

PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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is the beginning of Wisdom."
Psalm 111:10*

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The pages of *Perspectives on Science and Christian Faith (PSCF)* are open to original, unpublished contributions that interact with science and Christian faith in a manner consistent with scientific and theological integrity. A brief description of standards for publication in *PSCF* can be found in the lead editorial of the December 2021 issue. This is available at www.asa3.org → PUBLICATIONS → *PSCF* Academic Journal. Published papers do not reflect any official position of the American Scientific Affiliation.

1. Submit all manuscripts to: **James C. Peterson, Editor, Roanoke College, 221 College Lane, Salem, VA 24153.** E-mail: jpeterson@roanoke.edu. Submissions are typically acknowledged within 10 days of their receipt.
2. Authors must submit **an electronic copy of the manuscript formatted in Word** as an email attachment. Typically 2–3 anonymous reviewers critique each manuscript considered for publication.
3. Use endnotes for all references. Each note must have a unique number. Follow *The Chicago Manual of Style* (16th ed., sections 14.1 to 14.317).
4. While figures and diagrams may be embedded within the Word text file of the manuscript, authors are required to also send them as individual electronic files (JPG or PDF format). Figure captions should be provided as a list at the end of the manuscript text.

ARTICLES are major treatments of a particular subject relating science to a Christian position. Such papers should be at least 2,000 words but **not more than 8,000 words in length**, excluding endnotes. An abstract of 50–150 words and a list of 5–15 keywords are required and should be in both the text of the email submission and at the beginning of the attached essay.

COMMUNICATIONS are focused personal examples of how people are living out science and Christian faith. They have ranged from bringing computers to areas with no power, to being married to an experimental physicist, to an astronomer's sermon on the heavens telling the glory of God, to serving as president of a research university.

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James C. Peterson

Where at Least Some People Still Listen to Each Other

At a time of polarizing echo chambers and a constant stream of new stressors and conflicts, let's take a moment to appreciate this journal as a place where people still listen to each other. *PSCF* welcomes and learns from fellow Christians across disciplines, institutions, generations, and geography. In doing that as accessibly as possible, it fruitfully reveals to professionals across disciplines what each other is doing and learning.

Consider the articles of two of our most recent issues. In the March 2021 issue, the lead essay is written by an assistant professor at her first post in a Canadian Christian university. The second is by an emeritus professor at Ontario's research power, McMaster University. The third by a full professor at a university in England, and the fourth, by a professor at the state university of North Dakota.

In the June 2021 issue, the lead article is by an emeritus professor writing of New Zealand's experience with our current pandemic. The second is by a New Testament scholar who just completed his PhD at California's Fuller Theological Seminary. The third is by a senior physicist in Scotland, and the fourth by a team that includes a woman in graduate school at Yale University, a senior leader from commercial research and the ASA, and an associate professor in the state university system of Maryland.

In just these eight articles from two recent issues, one can see *PSCF* bringing to our common purpose, every stage of professional career, specialties from epidemiology to New Testament to physics, institutions ranging from Christian colleges and seminaries to state and private research universities to commercial research, and home locations spanning five countries.

As to the current issue now before you, it was printed in Pennsylvania after being fact and grammar checked in Ontario, and typeset in Massachusetts. I am writing to you from Virginia. The lead article stems from an author in Colorado, followed by two coauthors working together though one lives in Peru and the other in Italy. Then we hear from Canada. The piece that follows was developed from experience in Los Angeles. The review essay is from Seattle. The book reviewers are from Vancouver, Houston, Grand Rapids, Montreal, Norwich, Glasgow, and other cities, as they insightfully explain and dialogue with authors and publishers across the globe. As you read and reflect on this issue, wherever your local circle is, you are joining a thoughtful conversation with people in very different geographies and contexts.

This gathering to work together is seen not only in the finished pages, but also in the process each article goes through before being printed. Several expert peer reviewers have critiqued each of the articles that made it into rewrites, and eventually the journal. The peer reviewers and editors work with the authors to make each piece the best case for the perspective it brings, and to discern what will best serve the readers' time. The authors and reviewers do not always agree with each other, but they make a thorough case for the perspectives presented.

So we return here to expand on the standards that were enumerated eight years ago in the lead editorial (December 2013). We look for each piece in the journal to *further our mission*, that is to foster an accurate and fruitful dialogue between the best of the sciences and Christian faith. The journal cannot publish everything for everyone, but it does seek to be a leader in working through new territory and insight in the interaction between the best in theology and science.

Editorial

Where at Least Some People Still Listen to Each Other

In each article, the reader should see documented what is available on the topic for and against the author's thesis, especially from previous discussion in *PSCF*. Almost always, authors are joining a discussion that has already borne careful consideration. The *PSCF* index makes that treasure trove readily available under publications at ASA3.org. At the leading edge of inquiry, multiple views are in play and each should be given its best case.

There is no point in publishing an article that meets the above standards, but is difficult to decode. While our readers are erudite, they cannot know the inside jargon in every specialty. The content in this interdisciplinary field will usually be challenging, but the communication of it should not be any more difficult than it has to be. The selected essays are *to be clear*.

There can be recurring questions and themes, but each new article articulates some aspect worthy of consideration that was not part of the literature before. That contribution could be in the conclusion, or in an argument, or in a way of explaining the issue, but there will always be *an important new contribution*. The role of the journal is not to repeat what is already commonplace or a party line. If a perspective or argument has been articulated before in the journal and is relevant to the current article, it should be referenced, not done again. The point of each article in a current issue is to go on to new insights.

If a reader does not find a colleague's proposal here persuasive, they will hopefully submit their better approach to the journal's blind peer review process and potential publication. We are not a vanity press, nor for casual musing. Each essay has to stand on its own as building its case that is worthy of attention. Contrary to Foucault, *PSCF* is not pursued as a power game. It is not about one author triumphing over another. Rather, we are all to be listening for and submitting to what is actually the true, the good, and the beautiful. Indeed, to be delivered from a false view is to be appreciated with gratitude.

In sum, you may sometimes read an article in *PSCF* and be delighted to find someone so clearly articulating what you have always thought (even if maybe inchoately). Other times you may find a perspective that you had not even considered, but now you can see its point. We do not claim that *PSCF* is always brilliant in its corner, but at least we can say with confidence that there is a warm and welcome glow here that is to be particularly noticed when so much public cacophony has become as obscuring as it is ubiquitous. Here, at least, is one of the places where people still assume that the other has something to offer, listen to understand, respectfully test claims, and are better for it.

Carry on!



James C. Peterson, *Editor-in-Chief*

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THE AMERICAN SCIENTIFIC AFFILIATION



Terry M. Gray

Pronuclear Environmentalists: An Introduction to Ecomodernism

Terry M. Gray

Ecomodernism is a protechnology environmentalist movement spearheaded by the Breakthrough Institute. Ecomodernists are concerned with typical environmentalist concerns: climate change; air and water pollution; carbon-free energy; pesticide, fertilizer, and antibiotics pollution; and mass extinctions. Antinuclear is usually on the list but not so for ecomodernists. Ecomodernists advocate technological solutions to these issues and promote nuclear power as a low-carbon, small-land footprint and a high-density energy source to replace fossil fuels and to meet a growing global demand for energy (2 to 3 times current use by the end of the century). Ecomodernists also advocate high-yield mechanized food production and the concentration of human populations into urban areas to make room for more wild environments for other creatures. This article introduces the reader to ecomodernism and pronuclear environmentalists and urges Christians concerned about creation care to consider ecomodernism as an approach consistent with their Christian faith.

Keywords: ecomodernism, nuclear power, Pandora's Promise, environmentalism, pronuclear, creation care, Ecomodernist Manifesto, small modular reactors, Anthropocene

The environmentalist movement that I grew up with in the 1960s and 1970s was firmly antinuclear—with regard to both nuclear weapons and nuclear energy. Since its founding in 1971, Greenpeace has been antinuclear weapons (the “peace” of Greenpeace) and extends that opposition to nuclear power which it calls “dirty, dangerous, and expensive.” Greenpeace cites potential nuclear power plant disasters like Chernobyl and Fukushima Daiichi, the problem of nuclear waste, nuclear weapons proliferation, and the expense of building nuclear power plants as reasons to oppose nuclear power.¹ The National Resource Defense Council, while acknowledging the possible benefits of nuclear power with respect to CO₂ emissions, expresses practical opposition to nuclear power.² The Union of Concerned Scientists, Friends of the Earth, Sierra Club, Rocky Mountain Institute, and other environmentalist groups have similar antinuclear views.³

Imagine, then, the cognitive dissonance when you hear of environmentalists who are full-throated supporters of nuclear power. The argument is quite simple. The risks of nuclear power are small compared to the risks of supplying an ever-growing global energy demand with fossil fuels and accompanying CO₂ emissions that lead to global warming and climate change. Nothing is more dangerous than climate change. Two aspects of this view that are controversial in their own right are (1) that renewable energies (wind, solar, hydroelectric, geothermal, biofuels) will not be able to displace fully fossil-fuel-based energy, even over the long term, and (2) that nuclear energy is not nearly as risky as we think.

Terry M. Gray earned his PhD in 1985 in molecular biology from the University of Oregon. He now teaches chemistry at Colorado State University. Since the early 1990s, the ASA website has benefited immensely from his expertise and attention. He currently is serving as the president of the ASA Executive Council.

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I first encountered this argument in the 2013 documentary *Pandora's Promise* which featured the stories of a number of environmental and antinuclear activists who had changed their mind on the nuclear energy issue.⁴ These included the following:

- Stewart Brand, editor of the *Whole Earth Catalog*.⁵
- Gwyneth Cravens, former antinuclear environmentalist and author of the 2007 book *Power to Save the World: The Truth about Nuclear Energy*.⁶
- Mark Lynas, British climate change activist, who has also changed his mind about genetically modified organisms (GMO).
- Richard Rhodes, historian and author, who has advocated strongly against nuclear weapons.
- Michael Shellenberger, one of *Time* magazine's 2008 Heroes of the Environment and cofounder with Ted Nordhaus of the Breakthrough Institute. Shellenberger now heads up Environmental Progress, a pronuclear activist organization. He has recently published *Apocalypse Never: Why Environmental Alarmism Hurts Us All*.⁷

Pandora's Promise also describes the alleged dangers of nuclear power and attempts to answer them. It focuses on the exaggerated dangers of low-level radiation, the low volumes of nuclear waste and how it is currently stored safely, and new reactor designs with passive safety features. It highlights that nuclear power is low carbon and that it is able to meet the needs of a growing global demand for energy that might triple or quadruple by 2100 as the undeveloped world catches up economically with the developed world.

These individuals represent a new protechnology and prohuman environmentalism. The environmentalism I grew up with was rooted in Rachel Carson's *Silent Spring*, Paul Erhlich's *The Population Bomb*, Barry Commoner's *The Closing Circle*, The Club of Rome's *The Limits to Growth*, and similar books.⁸ The solutions to our environmental woes were to reduce the human population and the impact of humanity on the planet. Rather than being protechnology, this style of environmentalism had a back-to-the-garden feel to it, ramped up by a back-to-nature hippy movement (think Iron Butterfly's 1968 hit, "In-A-Gadda-Da-Vida"⁹). The planetary boundaries hypothesis of the Stockholm Resilience Centre

is a contemporary expression of this style of environmentalism, more worried about the limits of the planet and the negative impact of humanity.¹⁰ Ten planetary boundaries are now recognized: (1) stratospheric ozone depletion, (2) atmospheric aerosol loading, (3) ocean acidification, (4) biogeochemical flows (nitrogen and phosphorus), (5) freshwater use, (6) land system changes, (7) biosphere integrity and extinctions, (8) climate change, (9) chemical pollution, and (10) the release of novel entities.

At the same time, 1970 Nobel Peace Prize winner Norman Borlaug was using genetics, fertilizers, pesticides, and irrigation in his Green Revolution to feed the world and support a growing human population that is now nearly eight billion people.¹¹ The contrast between these two approaches to managing the world is found in *The Wizard and the Prophet* (2018) by Charles C. Mann.¹²

Doomsday environmentalism was deemed a dead end by activists Michael Shellenberger and Ted Nordhaus. They founded the Breakthrough Institute in 2003, and their 2004 essay "The Death of Environmentalism" was published shortly thereafter.¹³ In 2015 came the "Ecomodernist Manifesto."¹⁴ Shellenberger, Brand, and Lynas from *Pandora's Promise* are all contributors and initial signatories. Robert Stone, the director of *Pandora's Promise*, is also a signatory. Ecomodernism fully embraces modern technological solutions to issues relating to human well-being, development, and environmentalism. The "Ecomodernist Manifesto" is pronuclear, and its signatories are strongly in the pronuclear environmentalist camp.

Decoupling is one of the key ideas of ecomodernism. Decoupling refers to the separation of economic growth and development from environmental impact. Human well-being (even of a nearly eight billion human population) and development (absence of poverty; long lifespans; education; basic economic, political, and religious liberties) can occur without destroying the environment by utilizing more-intense and less-polluting forms of energy production, food production, and freshwater use. One of the mantras is to concentrate the human impact to make more room for wild nature. This is

sometimes referred to as “wilding.” Ecomodernists see these trends as already happening as a result of urbanization and the mechanization of agriculture. As of 2007, human beings crossed the threshold of over 50% of the population living in urban areas. Today that percentage is 55% and is expected to be 67% by 2050. The percentage is even higher in more-developed countries.¹⁵ Only 1–3% of the world’s land mass is taken up by cities.¹⁶ More mechanized, intense, and efficient agriculture supports these cities. Whereas subsistence farming means you grow food for you and your family, only a few workers today feed much of the world. The “Ecomodernist Manifesto” notes:

The growth of cities along with the economic and ecological benefits that come with them are inseparable from improvements in agricultural productivity. As agriculture has become more land and labor efficient, rural populations have left the countryside for the cities. Roughly half the US population worked the land in 1880. Today, less than 2 percent does.¹⁷

The “Manifesto” also notes that intensification of agriculture is good for the environment:

These improvements have resulted not only in lower labor requirements per unit of agricultural output but also in lower land requirements. This is not a new trend: rising harvest yields have for millennia reduced the amount of land required to feed the average person. The average per-capita use of land today is vastly lower than it was 5,000 years ago, despite the fact that modern people enjoy a far richer diet. Thanks to technological improvements in agriculture, during the half-century starting in the mid-1960s, the amount of land required for growing crops and animal feed for the average person declined by one-half.¹⁸

The “Ecomodernist Manifesto” disputes the planetary boundaries hypothesis except in three areas—climate change, accompanying ocean acidification, and stratospheric ozone depletion.¹⁹ Eliminating CO₂ emitting energy sources is a goal of ecomodernists. Thus, they are in line with nearly all environmentalists in wanting to move away from fossil fuels and promote zero-carbon solutions, including renewables such as wind, solar, hydroelectric, and geothermal. But ecomodernists strongly advocate nuclear power and even fossil-fuel use with carbon capture, utiliza-

tion, and sequestration (CCUS) technologies. While wind and solar move us in a zero-carbon direction, the land use and environmental impact of these technologies are of concern. Nuclear is favored because energy intensity is so much greater. The US Department of Energy estimates that land use requirements for a 1 GW nuclear power plant is 1 square mile, whereas to produce the equivalent in a wind farm requires 360 square miles; in a solar PV system, 75 square miles.²⁰ And these numbers for wind and solar need to be multiplied by 3 or 4 to account for differences in capacity factor. Wind farms and solar farms do not allow for as much wilding because of the large land use footprint.

What about the negatives that have historically been associated with nuclear power—questions of safety, nuclear waste, cost, and weapons proliferation? What has changed to turn some environmentalists into pronuclear advocates? Foremost is the perceived relative danger of CO₂ emissions from fossil-fuel combustion to meet the world’s energy needs. Global warming and climate change are now thought to be significantly more dangerous than any of the dangers of nuclear power.

But there are other factors as well. Next generation nuclear reactors promise passive safety features that would avoid the cause of nuclear accidents at Chernobyl or Fukushima Daiichi. Most of the current fleet of nuclear reactors involve pressurized water as the main reactor coolant. If the cooling system fails, pressurized water overheats and decomposes into hydrogen gas, resulting in an explosion that damages the containment facility and releases radioactive material into the environment. Next generation reactors use molten salt, molten elemental sodium, or pressurized helium as the coolant. If power to the active cooling systems fails, the reaction eventually stops on its own because of the heat transfer properties of the coolant molten salt, molten metal, or pressurized helium.²¹

Nuclear waste is still a serious concern. Currently, waste is safely stored on-site and the total volume is now considered relatively small (in the US, occupying the space of 55 gallon drums stacked three high on a single football field).²² The Yucca Mountain

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nuclear waste storage facility was cancelled by the Obama administration's Department of Energy administrator Steven Chu, in part because of a growing belief that there are better things to do with nuclear waste than to bury it in an underground storage facility. Reprocessing the fuel instead of one-time use and using transuranic elements as fission fertile material are becoming more feasible ways of reducing nuclear waste.²³

Small (60–100 MW) modular nuclear reactors (SMR), such as those being licensed by NuScale Power, are addressing the costs by using a standard design and factory-assembled reactors that can be transported to the reactor site by rail or truck.²⁴ The nuclear weapons proliferation danger remains, but international treaties and UN-based inspections have led to an uneasy peace.²⁵ In the minds of some, the urgency of addressing climate change overrules the concerns about weapons proliferation given these treaties.

There are other environmental problems addressed by ecomodernists using technology. Fresh water can be produced by desalination of ocean water instead of depleting aquifers and other freshwater sources. Desalination is an energy-intensive process, but that energy demand can be met using nuclear power.²⁶ Feedlots, tissue culture production of meat, and artificial meat stand in contrast to open pasture grazing which is a land-use demanding and antiwilding approach to meat production.²⁷ Managed aquaculture produces abundant food, but unlike open seas fishing, it does not deplete wild fisheries.²⁸

What should a Christian think of the "Ecomodernist Manifesto"? It appears to come from a humanistic and secular perspective. Some might perceive a techno-salvationism. The "Manifesto" ends with this:

We value the liberal principles of democracy, tolerance, and pluralism in themselves, even as we affirm them as keys to achieving a great Anthropocene. We hope that this statement advances the dialogue about how best to achieve universal human dignity on a biodiverse and thriving planet.²⁹

While one can make an appeal to these sorts of principles from a Christian perspective, the "Manifesto" has the feel of a secular religious creed rather than

Christianity. One could easily imagine that the original signers of the "Ecomodernist Manifesto" would be very comfortable with the Humanist Manifesto I, II, or III³⁰ and happy to do without religion at all.

Four aspects of the Christian faith, however, lead me to think that the "Ecomodernist Manifesto" can be enveloped by a broader Christian perspective and perhaps fully embraced by Christians.

1. The commandment to love your neighbor
2. Creation care
3. The idea of stewardship
4. The eschatological direction from garden to city

One does not have to be anti-God, antisupernatural, and antirevelation to be prohuman. Christians believe that humanity is made in God's image and that all people have dignity as a result of bearing that image. The commandments are summarized by "love God" and "love your neighbor." A children's catechism used in my tradition answers the question "Who is your neighbor?" with "All my fellow men are my neighbor."³¹ Galatians 6:10 says, "Therefore, as we have opportunity, let us do good to all people, especially to those who belong to the family of believers" (NIV). The desires of ecomodernism to see a thriving humanity, the elimination of poverty, good health, long lives, and peace between nations are also desires of Christians. From this point of view, humanism is fully compatible with Christianity. It could even be argued that ecomodernism's prohuman form of environmentalism aligns more closely with Christianity than traditional environmentalism. The American Scientific Affiliation (ASA) acknowledges this prohuman perspective in its own faith statement. "We recognize our responsibility ... to use science and technology for the good of humanity ..."³²

Creation care is based on the earliest instructions given to humanity as recorded in the Bible. Genesis 2:15 says, "The Lord God took the man and put him in the Garden of Eden to work it and take care of it" (NIV), "cultivate and keep" (NASB), "dress and keep" (KJV), and "cultivate and guard" (GNT). Psalm 24:1 says, "The earth is the Lord's and everything in it." Environmentalism is not a pagan

religion that makes an idol of the earth (although it could be turned into that). Caring for creation is part of humanity's calling. We do not own the earth; we steward it for its true owner, God. Thus, ecomodernism's goal of minimizing the human footprint (in a prohuman manner) while maximizing the natural environment is compatible with Christianity. The ASA's faith statement recognizes this idea as well. "We recognize our responsibility ... to use science and technology for the good of ... the whole world."³³

Stewardship is key here. We are to work (dress, cultivate) the earth. Ecomodernism fully recognizes the effect that human beings have had on the planet. The term "Anthropocene" has been adopted by ecomodernists to refer to the present geological age because of this impact. At first glance, it appears that the human effect is negative and harmful to creation—no doubt true to some extent. But working/cultivating/dressing creation becomes the very means to preserve it. High-tech solutions not only meet the needs of humanity, but they also solve problems that were created by previous "solutions."


Stewardship means using the resources and the minds that God has given to us in order to accomplish our earthkeeping (and other) tasks. The Bible does not have us merely living in the Garden of Eden doing subsistence agriculture. Humanity was called to fill the earth and subdue it (Gen. 1:28) and to create culture. In a sense, creation was not finished—in partnership with human beings, God continues to develop and to create his world. Science, medicine, engineering, agriculture, the arts, commerce, leisure, philosophy, and theology are all post-Garden of Eden endeavors.³⁴ Much culture building is linked to city building. In the parable of the talents, what became of the steward who merely buried what was given to him? The master expected something productive to be done with what he handed to the stewards, and commended the two who showed gain. Condemnation came to the one who merely preserved what he was given (Matt. 25:14–30).

Ecomodernists' use of technology to solve social and environmental problems is fully compatible with the stewardship motif of Christianity. Of course, in Christianity, technology is not our salvation, only

God is. But human knowledge, resourcefulness, and innovation to make the world, including the natural world, a better place are gifts from God and part of our stewardly tasks as Christians.

Finally, what is the arc of history according to a Christian perspective? The Bible begins in a garden, but appears to end in a city. While Christian theology has envisioned a supernatural return of Christ to bring final and full justice and peace to the earth, there are strands of Christianity that see the beginnings of the kingdom of God at the time of Jesus coming in the flesh and especially at the time of his resurrection. This kingdom grows throughout the present age before the return of Christ. But this growth is not just in terms of the missionary activity and growth and influence of the church. It includes culture building to the glory of God by Christians and non-Christians alike. Progress in the well-being of humanity is part of this kingdom work. Advances in science, medicine, technology, and agriculture are all gifts from God, especially when received with thanksgiving (1 Tim. 4:4–5). Dutch theologian Abraham Kuyper famously said,

Oh, no single piece of our mental world is to be hermetically sealed off from the rest, and there is not a square inch in the whole domain of our human existence over which Christ, who is Sovereign over all, does not cry, "Mine!"³⁵

Christianity is not just about worship services, devotions, and private ethics.³⁶ It is about all areas of life. When scientists, engineers, and technologists use their minds, and the resources found in creation, to accomplish good, it is to the glory of God and to the furthering of his kingdom. Ecomodernists point to a great Anthropocene as the eschatological goal. Christians point to a different eschatological goal brought about by the Second Coming of Christ. Nonetheless, there is overlap between the two, and Christians can partner with ecomodernists to do the work God is calling us to do. 

Notes

¹Greenpeace, "Nuclear Energy," accessed September 29, 2020, <https://www.greenpeace.org/usa/ending-the-climate-crisis/issues/nuclear/>.

²NRDC Policy Basics, "Nuclear Energy," Natural Resources Defense Council, February 2013, accessed September 29,

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2020, <https://www.nrdc.org/sites/default/files/policy-basics-nuclear-energy-FS.pdf>.

NRDC is not opposed in principle to nuclear power, and acknowledges its beneficial low-carbon attributes in a warming world but we take seriously the significant safety, global security, environmental, and economic risks that use of this technology imposes on society. This demands stringent regulation of the complete nuclear fuel cycle, beginning with the mining and milling of uranium and ending with the final disposal of radioactive wastes. Until these risks are properly mitigated, expanding nuclear power should not be a leading strategy for diversifying America's energy portfolio and reducing carbon pollution. NRDC favors more practical, economical, and environmentally sustainable approaches to reducing both U.S. and global carbon emissions, focusing on the widest possible implementation of end-use energy-efficiency improvements, and on policies to accelerate the commercialization of clean, flexible, renewable energy technologies. (p. 1, boxed text)

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Young people are leaving the faith in record numbers and at a record speed.

One of the reasons is the issue of origins. Many view Christianity as anti-scientific. They are also turned off by the evolution vs. creation debate.

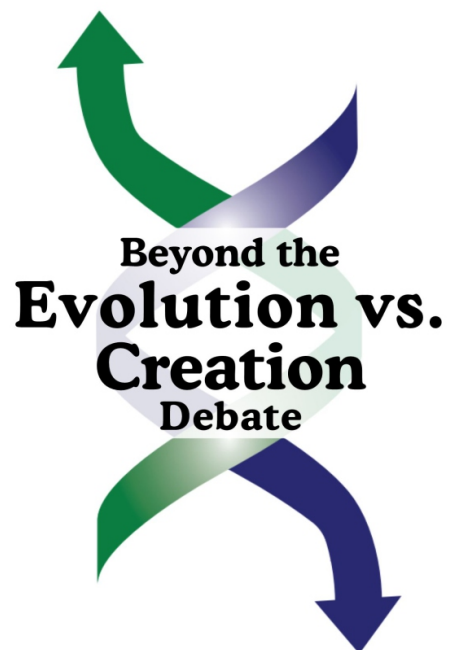
In a book written for high school students, theologian and scientist Denis O. Lamoureux offers various ways to develop a positive and productive relationship between Christian faith and modern science. He also shares his story of losing his faith as a young person, and later returning to the Lord. His approach to origins is ideal for developing critical thinking skills and for honoring Jesus' command (Matt. 22:37):

"Love the Lord your God with all your mind"



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For High School Students



Denis O. Lamoureux
Professor of Science & Religion

Article



Oscar Gonzalez



Dario Di Luca

Viral Diseases and the Neglected Commandment of Creation Care

Oscar Gonzalez and Dario Di Luca

Humans are called to rule over creation (Gen. 1:27) but not in an irresponsible way. We should treat creation, as we read in Genesis 2:15, by caring for it. That was the requirement from God for humanity. We can define creation care as nature conservation. However, we should acknowledge that we have been neglecting our role as stewards of creation. There is deforestation, species extinction, pollution, and other human activities that cause suffering not only for plants and animals, but also for people. Mismanagement of nature can cause spillover of disease. In wildlife, agents of disease are common, but they are somehow under control when there are many hosts. Scientists recognize today that pathogens and parasites have a role in the structure of ecosystems. By causing deforestation and removing animals from their natural habitats, we are increasing the possibility of zoonotic diseases that may cause epidemics and pandemics. This article will relate the origin of viral diseases, such as COVID-19, to a failure of proper nature management and provide examples of viral diseases resulting from such mismanagement.

Keywords: disease ecology, zoonosis, creation care, pandemics, viral diseases, pathogens, nature destruction

Destruction of Nature and Disease Ecology

Disease and nature destruction are linked if humans subdue the earth without caring for it. When people change the environment abruptly, the original ecosystems that were there might not be ready to face the new diseases that come.¹ Pathogens cause infections, and many of these agents of disease live in natural ecosystems. The new diseases caused by these pathogens can produce an epidemic

for plants, animals, and people, establishing a relationship between disease and ecology. Habitat and biodiversity loss are increasing diseases in wildlife,² and the homogenization of habitats by human activities leads to easier transmission of pathogens and epidemics.

Human land-use change causes habitat loss (fragmentation), mainly through the reduction of tree cover (deforestation). This contributes to the spreading of diseases and the occurrence of epidemics in forest communities. Deforestation increases the possibility of physical contact between humans and animals, which can result in the transmission of infectious diseases from parasites and pathogens of wildlife.³ Land-use change, such as deforestation, is the leading driver for emerging “zoonoses,” infectious diseases that have jumped from a nonhuman animal to humans.⁴

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Habitat loss will lead to the reduction of species richness, and the pathogens would be highly prevalent if there are few host species and few individuals.⁵ This means that a low biodiversity index is an invitation to disease in wildlife. Several epidemics have originated in the wild and affected crops, livestock, and people. The higher the biological diversity, the lesser the disease's prevalence is in the ecosystem.⁶ If there are more hosts in the ecosystem, the whole ecosystem's diseases are fewer.⁷ Knowing this fact, we should maintain the integrity of ecosystems by avoiding species loss.

Parasites and Pathogens in the Ecosystems

Diseases are mainly carried by pathogens and parasites, which formerly were relegated as anomalies in nature but now can be considered part of the food web in all ecosystems. Some scientists argue that the food web is incomplete without them because they could dominate food web links.⁸ Today parasites could be placed at the top of the food pyramid because they can produce more biomass than their hosts. Parasitism paradoxically may increase biodiversity because some parasites are "good," protecting individuals against more pathogenic forms.⁹ Parasites may modify every kind of interaction in an ecosystem. We should consider that natural diseases in an ecosystem are part of the process, not just anomalies.¹⁰ Life cycles of parasites and their dynamics, normal vectors of disease, affect wildlife's community structure and people.¹¹

All animals, plants, and people have symbionts inside their bodies, which could be parasites or potential pathogens. We should be familiar with the human microbiota.¹² Microbes' standard load in plants and animals is fundamental to resisting pathogens from outside their geographical scope. It has been proposed that wildlife outbreaks, such as the amphibian's chytridiomycosis (a disease that is killing frogs worldwide), are the result of change in microbial communities and a new disease dynamic.¹³ Pathogens and parasites have a function in nature. When we disrupt their cycles with deforestation or wildlife traffic, we are more likely to become contaminated by zoonosis.

Zoonotic Viral Diseases

Recent years have witnessed several outbreaks and pandemics in humans as a result of spillover. Spillover occurs when a pathogen (that may or may not cause disease in the natural host) comes in contact with a new host population and acquires the ability to replicate in the new host. Examples of recent spillovers include several Coronaviruses (SARS in 2003, MERS in 2012, SARS-CoV-2, the agent of COVID-19 in 2019), Nipah virus in 1999, Ebola virus in 1976 with several epidemics after that, Sin Nombre virus in 1993, several human outbreaks of highly pathogenic avian influenza, hantavirus, Zika, Ebola, HIV, and West Nile virus.¹⁴ Several of these outbreaks are viral diseases that came about due to environmental changes caused by human activities.¹⁵

Sometimes spillovers occur as a direct result of human behavior, as in the case of monkeypox in 2003. Despite its name, monkeypox is a disease caused by a rodent poxvirus that occasionally infects humans in different parts of Africa.¹⁶ In 2013, 47 cases of human monkeypox were reported in different parts of the United States. It was determined that the virus was introduced through a shipment of wild animals from West Africa, including African giant rats, tree squirrels, and different species of mice. The wild animals were later sold as pets. The outbreak was easily contained because there was no human transmission, but it highlights the dangers of introducing wild animals into our human environment.¹⁷ An unmanaged and uncontrolled wild animal market is a melting pot of zoonotic viruses.

Nipah virus represents another example of spillover due to human activities. Nipah virus is a member of the *Paramyxoviridae* family. The virus was first isolated in 1999, when over 250 infectious encephalitis cases, with over 100 deaths, occurred in Malaysia and surrounding areas. The disease was transmitted to humans by pigs, who became infected by eating fruit contaminated by bat saliva or urine. This first outbreak was successfully contained by culling one million pigs.¹⁸ However, since then, several small outbreaks have occurred in Bangladesh and India, where this disease is linked to the consumption of fruit products, such as date palm sap collected

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overnight in open containers that get contaminated with urine or saliva from infected bats.¹⁹ In this instance, safer agricultural procedures, such as avoiding livestock and agriculture in the proximity of wildlife, can eliminate spillover risk.

Machupo virus is a member of the *Arenaviridae* and is the etiological agent of Bolivian hemorrhagic fever. Machupo virus infects asymptomatic rodents and is shed with urine. The first recorded occurrence of the disease in humans dates to 1962, in the rural village of San Joaquín (Bolivia). Over 600 people were infected, and the lethality rate was close to 20%. The outbreak was associated with a decrease in the domestic cat population and an increase in rodent numbers that occurred after the region had a high incidence of malaria, and extensive DDT use was carried out. Cat mortality was associated with exposure to toxic doses of DDT through the alimentary chain and resulted in an uncontrolled burst of mice. The outbreak disappeared when rodents were controlled by extensive trapping, and the cat population was re-established.²⁰ The terrible legacy of DDT as a toxic agent for the ecosystems affected human health with the emergence of the Machupo virus.

Rift Valley fever (RVF) is a viral zoonosis caused by a Phlebovirus, affecting primarily animals, but it can also infect humans. The virus is transmitted by mosquito bites. In 1987, a massive outbreak of RVF, with about 200 human deaths, occurred in the areas surrounding the Senegal River after the Diama dam was built.²¹ Similarly, an outbreak of RVF occurred in Egypt following the completion of the Aswan dam.²² Dams cause ecological disasters by altering the water cycle and modifying the landscape in the places where they are built.²³ In these instances, creating artificial water basins and irrigation for agricultural purposes has increased the habitat favorable for mosquito breeding, consequently increasing the risk of RVF transmission.²⁴ These examples of RVF outbreaks in Africa are tied to nature destruction.

Climate change is also an essential factor for emerging viral diseases. In fact, several arboviral infections are transmitted explicitly by tropical mosquitoes. Increasing temperatures result in extended habitats

for tropical mosquitos, and therefore also for the viruses they carry. For example, dengue fever is a disease transmitted by female mosquitoes, mainly of the species *Aedes aegypti* and, to a lesser extent, *Ae. albopictus*. These mosquitoes are also vectors of chikungunya, yellow fever, and Zika viruses. Severe dengue is a leading cause of severe illness and death. According to the World Health Organization, before 1970, only nine countries had experienced severe dengue fever epidemics, but now the disease is endemic in over 100 countries.²⁵ About half of the world's population is now at risk, with an estimated 100 million symptomatic infections each year.²⁶ Furthermore, autochthonous transmission of arboviral disease is starting to occur also in temperate zones,²⁷ in association with heavy rains and temperatures permissive for mosquito breeding.²⁸ Our negligent stewardship of the climate moves viral diseases, once restricted to a tropical area, to temperate areas where previously people were not exposed.

Contention of Pandemics

We can trace terrible epidemics and historic pandemics as different cases of zoonosis. The zoonotic origin of this new Coronavirus is strongly supported by genetic analysis, showing close genomic homology to several bat and pangolin viruses.²⁹ As we write, evidences do not support a single direct spillover from a still unidentified animal source to humans (the horseshoe bat *Rhinolophus affinis* is a potential candidate), but they are consistent with multiple spillover events between different animal species, facilitated by typical meat-markets selling live animals.³⁰ Regardless, bats, pangolins, and other forest animals should have lived their lives freely in their undisturbed habitats. However, people destroyed their forests and removed the wildlife to bring them into human markets with insalubrious conditions. In those markets, wild animals interact in a way that is not natural, exchanging saliva, blood, and pathogens inside crowded cages. Here zoonosis occurs, and the conditions provide a very likely scenario for the origin of an epidemic.³¹ This is a scenario of mismanagement of creation with a lack of respect for other creatures and for the integrity of ecosystems, which are also part of God's creation. Both hypotheses

(lab-leakage and animal markets) indicate the importance of human contribution not only in spreading and failing to control the pandemic, but also, possibly, in its origin.

This pandemic caused by coronavirus is something that could be interpreted as one of the “groans of creation”:


We know that the whole creation has been groaning as in the pains of childbirth right up to the present time. (Romans 8:22)

This Bible verse is used mainly to describe soteriological or eschatological scenarios. But we can also see that human sin is still affecting creation in a way that natural decay is exacerbated. In our lust for nature’s products, creation groans, and as a consequence, we have this pandemic. With our irresponsible behavior, we are aggravating nature’s groaning.³² The creation has been in pain because of our mismanagement; it is time that we exercise adequate stewardship and bring healing in this broken world.³³

Proposed Solution: Creation Care

Humanity has survived previous pandemics in the past. Christians have taken part in the solution by caring for the needy. We can still do the same, and this is the time for Christians to heed the authorities when they promote vaccination and impose quarantines, mask mandates, and meeting restrictions because those are policies that offer some protection.³⁴ One of these policies should also involve nature conservation to prevent zoonosis.³⁵ This is not the time for Christians to spread misinformation and conspiracy theories about the pandemic.³⁶ These lies shame our testimony and do not provide a solution to those who are suffering. We have the opportunity to apply science and faith to solve a health crisis. Neither is this the time to blame God for the zoonotic diseases that caused so much suffering: we, of our free will, disturbed nature’s pathogens that originated those diseases.

We should also consider the neglected commandment of creation care more seriously by becoming agents of the Lord’s kingdom to conserve the integrity of the ecosystems that were entrusted to us.³⁷

This call to action is not equivalent to becoming political activists for a specific party: we care for creation because it is what God expects from us. We should conserve the forests and the animals that live there; in this way, we prevent the spillover of diseases from wildlife to humans.³⁸ We should advocate for the combat of the illicit wildlife trade that puts people at risk of zoonosis.³⁹ There could be more viruses or pathogens that would mutate quickly and affect us, even worse than the SARS-CoV-2 virus. The conservation of nature is not just for the sake of animals, plants, or romantic conservationists. It is a way to love God and our neighbor. 

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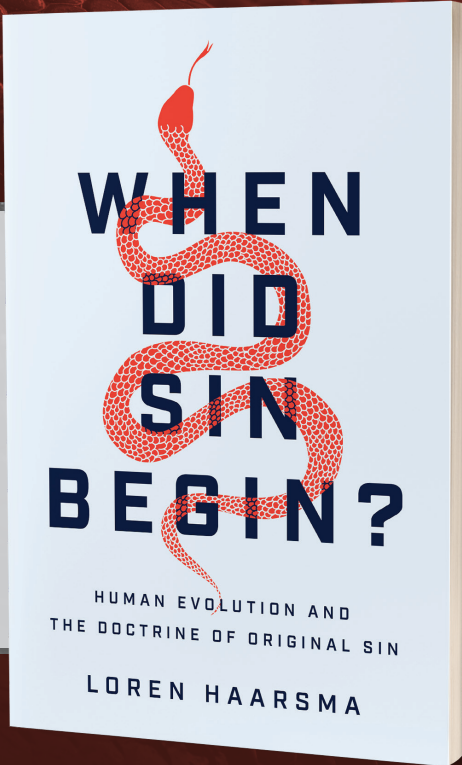
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Luke J. Janssen

Article

Are Global Disasters the Result of Original Sin or Part of Our Training as Co-regents?

Luke J. Janssen

Life on Earth has long been plagued by global calamities: pandemics, environmental disasters, climate change, and species extinctions. Humans have been witnesses and even victims of some of these; too often, we have contributed to the problem. Some people draw a direct causal link between those catastrophes and the third chapter of Genesis: our sinful nature and original sin. But perhaps we should also consider drawing another link coming from the first chapter of Genesis in which human beings are commanded to subdue and have dominion over a very good creation that had change, innovation, exploitation, and even death built into it. Humans were not yet up to that task: we were never omnipotent nor omniscient. But God wanted us to learn how to fill that role, and Jesus again redirected us into it when he inaugurated the arrival of the Kingdom of God on Earth.

Keywords: original sin, natural evil, moral evil, creation, human origin, image of God/*imago Dei*, human technology, species extinction

When imagining or describing creation as it might have been seen on day eight—the day after it had been completed and God had rested—Christian believers of many theological and denominational stripes envision much the same thing: humans living in blissful harmony in a beautiful ecosystem in which there is no disease, suffering, or hardship. Many will add to this picture the fact that there was no death nor predation. Many will further add to this picture the idea that humans existed in some kind of state of perfection, although the parameters around that become less well defined: whether we were immortal; our inherent sinful state

or sinful nature; the extent of our ability to “subdue and have dominion” over the rest of creation. Most pertinent to the argument of this article, though, is that they will also add to this picture the idea that the status quo would not have changed—this blissful Garden of Eden existence would have continued unaltered—were it not for some kind of human decision and action that then spoiled the tableau and sent creation on a downward trajectory.

This worldview goes a long way to explaining many of the evils and tragedies that now plague our existence today. It is used to tie our sinful nature to even the largest issues which afflict on a global scale: global warming, species extinctions, all forms of pollution, and, for some, even COVID-19.¹ To be clear, I am not questioning whether humans play any role, even a major and/or causal role, in these problems. I am instead calling

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attention to the line that some draw between these problems and “the Fall in the garden” and our sinful nature.² In particular, I would like to look more closely at that line of causality: its origin and its target. Is our conception of the initial state accurate, or is it filtered through some kind of metaphorical theologically rose-colored glasses? Could the problem be also rooted in Genesis chapter one (the very *first* mandate given to humans) in addition to Genesis chapter three (our sinful nature)? And although our discussion is relevant to evils in the world generally, an emphasis will be put on the present global “evil” represented by COVID-19.

Humans and Evil

There can be no dispute that there are many evils in this world. Theologians and philosophers have found it useful to distinguish between natural and moral evil.³ Natural evils include tragedies which appear to be completely outside human causality (hurricanes, earthquakes, asteroid bombardments, a tree falling on a picnic party), while moral evils result from a choice or decision which goes against some moral code. However, these two overly simplistic delineations do not cover all the possibilities, in part because both are open to interpretation: they are very fuzzy. For example, defining something as a moral evil depends upon what moral code is said to have been contravened. Causing human death is condemned within the moral codes of many religions and societies. Nonetheless, both have learned that it becomes necessary to distinguish between intentional versus accidental killings (murder and manslaughter, respectively), killings sanctioned by the state (wars between countries, capital punishment of criminals, do-not-resuscitate orders), and even the definition of “human” (some see this as being at the heart of the debate over abortion, and might also become part of the discussion around euthanasia). Some even include within that calculation the possibility that someone did not actually do the killing but had it completely within their power to have prevented it: being fully aware of a potentially deadly situation (such as poison in a food, or a live electrical wire on the ground), and being fully able to inform the other person and/or to even intervene, but then choosing

to do absolutely nothing except watch the other’s demise. This then allows some to consider a natural disaster such as the 2004 Indian Ocean earthquake and tsunami—which struck on Boxing Day, resulting in the death of hundreds of thousands, countless injuries, and tremendous destruction across a quarter of the globe—and call it a moral evil for which God is responsible.⁴ Similarly, questions like these come up when discussing the slaughter of Canaanite women and children attributed to God’s command: some dismiss any qualms on the grounds that “God’s orders are always just,” while others counter with the Euthyphro dilemma in which Socrates asks: “Is something right because God commands it, or does God command it because it is right?”⁵

Questions like these complicate many discussions of “natural evil.” Our encounter with COVID-19 has spawned considerable discussion over theological and philosophical aspects of creation gone awry. One frequently asked question essentially boils down to the age-old problem of theodicy: “how could a good God allow this evil into the world?” A few different answers are often given for this. One approach is to shift the blame from God to us humans. The point is made that God made everything good—in fact, “very good”—and left humans in charge, but we rebelled against God and spoiled all of creation. As a result, death, disease, predation, and COVID-19 are all seen ultimately as products of our own free will choice and not God’s original plan.⁶ That explanation is sometimes given to explain certain disasters which others deem to be completely outside human causality. For example, several high-profile Christian leaders have publicly linked natural disasters such as Hurricane Katrina in 2005 and HIV-AIDS to societal positions on abortion or homosexuality.⁷

The blame for these problems and many others is attributed too quickly and easily to humans, whereas the possible causal role(s) for other factors outside our control are too often downplayed or even excused (interestingly, even nonbelievers will pile on here, although without invoking theological concepts such as “original sin”). For example, we humans have indeed been responsible for species extinctions as we expanded across the continents and ate certain

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species to death, made the ecosystems of others completely nonviable, introduced other invasive species, and in many other ways made it impossible for them to live. We have also contributed to global warming: through the burning of fossil fuels, clear-cutting and burning of forests and jungles, and overemphasizing methane-producing animals in our diet.⁸ In fact, some have suggested the naming of a novel geological period—"the Anthropocene epoch"—the period in Earth's history when humans changed everything.⁹ But our planet has been going through warming and cooling cycles for millennia, long before we appeared on the scene.¹⁰ The peaks and troughs in Earth's pre-human climate have also caused massive extinctions of species and remodeling of whole land masses.¹¹ Asteroid bombardments of Earth¹² and massive volcanic eruptions¹³ have also disrupted Earth's climate and caused utter upheaval of the biosphere, including species extinctions and total ecological turnover on a global scale.¹⁴ Nevertheless, some would place the extinctions and geological/climate changes that we see today squarely on the shoulders of humans.

Let's consider a second example. We are not the first species to have completely altered the composition of Earth's atmosphere. Free oxygen was almost absent until certain bacteria and *Archaea* acquired the ability 3.5 billion years ago to photosynthesize, freeing them to exploit a natural resource for their own benefit and producing oxygen as a waste product.¹⁵ This "pollution" was a detriment for anaerobic organisms, which had to either evolve protective and compensatory antioxidant mechanisms or go extinct.

The invasion of plants onto barren land masses in the Precambrian period, roughly 850 million years ago, is a third example. Plants eventually led to massive remodeling of the land and the climate.¹⁶ The composition of the surface layers was forever altered: certain areas experienced greater erosion (when roots split rocks apart and acidification of ground water dissolved vulnerable rock layers), while other areas had less erosion and became bogs; vast regions became cooler because of the altered albedo.¹⁷ Algae are now recognized to be accelerating the melting of glaciers by also decreasing the albedo of those ice masses.¹⁸ These naturally caused geological changes are considered to be beautiful; but, to whatever

extent similar changes can be attributed to humans, the latter are seen as detrimental and destructive.

Fourth, some hypothesize that asteroids could have contributed to the seeding of life on Earth. Irrespective of whether one sees this as an atheistic explanation for the origin of life on Earth or as a mechanism that God could have used to introduce that life,¹⁹ both groups would see this as a "good" thing—but would see humans accidentally or intentionally introducing microbes onto foreign planets as completely anathema and "wrong."

So, humans are not solely responsible for global changes that have resulted in species extinctions, ecological disruption, and remodeling of the planet. The oxygenation of Earth's atmosphere by bacteria and *Archaea*, the modifications caused by plants invading land masses, and the chaotic changes caused by asteroid impacts are all welcomed as good things because they led to the life forms that we value, not the least of which includes the human species. Yet, comparable changes caused by humans are often seen by Christians to be a result of our sinful nature and therefore evil,²⁰ and by nonbelievers as wrong and spoiling nature, even if the original intent of those anthropogenic changes was beneficent or at the very least relatively benign.²¹ Why the double standard?

Again, some will say that this bias is owed to the fact that we humans are unique in that we have free will and can make choices that have moral impact. Nonliving things like asteroids do not choose. Nonhuman species do not seem to have a morality. And it is true that our sinful nature does certainly contribute to many moral evils in the world. It has contributed to certain species extinctions (for example, the indiscriminate slaughter of passenger pigeons and the dodo) and near extinction of many others (for example, bison, not only out of a sadistic pleasure of killing but also as a means to solve the "problem" of indigenous peoples).²² Our sinful nature has also contributed to certain environmental disasters: we carelessly discard toxic chemicals into waterways or trash onto the sidewalk, simply because it is too expensive or takes too much effort to dispose of these responsibly.

However, our sinful nature is not always at the heart of the “evils” in our world. There is another important consideration, one which is missed when the line of causality is drawn only from Genesis chapter three. I would advocate another perspective, one drawn from the *first* chapter of Genesis. One that still examines human history in the light of the creation story in the book of Genesis, but is also flexible enough to accommodate a broader view of time and process that science brings to this matter. I would therefore invite the reader to reconsider assumptions that may have been made, albeit subconsciously, about the unchanging nature of nature. What is meant by a “good” creation? And most importantly, what does the first chapter of Genesis tell us about how humans should interact with that good creation?

Redefining a “Good” Creation

Death, even on a massive scale, has always been endemic to our existence on Earth. This is what science tells us. We have fossil evidence of predation, starvation, disease, and carnivorous acts going back millions of years,²³ and even what looks like evidence of a murder going back to the middle Pleistocene era.²⁴ While young earth creationists might see those outcomes and that fossilized evidence as aberrant distortions of the original creation brought on by the Fall,²⁵ they may not appreciate that certain forms of death are normal processes in the miracle of life. The entirety of our diet—irrespective of whether one is strictly vegan, vegetarian, or enjoys animal products of all kinds—entails death; attempting to side-step this by redefining what constitutes “life” or “living,” or by drawing a bold line between plant and animal,²⁶ is playing with semantics.²⁷

The entire process of reproduction—from the generation of gametes, and the premature abortion of incorrectly fertilized and developing embryos, to the full and proper development of the fetus— involves countless millions of cells being designated to die, sometimes after playing certain critical roles, through a carefully orchestrated sequence known as apoptosis, or preprogrammed cell death.²⁸ Similar mechanisms are involved in repair of injured tissue. Many species must release an overabundance

of seeds or hatchlings—hundreds or even thousands from a given reproducing pair—in order for just a few progeny to survive to maturity and spawn the next generation. The vast majority of the rest of the progeny are killed by disease, starvation (as they compete with each other for limited resources), predators, and natural accidents. Even the idea that humans were innately immortal and never intended to die (which idea does not appear in the opening chapters of Genesis where a tree of life was needed to extend life) does not seem to adequately anticipate the unsustainable population boom that would result, given that they had been commanded to be fruitful and multiply.

In these ways and many more, death has always been necessary, and even “good.” A perfect example of this has been documented in Yellowstone National Park.²⁹ For over a century, wolves had been exterminated in order to benefit farmers and hikers. But the absence of predation led to the elk population skyrocketing and becoming increasingly unhealthy; that in turn led to the groves of aspen, willow, and poplar being nibbled to the ground (since greater numbers of elk were leaving the safety of high ground); that in turn removed nesting places for songbirds and a food source for beavers. The rivers flowed faster, riverbanks eroded, and marsh-life was disappearing. Reintroduction of wolves, against much public opposition, saw the reversal of *all* the changes mentioned above. The exact same sequence of events was noted in Zion National Park (Utah), Wind Cave National Park (South Dakota), Yosemite National Park (California), Olympic National Park (Washington), and Jasper National Park (Alberta) when the top predators (wolf, cougar, lynx) were decimated or eliminated, and then reintroduced.³⁰

Also, in contrast to an unchanging status quo that some envision after God pronounced creation to be “very good,” change and innovation have always been ingredients for the “good” of life on Earth. A major driver of biological evolution is genetic mutation and reorganization. Natural selection then sifts through those changes for increased reproductive success. At one time in our history, “dinosaurs ruled the world,” a diverse and beautiful ecosystem that

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blossomed for millions of years. This monarchy was overthrown and a new and entirely different ecosystem, with its own stunning beauty, took over. Two hundred and eighty million years ago, the Antarctic was a vast leafy forest,³¹ but now it has an entirely different beauty—the hues and lines of that icescape are stunning—and the story of the emperor penguins raising their brood through the southern winter is one of the most powerful and compelling I have heard. Who knows what creation might look like one hundred thousand or a million years from now if the evolutionary process continues (and what reason do we have to think that it will not, given that we are already many billion years into our journey)? Who knows what “humans” will look like? Will we still have strong reason to think that we are the pinnacle species?

A third key ingredient for the “good” of life has been exploitation: living organisms have a tremendously long history in taking advantage of every new natural resource they encounter. For example, certain bacteria have recently acquired the ability to metabolize plastic (a man-made substance which did not exist a few decades ago),³² and bacteria and fungi colonize the darkened interior of aluminum fuel tanks of modern jets.³³ Sometimes this exploitation involves organisms adapting their environment to their own interests at the expense of other species (aerobic bacteria during the Precambrian era, beavers building dams), or expanding to unsustainable population levels leading to catastrophic crashes (the reciprocal cycles of fox and lemming populations in the high Arctic³⁴).

Refocusing the Creation Account

In that first book of the Bible, God is presented as creating the *cosmos* and all life on our planet. Others have pointed out how the days of creation are arranged in two panels: one panel depicting God creating spaces for living things during the first three days, and the other panel showing God filling those spaces with living things. But what is sometimes missed in depictions like these is the element of causality: the causal agent(s) and causal processes are quite different between those two panels.

Yes, ultimately God is the Creator: the Prime Mover. And God is indeed the sole causal agent in the first panel. The causal act itself has a somewhat *passive* tone here (I am not using that descriptor in a purely grammatical sense). God simply speaks them into existence: “Let *there be*,” and then “*it was so*.” The other panel, though—the filling of those spaces—sounds more like an *active* process, and the acting agent is creation itself. God says: “Let the *earth put forth* vegetation”; “Let the *waters bring forth* swarms of living creatures”; “Let the *earth bring forth* living creatures according to their kinds.”³⁵ God is using the things that he had already created as starting materials and active agents in the creative process. He commands preexisting materials to bring forth—transform into?—newer and more complex things, rather than “passively” speaking these life forms into existence. This sounds like a great way for an ancient Semitic author to understand and describe chemical and biological evolution.³⁶

The creation of humans is different ... and yet similar. God takes a special interest in fashioning humans with his own hands—“Let us make humanity in our image”—and breathes into them the same breath of life that he gave to all the other animals. But once again he does this using preexisting material: dust from the ground. The same ground that had first put forth vegetation, later brought forth animals. This too sounds like an ancient paraphrasing of chemical and biological evolution.

Countless books have been written on the subject of what is meant by our being created in the image of God. It is beyond the scope of this article to fully unpack that theological concept; several others have already done so.³⁷ However, I think there is merit in dividing this discussion into two quite different camps. One camp interprets this concept from a Greek philosophical point of view: that the *imago Dei* pertains to cognitive abilities which distinguish us from all other living species.³⁸ Those abilities include reason, emotion, will, creativity, planning, and many others which we attribute to our more highly developed brains (or so we would have ourselves believe). The other camp interprets this more from an ancient Semitic (Hebrew) worldview, which

would presumably be the one held by the original human authors of Genesis.³⁹ In that ancient world, societies would build a temple and then install a statue in it to represent their god, or a statue representing the king who, in turn, represented that god to the people. That image represented the rule and authority of that god or king. So, this second camp of theologians sees the creation accounts in Genesis chapter one as referring to YHWH building a temple and then installing humans into that temple as his image—living images: his representatives or ambassadors—to extend his dominion over creation.

Their role was not just a passive one as nonliving statues, but a very active one: they were given the mandate to subdue the earth and have dominion over all creation. There are widely varying views on what is meant by that mandate, and a full hermeneutic of that too is beyond the scope of this article.⁴⁰ But many concur that it implies that creation was not yet finished—that it needed to be fully realized, developed, and even tamed—and that YHWH was inviting humans to participate in that process. Kristin Johnston Largen has warned against the danger of overemphasizing the distinctiveness of humans and “instrumentaliz[ing] the rest of creation, as though nonhuman animals and the natural world only have value insofar as they support the flourishing of humankind.”⁴¹ Instead, she writes about a “deep incarnation”: Christ taking on material form in order to enter into creation and unite it with God, and inviting humans to share in that process (below, I will link this invitation to Christ’s prediction of what his followers will later do in his name). Others emphasize the distinctiveness and rule of humans over the rest of creation, even in an authoritarian sense. Beisner, for example, sharply contrasts YHWH’s command to “the human” in the second chapter of Genesis to “cultivate and keep” the garden against the command given to humans collectively in the first chapter of Genesis to “subdue and rule” the earth.⁴² Within this wide spectrum of views, though, there is general agreement that the author(s) of Genesis are telling us that God uniquely distinguished humans collectively as his representatives. I will refer to this as our role as co-regents with God, extending his dominion over creation.⁴³

However, it is crucial to point out here that nothing in the text of Genesis indicates that we humans were perfectly able to subdue the earth, nor ready to have dominion over all creation. I am not referring to our later act of rebellion described in the third chapter of Genesis; that is indeed a fundamentally important aspect of Christian theology, but not the primary focus of this article. Instead, in the first chapter of Genesis, God left us humans with a very great task, but nothing in the text indicates that we were omniscient or omnipotent: our knowledge and abilities were both *quite* limited. This is indeed a characteristic of our limited and frail human nature, but that does not mean that we have to wrap it up together in a *sinful* nature, nor does it have to be linked to a *fallen* nature (the Fall had not yet happened). It is at this point that the traditional reading of the Genesis account has too often limited our imagination. It has been too easy to take from this account an image of a small group of humans, even a primal pair, quietly tending a small area of land, living in harmony with nature and blissfully in control of it, or at least of the small swath that we were tending.⁴⁴

But the broader view of time and process given to us by science paints a very different picture. Humans have *always* been overwhelmed by creation: “thorns and thistles” have *always* been subverting our efforts.⁴⁵ We have *for millennia* been dwarfed by the powers of nature, and have *always* struggled even to survive. This is what science tells us. But we also have scientific evidence that humans have been on a trajectory of learning that stretches back hundreds of millions of years, developing tools and technologies which would distinguish us from the rest of creation and enable us to have dominion over it.⁴⁶

If we overlay the views given to us from the ancient book of Genesis and from modern science, we get a more stereoscopic picture. Both sources tell us that humans arose from preexisting materials through a process that overlaps that which brought forth the animals. God was ultimately behind that, but used nature to do his bidding. God also recognized (fore-saw?) great potential in our species: the capacities for love, compassion, appreciation for beauty, creativity, foresight, wisdom, understanding, technology,

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and so many other qualities that he delights in. And he chose to work through us, and with us, to build something even bigger and better. A wise and compassionate parent handing over the family business to their children starts them off with smaller responsibilities, lets them practice their skills and develop confidence, and gives them valuable experience before handing it over to them completely. That parent fully recognizes and accepts that the process takes time and that the children will make mistakes, but the parent also trusts that those errors will prove to be learning experiences.

Growing Pains

We humans have been about the business of subduing and taking dominion of creation for hundreds of thousands of years, but only in the past few thousand years—arguably only the last few hundred years—have we reached a point in our evolutionary journey at which our efforts have global impact. The Industrial Revolution is said to have inaugurated our role in global warming of the planet.⁴⁷ In fact, we are beginning to have a harmful effect beyond the atmosphere of our planet. The plethora of satellites and “space-junk” orbiting our planet is creating the potential for collisions and debris raining down on the planet. There is a growing concern that our probes sent to other moons and planets in our own solar system may introduce Earth-life to those pristine celestial bodies, raising the possibility of competition and even displacement of any life forms that may already be there.

We have been trying out new things, learning from mistakes, and enjoying successes. Recall the “perfect example” I shared above in which we learned about the crucial role played by carnivores within ecosystems, and the superior outcome of controlling (“subduing”?) rather than eliminating those keystone predatory species. In the same way, we are learning from our mistakes made with fossil fuels and from the solutions offered by green energy: as battery technology and electrical infrastructure increase, electric mobility will out-compete its internal combustion engine counterparts. The destructive aftermath of introducing foreign invasive species into

ecosystems has opened our eyes to the greater value in expending tremendous energy to control those.⁴⁸ Likewise, the mistakes of using pesticides and herbicides have pointed us to the potential of using more ecologically friendly approaches which favor more controlled outcomes, or even more acutely targeted, genetically based approaches such as releasing sterilized mosquitos to control malaria and other diseases. DDT (dichloro-diphenyl-trichloroethane) was developed in the 1940s to combat malaria, typhus, and the other insect-borne human diseases with no awareness whatsoever of its potent carcinogenic and teratogenic effects, leading to horrible birth defects.⁴⁹ That experience taught us to explore a wide range of biochemical and physiological effects of new molecules being developed; this is why clinical studies now take so long, are so multistaged, and so expensive. It is also, in part, why all chemicals are now sold with extensive data safety sheets, and advertisements often feature an intimidating list of side-effects (albeit often in very small print at the bottom, or voiced in the background at very high speed). And it also taught us to explore other avenues, such as using biological approaches to control the mosquito vector (as already commented upon above).

Yes, humans will make mistakes. We will inevitably create yet other problems with our new technologies and projects. Again, we are not omniscient and omnipotent. But we are learning; we are growing into our role as co-regents with the One who is. And we can turn our technology toward the greater good. Like the beaver, we will build dams to benefit us; but we will also learn how to mitigate the damage done by the water that pools behind the dams, how to rescue the species which are threatened by the rising waters, and how to create a new ecosystem. We are learning how to use our technologies to care for natural problems which are not evidently of our own doing. For example, novel anticancer therapies, based on approaches developed for use in humans, have been adapted to treat Tasmanian devils for an aggressive tumor disease which otherwise threatened the extinction of that species.⁵⁰ In addition, reproductive technologies and wildlife management practices are being used to bring various species back from the brink of extinction.

COVID-19

We have indeed had many pandemics in the past, and we have also made many mistakes in dealing with them.⁵¹ Through those experiences, we have learned a great deal about our biology, how to deal with the causative agents (viruses, bacteria), and how to manage afflicted individuals and vulnerable populations. Now we are repeating that learning process as we deal with this latest pandemic. In the space of one year, we moved from declaring a pandemic⁵² to developing several vaccines with very high efficacy against it. Events like COVID-19 are part of our tutoring and apprenticeship. I am not claiming COVID-19 was sent or divinely directed for that purpose, any more than that the wise parent, whom I referred to above, might actively orchestrate disasters and upheavals in the family business simply “to teach the kids a lesson.” Instead, I am saying that God created a world full of organisms taking advantage of available resources and possessing the capacity for change, which can be good, productive, and beautiful while, at the same time, carry with it the risk of sometimes leading to imbalances, extinctions, and other such problems. In the March 2021 issue of *Perspectives on Science and Christian Faith*, Christopher Southgate referred to this “package deal” understanding of the natural world.⁵³ Into this changing and adapting creation, God has called us into co-regency and dominion to develop the abilities and capacities needed to subdue that creation. In that sense, these are learning opportunities, and it is wise to take full advantage of them.

There is debate as to whether humans are, at least in part, responsible for COVID-19. I am not referring to baseless claims that the virus was intentionally engineered but, instead, to the possibility that inadequate management of natural resources brought humans into contact with the bats that carried the virus, and that selfish interests (resistance to social distancing and mask-wearing, vaccine hesitancy) won out over the recommendations of physicians and scientists, resulting in accelerated and more-prolonged spread of the disease. We have learned much from this pandemic: the value of contact-tracing and social-distancing, entirely novel approaches to the control and treatment of viral diseases (the

latter may even revolutionize medicine, including the treatment of cancer⁵⁴), and the value of caring for our neighbor—sharing the vaccine with poorer and technology-deficient countries—not only for reasons of morality, compassion, and expression of religious faith, but also out of motivation for self-preservation.

Human Technology Is Part of Our First Mandate

Theologians have identified within the Hebrew scriptures numerous iterations of order being created from disorder: in the first creation of the cosmos, in the story of Noah’s Flood, in the establishing of the nation of Israel, and in the building of the first and second Jewish temples. Throughout those writings, there is the promise of a final state—the kingdom of God—being finally established on Earth. That kingdom is characterized by peace and harmony, the absence of suffering, the desert blossoming like a crocus (Isa. 35:1), and the lame walking and the blind seeing (Isa. 35:1; Isa. 35:6). This theme is picked up again in the New Testament, when Jesus announces the imminent arrival of that kingdom (Luke 4:17–30). Once again, humans are left in charge to found the Christian church and fully unpack what that kingdom will look like (Mark 16:15). It is interesting here that Jesus sends them out to “preach the gospel to the whole creation” (some translations have here “to every creature”): the gospel is intended not only for humans to hear! Within this handover, he pointed to the works that he did as evidence that it was the Father working through him and said: “Whoever believes in me will do the works I have been doing, and they will do even greater things than these” (John 14:12).

In the overly literalist phase of my spiritual journey decades ago, when I read biblical passages too superficially, I naïvely recalled the miraculous things that Jesus was doing—raising people from the dead, walking on water, commanding storms to stop and mountains to throw themselves into the sea—and pictured us doing even bigger things than that. To my disillusionment, practical reality and history always seemed to pale in comparison to those theological expectations. Recently, I have considered the

Article

Are Global Disasters the Result of Original Sin or Part of Our Training as Co-regents?


possibility that Jesus meant “greater things” in the sense of our finally beginning to fulfill God’s first command to us, to be his representatives toward all creation, and in the sense of our enabling the full arrival of the kingdom of God by bringing healing, food, water, housing, education, peace-keeping, and liberation to those in need.

Jesus modeled these actions in a few small parts of first-century Palestine, and changed the lives of thousands of people in his era. In the twenty-first century, his followers do the same things on a global scale, in every part of the world, and they improve the lives of billions of people. They may not turn water to wine, but they can use technology to bring clean water to villages which previously had only dirty water teeming with bacteria and parasites, or even no water at all; or his followers may turn food waste into jet fuel to dramatically lower greenhouse gas emissions.⁵⁵ They too turn small individual contributions into enough loaves of bread to feed thousands of hungry people. They may not calm the storm on the raging sea, but they bring peace and comfort to communities overwhelmed by floods, hurricanes, and earthquakes. They seed the skies with silver iodide particles to bring rain to drought-ravaged lands.⁵⁶ They also resuscitate the dead,⁵⁷ heal people of all forms of deadly illnesses, free others from the unclean spirits of mental illness, and restore broken relationships through modern medicine and compassion. They also bring freedom to oppressed peoples. These things are being done, on a global scale, by people wanting to make change(s) for the better, and often doing so in his name.

Conclusion

Some readers may not appreciate the rosy view of humans and human technology that they see me presenting here; they may even think it is somehow unscriptural. But the first chapter of Genesis tells us that we *were* commanded to subdue creation and have dominion over it, and technology is one way in which we do just that. In fact, I would argue that it is impossible for humans to subdue creation without technology. It is not our salvation, but it is an essential tool in fulfilling our first mandate. Sometimes technology itself creates problems. Are those mistakes

due only to our sinful nature (Genesis chapter 3) or also to the fact that we are only co-regents-in-training (Genesis chapter 1) who are still just honing our skills and learning our trade? In addition, technology is not always well applied. It can be misused in the same way that scripture, authority, and love can be, and have been, misused. *Those mistakes are* due to our sinful nature.

What do we humans now do, in light of all the considerations presented above? We should tread lightly in fulfilling our divine mandate to subdue the earth and take dominion over creation, and we should apply lessons learned from making mistakes. Also, we should be more careful and thoughtful in our theology and in how we read scripture; there can be more room for science and philosophy to inform our interpretation of it. Southgate quoted certain theologians who pin the blame for COVID-19 on either God or evil, and biologists who shrug and say that this is just a fact of nature (the “package deal”): the former see it as a consequence of living in a world ruled by Satan, whereas the latter see a world ruled by natural laws and physics.⁵⁸ We need to open up the dialogue, and welcome salient points from all quarters, rather than become siloed in our echo chambers. We should look to God for wisdom and direction. 

Notes

¹This is one of several arguments explored by Christopher Southgate in his article, “Explorations of God and COVID-19,” *Perspectives on Science and Christian Faith* 73, no. 1 (2021): 23–32, <https://www.asa3.org/ASA/PSCF/2021/PSCF3-21Southgate.pdf>.

²Daryl R. Climenhaga, “Towards a Theology of the Environment,” *Didaskalia* 20 (2009): 79–96; Francis A. Schaeffer and Udo W. Middelman, *Pollution and the Death of Man* (Wheaton, IL: Tyndale House, 1970), 82ff; Miriam Pepper and Rosemary Leonard, “Climate Change, Politics and Religion: Australian Churchgoers’ Beliefs about Climate Change,” *Religions* 7, no. 5 (2016): 47; Wylie Allen Carr et al., “The Faithful Skeptics: Evangelical Religious Beliefs and Perceptions of Climate Change,” *Journal for the Study of Religion, Nature and Culture* 6, no. 3 (2012): 276–99; Kristin Johnson Largent, “Un/natural Death and Extinction,” *Dialog* 57, no. 4 (2018): 279–86; Ted Peters, “Extinction, Natural Evil, and the Cosmic Cross,” *Zygon* 53, no. 3 (2018): 691–710; Terry Mortenson, “Young-Earth Creationist View Summarized and Defended,” February 16, 2011, <https://answersingenesis.org/creationism/young-earth/young-earth-creationist-view-summarized-and-defended/>; and E. Calvin Beisner, “Environmentalism: A Biblical Perspective,” in *The New Answers Book 4*, ed. Ken Ham (Hebron, KY: Answers in Genesis, 2011), chap. 20, <https://>

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- ⁵Stephen N. Williams, "Could God Have Commanded the Slaughter of the Canaanites?," *Tyndale Bulletin* 63, no. 2 (2012): 161–78, https://legacy.tyndalehouse.com/Bulletin/63=2012/01_Williams18.pdf; Eric A. Seibert, "When God Smites: Talking with Students about the Violence of God in Scripture," *Teaching Theology & Religion* 17, no. 4 (2014): 323–41, <http://dx.doi.org/10.1111/teth.12238>; Plato's dialogue: *Euthyphro*.
- ⁶John Calvin wrote "the earth was cursed on account of Adam ... the whole order of nature was subverted by the sin of man," *Commentary on Genesis*, 2 vols., trans. John King (1554; Grand Rapids, MI: Baker, 1996), 1:102, <http://www.ccel.org/ccel/calvin/calcom01.pdf>.
- ⁷John Hudson, "Pat Robertson Blames Natural Disaster Victims," *The Atlantic* (January 14, 2010), <https://www.theatlantic.com/technology/archive/2010/01/pat-robertson-blames-natural-disaster-victims/341489/>; and Warren J. Blumenfeld, "God and Natural Disasters: It's the Gays' Fault?," *HuffPost*, posted November 5, 2012, updated February 2, 2016, https://www.huffpost.com/entry/god-and-natural-disasters-its-the-gays-fault_b_2068817.
- ⁸"The Causes of Climate Change," NASA Global Climate Change: Vital Signs of the Planet, <https://climate.nasa.gov/causes/>; and D. J. Wuebbles et al., eds., *Climate Science Special Report: Fourth National Climate Assessment*, vol. 1 (Washington, DC: U.S. Global Change Research Program, 2017), https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf.
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- ¹⁷"Albedo" pertains to the ability of an object to reflect solar energy. Our snow-covered lawns and paved driveway have very different albedos (high and low, respectively), resulting in very different outcomes when the sun comes up in the morning.
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- ³⁵Gen. 1:11, 20, 24; my emphasis added.
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- ³⁷J. Richard Middleton, *The Liberating Image: The Imago Dei in Genesis 1* (Grand Rapids, MI: Baker/Brazos, 2005); David L. Wilcox, “A Proposed Model for the Evolutionary Creation of Human Beings: From the Image of God to the Origin of Sin,” *Perspectives on Science and Christian Faith* 68 no. 1 (2016) 22–43, <https://www.asa3.org/ASA/PSCF/2016/PSCF3-16Wilcox.pdf>; Daniel C. Harlow, “After Adam: Reading Genesis in an Age of Evolutionary Science,” *Perspectives on Science and Christian Faith* 62, no. 3 (2010): 179–95, <https://www.asa3.org/ASA/PSCF/2010/PSCF9-10Harlow.pdf>; Keith B. Miller, “Theological Implications of an Evolving Creation,” *Perspectives on Science and Christian Faith* 45, no. 3 (1993): 150–60, <https://www.asa3.org/ASA/PSCF/1993/PSCF9-93Miller.pdf>; Graeme Finlay, “Homo Divinus: The Ape That Bears God’s Image,” *Science and Christian Belief* 15 (2003): 17–40, <https://www.scienceandchristianbelief.org/articles/finlay.pdf>; and J. Wentzel van Huyssteen, *Alone in the World? Human Uniqueness in Science and Theology* (Grand Rapids, MI: Eerdmans, 2006).
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- ⁴²Beisner, “Environmentalism.”
- ⁴³Perhaps it is also worth mentioning that the humans who were so commanded preceded the Abrahamic covenant, and obviously also Jesus himself; so, this is not specifically a Jewish or Christian mandate.
- ⁴⁴And then losing control over nature in the third chapter of Genesis: thorns and thistles now taking over the ground that we had previously been tending so well.
- ⁴⁵See Gen. 3:18. The text does not say that thorns and thistles previously never existed and here suddenly appeared. Instead, it now portrays Adam’s work in maintaining the garden being made more difficult by those unwanted plants (Adam stepped outside of boundaries assigned to him; the plants would step outside of the boundaries he placed on them).
- ⁴⁶This timeline includes hominid and nonhominid ancestors and changes in them which prepared us for our own unique part of that trajectory. See Luke J. Janssen, “‘Fallen’ and ‘Broken’ Reinterpreted in the Light of Evolution Theory,” *Perspectives on Science and Christian Faith* 70, no. 1 (2018): 36–47, <https://www.asa3.org/ASA/PSCF/2018/PSCF3-18Janssen.pdf>.
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U.S. Geological Survey Circular 1383-A, <https://doi.org/10.3133/cir1383A>.

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⁵¹Luke J. Janssen, "Pandemics in Need of a Christian Response," *Perspectives on Science and Christian Faith* 73, no. 1 (2021): 13–22, <https://www.asa3.org/ASA/PSCF/2021/PSCF3-21Janssen.pdf>.

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⁵³Southgate, "Explorations of God and COVID-19," 23–32; also see Peters, "Extinction, Natural Evil, and the Cosmic Cross," for an analysis of Southgate's argument.

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⁵⁸Southgate, "Explorations of God and COVID-19," 23–32.

ASA Members: Submit comments and questions on this article at www.asa3.org→RESOURCES→Forums→PSCF Discussion.

Call for Papers

GENDER: FROM CHRISTIAN PERSPECTIVES

Questions of gender identity and gender dysphoria have become prominent in our culture. Our churches are not exempt from this development, as Christians can also struggle with gender identity. What do we know about the biology of gender? What are Christian perspectives on gender and the trans experience? What are the important and unresolved questions?

On the ASA and CSCA websites, Tony Jelsma, PhD (McMaster University), has written an essay that informs us about what we know and do not know about gender.

He is chair and professor of biology at Dordt University and has taught courses in human anatomy, physiology, biopsychology, and developmental biology. He has a research background in neuroscience and molecular biology, and a longstanding fascination with the brain and questions of faith and science. He is a Fellow of the ASA and has given multiple presentations at ASA annual meetings on faith and science topics.

Readers are encouraged to take up one of the insights or questions in the invitation essay, or maybe a related one that was not yet mentioned, and draft an article (typically about 5,000–8,000 words) that contributes to the conversation. These can be sent as an attachment to Tony Jelsma at Tony.Jelsma@Dordt.edu. An abstract should be included in the text of the email. He will send the best essays on to peer review and then we will select from those for publication in a theme issue of *Perspectives on Science and Christian Faith*.

The lead editorial in the December 2021 issue of *PSCF* outlines what the journal looks for in the articles we publish. For best consideration for inclusion in the theme issue, manuscripts should be received electronically before April 30, 2022.

Looking forward to your contributions,

James C. Peterson, *Editor-in-Chief*



Grace Lew

Article

Teaching the Beauty of God in Computer Programming and Design

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Even though aesthetics is often not explicitly included in computer science curricula, a review of computer science literature shows that incorporating beauty is beneficial in areas such as programming and design. Beauty in the field of computer science unified with a theological view of beauty forms a faith-integrated perspective with vertical and horizontal dimensions. This article shows that a faith-integrated perspective of beauty in computer science adds transcendent meaning and purposes for incorporating aesthetics as part of a computer science academic curriculum. Some examples are also provided for teaching with a faith-integrated perspective of beauty in computer science courses for Christian higher education.

Keywords: beauty, faith integration, computer science, Christian higher education, biblical worldview

In education, aesthetic appreciation is typically not ranked very highly on the priority hierarchy for curriculum.¹ For example, while the Computer Science undergraduate program curriculum guidelines (developed by a joint task force of the ACM and IEEE academic and professional organizations) contain a general reference to the importance of aesthetic values, they do not specifically include aesthetics in the curriculum.² However, a review of computer science literature shows that incorporating beauty is beneficial in areas such as programming and design.

This article shows that a faith-integrated perspective of beauty in computer science adds transcendent meaning and purpose for incorporating aesthetics as part of a computer science academic curriculum.

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A faith-integrated perspective of beauty in computer science is to view beauty in the field of computer science unified with a theological perspective of beauty formed through a biblical worldview. A biblical worldview is a conceptual framework, based on the Bible, for viewing the world; it is a belief system that guides individual behavior.³ How beauty in computer science might be taught from a faith-integrated perspective stems from the findings in the next two sections on beauty in the field of computer science and a theological perspective of beauty.

Beauty in the Field of Computer Science

In this article, beauty in the field of computer science refers to ways in which aesthetics is applied in computer science. The examples of beauty in computer science encountered in a review of literature were primarily in the areas of programming and design.

Beauty in Programming or Software Development

Even though aesthetics is not often explicitly included in computer science curricula, one notable exception is the Beauty and Joy of Computing (BJC) launched by the University of California, Berkeley, for high school and undergraduate freshmen. In this curriculum, there is an emphasis on the “beauty and elegance of the code.”⁴ Donald Knuth, professor emeritus at Stanford University and recipient of the A.M. Turing Award (often referred to as the “Nobel Prize of Computing”),⁵ offers some criteria for what makes a program beautiful in his article, “Computer Programming as an Art.”⁶ His criteria include utility, correctness, robustness, readability, usability, and efficiency.⁷ These criteria have remained relevant throughout the years.⁸ Knuth says that “computer programming is an art ... because it produces objects of beauty.”⁹

In contrast, “ugly code ... is poorly indented, poorly documented, not robust, uses inappropriate data structures, [and] uses poor identifier names.”¹⁰ Ugly code is defined as “programming source code that is either poorly written or so complex that it is extremely difficult to figure out.”¹¹ With ugly code, it is challenging to detect and remove errors or validate correctness.¹² One example of addressing poor indentation in ugly code is the Python programming language interpreter requiring indentation for all blocks in the code.¹³ The enforced structure enhances readability, which is beneficial for understanding and maintaining the code.

Edsger Dijkstra, a Dutch computer scientist most well known for his shortest-path algorithm, sought to battle chaos and complexity in mathematics and computer science.¹⁴ Since the theoretical foundations for computer science are based on mathematics, many of the references to beauty by the mathematical community apply to computer science as well. Mathematician G.H. Hardy argues for the value of mathematics based on its beauty, and even says that “there is no permanent place in the world for ugly mathematics.”¹⁵ He points to the “simple and clear-cut” elegance of beautiful theorems, such as those of Euclid and Pythagoras.¹⁶ Computer programs often implement mathematics and algorithms to

solve problems, and desirable characteristics include correctness, performance, and efficiency.¹⁷ These contribute to the development and design of beautiful code.

Beauty in Design

Human Computer Interaction (HCI) is another area in which interest in the importance of aesthetic value continues to grow.¹⁸ HCI is a field of study focusing on the interaction between human users and computers in technology design.¹⁹

The study of aesthetics in HCI often refers to visual beauty and sensory appeal.²⁰ HCI studies by N. Tractinsky and coauthors and Kai-Christoph Hamborg and coauthors show that there is a relationship between beauty and usability, although there are some inconsistent results regarding the exact relationship between the two.²¹ In their studies on the impact of beauty on product choice, Sarah Diefenbach and Marc Hassenzahl show that there is “a ‘beauty dilemma’ – the idea that people discount beauty in a choice situation, although they value it in general.”²² While results confirm that there is a complex relationship between beauty and usability, these studies do corroborate that beauty is appreciated and contributes to a more positive overall user experience. In other research focusing on visual beauty for Web design, Kristiina Karvonen states that “the feeling of trust is promoted through beautiful design.”²³ She specifically recommends the beauty of simplicity in design. Carlos Flavian and coauthors similarly affirm the importance of simplicity, particularly for navigation through a website.²⁴

Some researchers have explored aesthetics beyond just the visual characteristics and simplicity in design.²⁵ For example, Mads Nygaard Folkmann evaluated various sources of aesthetic theory, particularly related to philosophical aesthetics and art-related hermeneutics, to find other concepts that might contribute to understanding beauty in the field of HCI.²⁶ Folkmann determined that reflectivity and representation enable a deeper understanding of the relationship between humans and design. Reflectivity “invites interpretation of its function”²⁷; representation “questions what design solutions

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mean for the user and how they represent meaning.”²⁸ These indicate an interest in understanding what can be communicated through beauty in design.²⁹

In the preceding examples, beauty in computer science is found to be beneficial in the areas of programming and design. Thus, if beauty in computer science is to be incorporated as part of an academic curriculum, it might be included in courses that teach concepts related to development and design. To teach beauty in computer science from a faith-integrated perspective, a literature review was conducted to form a theological perspective of beauty.

A Theological Perspective of Beauty

This section summarizes a review of beauty in scripture and theological literature, presented within a framework of David de Bruyn’s classifications of beauty.³⁰ According to de Bruyn, definitions of beauty can be broadly categorized as theological, classical, subjective, or transcendental.³¹

Theological definitions see God as the source and foundation of beauty.³² “God’s own beauty makes beauty itself objective.”³³ Fourth-century bishop Gregory of Nyssa, a theologian of the divine beauty, says Beauty is one of the names of God.³⁴ In scripture, the psalmist seeks to “gaze upon the beauty of the Lord and to inquire in his temple” (Ps. 27:4 ESV). Thus, the pursuit of God’s beauty is an act of Christian worship.³⁵ Even the beauty in creation is a display of God’s “invisible attributes, namely, his eternal power and divine nature” (Rom. 1:20).

Classical definitions of beauty focus on proportion and symmetry, resulting in a sense of order and harmony.³⁶ A theologically informed description of classical beauty would include “notions of unity, proportion, harmony, order, brightness, clarity, color, and pleasure.”³⁷ Specifically, philosopher and theologian Thomas Aquinas defines a standard of beauty as having conditions of “perfection or integrity, proportion or harmony, and brightness or clarity.”³⁸ He says that “beautiful things are those which please when seen,”³⁹ primarily due to proportion and form.

Some scriptural illustrations of classical beauty are the detailed descriptions given for the structure, unity, and proportion of the tabernacle curtains and frames in Exodus 25–31 and 35–40.

Subjective definitions refer to the experiences of perceiving beauty with our senses. While this perception can also be related to recognizing classical beauty, the emphasis is on the view of the subject or person sensing and perceiving. Some examples in the Bible include 1 Samuel 9:2 where Saul was perceived by Israel as being more handsome than other men, or 2 Samuel 14:25 where Absalom was praised by all Israel for his appearance. Though subjective perceptions of beauty may be influenced by culture and personal preferences, philosopher David Naugle sees these as relative only to the objective beauty of God.⁴⁰

Transcendental definitions relate beauty to truth and goodness, all three of which form the Platonic triad. Truth and goodness are qualities that are not visible to sight, but, since God is beautiful and invisible, beauty is not limited only to what can be seen.⁴¹ Swiss theologian Hans Urs von Balthasar wrote a fifteen-volume trilogy on beauty, goodness, and truth as being anchored in and inseparable from theology.⁴² He recognizes that beauty is not just in the visible form, but that the actual content lies within, radiating God’s glory.⁴³ He says that beauty through faith, from a theological perspective, enables the perception of the glory of God revealed to us.⁴⁴ For example, Psalm 19 describes creation as declaring God’s glory. God creates with beauty, and in Genesis 1, everything that God made was declared to be “good.” Thus, beauty in this definition has to do with “fittingness and excellence,”⁴⁵ according to God’s design.

De Bruyn says that Jonathan Edwards synthesizes the theological, classical, subjective, and transcendental categorizations of beauty into a consolidated definition, which essentially says that beauty is inseparable from God, in that “the large varieties of beauty are emanations of God’s beauty.”⁴⁶ So, even the classical, subjective, and transcendental categorizations of beauty are related to the theological,

because all beauty is a reflection of God's beauty. Thus, a summary theological perspective is that beauty is inseparable from God, and that which is beautiful is a reflection of God's beauty. The next section will unify the previous examples of beauty in computer science with this theological perspective of beauty to form a faith-integrated perspective for computer science curricula, particularly in Christian higher education.

Integrated Perspective of Beauty in Computer Science

The earlier examples of beauty in the field of computer science incorporate characteristics from de Bruyn's classical, subjective, and transcendental categorizations of beauty.⁴⁷ Classical qualities such as structure and order are important in program code for practical purposes. Not only do they make code easier to read, understand, and maintain, they are also recommended as best practices.⁴⁸ Subjective qualities, particularly in design, can improve user experiences and product appeal, often generating increased usage, which can sometimes result in financial gain.⁴⁹ Transcendental characteristics such as correctness and robustness are found to be important for product quality.⁵⁰ These indicate that beauty is incorporated in computer science for practical and functional benefits, such as improved maintainability, increased usage, or enhanced product quality. However, discussions of beauty in the field of computer science do not typically make associations between beauty and God, even though from a theological perspective, beauty is inseparable from God.

Therefore, an integrated perspective is needed because beauty is best understood in connection with God. As Paul Spears and Steven Loomis point out, integration (which is to unite into one whole) is required for complete understanding in any discipline.⁵¹ The next two sections show that a faith-integrated perspective of beauty in computer science has a vertical dimension relating to God and a horizontal dimension relating to others, which then lead to implications for a Christian higher education computer science curriculum.

Vertical Dimension

The earlier summarized theological perspective is that beauty is inseparable from God, and that which is beautiful is a reflection of God's beauty. Psalm 19:1 says, "The heavens declare the glory of God, and the sky above proclaims his handiwork." Through general revelation in the "book of nature,"⁵² the world is able to perceive the beauty of the Creator. God's beauty in design is not only revealed in nature but also in scripture, such as in passages on the tabernacle and all its furnishings (Exodus 25-31 and 35-40). God includes beauty in the tabernacle design, as he incorporates classical qualities such as colors, structure, and proportion. The artistic craftsmanship of the ornaments and the use of precious metals such as gold also contribute to the aesthetics. The lampstand has crafted "almond blossoms, each with calyx and flower," which are designs that reflect those in creation. These demonstrate that the tabernacle is not just for utilitarian functionality but that it also reflects divine beauty, thus enhancing worship.⁵³

However, minister Lisel Joubert points out that in the time between the giving of instructions for building the tabernacle and its completion, the incident of the golden calf occurred (Exodus 32).⁵⁴ This is an example of focusing on the created object, which indeed has some elements of visual beauty, rather than on God, who is the source of that beauty. The first chapter in the Book of Romans warns against confusing beautiful objects with beauty in the Person of God himself.⁵⁵ Whenever encountering beauty, we are to look to God, the source and foundation of beauty, because all that is beautiful is a reflection of God's beauty. For example, mathematics professor Jason Wilson notes that while math itself is beautiful, Christians in the mathematical community have written about mathematical beauty pointing to God and inspiring worship of him.⁵⁶ Thus, through the eyes of faith, beauty in computer science should point to God as the source of beauty.

Also, just as HCI studies explore communication through design aesthetics, an integrated perspective might view designing with beauty as a means of pointing others to God, since "beauty is a medium for knowing God."⁵⁷ There is even a connection

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between beauty and doxology.⁵⁸ Since “the concepts of design and purpose are closely related,”⁵⁹ products can reflect the purpose of the designer. For example, the beauty in the design of the tabernacle was a visible reminder that it was to represent God’s earthly dwelling place.⁶⁰ Thus, creative works can potentially have the ability to communicate God’s presence.⁶¹ Church websites listed as “beautiful” or “well designed” on ChurchThemes.com often include beautiful designs depicting biblical content or people in worship, which help point to God and communicate purpose.⁶² An analogy may be made to stained glass windows in cathedrals that present content within beautiful designs. Using Notre Dame de Paris as an example, architectural engineering professor Nelly Shafik Ramzy describes how designers of cathedrals intentionally incorporate elements of beauty to enhance worship: towers and spires are vertical elements symbolizing aspirations to be united with God, canopies point heavenward, light passing through stained glass is likened to the Light that came to the world through the Virgin Mary, and the windows depict theological images and events related to the Bible.⁶³ Intended results are that the beauty incorporated in the cathedral would point to God and inspire worship of him.

To summarize the vertical dimension of a faith-integrated perspective, it is beneficial to recognize that designing and developing with beauty is a reflection of God’s creative processes. Also, whenever incorporating beauty into the design and development of computer systems, it is important to look beyond the beauty in the product, and instead focus on God, the source of beauty. Furthermore, intentionally incorporating beauty in programs and designs, such as developing simple elegant code that resolves a complex problem, may have the effect of pointing others to God. This leads to the horizontal dimension of integration, focusing on those who see, use, or work with the resulting computer products or technologies.

Horizontal Dimension

God deliberately created the world with aesthetic qualities, and human beings appreciate beauty as a result of being created in the image of God.⁶⁴ Sin and

brokenness after the Fall have darkened the beauty in the world, but the beauty of Christ has redeemed what was disintegrated in the Fall.⁶⁵ Thus, beauty can transform society and lead it toward shalom, which is a state reflecting truth, goodness, and beauty.⁶⁶

In the horizontal dimension of the faith-integrated perspective, beauty would be incorporated into computer science not only for practical and functional benefits but also to reflect God’s love to others. Programming with structure, order, readability, and simplicity would benefit anyone who needs to maintain the program code. Similarly, improving product appeal, correctness, robustness, and user experience could be viewed as reflecting God’s love through these enhancements. Related to Aquinas’s view that beauty brings pleasure, providing an overall enjoyable user experience can be an expression of care for the user.

In the earlier examples of beauty in the field of computer science, simplicity is often cited as important. A simple design is easy to understand, comprises only the essential, and is free from elaboration.⁶⁷ This reflects the quality of fittingness according to design because there is nothing extra added. Since simplicity as a transcendental quality reflects truth, goodness, and beauty, it is consistent with the research in computer science showing that beautifully designed products have positive effects on users, such as promoting feelings of trust.⁶⁸

Overall, these vertical and horizontal dimensions of the faith-integrated perspective illustrate that beauty contributes to focusing on God and others when designing and developing. Ignoring the importance of aesthetics when teaching computer science could result in neglecting a significant aspect of an integrated curriculum.⁶⁹

Implications for a Computer Science Curriculum

Integration of faith and learning is a distinctive of Christian higher education, so the integrated perspective is essential.⁷⁰ Professor Octavio Esqueda says that education should be grounded in a biblical worldview, and that the creation, Fall, and redemption metanarrative of the Bible is a framework for

integrating faith and learning.⁷¹ When God created the world, he declared all to be “good,” and there was complete integration.⁷² “Because everything that existed came from God, there was really no distinction between sacred and secular; everything was sacred.”⁷³ However, after the fall, when sin entered the world, there was complete disintegration.⁷⁴ Christ’s redemption is what enables reintegration.⁷⁵ So, faith and learning in computer science should not be viewed as separate, but must be integrated because God is the source of all truth.⁷⁶ As seen with the vertical and horizontal dimensions of a faith-integrated perspective, the aim of incorporating beauty into computer science as part of the curriculum would be to reflect the creative processes of the Creator, point to the beauty of God, express God’s love, and make a positive impact on others. Neglecting beauty, on the other hand, can have detrimental effects, because that which is ugly can obstruct the restorative process.⁷⁷

Concepts related to programming and design in computer science might be taught in courses such as Introduction to Programming, Data Structures, Algorithms, User Interface Design, or Software Engineering. Teaching with a faith-integrated perspective of beauty in computer science would include the practical and functional benefits of incorporating beauty, viewed through both the vertical and horizontal dimensions. Some practical exercises when integrating aesthetics into computer science courses might include students reflecting on scripture passages and then relating them to computer science design and development. Several examples are provided below, along with anecdotal observations from experiences in the classroom.

In courses such as Introduction to Programming, Data Structures, or Algorithms, having students reflect on the creation account in Genesis may help them to recognize that order and structure, as seen in the process of creation, are important. It has been observed that students enjoy seeing the connection to God through similarities between computer programming and God’s creative processes. Also, as God gave humans stewardship care over creation, students may be reminded to consider those who

will use or maintain their program code. Students have also been able to recognize that debugging programs or removing errors can be part of the restorative process, as an analogy to God’s redemptive work. Bugs in programs are ugly because they prevent the program from functioning according to design. Some students have commented on experiencing the enjoyment of “good” code, which shows that beauty in programming can have a restorative effect on the programmer or designer as well.

Another curriculum example would be for students in a User Interface Design course to reflect on the biblical narratives for the building of the tabernacle, and particularly on Exodus 31:1-5. This passage describes the Spirit of God filling Bezalel with “ability and ... all craftsmanship to devise artistic designs” (Exod. 31:3-4), and indicates that the ability to create with beauty comes from the Holy Spirit. Students have been able to see that incorporating beauty in their designs is a reflection of God’s design processes and to recognize that their ability to do so comes from the Holy Spirit. In addition, just as the beauty in the design of the tabernacle enhances the experience of the worshipper, students may reflect on how the beauty in their designs will enhance user experiences.

Yet another example would be for students in a Software Engineering course to reflect on the Psalm 19:1-6 passage, on what creation communicates about God. They may also reflect on the Exodus 25-31 and 35-40 passages, on what the tabernacle design communicates. Students may then be asked to consider what they would want their software engineering products to communicate about God or what message content they want to share with others through beauty in their designs.


As illustrated through these examples, aesthetics may be incorporated in Christian higher education computer science curricula with a faith-integrated perspective. The practical and functional benefits from the earlier examples of beauty in the field of computer science can be taught through the lenses of the vertical and horizontal dimensions of the integrated perspective. Some goals in teaching a

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faith-integrated perspective of beauty in computer science courses related to development and design would then be to manifest the beauty of God, incorporate God's design processes, reflect God's love to others, bring enjoyment to users, and point to God.

Conclusion

We conclude that a faith-integrated perspective of beauty in computer science has vertical and horizontal dimensions that provide transcendent meaning and purpose for incorporating aesthetics as part of a computer science curriculum. Professor Michael Lawson says, "An integrated life should be taught through an integrated curriculum in order to reflect the integrated nature of truth found ultimately in God himself."⁷⁸ Just as the aesthetics of cathedral buildings can "express spiritual aspiration,"⁷⁹ it may be possible to produce a similar effect when beauty is intentionally incorporated in computer science design and development from a faith-integrated perspective. David Dockery says that the Great Commandment (Matt. 22:36-40) to love God and to love others may be used as a framework by those called to be Christian educators.⁸⁰ Thus, a faith-integrated perspective of beauty in computer science education adds the transcendent meaning and purpose of aspiring to obey the Great Commandment through utilizing intentional creative processes with vertical and horizontal dimensions. 

Notes

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- ⁷⁸Michael S. Lawson, *The Professor's Puzzle: Teaching in Christian Academics* (Nashville, TN: B&H Academic, 2015), 42.
- ⁷⁹Michael H. Mitias, "The Aesthetic Experience of the Architectural World," *Journal of Aesthetic Education* 33, no. 3 (1999): 75.
- ⁸⁰David Dockery, ed., *Faith and Learning: A Handbook for Christian Higher Education* (Nashville, TN: B&H Publishing, 2012), 3.

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Benjamin J.
McFarland

Essay Book Review

Mixed Metaphors: Intelligent Design and Michael Polanyi in *From Darwin to Eden*

Benjamin J. McFarland

From Darwin to Eden: A Tour of Science and Religion Based on the Philosophy of Michael Polanyi and the Intelligent Design Movement by William B. Collier. Eugene, OR: Resource Publications, 2020. 308 pages. Paperback; \$36.00. ISBN: 9781532692710.

Keywords: intelligent design, evolution, theology, natural history, science and faith, Michael Polanyi, protein chemistry

From Darwin to Eden: A Tour of Science and Religion Based on the Philosophy of Michael Polanyi and the Intelligent Design Movement by William B. Collier is unique among the books about intelligent design (ID) theory in its combination of scope and audience. The word “tour” in the subtitle is the first clue that the scope and audience are both broad. In the Preface, Collier writes, “Most of the material presented in this book was presented by many others in more technical publications.” Each chapter corresponds to a previous book or two by an ID author making more-detailed arguments, sometimes reproducing entire figures from previous books.

So, to review this book is to review the entire ID movement. None of the arguments as described is complete in itself, nor can it be. Detailed rebuttals to the arguments from *Darwin’s Doubt* or *Darwin’s Black Box* must be located elsewhere. *From Darwin to Eden* invites a

different kind of response, one that is more personal.

The personal response is provoked by two framing devices: First, Collier intersperses the arguments with a Greek chorus of sorts, in the form of vignettes of undergrads eating lunch and taking classes together while discussing the points in the surrounding text. Second, Collier integrates the life and writings of Michael Polanyi, including Polanyi’s masterwork, *Personal Knowledge*. Polanyi’s focus on the practical and social aspects of learning science resonates with undergrads, as I know from my personal classroom experience of assigning his texts. Therefore, the audience for this book is specifically focused at the general undergraduate level.

As a result, *From Darwin to Eden* is the closest thing we have to an intelligent design textbook for undergraduates. In addition to this survey of the ID movement, it includes some of Polanyi’s thinking, but Polanyi’s ideas are not deeply engaged. Polanyi died in 1976 and can’t personally respond, but my guess is that Polanyi would object to the negative nature of the argument. Polanyi’s ideas

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about tacit knowledge are more about how scientists know than what scientists don't know. Collier reverses this emphasis. Polanyi's tacit knowledge inspires me as a teacher toward positive actions: to involve students in the process of science so that they acquire the habits and language to recognize patterns and design structures. Polanyi's concept enables scientific work and experimentation, whereas Collier's interpretation of Polanyi's concept does not.

Both habits and language are creative scientific activities involving metaphors to communicate the patterns and designs, so that how you use metaphors is a key point to how you use Polanyi's ideas. In recognition of this, Collier's chapter on "Science and Metaphors" opens with a definition of metaphor (p. 173) from Janet Soskice's *Metaphor and Religious Language*,¹ which is another lodestone of potential inspiration, and is one of my personal favorite books on science and religion. A deeper look at Soskice's argument reveals that her definition of metaphor holds helpful nuance. Later in her book, Soskice writes that "a metaphor is *genuinely creative* and says something that can be said adequately in no other way, not as an ornament to what we already know but as an embodiment of a new insight" (emphasis mine).² Like Polanyi's tacit knowledge, Soskice's metaphor is a positive, creative act that supports, and perhaps even *is*, science.

When this many ID arguments are gathered in one place, it becomes clear that these metaphors are not used to construct and qualify theories such as those of Polanyi and Soskice, but are used to deconstruct and disqualify theories, especially regarding evolution. When a problem arises, often the issue is not with the theory itself, but with the metaphor. For example, ID's metaphors are consistently mechanical in nature, but they are applied to biological and chemical situations that are more biochemical than mechanical.

This has been a problem with ID arguments since the beginning. It is true that Michael Behe's irreducibly complex mousetrap would not be assembled from mechanical, human-sized nuts and bolts; however, proteins in aqueous solution at room temperature

are dynamic biochemical polymers with nonspecific affinities and functions. The atomic world is different from the human world. Even the most "mechanical" of proteins (e.g., ATP synthase) is difficult to describe with completely mechanical metaphors in the present tense—how much more difficult would it be to describe its origin that way!

Biochemistry requires nonmechanical metaphors, but in *From Darwin to Eden*, mechanical metaphors are used throughout. Collier writes, "Let us try to envision a good mechanical analog" to the heart and lungs; he then compares them to motorized vehicles (p. 253). My personal knowledge of how proteins work says this is an inadequate comparison: my PhD in protein design does not make me a better car mechanic.

In my view, the most convincing evidence for evolution can be found by comparing genes, which Collier addresses on pages 254–56 in chapter 10. However, like the discussion of Soskice's proposals about metaphors, *From Darwin to Eden* remains superficial in this area. Collier shows an alignment of cytochrome c protein sequences from multiple species arranged from humans at the top to yeast on the bottom. My eye, trained with Polanyi's tacit knowledge, immediately reads this alignment as clearly showing gradual biochemical variation corresponding to the variation inferred from biology. The power of this observation is that this can be done with almost any shared protein sequence, and the alignment would look the same. You can choose a common gene at random and investigate this yourself on your laptop. Most genes will look the same as the figure Collier shows.

But instead of zooming out to note all the proteins this would apply to, Collier zooms in to a pattern of four amino acids. He writes,

... students quickly notice all of the insects have the pattern VPAG near the start of the protein sequence, except for the honeybee which has IPAG ... Is it *descent with modification* that caused this difference [the pattern IPAG] or *needed design constraint*? It all depends on your perspective. (p. 256)

I am not satisfied with shrugging and saying "it all depends" for an argument like this. Collier's example

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is specific enough that it can entail a specific chemical hypothesis: the V/IPAG sequence in insects is a design constraint because it provides a certain chemical structure that interacts with another part of the organism. I can imagine experiments to investigate this step by step.

No structural rationale is investigated or even proposed. This example is meant to tear down evolution, not to build a theory of the chemical nature of “design constraints.” Even if a “design constraint” is found, an evolutionary path might be found to that constraint, leaving us back at square one.

This chapter’s argument culminates with a tacit admission that, to the biologist looking at genes (like me when I looked at the cytochrome c alignment), evolution makes sense. Collier writes, “If you are looking at the tree of life from the top it is very easy to extrapolate down and call it a fact of science” (p. 258). This means that most protein sequence alignments, as views “from the top,” make sense with evolution. Then Collier contends, “If you look at the tree of life from a bottom-up view, the case for evolution and the tree of life is pretty terrible. From the physical scientist’s perspective it is tempting to call it impossible ...” (p. 258).

Indeed, chapter 6 details the shortcomings of origin-of-life chemistry, arguing from a “bottom-up view,” and chapter 11 is titled “View from the Bottom.” But earlier, in chapter 4, Collier argues “from the top” to support intelligent design from astrophysical arguments, repeating fine-tuning arguments to conclude, “We are positioned in time for the best possible view of the universe” (p. 105). The argument flips from “top down” to “bottom up” in its use of data depending on the scientific discipline.

If the difficulties of building origin of life chemistry from the bottom up prevent knowledge about the evolution of species, as Collier asserts, then the difficulties of building a universe through the inflationary epoch (for example) would also prevent knowledge about the privileged nature of our planet—yet Collier never makes this argument. On the other hand, if we are positioned for a top-down view back in time using a survey of the universe to

show how special our planet is, then I would argue that we are also positioned in time for a top-down view back in time using a survey of DNA sequences.

Looking top down in astronomy, we see that our planet has unique features; in biology, we see molecular similarities among species. Evolutionary theory can “connect the dots” (at least most of them) into reasonable biological mechanisms of species formation. Arguing that our uncertainty about some of these “dots” at the origin of phyla or the origin of life invalidates evolution, shifts the argument far back in time to either the Cambrian explosion 540 million years ago or the origin of life 4 billion years ago. It is like arguing that any uncertainty about the inflationary epoch after the Big Bang somehow invalidates the wealth of evidence from the Cosmic Background Explorer’s top-down scan of the entire sky. Collier’s survey of ID literature lays out this contradiction by repeating these arguments in nearby chapters.

As you have no doubt noticed, in reviewing a book so dependent on Polanyi’s ideas, I cannot avoid using the first person and invoking my own personal knowledge. I have experiences both in the lab and in church that have given me a much more positive view of evolution than that held by Collier.

From my own personal laboratory knowledge of designing proteins, I have found that small changes are usually tolerated and can even increase binding function. I was not testing this point directly, but it emerges from the data in many of my published papers. In one case, we reshaped amino acid residues that are “hot spots” for binding, and found that most of the changes we tried were tolerated. In fact, substituting in one kind of residue actually increased affinity over the wild-type native protein, suggesting that the protein is not optimized for function in the manner that ID theories would suggest.³ In another set of experiments, a “broken” protein design bound more tightly than the “fixed” version!⁴

In my personal laboratory experience, proteins are much more plastic and dynamic than implied by Douglas Axe⁵ and by Michael Behe and David Snoke.⁶ I could be convinced against my own personal experiments by something like a meta-analysis of *in vitro*

binding data from scientists who are not trying to prove protein plasticity either way. A wealth of such data exists in the literature. I suspect that, like my inadvertent experience, such neutral evidence shows that most proteins tolerate minor alteration without complaint.

My own personal theological knowledge has also contradicted the view of divine action assumed in books like Collier's. One theologian who recently unfolded scripture in this regard for me is Katherine Sonderegger. She starts from the perfect Oneness of God and develops it into a systematic theology that explicitly critiques William Paley's design arguments while keeping a strong view of God's otherness and unity (expressed as God's omnipresence, omnipotence, and omniscience).⁷ Sonderegger writes, "The omnipotent Nature of God *intends* the creation: Let there be light!"⁸ When I read this, I heard the same ultimate theological goal as Collier's, despite the vast difference in arguments: this planet is personally privileged with blessing, or at least I am. I need a theology that lets me know that I am personally intended—I am loved—by the Creator of the universe. This is true for all of us, whether we see the origin of life as a problem or not. Sonderegger accomplishes this gratitude and wonder with a Divine Designer who acts in mysterious, not mechanical, ways. How else should an omnipresent yet personal God work? His ways are not our ways.

Personal knowledge is inherently political. Throughout *From Darwin to Eden*, Collier remarks on the political nature of scientific decisions, especially when ID is not given a seat at the table for scientific discussion. By reviewing this book, I am personally implying that the "table" set by the ASA is a place where Collier's arguments should be heard and debated in good faith. But every finite table involves some exclusion—even Collier's table. For example, I can't locate myself on Collier's spectrum of science-and-faith views (p. 242). I see design in the universe, but it is eternal and outside of time: chemical design in the construction of the periodic table from consistent physical laws unfolding over billions of years. This increases my confidence in both evolution and purpose.

Collier quotes Phillip Johnson quoting paleontologist David Raup: "In the years after Darwin, his advocates hoped to find predictable progressions. In general, these have not been found ..." (p. 248). Collier effectively closes his investigation at this point, like someone who made up their mind first and went searching for a quote to support their stance second. But what if you keep an open mind that predictable progressions may exist—and what if you find one? I ask because I believe I have.

Since we are talking about personal knowledge here, I should mention that I have written a book about how a predictable geochemical progression in mineral evolution led to a predictable biochemical progression in biological evolution.⁹ Raup, quoted decades ago, was disappointed in one paleontological progression, but I found a biochemical progression. This is not *intelligent* design, but the metaphor of design used in a different way, maintaining the integrity of nature fitting with Sonderegger's theology about the patient, consistent, and humble working of God.

Sonderegger and Collier (and I) have very different views on Darwin and Paley, but we agree that there is more to this life than mere atoms and void. We inherit this anti-Epicurean argument from Paul of Tarsus at Mars Hill.¹⁰ This speech, and Paul's first speech to Gentiles at Lystra,¹¹ both appeal to God's action as the font of existence, above all idols and mechanisms. The evidence (or "testimony") Paul cites at Lystra is all in the present tense: rain from heaven, crops, and food. Now that science allows us to look into the deep past, we can look for God's goodness and design there as well, but it must be secondary to God's present work—after all, Paul didn't need design arguments to preach the gospel in Lystra.¹²

The apparatus of science provides many kinds of evidence, from the astronomical to the biochemical. Polanyi's writing about tacit knowledge and the inadequacies of naturalism opens the door to other kinds of evidence, but that evidence must be weighed fairly and completely. It is a good thing if we as ASA members end up talking more about Polanyi and Soskice, so I appreciate the philosophical

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frame of Collier's argument and citations, and hope that future ASA meetings will discuss these thinkers and others.

Michael Polanyi's life and work promoting personal knowledge is a welcome framing device, but what this device frames is not new. Collier's stated goal is breadth, not depth, and a broad array of unconvincing arguments does not add up to anything: to use a mathematical rather than mechanical metaphor, the series does not converge. Let's continue to bring new findings to the table and debate them to see what kind of adjective is best suited for the design and purpose we intuit in the universe. For now, I find the adjective "intelligent" for "design" to be wanting. 🌐

Notes

¹Janet Martin Soskice, *Metaphor and Religious Language* (Oxford, UK: Clarendon Press, 1985).

²*Ibid.*, 48 [emphasis mine].

³David J. Culpepper et al., "Systematic Mutation and Thermodynamic Analysis of Central Tyrosine Pairs in Polyspecific NKG2D Receptor Interactions," *Molecular Immunology* 48, no. 4 (2011): 516–23.

⁴Candice S. E. Lengyel et al., "Mutations Designed to Destabilize the Receptor-Bound Conformation Increase MICA-NKG2D Association Rate and Affinity," *Journal of Biological Chemistry* 282, no. 42 (2007): 30658–66.

⁵Douglas D. Axe, "Estimating the Prevalence of Protein Sequences Adopting Functional Enzyme Folds," *Journal of Molecular Biology* 341, no. 5 (2004): 1295–315.

⁶Michael J. Behe and David W. Snoke, "Simulating Evolution by Gene Duplication of Protein Features That Require Multiple Amino Acid Residues," *Protein Science* 13, no. 10 (2004): 2651–64.

⁷Katherine Sonderegger, *Systematic Theology*, vol. 1 (Minneapolis, MN: Fortress Press, 2015), 57–65 on Paley; 300–318 on Genesis.

⁸*Ibid.*, 318.

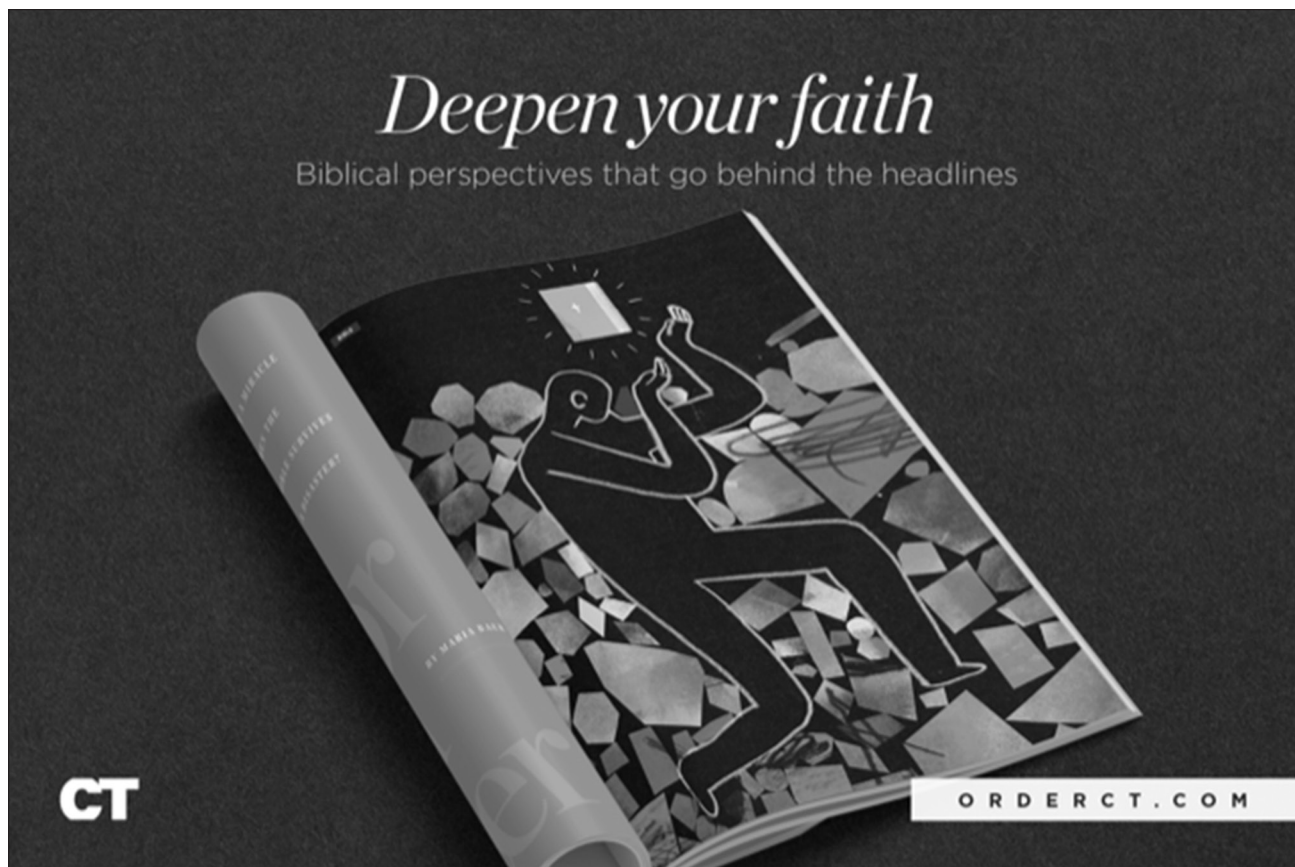
⁹Benjamin J. McFarland, *A World from Dust: How the Periodic Table Shaped Life* (New York: Oxford University Press, 2016).

¹⁰Acts 17:22–31.

¹¹Acts 14:15–17.

¹²Paul's statement that "From one man he made all the nations" in Acts 17:26 does not seem like a design argument to me, because it does not require design but rather purpose ("that they should inhabit the whole earth"); this idea fits equally well with Sonderegger's creation theology, given its emphasis on God's intention for what they should do.

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HEALTH AND MEDICINE

CHASING METHUSELAH: Theology, the Body, and Slowing Human Aging by Todd T. W. Daly. Eugene, OR: Cascade Books, 2021. 307 pages, index. Paperback; \$38.00. ISBN: 9781532698002.

Chasing Methuselah brings “a Christological anthropology to bear on the scientific quest to attenuate aging by manipulating the body” (p. xi). Todd T. W. Daly, who teaches at Urbana Theological Seminary, argues that faith-based lenses are integrally important for interpreting historically diverse, and mostly failed, efforts to slow human aging—an elusive goal typically pursued by biomedical professionals, technocrats, and quacks. “The idea of a significantly prolonged healthy life has captured the public’s imagination,” Daly states in his Introduction, but “to date, the ethics of aging attenuation contains assumptions that often go unchallenged, leaving fundamental questions unasked” (p. 11).

With bold originality and astounding erudition *Chasing Methuselah* fills a major gap in critical gerontology by highlighting ethical foundations and existential dilemmas that scientists and commentators have generally ignored while attempting to alter bodily homeostasis and manipulate basic processes. Blazing a *terra incognita* full of unfamiliar names and references, *Chasing Methuselah* poses questions that reframe a fundamental debate: Should healthful longevity be extended by trying to cure age-related diseases or by slowing the rate of aging? In his critique of this “two endings [that] speak of two disparate paths of old age” framework, Daly pushes gerontology’s limits beyond what most researchers, teachers, and practitioners (regardless of their specialization) regard as its transdisciplinary, cross-professional domain.

Chasing Methuselah has five richly nuanced, assiduously researched chapters. Chapter 1 alone is 58 pages long with 284 footnotes. It traces “the quest for longevity [that] has moved from legend to laboratory,” thereby engendering “new hope that human aging might be brought under human control” (p. 76). Daly’s second chapter chronicles how certain Christian texts and doctrines have bolstered two conflicting perspectives—specifically, a secular contention that “prolonging life is unequivocally good”

and an “unequivocal foreclos[ing of] all attempts to secure a longer life by slowing aging” (p. 112).

Chapter 3 examines the legacy of Francis Bacon (1561–1626). Its title, “Relief of Man’s Estate: Francis Bacon and the Theological Origins of the Modern Quest to Slow Aging,” pivots the book to a contrapuntal, interpretive turn wherein technological and theological pathways toward greater longevity have complemented, paralleled, or contradicted themselves for centuries. On the one hand, Daly affirms that Bacon birthed biomedical science as an indispensable approach to practical knowledge about old age and aging. On the other hand, Daly quotes Bacon’s objections to the project: “Natural philosophy [the study of nature] should not be invaded by revealed theology in the Bible,” declared Bacon, “but rather be bounded by it” (p. 148).

The last two chapters of *Chasing Methuselah*’s narrative invite laboratory scientists, policy analysts, and healthcare professionals to grapple with theodicy and eschatology—subjects usually taught in seminaries, not showcased in conferences on aging. Chapter 4, entitled “Adam Again,” reveals the typically unacknowledged importance of theology in reflecting and refracting scientific views on slowing bodily aging. Ascetics tried to attenuate aging to reframe Adam’s Fall in Genesis. For the Desert Fathers,

Bodily practices such as fasting were viewed as the primary means by which the Christian might regain a measure of what was lost by Adam’s sin, namely, a heightened degree of bodily incorruptibility allowing for the possibility of longer life. (p. 199)

Chapter 5, “The Last Adam and Slowing Aging,” builds upon the connection between asceticism, fasting, and prolongation of life espoused by Saints Anthony, Athanasius, and other Desert Fathers. This chapter also considers the work of the Swiss theologian Karl Barth in particular, employing Barth’s “dynamic anthropology” or “dialectical-dialogical anthropology” for framing “christologically informed discussions on the relationship between one’s body and soul as it relates to slowing aging” (p. 206). By taking on “finite humanity as embodied soul and ensouled body” (p. 253), the incarnation affects our perspective on lengthening life: “In light of the real man Jesus, any use of biotechnology ... is

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not without risk, as it may threaten our pursuit of the proper order to body and soul” (pp. 253–54).

Reading *Chasing Methuselah* can be daunting. I had to Google many references, and readers without theological training may well find the discussion of Barth difficult to comprehend. I associated Daly’s *modus operandi* with “thick description” – Clifford Geertz’s method of doing cultural anthropology. This approach gathers biographical details, historical milieus, and societal belief systems to contextualize actors’ symbols, legends, and rituals, thereby explicating individual worldviews and collective behaviors. Geertz (omitted in the 34-page bibliography) used reams of data to synthesize and interpret what he observed being enacted ethnographically.

Daly, in contrast, offers a “conclusion” to each chapter, but rejects narrative foreclosure. To wit: The last sentence of *Chasing Methuselah*’s four-page Conclusion, which begins “Perhaps the best question is whether the use of such biotechnology will help or hinder our pursuit of Jesus” (p. 258), requires readers to formulate their own answer to what Daly implicitly articulates. This tack leaves loose ends unresolved – perhaps frustrating for scientists accustomed to explicit, straightforward conclusions. That Daly chose not to bridge two specific cultures (humanities and science) diminishes his argument’s impact. Reviewing this as an historian of aging, a religious/spiritual believer, and a critical gerontologist, I opt for more transparency.

I commend Daly for invoking Tom Cole and Gerald Gruman, whose histories of science, theology, and myth orchestrated early parts of *Chasing Methuselah*. I am dismayed, however, that the book does not sufficiently acknowledge two fierce competitions raging for decades: (1) turf wars over intramural status and extramural authority within the Gerontological Society of America (GSA); and (2) ideological and methodological rivalries that have pitted GSA advocates against experts in the American Academy of Anti-Aging Medicine (4AM).

For example, the pro-longevity claims made by David Sinclair and Valter Longo, 4AM stalwarts whom Daly frequently cites, are important and pertinent. Nonetheless, their research does not enclose the vast array of theories advanced and debunked by specialists and emerging professionals within GSA.

That strand of historical gerontology was evident in the early twentieth-century pathological model of aging (articulated by Elie Metchnikoff) and its physiological counterpart (presented by I. L. Nascher, the father of US cross-disciplinary geriatrics). Similarly, Daly’s historiography could have paid more attention to Clive McCay’s caloric-reduction experiments (replicated persistently for 90 years) and to Roy Walford’s fasting regimen in Biosphere 2.

This Episcopalian wanted more exegesis in *Chasing Methuselah*. How do women’s opinions about slowing human aging compare with those of male theologians and mystics? Doesn’t Daniel Callahan merit more than a footnote citing his claim that “‘national necessity’ [is] another way of saying ‘research imperative’” (p. 12)? Might assessments of non-Christian or agnostic ethicists have sharpened Daly’s focus on a faith-based lens?

As a critical gerontologist, I was frustrated at the outset by the phrase, “slowing human aging.” What does Daly intend this wording to encompass and exclude? Is it the equivalent of “the scientific quest to attenuate aging by manipulating the body” (p. 15)? Is “limiting caloric intake [which] reduces oxidative stress, allowing DNA to repair damage suffered by cells” (p. 54) a modern-day version of “holy anorexia” practiced by prayerful nuns during the Middle Ages?

This critique of flaws hardly lessens my admiration and respect for what Daly contributes. Rarely, in fifty years of evaluating multidisciplinary books on old age and longevity, have I so willingly engaged dialogically with an author. Addressing questions raised in *Chasing Methuselah* prompted rethinking the dialectical symbiosis of religion and science. Many of my colleagues in age studies will dismiss this book as an outlier, I suspect, because Daly’s Christological anthropology turns them off. That is a pity, if so: The debate and search for meanings embodied in *Chasing Methuselah* advances what truly matters in anchoring the aging enterprise.

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HUMAN PERSONHOOD

RESPONSIVE BECOMING: Moral Formation in Theological, Evolutionary, and Developmental Perspective by Angela Carpenter. New York: T&T Clark, 2020. 200 pages. Paperback; \$39.95. ISBN: 9780567698162.

Carpenter, in this well-written, methodologically astute, and thought-provoking study on moral formation rubs several unusual sticks together: Reformed theologies of sanctification, extended evolutionary synthesis theories, and current offerings in developmental psychology. The result is a wonderful fire that sheds much light on all these areas. This study is sure to be an important conversation partner for those interested in the ongoing dialogue between theology and the social sciences, as well as those interested in the doctrine of sanctification and its relationship to understandings of moral formation. We are in Carpenter's debt for such stimulating interdisciplinary work.

The subtitle lists Carpenter's three main interlocutors. In her first three chapters, she begins with a theological analysis of the views of sanctification of John Calvin (chap. 1), John Owen (chap. 2), and Horace Bushnell (chap. 3), in which she uncovers several "recurring questions and difficulties" in the Reformed tradition (p. 3). These difficulties include, first, the extent to which sanctification should be dependent upon "a particular cognitive-affective state" (p. 36)—namely that the believer trusts in God as a loving parent such that one's good works flow from this state of "faith." This can prove to be an unstable foundation given the "unreliability of subjective awareness" (p. 152). A second question centers on the extent to which God's trinitarian sanctifying action should be understood to work through, or alternatively totally displace, "intra-human sources of formation" (pp. 37, 152). Calvin's theology is filled with tension in these areas, tensions which are resolved in one direction in John Owen's theology as he reacts against "Pelagian" threats in his day and upholds "the integrity of grace" (p. 3) in a certain way. Owen emphasizes the objective work of God in sanctification, such that human cognitive-affective states do not matter much, nor is sanctification seen to be mediated through any human formative influences. Bushnell, responding against revivalist

accounts of sanctification in his day, takes the opposite tack, and emphasizes both the human subjective response to God and formative processes such as the nurture of children by Christian parents, so much so that "the activity of the Spirit cannot be considered apart from the natural means through which it operates" (p. 87). I learned much from Carpenter's appreciative yet incisive exposition and analysis, not least of which are the ways that typical Protestant views of sanctification, such as those of Calvin and especially Owen, can pull one in the opposite direction from much of the recent revival of virtue theory and discussions of formative practices in Christian ethics and practical theology.

The key link between these chapters and the following ones is the importance of the parent-child metaphor for the relationship of the Christian to God. "God as a loving parent and the faithful person as the adopted child of God" (p. 5) is a common and important image for Calvin, and indeed for the Christian tradition as a whole, as attested by the first two words of the Lord's Prayer. This raises questions about the extent to which the divine-human parent-child relationship has dynamics that are analogous to human-human parent-child relationships, and the extent to which natural processes of human moral formation are related to the process of sanctification through the gracious activity of God, our heavenly parent.

She pursues these and other questions through a deep dive into the intricacies of current discussions of evolutionary theory (chap. 4) and developmental psychology (chap. 5). In both these chapters, a recurring motif is that relationships of care, affect, and social acceptance bring about important changes in humans. The "niche construction" of systems of affect, attachment, and "concern for the emotions and welfare of others" (p. 111) plays a key part in our evolutionary history, and "early and affective social acceptance" (p. 129) plays a key part in the moral development of children. One can see how important moral changes that these natural processes create in human beings resonate with descriptions of sanctified human behavior that result from the parental love of God. Could these processes, especially when seen in light of trinitarian accounts of the work of Christ and the Spirit, help us better understand God's sanctifying work, without reducing God's gracious action

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to simply these natural processes? Could such an account help one move through the tensions within doctrines of sanctification in the Reformed tradition? This is the direction of Carpenter's questioning and answering throughout the text and especially in her constructive account of sanctification in chapter 6, "Sanctification Revisited."

I have so much admiration for this excellent study, and there is so much to respond to in this rich text. One key lesson I gained was that love, here understood primarily as an affective relationship of social acceptance and care, is not some added luxury in human life, but rather is a foundational component for human evolution and moral formation. As a theologian this will change the way I think about "justification," which was interestingly not a word highlighted in the text. Carpenter pushes me to anchor my Protestant understanding of justification deeply within the realm of a relationship of acceptance and care between a human and God, rather than seeing it primarily as a juridical status. Carpenter shows there are important "sanctifying" aspects of this relationship; the two theological concepts are linked in important ways.

I also came away with two primary sets of questions, especially regarding her proposals for a revisited doctrine of sanctification. The first has to do with the description of sanctification itself. What does a sanctified or holy life look like? Carpenter emphasizes aspects of sanctification that are direct results of being adopted as a child of God; in this way one becomes a "new being" in Christ (p. 153). This relationship with God satisfies "affect hunger" (p. 158) and provides a social context in which a "new heart" can develop (p. 158). Instead of focusing on an examination of one's own heart (p. 161), or alternatively on following rules or examples outside of oneself, such as the example of Jesus understood "legalistically" (p. 158), Carpenter emphasizes that the Christian life of sanctification is an ongoing repentance from alienation from the creator (p. 162); vivification occurs when one turns again and again to the loving arms of God (p. 163). My wonder here is whether increasing conformity with clear models of God's holy intentions for human life that go beyond the activity of continual repentance and returning to God should also be emphasized. Carpenter certainly talks about conformity to Christ, but the pattern of

Christ is usually talked about in terms of "repeated returning" (p. 161) and "perfect fellowship with the Father" (p. 162). I sense perhaps an overemphasis on Spirit, and not enough on Word or the patterns that sanctified life takes: in Calvin's trinitarian theology, "Word" (related to attributes of form, pattern, or way of life) and "Spirit" (related to the energy by which that form is achieved; see *Institutes* 1.13.18) must go together. While the law and prophets hang on the command to love God and neighbor, such love is fleshed out in a variety of holy ways of life that God intends for humanity. Carpenter's wariness about virtue ethics seems to go hand in hand with this reticence to name behaviors, virtues, or practices other than repentance, acceptance, and positive affectivity. It is unclear to me whether this is simply a matter of scope and focus—"focus on the relationship with God, rather than on one's inner life or outer behaviors" is a clear and salutary message throughout the text—or is a feature of her total understanding of sanctification.

I also wonder whether Carpenter's description of God's activity in sanctification could be improved by considering different ways that God relates to the world. Both Karl Barth and especially David Kelsey (in *Eccentric Existence*) have taught me to consider that God's activity toward all that is not God takes three primary shapes or "trinitarian taxes" in God's work of creation, reconciliation, and in drawing all that is not God to eschatological consummation. Carpenter's important insights about the foundational nature of affective relationships might find greater sharpness through a distinction between (1) God's creational work (which would be mediated generally through evolutionary processes which include human parent-child relationships), (2) God's reconciling work (which many would claim is mediated primarily and more particularly through the people of God), and (3) God's "kingdom" work (mediated through Spirit-inspired renewed ways of life). This might create greater space for talk of justice and vocation, as well as greater distinctions between God's activity in Christian communities and elsewhere. All three avenues of God's activity and human response to it involve the intertwined, yet unified, sanctifying work of God that is based upon affective acceptance; however, by noting these distinctions, greater space might be created both for greater specifications of holy living and for distinctions between

God's more particular and more general work in the world.

None of these wonderings should detract from the seminal nature of Carpenter's work. Her emphasis on the importance of intra-human and divine-human affective relationships in moral formation and sanctification provides an important foundational structure to discussions of sanctification. Carpenter's methodologically careful, insightful, and thought-provoking work will surely be a voice of continuing importance in ongoing discussions of sanctification within theology and in the needed intra-disciplinary dialogue between theology and the social sciences.

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Φ PHILOSOPHY

ALL THINGS WISE AND WONDERFUL: A Christian Understanding of How and Why Things Happen, in Light of COVID-19 by E. Janet Warren. Eugene, OR: Wipf & Stock, 2021. 208 pages + index. Paperback; \$27.00. ISBN: 9781725292031.

In *All Things Wise and Wonderful*, E. Janet Warren develops a multidisciplinary, Christian understanding of causation with the hope that it will help us "to respond with integrity and compassion for those who suffer" (p. 182). Warren is not short on familiar examples of uncompassionate responses to suffering that are worth critiquing: "God caused the pandemic to teach us to be kind" (p. 127), "Everything happens for a reason" (p. 180), and "This tragedy happened to grow your faith" (p. 22). Warren argues that these symptoms point toward a common diagnosis: a false, "omni-causal" view of God, according to which God "causes everything that happens, including pandemics" (p. 31).

Chapter 1: Introduction lays the groundwork for the rest of the book in two ways: first, by giving a complex taxonomy of philosophical distinctions bearing on causation; second, by introducing (as Warren argues) the problematic practice of too easily explaining an event as the result of God's direct causal intervention (e.g., God provided a parking spot!) when mundane explanations suffice. The tension between the complexity of causation and the human tendency to gravitate toward simplistic (divine) explanations becomes the book's recurring

theme. In chapter 2, Warren surveys biblical claims about causation, concluding that the Bible "does not give a simple account of causation," (p. 45) and encouraging the reader to "accept ambiguity and complexity" (p. 36) in the text rather than demanding a coherent biblical theory.

The third chapter, "What Does Christian Theology Say about Causation?" is the clear standout and would make a provocative discussion-piece for an undergraduate class on divine providence in a science and religion course. Warren contrasts two pictures of God, one in which God is an omni-causal, omni-controlling dictator of a deterministic world (pp. 57, 77) and another in which God is a servant king who relinquishes the option to utilize God's power in order to preserve space for indeterministic, creaturely freedom (pp. 53, 58). The strokes are intentionally broad, nudging the reader to see the potential ethical pitfalls of positing an omni-causal God. In particular, Warren worries that an omni-causal God would not be capable of being lovingly responsive to creaturely agents (p. 57).

In Warren's preferred picture, God builds a world that can host longstanding causal patterns without repeated divine intervention; once created, the world is, in some sense "self-causing" (p. 35) and does not require any special act of divine conservation. Although God does act in the world, God refrains from fully exercising his power to control in order to respect "the freedom he has granted to humans and the created order" (p. 60).

The contrasting portraits, however vivid, also preempt discussion of various middle views—one might distinguish between an omni-causing and omni-controlling God, for instance. Warren is also stronger on critique than on the details of her own positive proposal—perhaps by design. "The language of metaphor and analogies is more accessible," Warren writes, "than the language of philosophy or science" (p. 68). This is faithful to her refrain that real-world causal networks are messy and not easily wrapped in neat theological packaging, but it may prove frustrating to those readers eager to engage the details of a constructive project.

In chapter 4, Warren gives the reader a crash course in statistical concepts that are useful for understanding causation, quickly covering (for instance) base

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rates, regression to the mean, and the law of large numbers. Genuine chance is not incompatible with a kind of sovereignty, Warren argues; rather, God “created randomness” (p. 90) and is capable of guiding overarching events through it while fostering the vulnerability, excitement, and intellectual humility that comes with real chanciness. Chapter 5 asks what science says about causation. Notable—both for the audience it will attract and exclude—is Warren’s commitment to take divine healings, demonic activity, and parapsychology seriously while also summarizing key concepts from quantum theory and medicinal practice.

In chapter 6, Warren turns to psychological explanations of why we jump to simple causal explanations. Drawing liberally from Kahneman,¹ Warren introduces dual processing theory, distinguishing between our quick, automatic system 1 judgments and our reflective, deliberate system 2 judgments. Citing Barrett’s hypersensitive agency detection device² and Taleb’s narrative fallacy,³ among other mechanisms, Warren suggests that causal explanations that invoke a narrative about God’s intentions are often psychologically easy for us to jump to (via system 1). A reflective Christian should, Warren argues, be aware of this tendency and moderate our confidence in unreflective judgments about divine intervention in ordinary events.

Chapter 7 and the conclusion that follows take a pastoral turn and will be of special interest to church study groups. Alongside giving practical recommendations for exercising discernment, Warren concludes that “by better understanding the nature of causation and the nature of God’s interaction with our wise and wonderful world, we can better evaluate how and why things happen, without glibly assuming God causes everything” (p. 177).

Warren’s book could profitably be read by undergraduates in a science and religion course at a confessional college, with special attention given to the third chapter, which has points of contact with Polkinghorne,⁴ Bartholomew,⁵ Boyd,⁶ and Oord.⁷ But the book may be even more at home in study groups at (broadly) evangelical churches, where the writing’s therapeutic lens can shine. Warren’s easy prose is accessible as she hops without hesitation from the Bible to Polkinghorne to Aristotle to *Bruce Almighty*.

While the breadth of Warren’s book is impressive, any interdisciplinary book is liable to engage more fully with some disciplines than others. It is no surprise that Warren’s book is strongest when drawing on her expertise in medicine and theology and less so when discussing philosophy.

One philosophical concern for Warren’s argument against an omni-causal God is the possibility of causation from nonaction. Some philosophers think that absences cause: My *not* watering the plant causes it to die; my *not* calling on his birthday causes Dad to be sad. In each of these cases, there is something I could have easily done that would have prevented the effect. But if absences cause, then there is a serious challenge for Warren’s view. A powerful and wise (even if not classically omniscient) God can easily prevent most events from happening. God could easily have prevented me from getting that last parking spot or my friend from being infected with a virus. Perhaps, then, God’s *not* preventing these events should number among their causes (or at least their explanations).

This need not be a criticism of the overall theological picture Warren develops—one in which God does not intend or directly intervene to prevent the normal operation of the world except (usually) for explicitly theological reasons. Rather, I suggest that how much leverage can be gained by critiquing the concept of an omni-causal God depends on substantive philosophical commitments about the nature of causation and how causation relates to other philosophical concepts such as explanation and responsibility. Perhaps a God as powerful and involved as traditional Christian theology posits can’t help but be in close causal contact with the world—a God whose interventions, however sparingly placed, ripple far throughout the created world, either by preventing or by failing to prevent events that are well within God’s power to stop. If so, then “God didn’t cause that” may not often be strictly true. Even if God didn’t specially intervene with the purpose of bringing the event about, saying “God didn’t intend that,” “God didn’t plan that,” or “God didn’t want that” may be more honest. Retaining God’s action or inaction as causes of mundane events—while complicating the story about divine intent and providence—may also allow us to vindicate the biblical practice of prayerful complaint against God’s (in)action (with Job and

the psalmist) as a therapeutically important and theologically understandable response to suffering while simultaneously allowing us to join Warren's critique of "comforting" clichés about God's specific purposes for particular harms.

But these are concerns about tactics within the context of a shared goal to enrich and complexify Christian understandings of causation. At its best, Warren's work therapeutically nudges the reader toward a healthy skepticism of over-easy ascriptions of God's direct causal intervention in the world. And this amidst an ambitious, interdisciplinary conceptual toolkit that weaves accessibly through theology, philosophy, statistics, psychology, and the sciences more broadly.

Notes

¹Daniel Kahneman, *Thinking, Fast and Slow* (Toronto, ON: Doubleday Canada, 2011).

²Justin L. Barrett, *Born Believers: The Science of Children's Religious Belief* (New York: Free Press, 2012).

³Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable*, 2nd ed. (New York: Random House, 2010).

⁴John C. Polkinghorne, *Science and Providence: God's Interaction with the World*, 2nd ed. (West Conshohocken, PA: Templeton Foundation, 2005).

⁵David J. Bartholomew, *God, Chance and Purpose: Can God Have It Both Ways?* (Cambridge, UK: Cambridge University Press, 2008).

⁶Gregory A. Boyd, "The Open-Theism View," in *Divine Foreknowledge: Four Views*, ed. James K. Beilby and Paul R. Eddy (Downers Grove, IL: InterVarsity, 2001), 13–47.

⁷Thomas Jay Oord, *The Uncontrolling Love of God: An Open and Relational Account of Providence* (Downers Grove, IL: InterVarsity Academic, 2015).

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WHY SCIENCE AND FAITH NEED EACH OTHER: Eight Shared Values That Move Us beyond Fear by Elaine Howard Ecklund. Grand Rapids, MI: Brazos Press, 2020. 176 pages. Paperback; \$17.99. ISBN: 9781587434365.

Elaine Howard Ecklund is a professor of sociology, the Herbert Autrey Chair in Social Sciences at Rice University, and the founder of Rice's Religion and Public Life Program. She is well known for her studies of the intersection of science and spirituality, having published books on how scientists view religion (*Science vs. Religion*, Oxford University Press

2010, and *Secularity and Science*, Oxford University Press, 2019) and how religious people view science (*Religion vs. Science*, Oxford University Press 2017). In 2018 she delivered the Gifford Lectures at the University of Edinburgh on this topic. Her research takes advantage of a mixed methods approach, combining quantitative analysis of large-scale survey data and qualitative analyses of in-depth structured interviews. These scholarly studies have yielded interesting observations and paint a more complex and nuanced picture of this area than the caricature of irreconcilable conflict often suggested by the general media.

Why Science and Faith Need Each Other: Eight Shared Values That Move Us beyond Fear is Ecklund's first book in this area directed toward a lay audience. It is an engaging book that integrates her research and that of others, as well as personal anecdotes and stories, to illustrate her main points. It is designed not only for individual reading, but also for discussion in small groups, as each chapter finishes with suggested questions for further discussion. Although oriented toward a lay audience, it is carefully referenced for readers who are interested in delving into the primary sources. While not explicitly stated, the book appears directed, in particular, to evangelical Protestants who are more likely than other Christians to have difficulties integrating science and faith in their worldviews. This is consistent with much of the data cited in the book in which evangelical Protestants are often more likely than mainline Protestants and Catholics to hold skeptical views regarding certain aspects of science. It is also consistent with the funding support for this book—a Templeton Religion Trust grant for a project entitled Reaching Evangelical American Leaders to Change Hearts and Minds.

The main thesis of the book is that science and faith share eight common values; an awareness of these commonalities can provide a meeting point where people of faith and scientists can come to better understand each other and thereby decrease fear and suspicion toward each other. These values are curiosity, doubt, humility, creativity, healing, awe, shalom, and gratitude, with a chapter devoted to each of these values. The first four values relate to what Ecklund calls "process"—values which speak to how scientists carry out their work and how people of

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faith develop their spirituality. The latter four values relate to what Ecklund calls “redemption” – values which speak to the practical applications of the work of scientists and the practical responses emanating from the spirituality of people of faith, with both groups exercising these responses toward improving the common good.

I was certainly convinced that these values are shared by both people of faith and scientists as attested to by citations from her research and the literature. But I think that they are shared in different ways and to different degrees. Part of this reflects differences in their core features: science is above all a process, a method of looking at the world and viewing it through the lenses of observation and reason to generate, usually, some mechanistic understanding. So if we consider the value “doubt,” for the scientist, doubt is an essential part of the scientific method that involves constantly exploring alternative explanations for the observations. Without doubt, the scientist would achieve little progress. Faith is, above all, a process or method of looking at life and addressing questions of meaning and purpose. Although many persons of faith experience doubt at some point in their journey and processing such doubt can be a path to spiritual growth, it is not essential and certainly not a daily part of life for most believers. Conversely, “gratitude” is essential to the person of faith, forming a core part of the believer’s daily worship and often present even in times of suffering. Without gratitude, the person of faith achieves little spiritual progress. Scientists, including the Christian ones referred to by Ecklund, may express a sense of gratitude for the opportunity of discovery and for the potential benefits to humanity of the results of such discovery; however, it is not an essential value for the scientist and is unlikely to be expressed by most scientists in a prominent way on a daily basis.

Arguments can be made for similar differences in the expression and relative importance of some of the other values such as curiosity, creativity, and awe. Such probing can be fodder for interesting discussions by groups using the book. Although these discussions may suggest that the terrain of this common meeting place for scientists and people of faith may be rough and uneven, I believe that such discussion will lead to a better understanding of scientists and people of faith. Differences in the expression of

these values may lead to recognition of the distinct purposes and methods used by science and religion that underlie the irregular terrain. As quoted by Ecklund, distinctions between science and religion are famously described by the late paleontologist Stephen Jay Gould as “non-overlapping magisteria.” These non-overlapping magisteria govern distinct parts of life—“science in the empirical constitution of the universe and religion in the search for proper ethical values and spiritual meaning of our lives” (p. 154). Perhaps it is a recognition of the shared values of science and faith as well as their non-overlapping and complementary areas of endeavor that will have the best chances of resolving fear and suspicion between scientists and people of faith. Some conflict will persist as the magisteria are not completely non-overlapping. For example, as discussed in the chapter on healing, reproductive genetic technologies that incorporate gene editing have the potential to correct some human genetic disorders as well as to enhance certain human traits. The uses of such technologies involve both a scientific understanding of human development and a religious understanding of the nature of being human and the role of suffering in life. Such areas of overlap will likely be a source of contention for some time.

Ecklund has written a thoughtful book that addresses areas of interest shared by both scientists and people of faith and explores some of the issues that may continue to divide them. It will be a useful book for facilitating discussions about science in our faith communities—something which Ecklund correctly identifies as sorely lacking. However, I am not convinced that she has truly answered the question of “why science and faith need each other.” The word “need” implies that one is diminished by having only one, without the other. She cites scientists who feel that their faith has enriched their work. But is “enriching” all that faith can do, and is that a need or an optional enhancement? If it is indeed a need, then there should be evidence of benefit by those who possess both. Do scientists of faith produce more or fewer leading-edge discoveries than secular scientists? Are they more or less likely to be outstanding mentors, more or less likely to become academic leaders or leaders in industry, more or less likely to serve in professional societies? Similarly, are people of faith who have positive views of science and employ values such as curiosity, doubt,

creativity in ways similar to that of scientists—are they more or less likely to be leaders or influencers in their community, more or less likely to be satisfied with their spiritual lives, more or less likely to be involved in outreach, evangelism, or social justice ministries? As sociologists with extensive experience in this area and in the required methods, Ecklund and her colleagues are uniquely equipped to answer these questions.

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SOCIOLOGY OF SCIENCE

THE SCIENTIFIC METHOD: An Evolution of Thinking from Darwin to Dewey by Henry M. Cowles. Cambridge, MA: Harvard University Press, 2020. 384 pages. Hardcover; \$35.00. ISBN: 9780674976191.

Despite its main title, this book is not an analysis of the scientific method as such, or its use by scientists, but rather it is a socio-cultural history of that method as an idea, as the subtitle indicates. Cowles begins the book with the eye-catching claim: “The scientific method does not exist. But ‘the scientific method’ does.” By this he means that the scientific method, as portrayed in (high school) science textbooks, does not exist as a universal method employed by scientists in their quest for new knowledge. Rather, what does exist is a history of ideas: a set of philosophical ideas that transformed into notions about the mind and cognition, which ultimately ended up as a set of steps in introductory chapters in textbooks presented as a universal method.

Cowles combines exhaustive research with interesting storytelling to weave a fascinating narrative about the history of the idea of method. The second chapter, “Hypothesis Unbound,” sets the stage for his narrative: although Thomas Carlyle, Charles Babbage, and John Herschel make cameo appearances here, Cowles’s main thread is the public philosophical disagreement between William Whewell and John Stuart Mill on what constituted thinking. This prepares the ground for Cowles’s main thread, which begins in earnest with the third chapter, “Nature’s Method.” Here he suggests that Charles Darwin’s goal of presenting evolution meant paying close attention to methods of thinking—and this began

the story of how a philosophical idea about method evolved into taking it as a natural form of cognition.

Chapter four, “Mental Evolution,” highlights Alexander Bain and Herbert Spencer’s thought, which takes the debates about method and evolution into the realm of social development, whereas chapter five, “A Living Science,” chronicles the rise of pragmatism in the United States—with Charles Pierce and William James—and its use of method as a way to think about logic, psychology, and practical problem-solving. Chapter six, “Animal Intelligence,” feels a bit like an interlude with its focus on the rise of behaviorism in psychology, featuring John Watson, Edward Thorndike, and B. F. Skinner. Cowles’s history ends with two chapters entitled “Laboratory School” and “A Method Only,” in which he narrates how John Dewey’s book *How We Think* became the basis for embedding this naturalized model of thinking into textbooks as “the scientific method.” The main threads of Cowles’s narrative move from discussions around what sort of methodology might unite science generally to the way that psychology sought to read “method” as a way of understanding intelligence and cognition.

As a book of cultural history, *The Scientific Method* is a fascinating, detailed account of how “method” threaded its way through political, cultural, social, and academic discussions. Cowles’s chapters are exhaustively researched, and are peppered with quotes and anecdotes. It is impressive scholarship, although perhaps dizzying at times, for it is sometimes difficult to keep track of the main theme in the myriad of detail that rushes at the reader. This also makes the book feel a bit unfocused—as a chapter develops its rich details of analysis and discovery, the main idea about accounting for “the scientific method” seems to get lost; at times, it is difficult to see the relevance of all the rich and interesting detail to the book’s main point.

Further, although the book claims, in its first chapter, to show that there is no such thing as “the scientific method,” it actually spends little to no time actually analyzing the legitimacy of “the method” itself or its possible use among scientists, either in the social or natural sciences. Do psychologists or sociologists use (something like) scientific methods? Do biologists, chemists, or physicists? Cowles’s book says little about this. Although Cowles’s introductory

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claim might lead a reader to think that they would find at least reference to philosophical analyses of the scientific method—such as Barry Gower’s historical and philosophical book, *Scientific Method* (Routledge, 1997)—Cowles’s book is not about the use of methods by actual scientists in the course of their research nor about a philosophical analysis of the philosophical debates and controversies around “the scientific method.” This might have required substantive discussion—perhaps with their own chapters—about figures such as Galileo Galilei, Francis Bacon, and Isaac Newton, as well as more recent figures such as Rudolf Carnap, Karl Popper, and Hans Reichenbach; discussions around induction and truth would have figured more prominently as well. Although, at the start of the book, a reader might feel that the book is meant to be a complete history of this idea, in the end, it has a more limited claim—that is, how “the scientific method” ended up as a set of steps of inquiry in (high school) science textbooks. Cowles’s book is an interesting history of this more limited claim, and those looking for a more conceptual or philosophical discussion around the merits of “the” scientific method, will have to look elsewhere.

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SECULARITY AND SCIENCE: What Scientists around the World Really Think about Religion by Elaine Howard Ecklund et al. New York: Oxford University Press, 2019. 352 pages. Hardcover; \$31.95. ISBN: 9780191926755.

I was raised in the 1980s and 1990s under conservative evangelicalism, which means my father’s bookshelf was full of creation/evolution texts, and we never missed Ken Ham when he came to town. The conflict narrative between science and religion was in full force then, and it remains with us today (if slightly diminished). Religious conservatives weren’t the only ones talking secularization, though. Scholars such as Peter Berger had observed decades earlier that science often acts as a carrier of secularization. Berger lived long enough, however, to see that secularization did not unfold as expected, and he modified his view near the close of the millennium to indicate that secularization is not a uniform process. Rather, we observe “multiple modernities” marked by various trajectories of secularization and religious growth.

Such is the essential backdrop for *Secularity and Science: What Scientists around the World Really Think about Religion*. Here, Rice University sociologist Elaine Howard Ecklund and her team ask a simple and compelling question: If science is linked to secularization—as the story so often goes—what do scientists actually think about religion? The answer comes via survey research on 20,000 physicists and biologists in France, Hong Kong, India, Italy, Taiwan, Turkey, the United Kingdom, and the United States, as well as 600 in-depth interviews. The result is an impressive and wide-ranging report not only on the status of religion and science in a global perspective, but also on several theoretical and practical considerations surrounding the secularization debate. As sociologists they take care to address hierarchical and institutional matters (i.e., academic rank, university status and prestige, levels of science infrastructure, etc.), and as scholars of religion they investigate how religious factors vary across national contexts (i.e., definitions of religion and spirituality, religious characteristics of populations, state-church relations, antagonism between scientists and the general public, the place of religion in the scientific workplace, etc.). Each country or region receives a focused chapter, briefly summarized below.

The *United States* (chap. 3, “The ‘Problem’ of the Public”) is characterized by a soft secularism in which 65% of scientists believe in God. US scientists aren’t particularly antagonistic to religion, but significant conflict between scientists and the public exists due to the large, politically active, conservative Christian population. This public issue plays a role in undermining the US scientific enterprise.

In the *United Kingdom* (chap. 4, “‘New Atheists’ and ‘Dangerous Muslims’”), 57% of scientists believe in God. The UK is characterized by a unique dynamic in which new atheist scientists speak at the popular level while at the same time half of the country’s scientists originate outside the UK, often bringing religious values with them. UK biologists expressed concern about a growing Muslim population and implications for some realms of scientific thought (e.g., evolution).

In *France* (chap. 5, “Assertive Secularism in Science”), 49% of scientists report belief in God. French secularism is based on *laïcité* (freedom from religion) and the

state actively excludes religion from public life. The result is that dialogue between religion and science is difficult to sustain, with *laïcité* disproportionately affecting Muslim women in science.

Eighty percent of scientists in *Italy* (chap. 6, “A Distinctively Catholic Religion and Science”) believe in God. Conflict between science and religion is a non-issue, largely due to the monolithic nature of cultural Catholicism (“Everyone’s Catholic. And nobody cares,” p. 7). Even non-Catholic scientists, many of whom identify as “spiritual but not religious,” tend to see religion and science as separate realms in what could be called “a version of religious modernity.” Scientists belonging to certain Catholic networks appear to have better access to jobs, funding, and other opportunities.

In *Turkey* (chap. 7, “The Politics of Secular Muslims”), 94% of scientists say they believe in God. Turkish scientists broadly believe in God but do not see themselves necessarily as personally religious. They observe little conflict between science and religion when Islam is considered broadly, but express concern about the ascendancy of a political form of Islam which threatens academic freedom. Many Turkish academics are leaving the country, and scientific infrastructure has suffered in recent years.

In *India* (chap. 8, “Science and Religion as Intimately Intertwined”), 90% of scientists report belief in God, and religious affiliation among scientists is higher than in the general public. India is a growing scientific superpower, and religion is so “in the air” that Indian scientists often make connections between religion and science without even noticing. A number of Indian scientists observe that the “conflict” between religion and science is a Western construction.

In *Hong Kong and Taiwan* (chap. 9, “A Science-Friendly Christianity and Folk Religion”), 90% (Taiwan) and 74% (Hong Kong) of scientists believe in God or gods. Like India, affiliation among scientists is higher than in the general population. Both of these regions’ education systems have been influenced by Christianity, and scientists in Hong Kong speak of meeting faculty and administrators in the sciences at Christian churches. Despite the influence of Christianity, the Western science and religion conflict narrative is not strong.

These summary points hardly do justice to the scope of the authors’ project, but they do highlight something that they themselves hold up as a central finding: namely, that *conflict between religion and science is an invention of the West*. The data indicate that a conflict perspective animates just one-third of scientists in the US, the UK, and France, with the remaining countries evincing much lower numbers. Rather, science and religion are most commonly viewed as different aspects of reality—independent of one another—a view embraced by both nonreligious and religious scientists. Regarding religious scientists, the authors report that from a global perspective there are many more than commonly assumed. Even scientists themselves consistently underestimate the proportion of their colleagues who are religious.

Overall, the book provides tremendous insight, thanks to rich quantitative and qualitative data, into how national and social contexts shape and interact with scientists’ views of religion. No other study of this magnitude exists, and that fact alone makes it a remarkable achievement worthy of examination. Its greatest strength lies in the treatment of each country and region, with effective data and storytelling illuminating the relation between science and religion in that location.

The primary weaknesses are the minimal synthesis of cross-national data and the limited discussion of how results fit within the larger secularization debate (which the authors use to frame the book). Secularization themes are treated on a country-by-country basis, but only seven pages of the concluding chapter attempt a synthesis, and the discussion is largely practical. Given the expertise of the authors involved, it feels like a missed opportunity for a more theoretically rich discussion. I would like to have seen, for example, discussion on whether the independence model (as opposed to the conflict model) is itself linked to secularization. The majority of the world’s scientists may be at least nominally religious, but without explicit philosophical and theological work to engage science, isn’t it probable that the independence model might just as easily contribute to secularization as oppose it? In other words, whose secularity are we talking about? Strong atheists may view independence as accommodating religion; the highly devout may interpret it as another facet of secularity.

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That said, the book is an empirical rather than a theoretical work, and an excellent one at that. The data are rich enough for readers well versed in the secularization debate to incorporate them into their own hypotheses. The primary message, supported by a wealth of rigorous data, indicates that global scientists are more religious than we often realize, and that narratives around science and religion in the US are not the only ones requiring our attention.

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TECHNOLOGY

MASTERS OR SLAVES? AI and the Future of Humanity by Jeremy Peckham. London, UK: InterVarsity Press, 2021. 256 pages. Paperback; \$31.99. ISBN: 9781789742398.

Will humans maintain their status as masters of their own creation or will they inevitably become slaves to these creations? Jeremy Peckham's book is another Christian analysis of the progress in artificial intelligence (AI) and a warning to the world of the dangers AI poses for the individual and for society at large. Peckham believes that the unregulated research and development of AI coupled with the laissez-faire usage of AI systems will result in humanity's degradation.

In the first chapter, Peckham captures the reader's attention by presenting a short fictional account of the Jefferson family starting their day in a world saturated with computer technology. This introductory story highlights the new technological reality in which we need to seriously explore AI's influence on humanity. In chapters two and three, Peckham presents a quick historical overview of computer and AI development. Chapter two begins with how computers and AI started as simplistic number-crunching machines that went from "winters" of technological disappointment to rapid progress with massive global impact. With this rapid evolution of AI, a necessary change is needed to determine whether AI can be considered morally neutral.

To address the growing danger and influence AI has on humanity, Peckham builds his argument in chapter four on the foundation that there is something special and unique about humanity. Humans are not only flesh and blood creatures but also bearers of

God's given *imago Dei* ("image of God"). This *imago Dei* is what separates humans from other nonliving and living things. In addition, as part of the *imago Dei*, Peckham affirms that humans have true freedom of choice. While Peckham does not provide a comprehensive examination of various philosophical stances regarding free will, he suggests that the ability of human beings to make choices freely is crucial to understanding how they are created in God's image. Beginning with the foundation of human's *imago Dei*, Peckham develops a Christian critique of AI by examining technology's effect upon this most important aspect of humanity.

Following his chapter on humanity's *imago Dei*, Peckham's main argument is further developed in chapters five to ten where he identifies six key areas of technology which threaten or have the possibility of threatening the *imago Dei*. In chapter five, Peckham is concerned that the continued reliance on AI to make decisions based on the premise that AI is unbiased is dangerous. Trusting AI technology in this manner further distances our relationship with other humans and elevates AI "reasoning" to human-like levels. In chapter six, human relationships with chatbots and digital assistants are the focus. Here, Peckham fears that the increasingly human (and often female) personification of digital assistants will lead to a distortion of emotional attachment and even to the illusion that we owe these artifacts ethical treatment. In chapter seven, Peckham considers whether the increased convenience and perceived general safety offered by state-controlled AI is worth the cost of restricting individual freedoms. For Peckham, the cost of individual freedom is too high a price to pay for the convenience which the state or the "Big Tech" companies now wield with substantial power and influence over the individual.

Chapter eight highlights the moral dilemma of whether an autonomous machine (such as a self-driving car) should be held morally responsible for its actions. Peckham believes that moral responsibility must ultimately remain with a human rather than placed on a machine. In chapter nine, Peckham addresses the growing concern that continued AI progress will result in fewer jobs available or in jobs that require higher technological proficiency. To address this growing concern, Peckham briefly explores the possibility of a UBI (universal basic

income) and encourages a reexamination of a theology of work. Finally, Peckham's last critique of AI centers on its implementation in video games and virtual reality. Peckham fears that these digital realities present a slippery slope for users who will be unable to differentiate between true reality and digital reality.

In the final two chapters (eleven and twelve), Peckham considers a Christian response to AI progress along with developing a Christian manifesto toward AI research and usage. Rather than utilizing AI technology mindlessly or carelessly, Peckham exhorts the reader to seriously consider the substantial influence AI has upon the individual and how AI development should be regulated moving forward. To properly consider and regulate AI, Peckham argues that a Christian worldview provides the best framework with which to understand humanity and our relationship with technological artifacts. Thus, his brief Christian manifesto serves to introduce how Christians can have a voice in the AI conversation.

Peckham's educational and vocational background in computer technology serves him well in writing this book. He has worked on computer and AI technology in both the government and commercial sectors. With his background in various AI technologies, Peckham understands how AI technology is built, how it functions, and the intentions behind the design. This is a strength of the book since many Christians who discuss AI often lack the requisite training and expertise.

Although Peckham does understand AI technology well, he does not examine the ontological considerations of AI. Peckham looks mostly at the effects of AI technology and then tries to develop a critique of that technology rather than relying on more philosophical arguments. Peckham's critique throughout the chapters would be stronger if he considered an ontology of AI or provided a more detailed explanation of what AI is before presenting his critique. At several points throughout the book, Peckham implores the reader to consider the harmful consequences of AI technology, but he does not look into the deeper fundamental philosophical presuppositions.

In addition, chapter ten, addressing video game AI and virtual reality technology, comes across as outdated, restating many of the traditional Christian

arguments against video games. While Peckham does helpfully highlight the new AI technologies used in video games (such as augmented and virtual reality), his criticisms of video games ignore the numerous variations of games as well as the communities built around video games. By presenting a familiar Christian critique, Peckham risks dismissing some of the more-recent developments in the video game industry as well as alienating readers who are active within that community.

Overall, *Masters or Slaves?* is a welcome addition to the growing Christian literature on AI. In comparison to other recent Christian publications on AI, such as Jason Thacker's *The Age of AI* or John Lennox's *2084*, Peckham's contribution has a stronger technical foundation due to his extensive background in the technology. Peckham expresses moral concerns similar to those of other authors about the development of AI, while covering a large number of areas that AI currently, or will inevitably, affect. Although Peckham could certainly provide even more background on specific AI technologies, his book serves as an excellent introduction to a Christian response to AI.

Reviewed by Eddy Wu, IT Operations Manager and PhD student at Southeastern Baptist Theological Seminary, Wake Forest, NC 27587.

THE ALIGNMENT PROBLEM: Machine Learning and Human Values by Brian Christian. New York: W.W. Norton, 2020. 344 pages. Hardcover; \$28.95. ISBN: 9780393635829.

The global conversation about artificial intelligence (AI) is increasingly polemic—"AI will change the world!" "AI will ruin the world!" Amidst the strife, Brian Christian's work stands out. It is thoughtful, nuanced, and, at times, even poetic. Coming on the heels of his two other bestsellers, *The Most Human Human* and *Algorithms to Live By*, this meticulously researched recounting of the last decade of research into AI safety provides a broad perspective of the field and its future.

The "alignment problem" in the title refers to the disconnect between what AI does and what we want it to do. In Christian's words, it is the disconnect between "machine learning and human values." This disconnect has been the subject of intense research in recent years, as both companies and academics

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continually discover that AIs inherit the mistakes and biases of their creators.

For example, we train AIs that predict recidivism rates of convicted criminals in hopes of crafting more accurate sentences. However, the AIs produce racially biased outcomes. Or, we train AIs which map words into mathematical spaces. These AIs can perform mathematical “computations” on words, such as “king - man + woman = queen” and “Paris - France + Italy = Rome.” But they also say that “doctor - man + woman = nurse” and “computer programmer - man + woman = homemaker.” These examples of racial and gender bias are some of the numerous ways that human bias appears inside the supposedly impartial tools we have created.

As Norbert Wiener, a famous mathematician in the mid-twentieth century, put it, “We had better be sure the purpose put into the machine is the purpose which we really desire” (p. 312). The discoveries of the last ten years have shocked researchers into realizing that our machines have purposes we never intended. Christian’s message is clear: these mistakes must be fixed before those machines become a fixed part of our everyday lives.

The book is divided into three main sections. The first, *Prophecy*, provides a historical overview of how researchers uncovered the AI biases that are now well known. It traces the origins of how AI models ended up in the public sphere and the history of how people have tried to solve the problems AI creates. Perhaps one of the most interesting anecdotes in this section is about how researchers try to create explainable models to comply with GDPR requirements.

The second section, *Agency*, explores the alignment problem in the context of reinforcement learning. Reinforcement learning involves teaching computer “agents” (aka AIs) to perform certain tasks using complex reward systems. Time and time again, the reward systems that researchers create have unintended side effects, and Christian recounts numerous humorous examples of this. He explains in simple terms why it is so difficult to correctly motivate the behaviors we wish to see in others (both humans and machines), and what it might take to create machines which are truly curious. This section feels a bit long. Christian dives deeply into the research of a few

specific labs and appears to lose his logical thread in the weeds of research. Eventually, he emerges.

The final section, *Normativity*, provides perspective on current efforts to understand and fix the alignment problem. Its subchapters, “Imitation,” “Inference,” and “Uncertainty,” reference different qualities that human researchers struggle to instill in machines. Imitating correct behaviors while ignoring bad ones is hard, as is getting a machine to perform correctly on data it hasn’t seen before. Finally, teaching a model (and humans reading its results) to correctly interpret uncertainty is an active area of research with no concrete solutions.

After spending over three hundred pages recounting the pitfalls of AI and the difficulties of realigning models with human values, Christian ends on a hopeful note. He postulates that the issues discovered in machine-learning models illuminate societal issues that might otherwise be ignored.

Unfair pretrial detection models, for one thing, shine a spotlight on upstream inequities. Biased language models give us, among other things, a way to measure the state of our discourse and offer us a benchmark against which to try to improve and better ourselves ... In seeing a kind of mind at work as it digests and reacts to the world, we will learn something both about the world and also, perhaps, about minds. (p. 328)

As a Christ-follower, I believe the biases found in AI are both terrible and unsurprising. Humans are imperfect creators. While researchers’ efforts to fix biases and shortcomings in AI systems are important and worthwhile, they can never exorcise fallen human nature from AI. Christian’s conclusions about AI pointing to biases in humans comes close to this idea but avoids taking an overtly theological stance.

This book is well worth reading for those who wish to better understand the limitations of AI and current efforts to fix them. It weaves together history, mathematics, ethics, and philosophy, while remaining accessible to a broad audience through smooth explanations of detailed concepts. You don’t need to be an AI expert (or even familiar with AI at all) to appreciate this book’s insights.

After you’re done reading it, recommend this book to the next person who tells you, with absolute certainty, that AI will either save or ruin the world.

Christian's book provides a much-needed dose of sanity and perspective amidst the hype.

Reviewed by Emily Wenger, graduate student in the Department of Computer Science, University of Chicago, Chicago, IL 60637.

THE MYTH OF ARTIFICIAL INTELLIGENCE: Why Computers Can't Think the Way We Do by Erik J. Larson. Cambridge, MA: Belknap Press, 2021. 312 pages. Hardcover; \$29.95. ISBN: 9780674983519.

The Myth of Artificial Intelligence (AI) offers a technical and philosophical introduction to AI with an emphasis on AI's limitations. Larson, a computer scientist and tech entrepreneur, keeps his central claim modest: true general AI is neither inevitable nor imminent, and if it is possible, it will require fundamentally new approaches. It is an easy read, combining references to fiction, history, and science. It lays out a bird's eye view of the origins and ideas behind current AI methods, focusing on general AI, a category of AI that would need to learn and engage with a wide variety of problems.

Separated into three parts, *The Myth of AI* begins with the history and algorithmic logic of AI, largely through the lens of the Turing test. Larson argues that we are not near the singularity (superintelligent computers able to create ever more intelligent machines) and that, in fact, the basic premise of the singularity is flawed.

The second part discusses inference. AI falls short of human intelligence because it can work with hard rules, but cannot make the guesses necessary to formulate new ones or handle uncertain rules. In attempts at the Turing test, AI can throw data at the problem but will always lack understanding. Achieving the understanding necessary for true intelligence will require an approach fundamentally different from recent advances made in AI, which are only effective for narrow AI (a category of AI for solving specialized problems) and not general AI.

The final, and relatively brief, part examines AI in science. According to Larson's assessment, new scientific research relies heavily on newly available computation power and big data in order to use narrow AI to its full extent. Larson claims that this approach will hinder development of new theories. He also claims that this leads to treating scientists as if they were computers as well, which causes overvalu-

ing the system of science above people. He criticizes "swarm science," which he describes as a large group of scientists approaching one problem with a variety of projects, emphasizing this collaboration over the individuals. Instead, he claims, we need our culture to continue to emphasize individual discovery and intelligence, as it is the key to innovation.

Through the discussions of the history, philosophy, and logic of AI in the first two parts of the book, Larson disentangles the hype of AI from what is actually possible with current technology. Even as he sheds light on the gap between the singularity prediction and what machine learning is truly capable of, he emphasizes the significance of the myth. "The myth is an emotional lighthouse by which we navigate the AI topic" (p. 76). The stories we tell through predictions and science fiction define AI in the public eye and set the goals for AI research.

Our underlying philosophy matters as much as the current state of AI research, when we consider the social role of AI and what we predict for our future. In the development of AI, we must define intelligence and explore what it means to be human. While this is not a book with overtly religious claims, it does acknowledge the spiritual claims inherent in discussions of personhood. It also frames technoscience as replacing philosophy and religion and as the oversimplified understanding of humanity and the precursor to expectations of the singularity.

Beyond the stated goal of disenchanting the reader of the inevitability of AI, the book highlights the significance of stories to both society and science and emphasizes the importance of understanding for both humans and AI. We need to understand not only the technical aspects of the technology we build but also the philosophy that defines our goals.

While I found the first two sections of the book to be an engaging and accurate discussion of the tension between the science and hopes of AI, I had concerns about the warnings of "swarm science" in the third. Larson is placing a strong emphasis on individual genius in science; however, science has never been a truly independent endeavor. Many times in history, from evolution to DNA, multiple teams of scientists independently made the same discoveries at nearly the same time, based on previously published work. Though these discoveries were not inevitable, they

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built upon other research and relied on collaboration at least as much as individual genius. Larson focuses on a particular neuroscience project and makes some valid criticisms, but then he generalizes his observations to all of science in ways that I do not believe to be accurate. His argument that all of science is moving away from theory toward shallow observations is not as obvious as he claims, nor is it supported by the evidence offered in the book.

As a counterexample, the research that resulted in the COVID-19 vaccine could be considered “swarm science” and was effective. Large amounts of funding were very suddenly directed to many scientists for one goal: understand and prevent the coronavirus. Due to both new funding and established research, we developed and approved multiple vaccines in one year. I was not convinced of several of Larson’s generalizations in this third section. Tension between celebrating collaboration and individual genius will persist. However, it appears that there is more collaboration in science today. This is likely due to a variety of reasons, including a scientific community connected by the internet and more contributors receiving appropriate credit for their work.

The Myth of AI is a broad view of AI that should prove valuable and comprehensible to readers with or without a technical background. The first two sections offer a clear explanation and history of AI, and the third offers food for thought on how the process of science has been shaped by advances in AI and computer technology. The first sections would be a good introduction to someone not familiar with AI or looking to think about the philosophy of AI and I would recommend the book for these sections.

While the book avoids religious claims, the philosophical discussions of what it means to “understand” and the level of trust we place in AI are essential questions for Christians working in technology-related disciplines. *The Myth of AI* presents a jumping-off point for much deeper reflection about using AI responsibly and what it means to be human.

Reviewed by Elizabeth Koning, graduate student in the Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, IL 61801.

THEOLOGY

SCIENCE IN THEOLOGY: Encounters between Science and the Christian Tradition by Neil Messer. New York: T&T Clark, 2020. xii + 191 pages. Paperback; \$22.95. ISBN: 9780567689818.

When reading this title, I confess that I wondered if we really need another book on science and theology, or another typology of the relationship between the two, or another critique of typologies. On finishing the volume, however, I believe that it does indeed make a helpful contribution to the expanding literature on the subject.

Neil Messer, professor of theology at the University of Winchester, UK, has a PhD in molecular biology and an MA in Christian ethics. *Science in Theology* is a well-researched, accessible treatment of the relationship between the two. The preposition in Messer’s title is intentional, suggesting that we focus on what part science plays *in* our Christian conceptions about ourselves and our world in relation to God, rather than adopting a modern view of science *and* theology as separate categories. This hints at his welcome prioritizing of theology—faith seeking understanding, not faith looking for science to justify faith’s veracity. Like many, he considers both the voice of the Christian tradition (incorporating the familiar quadrilateral of scripture, tradition, reason, and experience) and the scientific voice (including only the last two aspects of the quadrilateral). Messer argues that previous typologies are too broad and have difficulty accommodating the diversity and complexity of current literature in the field.

He proposes a five-fold typology, which I find appealing in its simplicity and applicability:

1. Only the scientific voice contributes; contributions from Christianity are denied or dismissed.
2. Both voices contribute, but the scientific one is dominant; Christian claims must be adjusted to fit the scientific perspective.
3. Both voices contribute equally.
4. Both voices contribute, but the Christian one dominates in shaping the encounter.
5. Only the voice of the Christian tradition contributes; scientific claims are denied or dismissed.

What is unique about Messer's work is not just his new typology, but the fact that he tests it and, in doing so, also provides a summary of the current literature in three diverse areas of the science-faith dialogue: divine action, natural evil, and the cognitive study of religion. Messer notes that his typology focuses on the approach to a topic, not on the content of the argument. Thus, two authors may use the same method but disagree with each other's conclusions. In addition, the contribution of each tradition is qualitative as well as quantitative; how much as well as what we learn from science or theology is important.

Messer acknowledges that it is easy for types to meld together: a Type 3 plan can easily slip into a Type 2, and a Type 4 approach could be similar to the concept of non-overlapping magisteria (more like Type 5). He cautions that his typology can only describe particular positions, and thus should not be used to make generalizations. He also admits that his typology focuses on cognitive aspects of faith to the exclusion of confessional and practical aspects, and that not all topics allow integration (e.g., Christ's incarnation and resurrection, eschatology). However, Messer's typology does allow for flexibility and nuance—he claims that his typology makes diversity more visible. Furthermore, each approach can be used as a critique to the others.

Messer notes that Types 1 and 5 tend to close down the dialogue but offer helpful contributions on occasion. Interestingly, he notes an example of a Christian who uses a Type 1-style argument: cognitive scientist Justin Barrett uses only empirical evidence and reason to support claims about God's existence and nature. Messer believes that Types 3 and 4 are generally the most helpful approaches. This is interesting because it is often assumed that ideal science-faith integration should allow equal contributions. But a true Type 3 approach is challenging because we all start from a particular position. If we view the world through a Christian lens, then Type 4 becomes the aim.

With respect to his first topic, divine action, Messer appropriately notes that most of the work done in this area, namely the Divine Action Project, has been of a Type 2 variety. The critique is that excess reliance on science may limit our conceptions of how God acts in the world. This was personally helpful,

as I have questioned the feasibility of such a project—categorizing it helps to explain my doubts. Messer discusses the recent "theological turn" in the debate, noting that it too has problems.

On the topic of evolution and natural evil, Messer, not surprisingly, refers to his own publications, categorizing his work as Type 4. He argues that Type 2 approaches require unnecessary distancing of God from his creation, and that the "only way" or "best of all possible worlds" (Type 3) argument of Christopher Southgate inadequately accounts for suffering, and places too much weight on science as a means for understanding God's goodness. Messer instead follows Barth in viewing evil as "nothingness," a by-product of creation, and emphasizes our need to counteract evil.

I especially appreciate Messer's inclusion of scientific studies of religion as his final test case; this topic is not often considered in science-theology texts. He considers cognitive factors in religious belief, evolutionary accounts of religion, and neuroscientific studies of belief. Type 3 examples include Barrett's "confessional natural theology" and Nancey Murphy's idea of theology as secondary to experience. Barth's critique of theology that starts with human experience is used as an example of Type 4 (although Barth would not have known about scientific studies of religion). Perhaps because of the diversity of the topic, the treatment of it was less clear than in previous chapters. Works used to illustrate the typologies are often addressing quite different questions. This chapter would have benefited from a clarification of the distinctions between faith and religion, and a consideration of differing presuppositions, such as the mind-brain relationship, in the various positions.

In his conclusion, Messer interestingly considers other voices aside from science and theology, namely, philosophy and the arts. I love that he offers a nod to poetry as a nonscientific way to understand reality. Unfortunately, these discussions are very brief. I would have liked more discussion on how the arts relate to his typology, or a broader typology such as models of the relationship between culture and Christianity.

Finally, Messer offers suggestions for how to use this book, either as a means to evaluate, clarify, and categorize other works, or to write a new one. Naturally,

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I evaluated my own recent work on causation and discovered that although my intent was more Type 3, I ended up perhaps closer to Type 4! It will be interesting to see how others apply Messer's typology.

Although I appreciate its brevity, I would have read this book even if it were longer! I do wonder if some topics could have been addressed with greater detail, and if other topics, such as technology, creation care, or astrobiology could have been included. Nevertheless, *Science in Theology* offers a very helpful new framework for conceptualizing the dialogue between the two subjects as well as providing an excellent introduction to some contemporary issues, suitable for students or for the nonspecialist looking to further his/her education on the topic.

Reviewed by E. Janet Warren, Past President of the Canadian Scientific and Christian Affiliation.

THE DOCTRINE OF CREATION: A Constructive Kuyperian Approach by Bruce Riley Ashford and Craig G. Bartholomew. Downers Grove, IL: IVP Academic, 2020. 366 pages, appendix, bibliography, index. Hardcover; \$50.00. ISBN: 9780830854905.

This book is a welcome addition to our need for more work on the doctrine of creation. The authors, one Baptist (Ashford) and one Anglican (Bartholomew), offer what they term a "Kuyperian" or Dutch neo-Calvinist perspective (perhaps more properly, neo-Reformed?). They seek to be exegetical, not merely creedal, in their exposition. In 366 pages of text, they offer a doctrine of creation that comprehends the classical loci and add some of more recent concern.

The authors cover the classical loci in a systematic, well-organized way. In the first, creedally based, chapter, they lay out their approach and orient readers to their exposition of the doctrine. The following two chapters provide a brief but very well-done history of the doctrine. In the chapter from the early church up to the modern period, they survey the teachers of the church, with Irenaeus holding pride of place. This survey touches on the right people and draws out the constructive contributions that each makes. The only group that is treated almost entirely negatively is, predictably, the Anabaptists (pp. 66–68). The authors select negative examples, confuse an Anabaptist doctrine of the world with a doctrine of creation, and make tendentious use

of selective quotes. It's hard to credit Anabaptists with a denigration of creation (or earthly matters) when they have well-formed practices of communal life, the sharing of goods, and, to be anachronistic, a thoughtful political theology rooted in particular practices of pacifism. Anabaptists are far from perfect, but they do not lack a doctrine of creation. It's just not one that's discernible through Dutch neo-Calvinist eyes.

The following chapter is an insightful tour of some highlights of the Modern Period with welcome attention to the wrongly neglected Johann Georg Hamann (pp. 75–80). In a clear and concise account of interpretations of Genesis 1 and the entanglement of God, creation, and science, Ashford and Bartholomew describe five positions that depend on "the conclusions of modern science" (p. 98). They then espouse a "literary framework theory" represented by Lee Irons and Meredith Kline, which argues that Genesis 1 reveals "three creation kingdoms" (days 1–3) and "three creation kings" (days 4–6). The picture is completed on day 7 when "God establishes himself as King on the Sabbath" (p. 98). This is filled out in the authors' later chapter on Genesis 1: the three creation kingdoms are "light; sky/seas; land/vegetation;" the three creation kings are "luminaries; sea creatures/winged creatures; land animals/men" (*sic*, pp. 155–70). This chapter concludes with a foundational assertion:

In the twenty-first century, a full-orbed Irenaean doctrine of creation presents itself as a salient remedy for the ills of our modern and postmodern eras ... Among Christian traditions in the modern period, the Dutch neo-Calvinist tradition is, in our opinion, particularly fruitful in providing resources for a recovery and renewal of the Irenaean doctrine of creation. (p. 99)

Following from this, the authors "outline the broad contours of the neo-Calvinist view of creation in seven propositions ..." (p. 103). Most of these propositions are familiar and commonplace within Christian orthodoxy. But two require further comment. The sixth proposition states that "*sin and evil cannot corrupt God's good creation structurally or substantially*" (p. 102; italics theirs). There may be profound truth in this, but the question of corrupt structures must be clarified. How does a "Kuyperian approach" empower a critique of injustice and oppression in, for example, the over-familiar case of apartheid?

The concept of incorruptible structures cries out for further elucidation and glaring warnings against its abuse. The seventh proposition states that “*God’s restoration of creation will be an elevation and enhancement of creation in its original form*” (p. 102). Here the language seems to fall short of a full-orbed Irenaean doctrine of creation. Isn’t God’s restoration the *fulfillment and completion* of creation?

After these first chapters that establish the direction and tone for the book, the following chapters are remarkably comprehensive in doctrinal coverage and practical import. Most of the ground covered is traditional, but the authors’ discussions are lively and well argued. They proceed mostly by engaging the works of others, so readers of these chapters will receive an education in the scholarly world of the doctrine of creation. One welcome contribution, among others, is an entire chapter devoted to “The Heavenly Realm,” which retrieves this inescapable biblical teaching and guards against “over-spiritualizing” (pp. 202–22).

Throughout the book, the authors maintain their commitment to biblical exegesis. They do this through engagement with the work of other scholars, which occasionally threatens to overshadow the biblical text itself. Like the rest of us heirs of modernity, they struggle to achieve what Oswald Bayer says of Hamann: “Scripture interprets me and not I scripture” (p. 77). Still, their determination to be faithful to the biblical narrative as they “do theology” is one to emulate.

Their commitment to exegetically grounded theology is fully displayed in a chapter devoted to Genesis 1. As they engage critically with other scholars, they lay out the foundations of their doctrine of creation. The chapter concludes with an exposition of creation order in the Kuyperian tradition. For the authors, “Creation order is good news!” (p. 173), allowing for the flourishing of life. Injustice only appears against the backdrop of this order. They conclude the chapter with one of their many in-text excurses, asserting that “at the heart of the biblical metanarrative stands the cross, which alerts us to the grace of the biblical story and its resistance to violent coercion” (p. 174).

Here, a number of questions arise. How can the crucifixion of a Galilean peasant on a hill outside Jerusalem sometime around AD 33, be part of a

metanarrative? Doesn’t its particularity preclude that? Don’t we need some other language? Would “Christ is Lord” suffice? How might their account of creation order change if the crucifixion was indeed at the heart of their account? Are there forms of coercion that are not violent? If so, does the biblical story resist those? Is “resistance” strong enough to represent the relationship between the story and violence?

The following chapter, “Place, Plants, Animals, Humans, and Creation,” covers a wide range of topics grounded in exegetical theology that leads to changed disposition. This excellent chapter brings together all the strengths of the book: its biblical exegesis, theological maturity, and practices grounded in the first two.

In the chapters that follow, Ashford and Bartholomew cover a lot of ground and give direction from “the Kuyperian tradition.” This is evident in their discussions of sin, common grace, culture making, and providence, among other things. Culture making (in chapter 9, “Creation and Culture”) takes on particular importance in their account. It occurs in “spheres” that “have their own integrity and function according to unique, God-given principles” (p. 267). But like some of their earlier accounts of creation order, true relationality is mostly missing. Culture doesn’t occur in spheres; it occurs in messy, boundary-crossing relationships between God, humans, nonhuman creation, and self. Yes, God is sovereign over all of life, but it is a relational sovereignty, not a spherical and principled sovereignty. Moreover, one could easily conclude that culture making, as in the Kuyperian tradition, is the main calling of human beings. Missional witness to Jesus Christ by the body of Christ is offstage. It is possible to see the so-called cultural mandate of Genesis 1:26–31 as our missional mandate, in which case the wholistic calling envisioned by a “cultural mandate” is really a full, biblical practice of the missional mandate of Genesis 1. The calling is lived out in the healing of relationships under the condition of fallenness through the crucifixion of the one “through whom and for whom all things have been created,” and in obedience to the Great Commission and Great Commandment.

Perhaps one striking indication of the absence of a robust account of relationality is the rare appearance of the Holy Spirit in the book, especially a book that aspires to be trinitarian. This may also account for

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the relatively minor role that the people of God play in the authors' exposition.

Even in a lengthy review such as this, I have not adequately represented the breadth and depth of this book. The authors manage to comment, often at length and in depth, on an enormous range of life, which, of course, the doctrine of creation comprehends.

My criticisms of this book (I have more!) are a sign of my deep respect for and learning from Ashford and Bartholomew. Critical matters for the life and witness of God's people are at stake in the development of a mature, robust conversation about the doctrine of creation and living it out. Bruce Ashford and Craig Bartholomew articulate a mature, robust, Irenaean doctrine of creation reshaped by Dutch neo-Calvinism that should be a part of a larger conversation and urgent action as we seek to bear witness to the One Creator and Redeemer in these times.

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RAMIFIED NATURAL THEOLOGY IN SCIENCE AND RELIGION: Moving Forward from Natural Theology by Rodney Holder. New York: Routledge, 2021. 244 pages. Hardcover; \$160.00. ISBN: 9780367373191.

"Natural theology" is the study of what can be learned about God from a consideration of the universe of nature, and it has often been used to support claims of God's existence. The theologian Richard Swinburne applied Bayesian probability theory to various aspects of natural theology in order to present a justification for God's existence that could be evaluated numerically. Such a method has a certain objectivity about it, he felt. Moreover, it can be applied further to support the specific claims of the Christian faith through a similar treatment of historical facts given in the Bible. This latter effort he called "ramified natural theology," and it is the subject of the present book by Rodney Holder, who held a DPhil from Oxford in astrophysics before being ordained into the Anglican ministry.

This approach to Christian teaching is to be contrasted with those that are based on taking the scriptures as doctrinally authoritative in themselves, as exem-

plified by the position of Karl Barth. With ramified natural theology, the scriptures must be regarded as historical documents written in good faith by the authors of the time—just as any historian would normally assume about any historical documents—but with the proviso that supernatural events such as miracles are to be accepted as possible. That is something that academic historians will not allow, and it marks a key difference between the two disciplines. Arguing from a historic basis of the scriptures is, of course, not new. What is more innovative is to combine this with a consideration of natural theology, and to use a common analytical technique such as Bayesian theory to assign overall probabilities to the truths of central Christian beliefs.

Bayesian probability theory is a well-established technique. A good illustration would be of a doctor who is visited by a patient displaying symptoms that could come from one of several diseases. But which one? It is known from published statistics what is the a priori probability for a given citizen to have each of these diseases, and the probability for each of them to give the reported set of symptoms. From this information, the doctor can multiply the numbers together to obtain the relative probabilities that the patient has each of the possible diseases. The Bayesian formula allows the doctor to quantify the relative importance of each symptom and find the most likely diagnosis.

This approach can also be used to give believability estimates for more-abstract propositions. For each alternative proposition under consideration we must propose an a priori believability, taken to resemble a probability. We then consider the likelihood that each of the propositions could give rise to a set of given observations, and we finally apply the Bayesian formula. This may persuade us that one initial proposition is much more believable than another, but it does depend on the formation of numerical estimates of believability. These might be objective numbers that we do not know very well, or they may be intrinsically subjective in nature. It seems to me that the most important cases are unavoidably subjective, but quantifying one's degree of belief may be helpful in order to make progress.

Holder applies this type of analysis to the philosopher David Hume's skeptical evaluation of miracles.

Hume argued that for a reported miracle, the proposition that it is mistaken is always more probable than the proposition that it is true—but we can put some numbers into this. Suppose that there is testimony T that a given miracle M has occurred, and that God G is proposed as the source of this miracle. Holder calculates a formula which I write here (slightly re-expressed) in order to give a flavor of the contents of the book:

$$P(G|T) = P(G) \{P(M|G) + P(T|\sim M)\} \\ / \{P(G)P(M|G) + P(T|\sim M)\}.$$

This is to be interpreted as saying that the probability that God is the source of the miracle as attested, $P(G|T)$, is to be evaluated in terms of three quantities: the a priori likelihood of God's existence, $P(G)$, the probability that God will perform this miracle, $P(M|G)$, and the probability $P(T|\sim M)$ that this testimony will be obtained when such a miracle did *not* occur (Hume's mistaken testimony). These numbers are clearly uncertain, but if we are sufficiently confident in the smallness of $P(T|\sim M)$, and are willing to believe that God may perform miracles, then even a small initial belief in God can be enhanced by a large numerical factor by the testimony of the miracle.

Holder begins his account by discussing the natural theology of God as the First Cause of the universe and of its apparent physical fine-tuning to give intelligent life. Fuller accounts of these subjects have been given elsewhere (including in my own book) and can be referred to. Holder is concerned to provide enough information to justify the application of the Bayesian method to support a proposed belief in God, but most chapters in the book use Bayesian method to support belief in the Christian teaching of the death and resurrection of Jesus, using as factual evidence the material recorded in the Gospels and in other places. Extremely high levels of credibility can be claimed using this method, which can be combined with the natural theology arguments. Holder argues that the conclusions follow convincingly even when the assumptions and numerical probabilities that are used are allowed to vary considerably.

There are, however, some deficiencies in the Bayesian method that may impede its use. It might be questionable, as Holder accepts, to take the different pieces of evidence for the Resurrection in the New Testament as independent witness accounts. This

they probably are, I would happily agree, but a determined skeptic might want to write off entire accounts at one go. After all, the later church had no hesitation in dismissing the so-called apocryphal gospels—for good reasons, needless to say—but we must be justly confident that the accepted gospels are the genuine article. Since the main reason that skeptics usually have for doubting this is that they disbelieve the contents, their argumentation may often seem circular. Holder is quite good at rejecting the methodology of skeptical scholars such as Bultmann.

A more serious problem is that the Bayesian method *cannot convince the total skeptic*. That is, if someone's initial belief value of a proposition is zero, then multiplying this value by a large numerical Bayesian factor will still give zero. For this reason, as Holder states but perhaps not strongly enough, the employment of another method such as "inference to the best explanation" may be indispensable. In this way, one might perhaps convince the skeptic to accept some kind of nonzero likelihood of God after all, and then the Bayesian method may help—at least to make it clear that evidence can indeed be cumulative and can be used to give ordered reasons for belief when strong enough. But the total skeptic may require a different kind of approach. Hume simply disbelieved in miracles. There are people today who likewise disbelieve in miracles, and there are those today who would likewise reject them "on principle," whatever the evidence presented.


Even with these reservations, the Bayesian method provides a healthy contrast to the kind of vagueness that often seems to beset theological discussion. It proposes attributing defined numerical values to all quantities and evaluates their consequences. Even if the reader is unconvinced by the method's claimed precision, it does at least give a clear indication of where a well-specified argument is capable of leading.

Even without the Bayesian aspects, the book is useful in collecting together quite a lot of material that is relevant for presenting the Christian faith. I would, however, point to two areas that are not very well covered. One is the entire topic of biological evolution, which has been the subject of so much familiar controversy and really needs a bit of clear discussion to decide whether it adds to the natural theology. The other is that incidental textual details found in

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the New Testament are themselves capable of adding considerably to our belief in the documents' historical authenticity. F. F. Bruce and, more recently, Peter Williams have published accessible studies of this, and it is an area that strongly merits being taken into consideration.

Throughout the book Holder's writing is clear and readable, although some of the on-the-fly references to various philosophers and theologians might frustrate a beginner. One must digest a fair bit of mathematics at the level illustrated above. It seems to me that, on the whole, the book is a graduate-level text whose hefty price-tag (even the e-version is not inexpensive—\$48.95) will deter many potential readers. Still, within its given remit and despite a few limitations, the book does a good job. It can be well recommended for theological libraries and researchers in the area. I suspect, however, that the conclusions may need to be de-mathematized a little in order to convince ordinary citizens.

Reviewed by Peter J. Bussey, Emeritus Reader in Physics at the University of Glasgow, Glasgow G12 8QQ, UK. 

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Expanding Isaac's Concluding Statement

In the article entitled "The Significance of *The Mystery of Life's Origin*" (PSCF 73, no. 3 [2021]: 158–62), Randy Isaac gives a very thorough, critical review of the two books on intelligent design (ID) by Charles B. Thaxton and others: the first published in 1984,¹ and its most recent edition with updates, published in 2020 by the Discovery Institute.²

At the conclusion of the article, Randy contends that "Origin-of-life research offers no compelling apologetic either for or against a Creator." That is well and good, but not surprising. Arguments from the mysteries of nature alone, be it origin-of-life, fine tuning of the universe, complexity of the structure of living cells, or others, are necessary arguments for a Creator, but they are not sufficient, ergo not compelling.

I wish Isaac had added to his above concluding remark, the statement that there are other evidences

that are necessary to make the argument of a Creator compelling.

We all know that in addition to the evidence from the physical world, we have evidence, for example, from human nature, from history and archeology, and from scripture and the person of Jesus Christ. Only when put together can these make the argument of a Creator compelling.

Each of the above evidences, starting with evidences from the physical world pointing to a Creator, form a single string which is necessary, but it can be broken by a counter argument unless the strings are all wound together to form a strong rope and thus make a compelling apologetic case. If the various strings of evidence are wound together, they would fulfill the case of a necessary and sufficient condition for the existence of a Creator.³

As an obvious illustration, Nobel Laureate and brilliant physicist Steven Weinberg (recently deceased), vehemently denied the existence of God all his life, whereas another Nobel Laureate, Eugene P. Wigner, gave credit to a Creator based on laws of nature in his lectures on quantum mechanics, when I was a graduate student at Princeton.

Notes

¹Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen, *The Mystery of Life's Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984).

²Charles B. Thaxton et al., *The Mystery of Life's Origin: The Continuing Controversy* (Seattle, WA: Discovery Institute Press, 2020).

³See Kenell J. Touryan, *A Cord of Multiple Strands: An Evidence-Based Assessment of Christian Truth Claims* (Holland, MI: Black Lake Press, 2011).

Ken Touryan
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The Mystery of Life's Origin: Know Thyself

Randy Isaac, in "The Significance of *The Mystery of Life's Origin*" [MLO] (PSCF 73, no. 3 [2021]: 158–62), provides a strong case for the failure of MLO-1¹ and MLO-2² to suggest, from the scientific work dealing with the origin-of-life question, the metaphysical implication for the existence of an intelligent designer. This is quite important since the MLO-1 book laid the foundation for the rise of the intelligent design movement.

Richard Bube³ emphasizes that scientific models are descriptive and not prescriptive. In describing nature by means of mathematical models, Einstein said, “Everything should be made as simple as possible, but not simpler.” Models can predict new results that may later be confirmed by observation or experiment. However, models are like maps of cities, helpful, but not actually the cities themselves.

It should be remarked that mathematical models, for example, Dirac’s relativistic theory of the electron, could not bring electrons into being. In fact, no scientific theory whatsoever can bring anything into being. This is obvious, since the notion of existence is not in the subject matter of the physical description of nature, namely, science. The ontological question of existence is solely the purview of metaphysics and theology. In science, one must first postulate a particular metaphysics in order to carry on the scientific enterprise.

In order to obtain a complete description and understanding of the whole of reality and to include a true description of what a human being is and what the totality of the human experience is, one must integrate science with a particular theology. However, which theology or religion should we use? As done in science, one must choose the theology that has the highest explanatory power—namely, by applying the principle of parsimony, Occam’s razor.

The inscription “Know Thyself” was carved on the stone entrance to the Temple of Apollo at Delphi, Greece. Scholars, philosophers, and civilizations have debated this question for a long time. A theist follows the ancient Greek injunction by basing it on the knowledge of God—namely, who God is and what his commandments are. However, a Christian must know not only God and his commandments, but also who Christ is and what he accomplished on the cross. Accordingly, science alone can give an accurate physical description of humans; however, science, together with the Christian faith, gives the complete and the true picture of what human beings are.

Notes

¹Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen, *The Mystery of Life’s Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984).

²Charles B. Thaxton et al., *The Mystery of Life’s Origin: The Continuing Controversy* (Seattle, WA: Discovery Institute Press, 2020).

³Richard H. Bube, *The Human Quest: A New Look at Science and the Christian Faith* (Waco, TX: Word Books, 1971), 65.

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Evidence for Genesis Historicity

Regarding Carol Hill’s article, “Original Sin with Respect to Science, Origins, Historicity of Genesis, and Traditional Church Views” (*PSCF* 73, no. 3 [2021]: 131–44), Genesis contains numerous clues that underscore the validity of the Genesis account as a fairly accurate narrative of the beginnings of the Semitic peoples, and that help pinpoint the time and place where Adam and his family resided. Genesis 2:10–14 focuses on southern Mesopotamia where the covenant family lived until the flood. The oldest city in that region dated by archaeologists to 4800 BC is Eridu.

Archibald Sayce (1845–1933) was a famous British Assyriologist and linguist, who held a chair as Professor of Assyriology at the University of Oxford from 1891 to 1919. He spent countless hours in the British Museum transcribing ancient texts from the Near East. In his *Lectures on the Origin and Growth of Religion* (1880), he stated: “Babylonian tradition places the Garden of Eden near Eridu.”

At the ASA Annual Meeting in Colorado in 2017, I presented a talk on commonalities between the Genesis 5 patriarchs and the Sumerian King List (SKL). In that talk, evidence was presented to show that the last three names recorded in Sumerian in the pre-flood portion of the SKL, ending with Ziusudra, most probably were also the last three pre-flood patriarchs—Methuselah, Lamech, and Noah. Even the seventh patriarch, Enoch, who “walked with God” in Genesis 5:24, has been linked with the seventh king, Enmeduranki, who according to legend was taken by the gods and taught “divine mysteries.”

The pre-flood part of the Sumerian King List also begins at Eridu, modern Abu Shahrein in Iraq. These are some of the names on the list recorded in the Sumerian language: Enmenluanna, Enmengalanna, Ensipadzidana, and Enmenduranna. The En- prefix designates kingship in both Akkadian and Sumerian.

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Note that Adam's two grandsons have the same designation indicating they were kings—Enoch for whom the city was named, and Enosh. Finding the city where Enosh might have reigned requires a bit of sleuthing.

When Cain committed a foul deed and got the boot from Eridu—where Adam lived after he too was booted from the Garden—Cain needed a place that contained a small population of Ubaidans where he could find a wife and build a city. Ubaid pottery remains also were found at the lowest level at Eridu. The “land of Nod” has not been found, but the city of Enoch still exists today as modern Warka located less than 60 miles north of Eridu as you go along the Purrettum/Eridu canal, linking the two cities.

The SKL relates that after the first two kings reigned at Eridu, “Eridu was smitten with weapons,” and kingship then rested in the victorious city, Badtabira. If true, this could indicate a departure for the remainder of Adam's children beginning with Enosh who could begin his reign in the neighboring city of Erech (Sumerian Uruk) that became part of Nimrod's kingdom in Genesis 10:10.

This appears in the epic tale, Enmerkar and the Lord of Aratta: “My sister, let Aratta (biblical Ararat) fashion gold and silver skillfully on my behalf for Unug” (the people of the city of Enoch). Enmerkar further describes this city as a twin city (Unug Kulaba) which would put Enoch and Erech (Sumerian Unug and Uruk) side by side which would explain similarities in the names of Cain's and Seth's immediate descendants.

One can question the validity of the king list and the validity of Genesis, but they are mutually supportive even down to the last king listed before the “flood swept thereover,” Ziusudra listed in W-B 62. And the Sumerian legend of Ziusudra tells the story of the flood.

Dick Fischer
ASA Member



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