hearing the anecdotes of back-office meetings, public outcries, and false claims was intriguing. If you, like me, wonder how we got to where we are today in the area of AI, this is the book for you.

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TEACHING MACHINES: The History of Personalized Learning by Audrey Watters. Cambridge, MA: The MIT Press, 2021. 313 pages. Hardcover; $34.95. ISBN: 9780262045698.

Teaching Machines, by freelance writer, researcher, and technology commentator Audrey Watters, is a history framed by a critical rallying cry. The main body of the book is a history of the development and demise of "teaching machines" (mechanical devices for self-paced, programmed instruction) from the 1920s to the 1960s. It attends closely to the extent and limits of the influence of B. F. Skinner (and his forerunner Sidney Pressey), the role of commercial interests and processes, the development of a receptive social imaginary through popular media, the inconclusive nature of empirical findings about the learning that resulted, the eclipse of the mid-century teaching machine by programmed learning in book form, and the rise of computers. This account by itself might seem a little arcane. It is, however, given added heft by a framing argument that ties the history of teaching machines to present-day trends, and critiques some common myths regarding the history of educational technologies that are used to sell current technological options. This framing argument contends, on the one hand, that the "Silicon Valley mythology" (p. 249), regarding education's digital future, rests on misinformation about the past, and, on the other hand, that current digital developments have more continuity with the behaviorist and totalitarian impulses of that past than is commonly admitted.

Concerning the former point, Watters points to a common narrative purveyed by figures such as Sal Khan and Bill Gates that presents education as beset by a static factory model rooted in the nineteenth century and buttressed by resistance to change on the part of Luddite educators. The solution then comes in the form of commercially sourced digital tools that now offer revolutionary degrees of individualization and access to learning. Watters's account undermines both halves of this story. She marshals a substantial body of evidence to show that education has been far from static over the past century, that technological innovations designed by educators regularly stalled due to inertia and disorganization on the part of the business world, and that the rhetoric of revolutionary individualization and personalization of learning has been the stock-in-trade of purveyors of a long string of new educational technologies but has also consistently fallen short in practice. A generous amount of space is devoted to B. F. Skinner's bouts of epistolary fury directed at his business partners who stalled development of his teaching machines until their moment had passed. More significantly, Watters makes clear that the recurring claim of individualization came within a recurring and expanding envelope of standardization. Proponents of teaching machines made much of the potential for individualized instruction, understood as the capacity for learners to proceed at their own pace. Those same learners were expected to follow programmed sequences, assemble predetermined atoms of knowledge, prepare for standardized tests, and submit to a rather deterministic process of behavioral manipulation. The talk of individualization may perhaps have been sincere, but it amounted in the end to something comparable to today's processes of "personalizing" your smartphone by choosing the same device as millions of others in one of a handful of colors, or perhaps clicking on the same online instructional video, framed by the same perspective, as everyone else. In the meantime, the appeal to individualization helped to shift product.

The suggestion of contemporary parallels points to the second part of the book's framing agenda, which claims that teaching machines were not just a curious episode that met its demise with the rise of computing. Watters points out that claims to revolutionary breakthroughs in education through technology commonly end up looking oddly conservative. Dreams of technocratic learning and robot teachers in the 1950s and 1960s still placed the robots in front of classrooms with rows of chairs in which students answered multiple-choice questions. Watters suggests that contrary to some tellings of the story, the teaching machines of the day did not give way to computers so much as help to establish assumptions about programmed learning rooted in behavioral manipulation, atomization of content, and linear progress that continue to inform today's digital educational technologies. The commercial involvement in all of this is, moreover, far from disinterested, with considerable research and design acumen going into the creation of digital products that reinforce behaviors favorable to those who make their living from eyeballs remaining on webpages and apps. After a

chapter starkly comparing the Skinnerian vision of education based on control through behavioral engineering to protests from figures such as Freire and Chomsky in the name of freedom, Watters wonders aloud in the concluding chapter whether the quaint teaching machines of yore were just setting us up for a larger-scale loss of freedom in the name of surveillance capitalism, a loss sold under the aegis of the latest reiteration of educational utopia based on individualization.

The book is engaging, well written, and highly readable. Its deconstruction of the popular narratives about technology and education that it targets is persuasive, patient, and useful. For a book that ultimately has some larger points to make, it narrates the history carefully and in a measured tone. The concluding argument about the continuities between Skinnerian teaching machines and the mechanisms of surveillance capitalism rings true, but comes as a bigger leap given that all of the detail is focused on the decades between 1920 and 1970, after which we race somewhat headlong to the present in a welter of telling one-liners from various authors. That there are family resemblances between now and then seems undeniable based on the evidence presented, but detailed lines of descent are less clearly established. One also wonders whether the key opposition of totalitarian control versus radical individual freedom is quite adequate to do justice to the landscape. The closing sections are a little broad-brush, but certainly well worth pondering. The book is recommended reading for anyone interested in technology's relationship to society and education, and for anyone who imagines that educational technologies are just tools for making schools better.

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SCIENCE FICTION by Sherryl Vint. Cambridge, MA: The MIT Press, 2021. 224 pages. Paperback; $15.95. ISBN: 9780262539999.

Science Fiction is the story of the romance between fiction and science. The goal of the book is not to define the history or essence of science fiction, but rather to explore what it "can do" (p. 3). How does fiction affect scientific progress? How does it influence which innovations we care about? In the opposite direction, what bearing does science have on the stories that are interesting to writers at a point in time? *Science Fiction* references hundreds of books to paint a cultural narrative surrounding science fiction. Throughout the book, Vint refers to the fiction as 'sf' in order to avoid distinctions between science fiction and speculative fiction. The dynamic between science and fiction is a relationship defined by both scientific progress and by forming judgments of the direction of development through a lens of fiction. Fiction is cause and effect; we use fiction to reflect upon changes in the world, and we use fiction to explore making change.

Vint, Professor of Media and Cultural Studies and of English at the University of California, Riverside, gives overviews of different areas of sf. These include some of the most common sf elements, such as utopias and dystopias (chap. 2), as well as relatively recent concerns, such as climate change (chap. 7). Through these questions, she is navigating one question: how does sf engage with the world? It is more complex than the commonly reflected-upon narrative that sf is an inspiration to inventors—it is a relationship moving in both directions and involves value judgments as well as speculation about scientific possibilities.

The book also navigates the attitudes at the root of sf. Vint presents sf as a fundamentally hopeful, perhaps even an optimistic, genre. She describes sf as "equally about frightening nightmares and wondrous dreams" (p. 13). Yet even dystopian stories require hope for a future. Showing the world gone wrong still requires "the seeds of believing that with better choices we might avoid these nightmares" (p. 32). This is certainly true in the discussion of climate change sf. Where nonfiction writing often focuses on the impartial mitigation of disasters, the heart of fiction offers "the possibility to direct continuous change toward an open future that we (re) make" (p. 136).

The most surprising chapter is the penultimate one, focusing on economics (chap. 8). Vint discusses the recent idea of money as a "social technology" (p. 143) and the ways our current economy is increasingly tied to science, including through AI market trading and the rise of Bitcoin. The chapter also focuses on fiction looking at alternative economic systems—how will the presence or absence of scarcity, altered by technology, change the economic system? Answers to this and similar questions have major implications on the stories we tell and the way we seek to structure society.

As Christians, we have stories to help us deal with our experiences in life and our hope for the future. *Science Fiction* discusses sf as the way that our

communities, including the scientific community, process life's challenges and form expectations for the future. We must not only repeat the stories from scripture, but also participate in the formation of the cultural narratives as ambassadors of Christ. While *Science Fiction* does not discuss the role of religion in storytelling, the discussion of our ambitions and expectations for the future is ripe for a Christian discussion.

Vint describes sf as a navigational tool for the rapid changes occurring in the world. *Science Fiction* references many titles that illustrate the different roles sf has played at historical points and that continue to form culture narratives. While some pages can feel like a dense list of titles, it is largely a book expressing excitement about the power and indispensability of sf. I would recommend this book for those who want to think about interactions between fiction, science, and culture, or learn about major themes of sf, as well as those interested in broadening the horizons of their sf reading.

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Letter

"Unformed" and "Formed"

In the June 2022 issue of *PSCF*, the editor James C. Peterson noted, in his helpful survey of different views of personhood ("Recognizing the Presence of a Person," *PSCF* 74, no. 2: 106–11), a list of Church Fathers culminating in Aquinas who made the distinction between "unformed" and "formed" (p. 108). One of the reasons these Church Fathers sometimes gave for this distinction was the Septuagint's translation of Exodus 21:22–23.

Exodus 21:22–23 speaks of two cases involving a fight which injures a pregnant mother. The Hebrew text is difficult to interpret. One interpretation (for example, the RSV and NRSV) holds that in the first case, if a miscarriage occurs with no harm to the mother, then monetary compensation is required. In the second case, if the woman is harmed the rule of *lex talionis* is invoked. Some argue that this stereotyped phrase was not to be taken literally, but that the one who hurt the woman had to compensate her husband for the death of either his wife or his baby.

The Hebrew text can also be interpreted, as in the NIV, to mean that in the first case a premature birth of a healthy child occurs with no harm to the mother or child, and that in the second case one of them is harmed.

The Greek translation (the Septuagint) reads quite differently from the Hebrew:

> When men strive together and hurt a woman with child so that the woman miscarries an unformed child (*mē exeikonismenon*), he shall pay according to the husband's account. If the child is formed (*exeikonismenon*), he shall give life for life. (Exod. 21:22–23)

The distinction between an "unformed" and a "formed" child may have been influenced by the views of Aristotle.

Aristotle held that the fetus receives a "vegetative or nutritive soul" at the moment of conception, an "animal or sensitive soul" at a later stage, and a "rational soul" as the moment of birth draws near. In his *History of Animals* 7.3, he expressed the belief that the first movement occurred on the 40th day for males and on the 90th day for females.

Stoics, in general, held that the fetus was merely part of the mother's body, and that its life began with its first breath. Though Augustus passed legislation to promote marriages and procreation, Roman law adopted the Stoic view that the fetus was not yet a person. The emperors Septimius Severus (193–211) and Caracalla (211–217) prescribed banishment for a divorced woman who had an abortion contrary to the will of her former husband, and the death penalty for those who provided an abortion drug which caused the death of the woman.

Augustine, following the Septuagint of Exodus 21:22–23, held that the destruction of an "unformed" fetus, though immoral, was not murder. The codification of the laws under Justinian simply listed abortion as grounds for divorce.

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