PERSPECTIVES on Science and Christian Faith

In This Issue …

The Science and Practice of Public Health in Dialogue with Christian Faith

Tractability, Testability, and Joyful Work

Against Restricted Methodological Naturalism

"Generational Sin" and Epigenetics

"The fear of the Lord
is the beginning of Wisdom."
Psalm 111:10

Manuscript Guidelines

JOURNAL VISION: The pages of *Perspectives on Science and Christian Faith (PSCF)* feature original contributions that advance human understanding of science and Christian faith. Consistent with the expectations for an academic journal, the articles it publishes should be clear, relevant, have an evident central thesis, engage the pertinent scholarly literature with fairness and rigor, exhibit charity, and conform to the highest standards of scientific and Christian theological integrity.

ARTICLES advance a position on a particular subject related to science and Christian faith. 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.

INSIGHTS inform readers of important emerging developments in science, theology, and other disciplines in a way that demonstrates both their intrinsic importance and their relevance for the science-faith conversation. Such papers should not primarily discuss their authors' own work and should normally be between 1,000 and 3,000 words in length, excluding endnotes. They are written by leading experts at the invitation of the editor-in-chief acting on the advice of the editorial board or in response to an author proposal. Prospective authors should consult the *PSCF* webpage for details as to what such a proposal entails.

REVIEWS contextualize, summarize, and evaluate important science and religion conversations while informing readers of the key concepts and issues involved and identifying promising avenues for further work. Reviews should be authoritative, comprehensive, and critical. They are written by leading experts at the invitation of the editor-in-chief acting on the advice of the editorial board or in response to an author proposal. Prospective authors should consult the *PSCF* webpage for details as to what such a proposal entails.

Although **THEME ISSUES** are normally co-edited by leading scholars at the invitation of the editor-in-chief acting on the advice of the editorial board, prospective authors of REVIEWS and INSIGHTS articles are also invited to consider whether such articles might serve as the basis for a future theme issue.

BOOK REVIEWS describe, contextualize, and evaluate books of significance to scholarly science-faith discourse. Book reviews are written under the guidance of subject area editors, who select books for review and offer them to scholars with appropriate expertise. Individuals who would like to be considered as potential reviewers are welcome to express interest to book review editor **Janet Warren** (ejanetwarren@gmail.com) for inclusion in the reviewer database. Publishers may also contact the book review editor if they are not sure which subject area reviewer would best consider a particular book.

- **Steven Ball** (StevenBall@letu.edu) mathematics and physical science
- **Dean Blevins** (dean.blevins@nts.edu): philosophy and theology
- **Brian Greuel** (btgreuel@gmail.com): biological and environmental sciences
- **Jay Medenwaldt** (jay.medenwaldt@nwciowa.edu): social and behavioral sciences
- **Brent Purkaple** (jay.medenwaldt@nwciowa.edu): history and philosophy of science
- **Derek Schuurman** (dschuurman@calvin.edu): computers, engineering, and technology

The viewpoints expressed in the books reviewed, and in the reviews themselves, are those of the authors and reviewers respectively, and do not reflect an opinion of their respective affiliations or the official position of the ASA.

LETTERS discuss material published in the preceding two issues of *PSCF* and should be no more than 300 words in length, excluding endnotes.

ALL CONTRIBUTIONS except ordinary book reviews and letters to the editor undergo both double-blind peer review and editorial review. Book reviews are subject to editorial review and may also undergo peer review at editorial discretion. Letters to the editor are subject to editorial review.

ADVERTISING is accepted in *PSCF*, subject to editorial approval. Please address inquiries for rates or further information to the Managing Editor. The ASA cannot take responsibility for any orders placed with advertisers in *PSCF* and does not imply endorsement by carrying the ad.

AUTHORIZATION TO PHOTOCOPY MATERIAL for internal, personal, or educational classroom use, or the internal or personal use of specific clients, is granted by ASA, ISSN: 0892-2675, provided that the appropriate fee is paid directly to Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923 USA for conventional use, or check CCC online at the following address: www.copyright.com/. No registration with CCC is needed: simply identify the article being copied, the number of copies, and the journal title (*Perspectives on Science and Christian Faith*). For those who wish to request permission for other kinds of copying or reprinting, kindly write to the Managing Editor.

Pondering What It Means to Stay on Mission in Disrupted Times

Stephen Contakes

I write this editorial in early February 2026 from my office at Westmont College in Santa Barbara, California, USA, a town sometimes dubbed the American Riviera. Outside, the sky is blue, there is a gentle breeze, and the air is warm, a pleasant scene. Nevertheless, I am cognizant that I and many others of us who are concerned about science and Christian faith have been experiencing various severe and profound disruptions. By this I do not mean the freezing cold temperatures, snow, and other aftereffects of Winter Storm Gianna, the bomb cyclone that swept through much of the Eastern and Central United States and Canada late January. Rather, I mean what the Oxford English Dictionary calls "violent dissolution[s] of continuity."[1] Of these, the most obvious involve the significant changes in US government science policy and practice since the beginning of Donald Trump's second term in office as the President of the United States, changes which have affected many of our readers. More broadly still I refer to any dissolution that has affected one or more dimensions of humanity's shared life together in the last few years, both locally and globally.

Some of these disruptions factor into the work of the journal, *PSCF*, though not every disruption affects us equally. For instance, over the past two weeks a number of disruptive incidents occurred. The national-level debates over immigration enforcement tactics came to Santa Barbara in the form of a US Immigration and Customs Enforcement agent violently attacking a Santa Barbara real estate agent who was peacefully filming an "enforcement action" taking place in her neighborhood. About the same time, I learned that two of Westmont's brightest chemistry majors—including one on a par with those of past students who have gone on to study in top programs and win National Science Foundation (NSF) fellowships—had yet to receive even a single acceptance or even an interview offer from any graduate program. Meanwhile, a reviewer had alerted me about a received manuscript that may have been written using AI in ways that violate our publication guidelines—a manuscript authored by a tenure-track faculty member at a Council for Christian Colleges and Universities (CCCU) institution.

Of the incidents mentioned, only the latter affected *PSCF* directly and called for immediate action. The possibility that we were considering an AI-written manuscript that had been undetected in the initial stages of our review process raised all sorts of questions. We quickly learned that policies which delineate appropriate AI use are insufficient; we also need policies for what to do when we suspect undisclosed and inappropriate AI use in submitted and published manuscripts. However, what policies are appropriate? Some were fairly easy to determine: We added a note to the instructions we send to reviewers asking them to not use AI checkers to conduct their own investigations but, rather, refer any suspicions to the editor-in-chief.

Other concerns are taking longer to navigate. For instance, we initiated conversations about how to follow the Committee on Publication Ethics (COPE) guidelines for research integrity and publication misconduct; these involve giving authors a chance to respond. If they do not, or if their response is unsatisfactory, then do we contact their institutions to report the potential misconduct and ask them to help us assess the integrity of the submission?[2] If so, how much should we disclose, and how should we frame the possibility of misconduct? I wanted to be careful to point out where the manuscript was original and remain open to the possibility that some of the problems may have resulted from either honest error or overreliance on English as an additional language editing tool.[3]

I am confident that we will arrive at workable policies for addressing cases of inappropriate AI use. Our editorial staff and board embody much wisdom and experience, and we can learn from the policies of other journals, as we have in the past. Over the last two years alone, we have developed procedures to make it possible for authors to propose theme issues, INSIGHTS articles, and REVIEW articles; we have defined policies for open-access articles, clarified that we will consider manuscripts that have already been posted elsewhere as preprints, and addressed a number of other scenarios, including the acceptable use of generative AI.

Editorial

Pondering What It Means to Stay on Mission in Disrupted Times

The other disruptions seem thornier. Whatever the merits or demerits in moral reasoning of those who develop AI, from the viewpoint of a journal editor, it is difficult to consider AI as possessing sufficient moral agency to morally praise or blame it for its disruptive effects.[4] However, that is not the case with law enforcement agents who resort quickly to violence in ways that discourage evaluation of their activities, admissions committees failing to select an exceptional young scientist for a spot in their graduate programs, or faculty considering promising opportunities that do not seem to fit a college's mission. For such, it is far easier to blame or praise particular people. For example, my student's experience with graduate school admissions reflects the fact that scientists who manage graduate programs are now being much more conservative when admitting students, and those managers are likely more conservative because of the actual and threatened disruptions to federally funded research in the United States enacted and proposed by various officials in the second Trump administration.[5]

In principle, this is a fit subject to take up. Budgets and policies encode moral judgments which, like all other moral judgments affecting science, can be analyzed from a Christian perspective in ways that merit publication in *PSCF*. Also valuable could be an examination of the links between the disruption of science and the moral reasoning of the US voters (85% of white evangelicals, 64% of Hispanic Protestants, 59% of white Catholics, 57% of white nonevangelical Protestants, 43% of Hispanic Catholics, and 14% of Black Protestants) who stand in the causal chain of responsibility for disruptions to science in the United States.[6] Indications are that the topic would be interesting. Previous studies of Christian opposition to science point to a more nuanced picture than suggested by these statistics[7] and hint at a complex mix of factors that serve to illuminate less-recognized aspects of the relationship between science and religion in real life.[8]

Nevertheless, I am reticent as an editor to encourage analyses that bear directly on charged and contested matters of public debate. It is proper and good for journals to provide a forum for rigorous academic debate of matters that pertain to their mission. But editors function most effectively as umpires who make sure that contributions fit our mission, and as producers who enrich the work of authors through feedback, including the work of authors whose conclusions we might disagree with! However, by last summer we were aware that public policy and science administration disruptions were creating practical and moral difficulties for some of our readers. Consequently, at *PSCF*'s summer 2025 editorial board meeting, we discussed whether we should solicit articles addressing recent changes in US science policy

and funding. Ultimately, we concluded that you would be better served by articles aimed at helping our readers to contextualize the recent changes to federal science policy within a larger historical frame and to equip them to understand Christian mistrust of science. Those articles are forthcoming.

In the meantime, know that we are also aware from both Christian theology and personal experience, that certain forms of inaction can elide into disobedience to the commands of Christ. As Bonhoeffer observed, writing in the early days of Hitler's Third Reich, "Christendom adjusts itself far too easily to the worship of power."[9] Indeed, he spoke those words even as the vast majority of German church leaders and academics were actively developing the intellectual and moral frameworks which enabled ordinary Germans to rationalize their complicity in militarism and the holocaust.[10] Both the above, and the changes many of America's top research universities have undergone in the face of various currents of empire left, right, and otherwise, weigh heavily on my thinking about these issues. For fallible humans, the boundaries between responsible action and inappropriate cooperation or complicity with unjust systems are necessary but difficult places to navigate.

PSCF does "not take an official position on controversial issues"[11]; however, as the journal of "an international network of Christians in the sciences,"[12] there is much we do not consider uncontroversial. Chief among them is the understanding of Christian faith encapsulated in the Nicene Creed, which affirms that it is Jesus who "will come again, with glory, to judge the living and the dead" and that we "look for the resurrection of the dead and the life of the world to come."[13] As C. S. Lewis reminded Oxford students amidst the outbreak of European hostilities in the Second World War, the real danger for the Christian arises at a time when things seem to be going our way. In contrast, loss and threats of loss can be a spiritual blessing.

> all schemes of happiness that centered in this world, were always doomed to a final frustration … If we had foolish un-Christian hopes about human culture, they are now shattered. If we thought we were building up a heaven on earth, if we looked for something that would turn the present world from a place of pilgrimage into a permanent city satisfying the soul of man, we are disillusioned, and not a moment too soon.[14]

Similarly, with the Nicene Creed we at *PSCF* affirm a belief in "the Holy Ghost, the Lord and Giver of Life … who spoke by the prophets" and can guide us into all truth. Consequently, we follow Lewis in offering that the reframing of our hope on the eternal does not make

either science or the type of scholarship featured in the pages of *PSCF* irrelevant. Rather, it reaffirms and properly refocuses our understanding of its importance. For as Lewis concludes:

> If we thought that for some souls, and at some times, the life of learning, humbly offered to God, was, in its own small way, one of the appointed approaches to the Divine reality and the Divine beauty which we hope to enjoy hereafter, we can think so still.[15]

It is in this spirit that I present to you a variety issue, addressing topics of longstanding interest to readers of this journal. The topics considered predate both the rise of generative AI tools and America's present cultural moment. Yet, to the extent that each develops our understanding of what is good, true, and right with respect to the Divine reality, they can in some small measure help us "understand the present time"[16] and know how to behave amidst "dissolutions of continuity."[17]

Notes

[1] "Disruption (n.), sense 1," *Oxford English Dictionary*, June 2025, https://doi.org/10.1093/OED/8356862144.

[2] COPE Council, "COPE Flowcharts and Infographics—Suspected Ethical Problem in a Submitted Manuscript—English," last reviewed May 1, 2021, https://doi.org/10.24318/cope.2019.2.19. See also, COPE Council, "COPE Guidelines: Cooperation Between Research Institutions and Journals on Research Integrity and Publication Misconduct Cases—English," last reviewed February 1, 1024, https://doi.org/10.24318/cope.2018.1.3. Note that *PSCF* is not yet a member of COPE, for reasons I have not yet ascertained. However, we do seek to follow COPE guidance where such is available.

[3] This problem may be exacerbated by the tendency of AI detectors to pick up the constrained language of nonnative English speakers as AI-generated prose. Weixin Liang et al., "GPT Detectors Are Biased Against Non-Native English Writers," *Patterns* 4, no. 7 (2023), https://doi.org/10.1016/j.patter.2023.100779.

[4] Yet it is possible to develop AI carelessly or deliberately in ways that promote illicit ends. For an example, see Marc Watkins, "An Open Letter to Perplexity AI: Absolutely Don't Do This," *Rhetorica,* October 17, 2025, https://marcwatkins.substack.com/p/an-open-letter-to-perplexity-ai. See also Marc Watkins, "Can Educators Counter 'Agentic AI'?," *Chronicle of Higher Education,* November 20, 2025, https://www.chronicle.com/article/can-educators-counter-agentic-ai.

[5] For the situation in early 2025, see Maddie Khaw, "This Year's Ph.D. Admissions Cycle Is Leaving Students in the Lurch," *Chronicle of Higher Education,* February 26, 2025, https://www.chronicle.com/article/this-years-ph-d-admissions-cycle-is-leaving-students-in-the-lurch.

[6] "Analyzing the 2024 Presidential Vote: PRRI's Post-Election Survey," Public Religion Research Institute, December 13, 2024, accessed on February 4, 2026, https://www.prri.org/research/analyzing-the-2024-presidential-vote-prris-post-election-survey/.

[7] I am not aware of a poll which clearly links Christian voters' support of Trump to his administration's science policy. Currently, it also appears that many of the proposed cuts to science will be less severe as a result of congressional input. See

Rebecca Trager, "Dramatic Reductions Proposed for US Science Agencies by Trump Administration Evaporate," *Chemistry World,* February 3, 2026, https://www.chemistryworld.com/news/dramatic-reductions-proposed-for-us-science-agencies-by-trump-administration-evaporate/4022868.article.

[8] For example, Americans' mistrust in science (a) seems strongly correlated with political affiliation, as documented in M. Anthony Mills and Price St. Clair, "The Strange New Politics of Science," *Issues in Science and Technology* 41, no. 3 (Spring 2025): 40–48, https://doi.org/10.58875/NDTQ1755; (b) reflects deeply held assumptions about the importance of market fundamentalism more than mistrust of science per se, as argued in Naomi Oreskes and Erik M. Conway, *The Big Myth: How American Business Taught Us to Loathe Government and Love the Free Market* (Bloomsbury, 2023); and (c) is fueled by a misinformation industry which functions to promote unChristlike social norms and practices, as argued in Scott M. Coley, *Ministers of Propaganda: Truth, Power, and the Ideology of the Religious Right* (Eerdmans, 2024), a misinformation industry that (d) feeds off evangelicals' and fundamentalists' tendencies to adopt a "paranoid stance" toward secular learning and enterprises, as argued in Antony Alumkal, *Paranoid Science: The Christian Right's War on Reality* (New York University Press, 2017). Although to my knowledge this has not yet been attempted, I also suspect evangelical mistrust of science can be understood as continuous with the historical trajectories outlined in Mark A. Noll, "Evangelicals, Creation, and Scripture: Legacies from a Long History," *Perspectives on Science and Christian Faith* 63, no. 3 (2011): 147–58, https://www.asa3.org/ASA/PSCF/2011/PSCF9-11Noll.pdf.

[9] Dietrich Bonhoeffer, "My Strength Is Made Perfect in Weakness," in *The Collected Sermons of Dietrich Bonhoeffer,* trans. Douglas W. Stott et al., ed. Isabel Best (Fortress Press, 2012), 169.

[10] For an account of the latter, see Robert P. Ericksen, *Complicity in the Holocaust: Churches and Universities in Nazi Germany* (Cambridge University Press, 2012).

[11] (a) Terry M. Gray, "The ASA Does Not Take an Official Position on Controversial Questions," *Perspectives on Science and Christian Faith* 68, no. 3 (2016): 177–90, https://www.asa3.org/ASA/PSCF/2016/PSCF9-16Gray.pdf, referring to (b) Richard H. Bube, "We Believe in Creation," *Journal of the American Scientific Affiliation* 23, no. 4 (1971): 121–22, https://www.asa3.org/ASA/PSCF/1971/JASA12-71Bube.html.

[12] "Who We Are," About the ASA, American Scientific Affiliation, https://network.asa3.org/page/ASAAbout.

[13] The text is taken from the Nicene Creed as posted on the American Scientific Affiliation webpage at https://network.asa3.org/page/Creeds with the exception that the word "living" is substituted for the word "quick."

[14] C. S. Lewis, "Learning in War-Time," in *The Weight of Glory and Other Addresses* (Eerdmans, 1965), 53–54.

[15] Lewis, "Learning in War-Time," 54.

[16] Romans 13:11.

[17] "Disruption (n.), sense 1," *Oxford English Dictionary*, June 2025, https://doi.org/10.1093/OED/8356862144.

Stephen Contakes
Editor-in-Chief

The Science and Practice of Public Health in Dialogue with Christian Faith

Mark A. Strand

Mark A. Strand

Call for Papers

Readers are encouraged to take up one of the insights or questions in the following invitation essay and its extensive endnotes, 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 scontakes@ westmont.edu. An abstract should be included in the text of the email. The best essays will go on to peer review and the potential for publication in a public health theme issue of *Perspectives on Science and Christian Faith*, or in a variety issue of *PSCF*.

The lead editorial in the March 2026 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 September 1, 2026.

Public health is the discipline of disease prevention and health promotion among populations. Preceding modern medicine, public health represents the earliest human attempts to reduce morbidity and mortality at the population level. As such, the science and practice of public health has been influenced by Christian theology and the contributions of Christian public health scientists from its beginnings. In the modern era, public health functions as a government agency, but is supported by many non-profit organizations, including the faith community. This review article defines public health, including the process by which public health was formalized as a science and a practice, including public health education and certification. It also describes the contributions of Christian scholars and Christian organizations to public health. Gaps in the scholarship addressing Christianity and public health are identified throughout, including where Christian scholarship in public health may uniquely enrich an understanding of public health and its practice.

Keywords: public health, global health, government, non-governmental organizations, faith-based organizations, community health, epidemiology, health systems

The dialogue between science and the practice of public health and Christian faith has a long history. Some consider Daniel to have conducted the first experimental trial when he requested to consume vegetables and water rather than the king's calorie-dense diet (Dan. 1:8–16).[1] Proto-public health principles evident in the Bible include dietary laws (Leviticus 11), washing rituals (Num. 19:11–13), infectious disease control practices such as burying human waste outside the camp (Deut. 23:12–13), and quarantining individuals with diseases such as leprosy (Leviticus 13–14).[2] Concern for

Mark A. Strand *(PhD, University of Colorado Denver) is professor in the Departments of Pharmacy Practice and Public Health at North Dakota State University. His research focus is chronic disease epidemiology and prevention of opioid use disorder. Mark is an ASA fellow and board member, and elder at Salem Evangelical Free Church.*

the well-being of the community (Acts 2:44–45) and for others (Mark 12:30–31) are public health values evident in the Bible. So, the influence of Christian faith on the science and practice of public health, and vice versa, is deserving of scholarly attention.

The following review serves the purpose of framing the science and practice of public health in relation to Christian faith and values. Recognizing the role of public health from antiquity to the present, and the sometimes-uncertain relationship between public health and Christian faith, *Perspectives on Science and Christian Faith* is calling for submissions to a public health and Christian faith theme issue. This review article provides a framework to understand the relationship between public health and Christian faith; scholarly contributions, concerning the questions posed, are particularly welcomed.

The review employs a wide-ranging historical overview of public health development with a specific eye toward influences from Christianity; this includes how Christianity was, in turn, influenced by public health practice. It begins by describing public health in the United States, including the process by which public health was formalized as a science and a practice, including through public health education and certification. Then global understandings of public health will be introduced, with an invitation to global dialogue. The nature of governmental public health will then be explained, along with the challenges that faith-based organizations face collaborating with governmental agencies. This leads to the issue of the role of trust in public health, and possible reasons for declining trust in the cultural authority of public health experts. Other topics considered include the effect of theoretical concepts such as individualism and secularism on public health and human flourishing as a public health and theological goal. Throughout, the research contributions of Christian scholars will be described as a model for needed scholarly contributions from Christian public health experts.

Questions posed along the way are meant to pique the curiosity of readers and potential contributors, not to limit the scope of offerings that are welcome.

What Is Public Health?

The practice of public health was the foundation and predecessor of modern medicine.[3] Time-tested practices addressing clean water and sanitation and quarantines against infectious disease outbreaks, proceeding right up to the germ theory of disease in the 18th century,

have enabled communities to extend human life expectancy.[4] In the advent of the scientific age, advances in chemistry and medicine allowed public health practitioners to implement population-based interventions such as vaccinations, clean water and air laws, safe food and drug laws, and maternal and child health programs to protect the public in unassuming but beneficial ways.[5] More recently, public health workers have elucidated risk factors for tobacco and alcohol consumption, risky sexual practices, excess body mass, sedentary lifestyles, insufficient consumption of fresh fruits and vegetables, and poorly controlled blood pressure; they have implemented highly effective public health interventions to alleviate them.[6] Christian beliefs and values have participated in this history, including through the activities of Christian organizations.[7]

What lessons can be learned from this history? What approaches, especially through how ancient Christian communities sought to help the sick or hinder the propagation of disease, offer lessons for the present?

A particularly important recent development is the concept of the Essential Public Health Services (EPHS), created in 1994 to clarify how the federal, state, and local public health agencies at all levels share the responsibility to keep the public healthy.[8] This was codified in the ten essential public health services:

1. assess population health status,
2. investigate health problems affecting the population,
3. communicate effectively to inform people about health,
4. strengthen community partnerships to improve health,
5. create policies and laws that impact health,
6. utilize regulatory action to protect the public's health,
7. assure an effective system that enables equitable access to needed services,
8. build a skilled public health workforce,
9. evaluate and continuously improve public health functions, and
10. build a strong organizational infrastructure for public health.[9]

Clarification of these ten essential services has proven critical for defining public health practice and for distinguishing public health from medical care. It has allowed public health to move from being primarily a deliverer of services to being the center of cross-sector collaboration for the public's good.[10]

In what ways do the EPHS complement the biblical narrative of what God is doing in the world through public health practitioners? In what ways does Christian theology critique or provide a deeper justification for the EPHS? How might the EPHS and Christian thought challenge each other to more fuller versions of themselves?[11]

Public Health in the United States

Public health in the United States operates in many ways but is fundamentally a government role with the charge to protect the public from health harms through disease prevention and health promotion.[12] However, many sectors are involved and much effective public health work is done by the non-profit and even the private sector, both independently and in collaboration with governmental public health efforts.

Governmental public health in the United States operates at three primary tiers: federal, state, and local.[13] A similar tiered system is found in virtually all countries. Federal public health in the United States is structured under the Department of Health and Human Services (HHS) and its many agencies. Substantial restructuring of the HHS has occurred since early 2025, including consolidating twenty-eight HHS divisions into fifteen. Several federal agencies still stand out for their direct attention to public health needs. These include the Food and Drug Administration (FDA), the Centers for Disease Control and Prevention (CDC), the United States Public Health Service (USPHS), the Agency for Healthcare Research and Quality (AHRQ), and the Health Resources and Services Administration (HRSA). These agencies establish laws and best practices which are disseminated to the states and localities which implement them, often with support by federal funding.[14] State public health comprises comparable divisions and departments, with the responsibility to coordinate public health programs, pass federal dollars to local public health units, and collect statewide public health data. Local city and county public health departments deliver the frontline public health services in their communities. Funding for local public health is composed of approximately half federal pass-through dollars, and half state, local city, and local county funding.[15]

Collaborations between government agencies and faith-based organizations (FBOs) occur in many communities.[16] Churches in African American communities have a particularly rich history of partnering with public health agencies and medical institutions to serve community needs.[17] Such collaborations represent involve-ment of the community and have high potential for advancing population health.[18]

How can faith communities collaborate with governmental public health efforts? Where are the best opportunities to expand and deepen such collaborations? Do faith communities have evidence-based best practices or other information they can contribute to public health science? Manuscripts answering one or more of these questions would be welcomed.

Challenges in Faith-Based Organizations Collaborating with Government Agencies

Public health operates as a government agency, working in a pluralistic, public space. Consequently, public health in the United States and elsewhere has, at times, avoided talking about religion and has hesitated to engage with religious partners, for fear of crossing the line of separation of church and state. Global agencies such as the World Health Organization (WHO), the World Bank Group, and the United Nations Children's Fund (UNICEF) were, in the past, biased toward a secular posture. When AIDS emerged in the 1980s, there was a desperate need for community partners to help in caring for and treating victims of the dreaded disease. Realizing that Christian churches and Christian hospitals were among the most consistent providers of services to people in need, particularly in sub-Saharan African countries,[19] the WHO began to partner with faith communities.

Over time, public health organizations recognized that they were ignoring a major component of the lives of the majority of the world's people by ignoring the faith community. As a result, the WHO hired a Partnerships Officer for faith-based and civil society engagement in 2004, and established the Faith Network in 2022, whose purpose was to increase collaboration and the sharing of accurate and relevant information at the intersection of faith and public health.[20] This fear of violating the separation of church and state was similarly overcome in the United States when President George W. Bush established the Office of Faith-Based and Neighborhood Partnerships within the Department of Health and Human Services in 2001.

These were positive developments. But at times, secular public health program implementers were opportunistic and treated churches and FBOs mainly as an avenue for disseminating health messages or interventions, while marginalizing the content of their faith and paying little

attention to underlying norms and values about health contained within religious communities' faith experiences. In fact, religion and spirituality have been identified as contributors to critical public health work for a long time. Programs such as Alcoholics Anonymous and hospice care emerged out of values that Christians distinctly hold about addictions and dying, respectively.[21]

What contributions might a Christian perspective make to other pressing public health problems, such as dementia, the psychological development of youth,[22] chronic pain, substance use disorders, psychiatric conditions, and loneliness, among others? How might a distinctively Christian perspective speak to present public health priorities? How can faith communities partner with public health entities that honor the intellectual and theoretical resources and goals of both parties?

This raises the question of how mutual benefit is assured when government and multilateral organizations serving pluralistic societies partner with faith communities. To address this question, researchers have introduced several models for public and faith-based collaboration. Kiser and Lovelace describe a Model Practices Framework[23] and Hardison-Moody and Yao discuss best practices for state-level bridging between public health and communities of faith.[24] Deeper analyses on the implementation of effective partnerships between governmental and faith-based organizations are needed.

A related question is that of how Christian communities should engage societies developing in the direction of secularism. Many Western societies are becoming more secular. Charles Taylor proposed the surprising argument that the move toward secularization may have resulted from Christian reform movements that focused excessively on individualism. He argued that the reform movements placed greater emphasis on spiritual needs and abilities of individuals, than on the transcendent and corporate elements of the faith community.[25] If this is true, it partially explains the uncertain relationship between the individualized Christian faith that characterizes much of North American Christianity and community-oriented public health endeavors. If Christians turn inward, they will inevitably feel themselves disconnected from the wider society and, most especially, from the portions of society not participating in a faith community. This, in turn, can lead them to resist contributing toward, or sacrificing for, public goods that benefit all.[26] Other explanations for the secularization of society point to the outsized role of universities and other public organizations.[27] Taylor's is not the only view.

To the extent that Taylor's thesis is true, how should Christians respond pastorally, prophetically, or politically to the secularization of society, and of the church itself? Is there a public health argument for supporting religious movements that resist excessive individualism and embrace collective dimensions of faith? Conversely, might Christians embrace the collective emphasis of public health as a call to spiritual renewal, specifically one that helps turn the tide of individualization and thus secularization?

While beneficial to individuals, the fundamental goal of public health is to improve population health, to focus on those efforts that will do the best for the greatest number and, in particular, the most vulnerable. Such a calling should appeal to Christians, whose focus is more on one's neighbor than oneself.

What are distinct contributions Christians can make to a sacrificial approach to serving the public's health? How is the church, as a fixed community, a population to be served with health promotion and disease prevention activities?

Public Health Globally

Public health systems vary from country to country, but to varying degrees, they all address common public health concerns, that is, factors that address large portions of the population but are difficult to manage or mitigate at the individual level. They require federal or regional coordination by the government to ensure the welfare of all members of society. This includes maternal and child health, chronic and infectious disease prevention and management, natural disasters, nutrition and food assistance, housing, clean water and sanitation, and others.

Similarly, public health systems in most countries serve a common set of public health functions, including surveillance and monitoring, emergency management, disease prevention and early detection, financing, protection from health hazards, community engagement, workforce development, and research and evaluation.[28] Countries variably prioritize these functions based on need in the local context. This makes each country a kind of experiment in how to best protect and serve the health of the public. For example, countries with endemic malaria have robust surveillance programs, while the U.S. would require little to no malaria surveillance. Consequently, through sharing experiences gleaned from different countries, learning occurs that generates best practices that can be applied elsewhere.

The Science and Practice of Public Health in Dialogue with Christian Faith

What can public health practitioners operating in various global contexts learn from each other as they encounter a range of emphases in local concepts of health, approaches to public health, and theologies of public health? What can Christians learn from or critique about efforts to "decolonize" global health practice? The Christian church can be found in every country of the world. What are the ways in which the church is serving the cause of public health in different contexts? Contributions from around the world are welcome in this theme issue.

Christian non-governmental organizations (NGOs) and churches work extensively across borders and advocate for global health foreign aid and pandemic preparedness. Changes to U.S. global health foreign aid and shifts in priorities call for a Christian response.

What can Christian theology and ethics contribute to discussions about the amount and priorities of global health foreign aid? What best practices for advocacy can inform faith-based efforts to influence national and multilateral health budgets?

Public Health Education

The efforts which established the science and practice of public health as a practice distinct from the clinical work of physicians, nurses, and therapists enabled better division of labor between public health, healthcare, and departments of human and social services and allowed public health education to create a curriculum which aligned with public health practice. One important point was the 2005 establishment of the National Board of Public Health Examiners (NBPHE), which created an examination process for accrediting public health professionals. This led to the Certified in Public Health (CPH) designation, a credential conferred by the NBPHE. Even earlier, the Council on Education for Public Health (CEPH) was established in 1974. The CEPH creates competency standards and curriculum guidelines for public health education which clarify the skills needed to be a public health professional. To receive CEPH-accreditation, programs must demonstrate that their students master the core competencies of epidemiology, biostatistics, behavioral science, environmental health, and health policy. Eight Christian colleges and universities offer CEPH-accredited Master of Public Health (MPH) programs.[29]

In addition to established competencies, public health has a code of ethics to guide practice,[30] including the call to obtain the community's consent for programs; to respect diverse values, beliefs, and cultures in the community; and to engage in collaborations and affiliations in ways that build the public's trust and the institution's effectiveness. Therefore, collaborating with people of faith and their values, and with faith-based community organizations, is built into public health ethics.

What unique approaches to education might be implemented in the Christian college public health programs that distinctively enrich their students' understanding of the core competencies of public health and effective delivery of the ten essential services?[31] In what ways might the teachings and example of Jesus Christ illustrate or enhance public health ethics?

Compatibility and Conflict

Public health and Christian faith share many compatible theoretical perspectives, such as a focus on hope and the possibility of change. Both disciplines also acknowledge that humans are complicated, and inclined to do things that result in harm to themselves and the public. Christian belief roots this observation in the notion of original sin; that is, people need transformation and assistance toward that which is truly good. Public health describes this observation in terms of human behavior, in which humans need guard rails and nudging in order to pursue health-enhancing behaviors and eschew health-harming behaviors.[32] Both public health and Christian faith accept that there is truth and falsity in the world, and that it is necessary to work to identify and uphold the truth, and minimize the harmful effects of falsity.[33] In Christian faith, this is established through the Scriptures, tradition, reason, and experience (expressed in authentic theology) found in and through Christian community. In public health, this is done through the application of epidemiology, biostatistics, and behavioral science.[34] Both disciplines also desire to see humans flourish through the application of those truth convictions.

How might these compatibilities serve as a basis for collaboration between Christian and governmental public health organizations? How might theological metaphors about sin and public health frameworks about behavior inform and enrich each other?

The science of public health has been able to identify risk factors and causes of disease, with benefit to individual and population health for many years. One of the more noteworthy contributions is the Framingham Heart Study.[35] Commissioned by Congress in 1948, this longitudinal study sought to determine the behavioral and dietary factors associated with heart disease. In fact, the study is the origin of the term *risk factor*. Beginning in 1948 with 5,209 healthy adults, it continues with their

descendants to the present.[36] In the interim, it has produced thousands of peer-reviewed publications, laid the groundwork for modern understandings of heart disease, and saved millions of lives so far. It exemplifies the kind of public health work that cannot be done using short-term, clinical trials; it requires sustained longitudinal government support and funding.

How might Christian organizations and public health practitioners distinctively contribute to critical longitudinal studies? What might be learned from existing examples such as the Global Flourishing Study (GFS) at Harvard University?[37] (While coming out of a secular institution, it includes a large number of Christian individuals and organizations, and a clear focus on spiritual flourishing.) What models and definitions of human flourishing have emerged from Christian thought? In what ways does the GFS align or not align with these models? In what ways might Christian theology enhance our understanding of its results? How should Christians respond when GFS results detect null or negative impacts of religion on human health?

Public health and Christian faith acknowledge that the collective, or the community, at times supersedes the individual, and strive to build generous community on that belief.[38] Humans are called to sacrifice for the common good. Both sectors also prioritize care for the weak and vulnerable; they are compelled to use the resources of their discipline to protect the weak, and to address the problems that are revealed by their truths.[39] So, it is not inherently in conflict for Christians to support government programs such as the Americans with Disabilities Act, and the Rehabilitation Act, which prohibit discrimination based on disability in federally funded programs; and the Individuals with Disabilities Education Act (IDEA), that ensures all students receive a free appropriate education and necessary support services.

What are the public policies that Christians can build on or advocate for to advance the public's health and to demonstrate Christian witness?

However, there are also areas of potential conflict between religious beliefs and practices and public health best practices. Christian faith has a set of morals for expected behavior, violation of which is considered harmful to oneself and others. For example, faith communities hold to moral values regarding sexual behavior, which have, at times, led to stigmatization of those with HIV because of the assumption that the route of transmission may have involved disapproved behaviors.[40] Religion has also been used as a reason to under-

mine public health support and practice.[41] For example, harm reduction is seen as a public health best practice, but some religious leaders perceive particular efforts directed at preventing harms as tolerant of less than salutary behavior and thus to be opposed. One such example is the dissemination of condoms to teenagers, which is known to reduce unintended pregnancies and spread of sexually transmitted infections[42] but has been seen by some as showing indifference toward irresponsible sexual practices.[43]

Another challenge involves conflicts over decisional autonomy, whereby some Christians claim the right to disobey human authorities that conflict with their perception of God's authority. Examples include the conflicts that arose during the COVID-19 pandemic between public health mitigation efforts which some religious communities held to violate their religious beliefs. In this, courts in the United States typically weighed in favor of religious freedom against public health authority.[44] The argument for autonomy has been challenged by writers such as Dietrich Bonhoeffer, who make the strong case that Christian freedom is not freedom *from*, but freedom *for* God and for one another.[45] Wolfhart Pannenberg has similarly argued that Christians find their center and completion outside of themselves (including their personal freedoms) in God and in other persons.[46]

How do Christians aspire to the common good when there are conflicts between individuals' personal convictions, or that of their faith community, and the wellbeing of others? When and how do Christian communities decide between conscientious objection and supporting public health efforts aimed at promoting the good of others when some aspects of the approach may not be fully reflective of core Christian values?

Individual and Population Understandings of Public Health

Public health is meant to contribute to individual and population health. However, the emphasis is on the population. It is not always understood that in population health, not every individual will obtain benefit from every public health intervention, and some will actually be inconvenienced while gaining no immediate benefit. This is due to the nature of population interventions. For example, some hypertensive persons are not sodium-sensitive, so they don't need to reduce sodium intake to control their blood pressure.[47] But it is in the best interest of population health to reduce sodium in foods at restaurants and in food service facilities. Consequently,

every individual makes a sodium sacrifice, because it reduces strokes at the population level, but not every individual receives blood pressure control benefit.

As a religion of self-sacrifice, what theoretical and practical riches embodied in the life and teachings of Jesus Christ (Eph. 2:14) do Christians have to share with public health?

During the time of the early church, the courage of Christians to remain in the city and minister to the sick and dying during the plague, rather than flee to country homes, was a major boon to the Christian faith by the testimony it made to onlookers.[48] It was suggested that the early Christians had created a miniature welfare state in a setting that lacked social services. In contrast, during the COVID-19 pandemic, some Christians, primarily in the U.S., eschewed being vaccinated, wearing masks, and avoiding public places in the name of religious freedom. For example, thirty percent of white evangelical Christians reported they did not intend to get vaccinated in March 2021.[49]

How is the balance between freedom and self-sacrifice to be maintained? Is the calling to love one's neighbor, and to serve the neediest without regard for oneself, a public health resource that could be offered by Christians? This is a question seeking insights and guidance from Christian public health scholars.

Trust in Public Health Practice

Public trust is a foundational pillar for the successful implementation of health policies and interventions, particularly during times of crisis. This trust influences whether communities accept and act upon public health guidance, such as in vaccination campaigns or in emergency response protocols.[50] Trust in public health remains high, with the highest levels of trust at the local level (73% high confidence), and lower at the state and federal levels (56% and 53% high confidence).[51] However, recent data highlight a gradual erosion of this trust across various sectors in the United States, including hospitals, pharmacies, public health departments, social service agencies, universities, fire departments, police departments, libraries, and local schools.[52]

The landscape is further complicated by the rise of misinformation and disinformation, particularly via social media, which has led to widespread skepticism of scientific expertise and public health recommendations.[53] To be clear, science skepticism is not new; it was evident when Edward Jenner introduced the first smallpox vaccine in 1796. However, modern trends have increased the influence of such skepticism.[54] This erosion of trust stems from several interconnected factors: perceived shortcomings in public health performance, limited public accountability, a lack of widespread support for core public health principles, ineffective communication about the role and value of public health, and a perception that public health represents governmental authority that threatens individual freedom.[55] In this "post-truth" environment, where facts are often supplanted by ideology on both the right and the left, rebuilding trust in public health requires more than sound policy—it demands intentional efforts to engage communities, address inequities, and reestablish the credibility of science and governance alike.

Peculiarly, Christians seem particularly vulnerable to popular depictions of health information and misinformation.[56] As believers in the truth, Christians have a calling to being truth-tellers and impeding the spread of falsity.[57]

What roles might Christian public health professionals play to commend truth in science and in theology, as they straddle their professional and faith communities?[58] Similarly, what role might pastors and faith leaders play in commending truth, both theological and scientific, to their faith communities? Where does the distrust lie? Is the distrust in so-called experts, in governmental authority, or in the fundamental credibility of the profession? If the distrust is in experts, then pastors and theologians are equally likely to eventually experience the loss of trust from their followers.[59] The issue of distrust in authorities or in experts needs further consideration.

Public health depends on reliable data and rigorous analysis of that data. This process results in the determination of causes and the design of interventions for prevention and mitigation of identified public health problems. This is followed by honest application of those analyses in the service of promoting improved health of populations. Public health will then evaluate the impact of such interventions at the population level. In other words, once the causes are determined, it needs to be demonstrated that the prevention of those causes at the population level can reduce the disease outcomes in a way that individual level initiatives cannot. Such was the case with the reduction of dental caries after municipalities began fluoridating their drinking water in the 1940s.[60]

Where is reliable data to be found, or generated? How are Christians in public health positioned to make distinct contributions to the analysis and application of those findings? How can trained public health professionals

advance population health initiatives in an era when expertise itself is suspect?[61]

Recent decades have exacerbated the isolation and siloing of many scientific disciplines.[62] This is unfortunate, given that collegiality and professional solidarity are necessary in order to establish shared expectations and ensure mutual accountability.[63] This shows the importance of public health associations and organizations, and the participation of Christian public health professionals in these associations. Christian public health professionals can in this way help to strengthen productive collegiality and scientific integrity.

What are ways that Christian public health professionals can help resolve areas of conflict between evidence-based public health and lay perceptions of public health? What are the strengths and weaknesses of Christian public health professionals isolating themselves and their work in exclusively Christian circles? What are the ways in which Christians can help the profession of public health improve their performance, and regain public trust? And is there evidence that faith-based organizations can improve trust in public health by virtue of their credibility with their adherents?[64]

Some would argue that the United States is facing a public health crisis with an uncertain future.[65] What is the source of this crisis? Some of the rising trends contributing to this crisis are antiauthoritarianism, excessive individualism, and national isolationism. The role of excessive authoritarianism by some leaders or government agencies in eliciting these reactions must also be considered.

Are the forces challenging public health primarily from certain social strata, such as high-income sectors, who feel less directly the need for public health services? Is opposition to public health an indirect attack on vulnerable and needy segments of the population who depend on public services for things such as vaccinations, general Women, Infants, and Children (WIC) services, and health screenings? What does Scripture teach about supporting the poor and the vulnerable? Or is opposition rooted in ideology that is concerned about excessive government intervention? Submissions providing insight on these issues are welcomed.

Public Health Research

A common theoretical perspective guiding public health research is the socio-ecological model.[66] This model presents health as operating at individual, inter-personal, community, and policy levels. For example, while smoking is an individual behavior, it is significantly influenced by one's interpersonal relationships and the community of which one is a part. Additionally, individual smoking decisions are affected by policies, such as high cost of tobacco products resulting from excise taxes, and the inconvenience of smoking in light of clean-air laws. This model explains the occurrence of many health problems in communities more completely than what an individual behavioral model can. Christian researchers have added to the literature with distinctly Christian contributions to a socio-ecological approach to health and well-being.[67] The Christian life is one lived within community, with service and sacrifice reverberating back and forth between the members according to need. The Christian life is more than one's individual bliss, it is even more so the blessing of participating in caring Christian community. One such example from Christian scholars Gary Gunderson and Larry Pray is the creation of the five leading causes of life—connection, coherence, agency, blessing, and hope. They place connection first in the list of the leading causes of health.[68]

How might understanding the health of the world's people be enhanced by such a community assets-based theological perspective?[69]

The pioneering work of Harold Koenig on the health benefits of religious faith, while focused on individual health, pioneered research into the health implications of Christian faith.[70] This work catalyzed a multitude of empirical studies on religion and spirituality (R/S), some supportive, and some critical. Despite the relatively mature state of R/S empirical research, there seems to be a persistent gap of true multidisciplinary work that explores intersections of R/S empirical studies and Christian theology.

How do these empirical findings complement or contradict truths gained through Christian theology?[71] *And what does it mean to be whole, in theological and biological perspective?*[72] Contributions that integrate Christian theological perspectives with empirical findings on religion and spirituality are encouraged.

The work of Tyler VanderWeele and colleagues at the Human Flourishing Program at Harvard University has provided insights into this question, showing the impact of religion and spirituality on human flourishing.[73] Another contributor is Ellen Idler, who has described religion as a social determinant of public health, that is, as an explanatory variable in good and bad health.[74]

What new evidence is there to build on the pioneering work of these researchers? The individualistic focus on health so common in the U.S. ignores the fact that one's individual health is a function of the health of their community; this begs the question, can an individual be healthy if they are part of an unhealthy community?[75] What role do Christian practices, such as fellowship, prayer, meditation, and forgiveness[76] have on individual and population health?

As a final consideration, Christians have contributions to make in the area of environmental health. The nine planetary boundaries—global environmental challenges that threaten the health of populations across the globe—have been identified.[77] Although indifference about climate concerns exists among some Christians, there are strong evangelical movements supporting climate-related advocacy, such as the Evangelical Environmental Network.[78] There are also Christian denominations that are particularly active, such as the Metropolitan African Methodist Episcopal (AME) Church. With many churches located in inner city communities, the AME has partnered with the Smart Surfaces Coalition to disburse grants to churches for the purpose of mitigating the effects of climate change.[79] This includes efforts such as retrofitting churches with cool roofs, starting community gardens, stormwater capture systems, and tree planting.

What does Christian stewardship of the environment look like, whether it be the unaltered environment (radon or sun exposure), the altered environment (solid and hazardous waste),[80] or the built environment (roads and buildings)?

Conclusion

This call for papers has attempted to sketch out the history and structure of public health, including accomplishments and challenges. It has laid out the theoretical underpinnings of public health, including areas of complement and conflict with Christian faith. It has striven to identify where gaps in scholarship exist at the interface of public health science and Christian practice and doctrine. As God's representatives on Earth (Gen. 2:15), humans are called to be stewards of the natural world; this includes understanding the material world and enhancing human flourishing (Luke 4:18–19). Public health is a multidisciplinary science whose primary aim is to promote health and to prevent disease and injury, through policy and evidence-based interventions, and to ensure equitable access to health resources. Therefore, Christian public health professionals are uniquely poised to contribute to public health scholarship infused with Christian teaching and values. It is hoped that expectant readers will build upon this introduction and expand the scholarship of Christian faith and public health through their contributed papers.

Acknowledgments

Notes

[1]David A. Grimes, "Clinical Research in Ancient Babylon: Methodologic Insights from the Book of Daniel," *Obstetrics & Gynecology* 86, no. 6 (1995): 1031–34, https://doi.org/10.1016/0029-7844(95)00276-W; and Susan Weingarten, "Food in Daniel 1:1–16: The First Report of a Controlled Experiment?," *Journal of the Royal Society of Medicine* 117, no. 12 (2024): 415–16, https://doi.org/10.1177/01410768241294253.

[2]Stephen Ko, "Public Health Approaches to Disease from Antiquity to the Current Day," in *All Creation Groans: Toward a Theology of Disease and Global Health*, ed. Daniel W. O'Neill and Beth Snodderly (Pickwick Publications, 2021), 127–40.

[3]Alfredo Morabia, *The Public Health Approach: Population Thinking from the Black Death to COVID-19* (Johns Hopkins University Press, 2023).

[4]Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present* (Yale University Press, 2019); and David Rosner and Gerald Markowitz, *Building the Worlds That Kill Us: Disease, Death, and Inequality in American History* (Columbia University Press, 2024).

[5]Jan Kirk Carney, *A History of Public Health: From Past to Present* (Jones and Bartlett Learning, 2023); and Michael T. Osterholm and Mark Olshaker, *Deadliest Enemy: Our War Against Killer Germs* (Little, Brown and Company, 2017).

[6]"Ten Great Public Health Achievements—United States, 2001–2010," reported by Ram Koppaka, *Morbidity and Mortality Weekly Report* 60, no. 19 (May 20, 2011): 619–23, https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a5.htm.

[7]Gary Gunderson et al., "Toward Common Ground: Rethinking Both Public Health and Religion, Together," *American Journal of Public Health* 115, no. 4 (2025): 492–94, https://doi.org/10.2105/AJPH.2025.308047; Doug Oman, *Why Religion and Spirituality Matter for Public Health: Evidence, Implications, and Resources* (Springer, 2018); Christoffer H. Grundmann, "Sent to Heal! About the Biblical Roots, the History, and the Legacy of Medical Missions," *Christian Journal for Global Health* 1, no. 1 (2014): 6–15, https://doi.org/10.15566/cjgh.v1i1.16; Gary B. Ferngren, *Medicine and Religion: A Historical Introduction* (Johns Hopkins University Press, 2014); Susan R. Holman, *Beholden: Religion, Global Health, and Human Rights* (Oxford University Press, 2015); Stephen M. Coleman and Todd M. Rester, *Faith in the Time of Plague: Selected Writings from the Reformation and Post-Reformation* (Westminster Seminary Press, 2021); Ted Karpf, "Faith and Health: Past and Present of Relations Between Faith Communities and the World Health Organization," *Christian Journal for Global*

Health 1, no. 1 (2014): 16–25, https://cjgh.org/articles/5/files/6626108845fb6.pdf; Gary B. Ferngren, *Medicine and Health Care in Early Christianity* (Johns Hopkins University Press, 2009); Amanda Porterfield, *Healing in the History of Christianity* (Oxford University Press, 2005); Willard M. Swartley, *Health, Healing and the Church's Mission: Biblical Perspectives and Moral Priorities* (InterVarsity Press, 2012); and Charles E. Rosenberg and Carroll S. Rosenberg, "Pietism and the Origins of the American Public Health Movement: A Note on John H. Griscom and Robert M. Hartley," *Journal of the History of Medicine and Allied Sciences* 23, no. 1 (1968): 16–35, https://www.jstor.org/stable/24621721.

[8]"National Public Health Performance Standards: The Public Health System and the 10 Essential Public Health Services," Centers for Disease Control and Prevention, accessed February 18, 2015, http://www.cdc.gov/nphpsp/essentialServices.html.

[9]"The 10 Essential Public Health Services," Centers for Disease Control and Prevention, revised 2020, https://phaboard.org/wp-content/uploads/EPHS-English.pdf.

[10]Karen B. DeSalvo et al., "Public Health 3.0: A Call to Action for Public Health to Meet the Challenges of the 21st Century," *Preventing Chronic Disease* 14 (2017): 170017, http://dx.doi.org/10.5888/pcd14.170017.

[11]Jason Paltzer, "Training a Christian Public Health Workforce: A Qualitative Study of Christian Public Health Training Programs," *Christian Journal for Global Health* 5, no. 3 (2018): 12–22, https://cjgh.org/articles/10.15566/cjgh.v5i3.228.

[12]Sandro Galea, *Within Reason: A Liberal Public Health for an Illiberal Time* (University of Chicago Press, 2023). Although the United States public health system is being featured, those of other countries have distinct and valuable experiences and approaches to public health that should be studied and considered. This is particularly so with Canada and Mexico, the near neighbors of the United States. Global contributions to this special issue are welcomed and needed.

[13]Justeen K. Hyde and Stephen M. Shortell, "The Structure and Organization of Local and State Public Health Agencies in the U.S.—A Systematic Review," *American Journal of Preventive Medicine* 42, no. 5, Supplement 1 (2012): S29–S41, https://doi.org/10.1016/j.amepre.2012.01.021.

[14]Valerie A. Yeager et al., "Funding Public Health: Achievements and Challenges in Public Health Financing Since the Institute of Medicine's 2012 Report," *Journal of Public Health Manage Practicing Medicine* 28, no. 1 (2022): E244–E255, https://doi.org/10.1097/phh.0000000000001283.

[15]Michelle M. Mello and Jamie Wang, "The Hard Road Ahead for State Public Health Departments," *JAMA Health Forum* 6, no. 3 (2025): e250817–e17, https://doi.org/10.1001/jamahealthforum.2025.0817.

[16]Gunderson et al., "Toward Common Ground."

[17]LaPrincess C. Brewer and David R. Williams, "We've Come This Far by Faith: The Role of the Black Church in Public Health," *American Journal of Public Health* 109, no. 3 (2019): 385–86, https://doi.org/10.2105/AJPH.2018.304939.

[18]Howard K. Koh and Eric Coles, "Body and Soul: Health Collaborations with Faith-Based Organizations," *American Journal of Public Health* 109, no. 3 (2019): 369–70, https://doi.org/10.2105/AJPH.2018.304920; and Ellen Idler et al., "Partnerships Between Public Health Agencies and Faith Communities," *American Journal of Public Health* 109, no. 3 (2019): 346–47, https://doi.org/10.2105/ajph.2018.304941.

[19]"The African Christian Health Associations' Technical Working Group on Human Resources for Health," African Christian Health Association, 2008; S. Litsios, "The Christian Medical Commission and the Development of the World Health Organization's Primary Health Care Approach," *American Journal of Public Health* 94, no. 11 (2004): 1884–93; and Ellen L. Idler, ed., *Religion as a Social Determinant of Health* (Oxford University Press, 2014).

[20]Karpf, "Faith and Health"; and Fabian Winiger and Simon Peng-Keller, "Religion and the World Health Organization: An Evolving Relationship," *British Medical Journal Global Health* 6, no. 4 (2021): e004073, https://doi.org/10.1136/bmjgh-2020-004073.

[21]Patrice Richardson, "Spirituality, Religion and Palliative Care," *Annals of Palliative Medicine* 3, no. 3 (2014): 150–59, https://doi.org/10.3978/j.issn.2224-5820.2014.07.05; and Taylor W. Dean, "Not Religion: The Problems of Religion and the Making of Alcoholics Anonymous," chap. 7 in *Holy Waters*, ed. Ryan Lemasters and Stephen Covell (Routledge, 2025).

[22]Julie E. Yonker et al., "The Relationship Between Spirituality and Religiosity on Psychological Outcomes in Adolescents and Emerging Adults: A Meta-Analytic Review," *Journal of Adolescence* 35, no. 2 (2012): 299–314, https://doi.org/10.1016/j.adolescence.2011.08.010.

[23]Mimi Kiser and Kay Lovelace, "A National Network of Public Health and Faith-Based Organizations to Increase Influenza Prevention Among Hard-to-Reach Populations," *American Journal of Public Health* 109, no. 3 (2019): 371–77, https://doi.org/10.2105/AJPH.2018.304826.

[24]Annie Hardison-Moody and Julia Yao, "Faithful Families, Thriving Communities: Bridging Faith and Health Through a State-Level Partnership," *American Journal of Public Health* 109, no. 3 (2019): 363–68, https://doi.org/10.2105/ajph.2018.304869.

[25]Charles Taylor, *A Secular Age* (Harvard University Press, 2007).

[26]Elizabeth S. Anderson, "What Is the Point of Equality?," *Ethics* 109, no. 2 (1999): 287–337, https://doi.org/10.1086/233897; and Jim Wallis, *The (Un)Common Good: How the Gospel Brings Hope to a World Divided* (Brazos Press, 2014).

[27]William H. Swatos Jr. and Kevin J. Christiano, "Introduction—Secularization Theory: The Course of a Concept," *Sociology of Religion* 60, no. 3 (1999): 209–28, https://doi.org/10.2307/3711934; and Christian Smith, *The Secular Revolution: Power, Interests, and Conflict in the Secularization of American Public Life* (University of California Press, 2003).

[28]*Defining Essential Public Health Functions and Services to Strengthen National Workforce Capacity,* World Health Organization (World Health Organization, 2024).

[29]Oman, *Why Religion and Spirituality Matter.*

[30]James C. Thomas et al., "A Code of Ethics for Public Health," *American Journal of Public Health* 92, no. 7 (2002): 1057–59, https://doi.org/10.2105/ajph.92.7.1057; and "Public Health Code of Ethics," American Public Health Association, https://www.apha.org/-/media/files/pdf/membergroups/ethics/code_of_ethics.ashx.

[31]Paltzer, "Training a Christian Public Health Workforce."

[32]Cornelius Plantinga Jr., *Not the Way It's Supposed to Be: A Breviary of Sin* (Eerdmans, 1996).

[33]Ross C. Brownson et al., "Evidence-Based Public Health: A Fundamental Concept for Public Health Practice," *Annual Review of Public Health* 30 (2009): 175–201, https://doi.org/10.1146/annurev.publhealth.031308.100134.

[34]Ross C. Brownson et al., "Getting the Word Out: New Approaches for Disseminating Public Health Science," *Jour-

[35]*nal of Public Health Management and Practice* 24, no. 2 (2018): 102–11, https://doi.org/10.1097/phh.0000000000000673.

[35]Charlotte Andersson et al., "70-Year Legacy of the Framingham Heart Study," *Nature Reviews Cardiology* 16, no. 11 (2019): 687–98, https://doi.org/10.1038/s41569-019-0202-5.

[36]Sarah Rosner Preis et al., "Trends in All-Cause and Cardiovascular Disease Mortality Among Women and Men With and Without Diabetes Mellitus in the Framingham Heart Study, 1950 to 2005," *Circulation* 119, no. 13 (2009): 1728–35, https://doi.org/10.1161/circulationaha.108.829176.

[37]Tyler J. VanderWeele et al., "The Global Flourishing Study: Study Profile and Initial Results on Flourishing," *Nature Mental Health* 3, no. 6 (2025): 636–53, https://doi.org/10.1038/s44220-025-00423-5.

[38]Jacob Samuel Howard, "Changing an Individualistic Cultural Identity into a Christocentric Identity at Community Alliance Church of the Christian and Missionary Alliance in Towanda, Pennsylvania" (PhD diss, Liberty University, 2023), https://digitalcommons.liberty.edu/doctoral/4216/.

[39]Alan C. Logan et al., "Vitality Revisited: The Evolving Concept of Flourishing and Its Relevance to Personal and Public Health," *International Journal of Environmental Research and Public Health* 20, 6 (2023): 5065, https://doi.org/10.3390/ijerph20065065; Tyler J. VanderWeele, "On the Promotion of Human Flourishing," *Proceedings of the National Academy of Sciences* 114, no. 31 (2017): 8148–56, https://doi.org/10.1073/pnas.1702996114; and Jeff Levin, "Human Flourishing: A New Concept for Preventive Medicine," *American Journal of Preventive Medicine* 61, no. 5 (2021): 761–64, https://www.ajpmonline.org/article/S0749-3797(21)00276-2/abstract.

[40]John B. Blevins et al., "Faith and Global Health Practice in Ebola and HIV Emergencies," *American Journal of Public Health* 109, no. 3 (2019): 379–84, https://doi.org/10.2105/ajph.2018.304870.

[41]Gunderson et al., "Toward Common Ground."

[42]Mona Bormet et al., "Faith-Based Advocacy for Family Planning Works: Evidence from Kenya and Zambia," *Global Health: Science and Practice* 9, no. 2 (2021): 254, https://doi.org/10.9745/ghsp-d-20-00641.

[43]Sneha Barot, "A Common Cause: Faith-Based Organizations and Promoting Access to Family Planning in the Developing World," *Guttmacher Policy Review* 16, no. 4 (2013): 18–23, https://www.guttmacher.org/gpr/2013/12/common-cause-faith-based-organizations-and-promoting-access-family-planning-developing; Jeffrey K. Wubbenhorst and Monique C. Wubbenhorst, "Should Evangelical Christian Organizations Support International Family Planning?," *Dignatas* 24, no. 2 (2017): 11–21, https://www.cbhd.org/dignitas-articles/should-evangelical-christian-organizations-support-international-family-planning; Michael J. Sleasman and Paige Comstock Cunningham, "Bioethics, the Global Church, and Family Planning," *Christian Journal for Global Health* 4, no. 3 (2017): 6–11, https://doi.org/10.15566/cjgh.v4i3.203; and Wiley Henry Mosley, "Why Evangelical Christians Are Supporting International Family Planning: A Response to 'Should Evangelical Christian Organizations Support International Family Planning?,'" *Christian Journal for Global Health* 5, no. 1 (July 2018): 4–15, https://cjgh.org/articles/133/files/6631ecf6b9a34.pdf.

[44]Lawrence O. Gostin et al., "The US Supreme Court's Rulings on Large Business and Health Care Worker Vaccine Mandates: Ramifications for the COVID-19 Response and the Future of Federal Public Health Protection," *Journal of the American Medical Association* 327, no. 8 (2022): 713–14, https://doi.org/10.1001/jama.2022.0852; and Jeff Levin et al., "Faith-Based Organizations and SARS-CoV-2 Vaccination:

[44]Challenges and Recommendations," *Public Health Reports* 137, no. 1 (2021): 11–16, https://doi.org/10.1177/00333549211054079.

[45]Dietrich Bonhoeffer, *Creation and Fall: A Theological Exposition of Genesis 1–3*, ed. John W. de Gruchy and trans. Douglas Stephen Bax (Fortress Press, 2004).

[46]Wolfhart Pannenberg, *Anthropology in Theological Perspective*, trans. Matthew J. O'Connell (Westminster John Knox Press, 1985).

[47]Fernando Elijovich et al., "Salt Sensitivity of Blood Pressure: A Scientific Statement from the American Heart Association," *Hypertension* 68, no. 3 (2016): e7–e46, https://doi.org/10.1161/hyp.0000000000000047.

[48]Rodney Stark, *The Rise of Christianity* (Harper Collins, 1997).

[49]Emmarie Huetteman, "Covid Vaccine Hesitancy Drops Among All Americans, New Survey Shows," *KFF Health News*, March 30, 2021, https://kffhealthnews.org/news/article/covid-vaccine-hesitancy-drops-among-americans-new-kff-survey-shows/.

[50]Julie Henderson et al., "Developing and Maintaining Public Trust During and Post-COVID-19: Can We Apply a Model Developed for Responding to Food Scares?," *Frontiers Public Health* 8 (July 14, 2020): 369, https://doi.org/10.3389/fpubh.2020.00369.

[51]Hannah Melchinger et al., "Change in Confidence in Public Health Entities Among US Adults Between 2020–2024," *PLOS Global Public Health* 5, no. 6 (2025): e0004747, https://doi.org/10.1371/journal.pgph.0004747.

[52]Izabelle Mendez et al., "Trust Trends: U.S. Adults' Gradually Declining Trust in Institutions, 2021–2024," *AAMC Center for Health Justice*, February 18, 2025, https://www.aamchealthjustice.org/news/polling/trust-trends.

[53]Shanto Iyengar and Douglas S. Massey, "Scientific Communication in a Post-Truth Society," *Proceedings of the National Academy of Sciences* 116, no. 16 (2018): 7656–61, https://doi.org/10.1073/pnas.1805868115; and Debora MacKenzie, "Living in Denial: Why Sensible People Reject the Truth," *New Scientist,* May 12, 2010, 276038–41, https://www.newscientist.com/article/mg20627606-100-living-in-denial-why-sensible-people-reject-the-truth/.

[54]Rina Fajri Nuwarda et al., "Vaccine Hesitancy: Contemporary Issues and Historical Background," *Vaccines* (Basel) 10, no. 10 (2022): 1595, https://doi.org/10.3390/vaccines10101595.

[55]Lewis A. Grossman, *Choose Your Medicine: Freedom of Therapeutic Choice in America* (Oxford University Press, 2021); and Brittany Acors, "Masks vs. God and Country: The Conflict Between Public Health and Christian Nationalism," *Studies in Church History* 58 (2022): 415–37, https://doi.org/10.1017/stc.2022.20.

[56]Richard Lee Rogers and Nicolette Powe, "COVID-19 Information Sources and Misinformation by Faith Community," *Inquiry* 59 (May 30, 2022): 469580221081388, https://doi.org/10.1177/00469580221081388; Bernard D. DiGregorio et al., "'God Will Protect Us': Belief in God/Higher Power's Ability to Intervene and COVID-19 Vaccine Uptake," *Review of Religious Research* 64, no. 3 (2022): 475–95, https://doi.org/10.1007/s13644-022-00495-0; Katie E. Corcoran et al., "Christian Nationalism and COVID-19 Vaccine Hesitancy and Uptake," *Vaccine* 39, no. 45 (2021): 6614–21, https://doi.org/10.1016/j.vaccine.2021.09.074; Matthew B. Arbuckle and David M. Konisky, "The Role of Religion in Environmental Attitudes," *Social Science Quarterly* 96, no. 5 (2015): 1244–63; A. Bardon, *The Truth About Denial: Bias and Self-Deception in Science, Politics, and Religion* (Oxford University Press, 2020); and Molly Worthen, "The Evangelical Roots of Post-Truth," Opinion, *New York Times*, April 13, 2017, https://www

.nytimes.com/2017/04/13/opinion/sunday/the-evangelical
-roots-of-our-post-truth-society.html.

[57]Joel James Shuman and Keith G. Meador, *Heal Thyself: Spirituality, Medicine, and the Distortion of Christianity* (Oxford University Press, 2002).

[58]Mark A. Strand et al., "Commending Public Health in a Time of Uncertainty," *Journal of Public Health Management and Practice* 32, no. 1 (2026): 3–9, https://doi.org/10.1097/phh.0000000000002220.

[59]Molly Worthen, *Apostles of Reason: The Crisis of Authority in American Evangelicalism* (Oxford University Press, 2013).

[60]H. P. Whelton et al., "Fluoride Revolution and Dental Caries: Evolution of Policies for Global Use," *Journal of Dental Research* 98, no. 8 (2019): 837–46, https://doi.org/10.1177/0022034519843495.

[61]Tom Nichols, *The Death of Expertise: The Campaign Against Established Knowledge and Why It Matters* (Oxford University Press, 2017).

[62]Christine A. Bevc et al., "New Perspectives on the 'Silo Effect': Initial Comparisons of Network Structures Across Public Health Collaboratives," *American Journal of Public Health* 105, Suppl. 2 (April 2015): S230–35, https://doi.org/10.2105/AJPH.2014.302256.

[63]Andrea Saltelli and Silvio Funtowicz, "What Is Science's Crisis Really About?," *Futures* 91 (2017): 5–11, https://doi.org/10.1016/j.futures.2017.05.010.

[64]Uzma Syed et al., "The Role of Faith-Based Organizations in Improving Vaccination Confidence and Addressing Vaccination Disparities to Help Improve Vaccine Uptake: A Systematic Review," *Vaccines* (Basel) 11, no. 2 (2023): 449, https://doi.org/10.3390/vaccines11020449.

[65]H. Elliott Larson, "Examining the Past to Enable the Future," *Christian Journal for Global Health* 12, no. 1 (2025): 1–3, https://doi.org/10.15566/cjgh.v12i1.424.

[66]D. Stokols, "Translating Social Ecological Theory into Guidelines for Community Health Promotion," *American Journal of Health Promotion* 10, no. 4 (1996): 282–98, https://doi.org/10.4278/0890-1171-10.4.282; and James F. Sallis and Neville Owen, *Ecological Models* (Jossey-Bass Publishers, 1997).

[67]Tracy A. Balboni et al., "Spirituality in Serious Illness and Health," *Journal of the American Medical Association* 328, no. 2 (2022): 184–97, https://doi.org/10.1001/jama.2022.11086.

[68]Gary Gunderson with Larry Pray, *Leading Causes of Life: Five Fundamentals to Change the Way You Live Your Life* (Abingdon Press, 2009).

[69]Mark A. Strand and Andrew M. Cole, "Framing the Role of the Faith Community in Global Health," *Christian Journal for Global Health* 1, no. 2 (2014): 7–15, https://cjgh.org/articles/17/files/66275bb897ed2.pdf.

[70]Harold G. Koenig, "Religion, Spirituality, and Health: The Research and Clinical Implications," *ISRN Psychiatry* 2012, no. 8 (2012): 278730, https://doi.org/10.5402/2012/278730; and Harold G. Koenig, *The Healing Power of Faith: Science Explores Medicine's Last Great Frontier* (Simon and Schuster, 1999).

[71]John Swinton, "From Health to Shalom: Why the Religion and Health Debate Needs Jesus," in *Healing to All Their Flesh: Jewish and Christian Perspectives on Spirituality, Theology, and Health*, ed. Jeff Levin and Keith Meador (Templeton Press, 2013): 219–42.

[72]Daniel W. O'Neill and Beth Snodderly, eds., *All Creation Groans*; and Daniel E. Fountain, *God, Medicine and Miracles: The Spiritual Factor in Healing* (WaterBrook, 1999).

[73]VanderWeele, "On the Promotion of Human Flourishing"; and Tyler J. VanderWeele, "Flourishing and the Scope of

Medicine and Public Health," *Journal of Epidemiology and Community Health* 78, no. 7 (2024): 466–70, https://doi.org/10.1136/jech-2023-220553.

[74]Idler, ed., *Religion as a Social Determinant of Health*; and Rebecca Meyer, ed., *Christian Global Health in Perspective: A Guide to Healing and Wholeness in Missions* (William Carey Publishing, 2024).

[75]Onyebuchi A. Arah, "On the Relationship Between Individual and Population Health," *Medicine, Health Care and Philosophy* 12, no. 3 (2009): 235–44, https://doi.org/10.1007/s11019-008-9173-8; Katherine M. Keyes and Salea Galea, *Population Health Science* (Oxford University Press, 2016); and Heather McGhee, *The Sum of Us: What Racism Costs Everyone and How We Can Prosper Together* (One World, 2021).

[76]Tyler J. VanderWeele, "Is Forgiveness a Public Health Issue?," *American Journal for Public Health* 108, no. 2 (2018): 189–90, https://doi.org/10.2105/AJPH.2017.304210.

[77]K. Richardson et al., "Earth Beyond Six of Nine Planetary Boundaries," *Science Advances* 9, no. 37 (2023): eadh2458, https://doi.org/10.1126/sciadv.adh2458.

[78]Jessica Moerman, "Faith in Action: Educating and Mobilizing Evangelical Christians to Act on Climate," paper presented at the 103rd American Meteorological Society Annual Meeting, Denver, CO, January 10, 2023. This section is intentionally brief so as not to excessively overlap with issues of *PSCF* devoted to creation care. But it has highlighted various key topics, questions, controversies, and examples so as to attract potential contributions from authors with experience in environmental health.

[79]Sophia Meador, "Metropolitan AME Church Supports Cooling via Smart Surface Solutions," *The Nation's Health* 55, no. 8 (October 2025): 9, https://www.thenationshealth.org/content/55/8/9.

[80]Danielle E. McBride et al., "Child and Adolescent Manganese Biomarkers and Adolescent Postural Balance in Marietta CARES Cohort Participants," *Environmental Health Perspectives* 132, no. 5 (2024): 057010, https://doi.org/10.1289/EHP13381.

Tractability, Testability, and Joyful Work

David Owen

David Owen

Fred Brooks is remembered for his Christian faith and for many contributions to computer hardware and software design, management, research, and education. Brooks is known particularly for his 1975 book, The Mythical Man-Month, *which includes reflections on unique joys, as well as management challenges, of software development. Computer programmers, according to Brooks, work in a tractable medium: What one imagines may be readily constructed, with few constraints imposed by the medium. And yet, in contrast to other kinds of creative work, the construct produced is testable: It is possible to determine experimentally, in a repeatable and unambiguous way, whether one has succeeded or failed. Here I consider whether these ideas of tractability and testability might contribute to our understanding of what makes (or could make) other kinds of work joyful. I also consider Brooks as a model for Christian vocation, as Brooks's writing provides the basis for a definition of joyful work grounded in a Christian understanding of the human person, made in the image of God.*

> The voice we should listen to most as we choose a vocation is the voice that we might think we should listen to least, and that is the voice of our own gladness … In a world where there is so much drudgery, so much grief, so much emptiness and fear and pain, our gladness in our work is as much needed as we ourselves need to be glad.
>
> –Frederick Buechner[1]

Frederick Buechner's words are profound and worthy of careful reflection. His ideas have been inspiring to many. But it is hard to read this and not react with questions: What about all of the unpleasant but much-needed work in this world? What about the needed work which might bring gladness but not a living wage? What if the voice of my gladness is shallow and self-centered, or uncertain, or inconsistent?[2] It may be true that I need to be glad and that the world needs my gladness. It may be true that I am called to find that place "where [my] deep gladness and the world's deep hunger meet," as Buechner famously said elsewhere.[3] But if I haven't yet found that place, how do I get from here to there? What practical steps can I take to move in that direction?

In this article, I reflect on ideas from Fred Brooks about gladness that he found in the work of software development. Rather than questioning or critiquing Buechner's advice, this article proposes Brooks as a model for Christian vocation consistent with Buechner: Brooks's writing about the joys of computer programming provides the basis for a definition of gladness in one's work grounded in a Christian understanding of the human person, created in the image of God. Moreover, Brooks's positive influence on so many people who knew him and worked with him throughout his

David Owen *teaches computer science at Messiah University in Grantham, Pennsylvania. In graduate school, he studied verification strategies used to assure that desired properties hold for a distributed software system. His more recent interests include computer architecture, graphics, and programming languages.*

life provides an illustration of Buechner's idea that gladness in one's work, shared with others, is something much needed in our world.

The Mythical Man-Month

Brooks is probably best known among software developers for his book, *The Mythical Man-Month,* first published in 1975.[4] Brooks writes about the joys of the craft of computer programming, including "the delight of working in such a *tractable* medium"—a medium "readily capable of realizing grand conceptual structures"—and yet creating a *testable* construct, "real in the sense that it moves and works, producing visible outputs separate from the construct itself."[5] Here, I consider, as Brooks does, tractability and testability as objective qualities, which may vary from one kind of work to another. Work in a tractable medium, to produce a testable construct, is *joyful* work—it produces various joys described by Brooks and summarized below. I also consider tractability and testability in the subjective experience of the worker, varying from one worker to another. The medium most tractable for you, through which you are best able to realize what you imagine, I may find awkward and frustrating to work with.[6] The construct most testable for you—you know how it ought to work, and it is obvious to you when you get it right—may be difficult for me to understand and evaluate.[7] Work in a medium that is tractable for you, to produce a construct testable for you, is likely, for you, to be joyful work—work in which you might hope to find deep and lasting gladness.

Fred Brooks wrote *The Mythical Man-Month* "to explain the quite different management experiences [he] encountered in System/360 hardware development and OS/360 software development" at IBM in the 1960s.[8] Software development was something relatively new at the time and, according to Brooks, surprisingly challenging to manage. The title of the book comes from Brooks's observation that the development of a complex software system requires much communication between developers. The bigger the team, the more communication is needed, so the idea that a development effort be measured in "man-months" is a "dangerous and deceptive myth."[9] Adding more workers to a task that requires training initially, and then ongoing communication between them, might not speed up the task; this might even slow it down, depending on just how much training and communication are needed. Because software development requires much training and communication, Brooks offers the following (greatly simplified, he admits) "law": "Adding manpower to a late software project makes it later."[10]

Referencing Andrey Ershov,[11] Brooks describes not only surprising management challenges but also particular joys of software development. Brooks mentions tractability and testability specifically in two places, but I suggest here that all of the joys he describes flow naturally from the tractability of the medium and the testability of the construct, if these are understood broadly as I have defined them above.

There are joys that flow from the tractability of the medium—joys of creativity and of excellence:

- The joy of creating something new, something of one's own design. "I think this delight," says Brooks, "must be an image of God's delight in making things, a delight shown in the distinctness and newness of each leaf and snowflake."[12]
- The joy of building a "complex, puzzle-like object of interlocking moving parts" that seems to take on a life of its own.[13] This is the joy of the craft, of excellence, of an elegant and not merely functional solution—a delight in the goodness or completeness of the thing one makes.

And there are joys that flow from the testability of the construct—joys of purpose and of learning:

- The joy of making something useful to others, the joy of solving a problem that others have judged to be worth solving, the sense of purpose and fulfillment in service to others.[14]
- The joy of learning, of growing in skill and understanding as one's ideas are tested experimentally in a working implementation.[15]

But joyful work is not always delightful and fulfilling. Gladness is not merely the absence of pain or uncertainty. There are woes inescapably intertwined with the joys of software development. There are woes that flow from the tractability of the medium—woes of confusion and instability:

- The woe of "arbitrary complexity" (as Brooks describes it in a later essay):[16] Programmers invent wonderfully and woefully complex systems, puzzling to themselves and bewildering to others.
- The woe of imminent obsolescence: Because the medium imposes so few constraints and evolves so quickly, others move on to new and better ideas before there is time for one's current idea to be realized.[17]

And there are woes that flow from the testability of the construct—woes of frustration and dependence:

- The woe of debugging, the tedious and frustrating effort to correct one's ideas and implementation so that the program runs correctly on a strict and unforgiving machine.[18]

- The woe of dependence on others, including managers or users who decide what one's program should do; including other programmers whose arbitrarily complex work must be integrated with one's own.[19]

Because the joys and woes are intertwined, the woes must be managed in order to make joyful work a realistic possibility. Gladness in our work, to be sustainable, must be found within the "real world" of daily life among flawed human beings. There are management challenges associated with tractability—challenges of unrealistic optimism and the need for much communication:

- The challenge of unrealistic optimism: In contrast with other activities that create or build something, activities in which the physical limitations of the medium serve to constrain one's ambitions, the comparatively unconstrained nature of computer programming leads to unrealistic optimism about how much can be done, and how quickly.[20]

- The need for much communication: Because of the tractability of the medium, every project is potentially different and new; much training and ongoing communication is therefore needed if developers working together are to understand each other's ideas.[21]

These challenges are also associated with testability:

- Unrealistic optimism is a challenge precisely because developers' ideas will be thoroughly tested in the implementation. "Because our ideas are faulty, we have bugs; hence our optimism is unjustified."[22]

- And much communication is needed, because developers must indeed understand each other's ideas; misunderstandings will become obvious as they are manifested in a program that doesn't work correctly or doesn't even make sense to users.[23]

Much of *The Mythical Man-Month* is concerned with the elaboration of these challenges and with strategies for addressing them. My experience as a professional software developer was short and was nearly twenty years ago, before I began a career in computer science education; I have no experience managing a team of professional developers. So I am not in a position to evaluate the strategies Brooks suggests. I trust him, and I trust a generation of developers and managers influenced by the ideas in his book, that strategies like what he suggests are necessary to make software development work sustainable and productive, especially as teams grow larger and projects more ambitious. Still, I am interested in this question: If the joys, woes, and management challenges of software development flow from tractability and testability, and are thus intertwined, will attempts to address the management challenges—to mitigate the woes—risk diminishing the joys as well? To put the question more broadly, as I imagine Buechner might: Will attempts to make work sustainable and productive in the "real world" necessarily undermine workers' opportunities for deep gladness? In the next section, I will consider a few of the management strategies Brooks suggests with this question in mind.

The Challenge of Conceptual Integrity

The idea most often associated with *The Mythical Man-Month* is implied by the title: software development effort should not be measured in "man-months," because much communication is needed between developers working together. But this is not the most important idea in the book, according to Brooks; for Brooks, the book is about "conceptual integrity" and about strategies for managing a team of developers so as to produce it in a programming product:

> A clean, elegant programming product must present to each of its users a coherent mental model of the application, of strategies for doing the application, and of the user-interface tactics to be used in specifying actions and parameters. The conceptual integrity of the product, as perceived by the user, is the most important factor in ease of use … There are many examples of elegant software products designed by a single mind, or by a pair. Most purely intellectual works such as books or musical compositions are so produced. Product-development processes in many industries cannot, however, afford this straightforward approach to conceptual integrity … Any product that is sufficiently big or urgent to require the effort of many minds thus encounters a peculiar difficulty: The result must be conceptually coherent to the single mind of the user and at the same time designed by many minds. How does one organize design effort so as to achieve such conceptual integrity? … Deliberate, and even heroic management actions are necessary to achieve coherence.[24]

What sort of management actions are necessary? First, Brooks prescribes a strict distinction between architecture and implementation: a distinction between "what" the product is and does, from the user's point of view, and "how" it works internally.[25] The implementation—making the thing and making it work—may require the effort of many developers working together, but a single "architect" should be assigned to design the "what" of the product, acting as a representative for a single user's point of view.[26] Developers working with the architect to implement the product should be assigned distinct roles to form one or more "surgical teams," each responsible for a relatively independent aspect of the implementation.[27] Each team's "surgeon" is responsible for directly doing the work; others have distinct and clearly defined supporting roles. This structure, with a single architect and developers working in surgical teams, addresses the challenge of conceptual integrity, both at the architectural level and at the level of each surgical team. It also reduces the need for communication between developers: Every surgeon communicates with the architect, but little communication is needed between surgeons from different implementation teams; within a team, communication can be focused because members have distinct roles and responsibilities.

If the joys, woes, and management challenges of software development are intertwined, what impact might such management actions have on the experience of individual developers? Specifically, how might an individual developer's experience of the tractability of the medium and the testability of the construct be impacted? I will consider this question from the point of view of an architect, of a senior developer (at the level of Brooks's surgeon, but in a present-day development team), and of a member of the development team in a supporting role.[28]

The joy of creating something new, something of one's own design—this is the joy of the architect, together with a sense of purpose, the joy of making something useful to another, as the architect represents the user's point of view. The joy of the craft, of excellence in building something and seeing it come to life; the joy of learning to build with greater skill and understanding—these are the joys of the development team, particularly of senior developers. There is also the joy of making something useful, as the implementation is validated by the architect and contributes to the overall design. But what are the joys for those in narrower supporting roles? Their work is validated by senior developers and by the team's contribution to the overall design, assum-

ing that they are included in the big-picture vision for the product and encouraged to identify with the user's point of view. There is a possibility, however, that as supporting roles become more specialized, their work may be valued primarily for its utility; others will call it "good" if it is good enough for their purposes, not recognizing or appreciating its excellence as someone experienced in the same kind of work would be able to do.[29] This is a danger for all roles as they become more specialized and distinct from each other, but especially for supporting roles as their work is further removed from the particulars of the product. There is a sense of purpose, a joy in making something useful to another, to be sure. But ideally the other joys—joys of creativity, excellence, and learning—would not be diminished for those in supporting roles.

How to Avoid Diminishing the Joys?

Is it possible to maintain conceptual integrity, assuming this requires a hierarchical structure of specialized roles, without diminishing the joys of creativity, excellence, purpose, and learning? Brooks must believe it is, as *The Mythical Man-Month* begins with an eloquent description of these joys before moving on to discuss management challenges and how to address them. One finds helpful ideas throughout the book. Here are some examples:

- The architect is responsible to make design decisions in a way that ensures conceptual integrity, but others should be encouraged to contribute design ideas.[30] Likewise, Brooks's surgeon (or perhaps a senior developer today) makes implementation decisions, but others should be encouraged to contribute implementation ideas. In particular, the architect should be prepared to suggest a possible implementation for any feature of the (architect's) design.[31]

- Assigning distinct roles might sometimes increase opportunities for creativity. If responsibilities are divided so that each person has authority to make decisions in their own area, they will be freed from time-consuming committee decision-making and enabled to focus on doing their own part well.[32] I would suggest that responsibilities be divided, not only so that each person has authority to make decisions in their own area, but so that each may also experience tractability in the medium of the work (choices through which they can express themselves creatively) and testability in the construct (time and resources to get it right, from their point of view, even if they have a higher standard than others).

- Brooks famously suggests that software developers "plan to throw one away."[33] The first version will be bad, but the team will learn from it, and the next will be much better. (This may be the second-most-well-known idea in the book.) In a later essay, he generalizes this idea and advocates for an incremental development process.[34] Either way, the idea is to treat learning as a normal and expected part of the design and implementation of a new software product. Consistent with this, Brooks suggests a non-threatening organizational structure with mechanisms for public documentation of tentative commitments.[35]

- Roles should be specialized and distinct, but each person should be trained for multiple roles and should be given opportunities to move between roles.[36] Also, a good manager will work to reduce role conflict[37] and to minimize sociological barriers (so that management roles are not given higher status, for example.)[38]

In the next section, I will consider whether these ideas from software development might offer insight into what makes other kinds of work joyful (or not). But first, imagine a team of developers working together on a project just for the joy of it, without the constraint that it must be profitable in order for them to remain employed. What sort of management structure could make such work sustainable and productive? Eric Raymond asks this question in *The Cathedral and the Bazaar*, a book about "hacker" culture and the open-source movement as it emerged along with Linux and the World Wide Web in the 1990s.[39] In a nutshell, the structure looks like this:

- A project typically has an "owner"; this person "has the exclusive right, recognized by the community at large, to distribute modified versions."[40]

- A project is initiated because it meets a need for the initial owner, who is the initial user, manager, architect, implementer, and tester. "Every good work of software starts by scratching a developer's personal itch," says Raymond.[41]

- The owner shares the project with (many) potential user-developer-testers. The owner exclusively retains the architect and manager roles while continuing to use, implement, and test the evolving code.

- Non-owner participants contribute feature suggestions, implementation changes, bug reports, and fixes publicly, but no changes are officially distributed to the group without the owner's approval.

The project itself is initially motivated by a developer's need. But what motivates the developer to share code with others? A variety of things, according to Raymond, including the need for help from other user-developer-testers, but most importantly "prestige," awarded and maintained in a "gift culture" based on shared appreciation for development ability and high-quality software.[42] In contrast to popular open-source licenses (the GNU General Public License, for example), which embody an "anyone-can-hack-anything consensus theory," says Raymond, "the open-source culture has an elaborate but largely unadmitted set of ownership customs."[43] In other words, ownership is highly respected. Any non-trivial change must be approved by the owner before it is distributed to the group, and transfer of ownership must happen in a deliberate, public way, even for apparently "orphaned" projects no longer maintained by the most recent owner.

In some ways, the open-source structure, as described by Raymond, is surprisingly similar to the structure suggested by Brooks. There is an architect (the owner), a single mind responsible for the conceptual integrity of the product; there are distinct roles that function like a surgical team: a senior developer (the owner) who has the final say, and a team of supporting user-developer-testers who offer suggested changes.[44] Those in supporting roles clearly do find joy in their work, or they wouldn't keep doing it. So a multi-level structure, with distinct roles and responsibilities and a dynamic of unequal prestige—whether in Brooks's surgical team, Raymond's open-source gift culture, or a present-day development team with a mix of senior and supporting roles—is not necessarily opposed to joyful work; in fact, such a structure may be important for making joyful work sustainable and productive.

What About Other Kinds of Work?

Brooks, and likewise Raymond, make a distinction between software development and other kinds of work, such as "reaping wheat or picking cotton"[45] or "flipping burgers or digging ditches."[46] The implication is that, in software development, joyful work—creativity, excellence, purpose, and learning—is rewarded by productivity and is thus sustainable; in other kinds of work, such things may be irrelevant to productivity or even opposed to it.

In *Peopleware* (another well-known classic in the genre of software project management), Tom DeMarco and Timothy Lister devote the second chapter to a critique

of managers who treat developers as if they were making and selling cheeseburgers in a "production environment."[47] In such an environment, it makes sense to "optimize for steady state," to "do everything by the book," and to "eliminate experimentation."[48] To be fair, this advice is offered tongue-in-cheek, with the "production environment" put forward only as a foil for the management style DeMarco and Lister advocate for software development, which honors the unique value of each worker in various ways. Still, the suggestion is that software development is a special kind of work for which it is important to treat people well if you want to get a good product; there are, apparently, other kinds of work—production work—where treating people well is optional or even counterproductive.

This distinction between creative design and development work versus production work is treated by Brooks (and Raymond, and DeMarco and Lister) as an essential fact of software development, which managers would be foolish to ignore. Brooks writes about software development at scale as something new, as it was in the 1960s, for which he and others discovered that new management strategies would be necessary. In the years since, one finds a tension in the literature between this view, that unique management strategies will (always) be necessary, and an opposing view, that with adequate research, informing better processes and more effective tools, software development can be made more manageable—more like production work.

The first edition of *Peopleware* was published in the 1980s, 10 years after *The Mythical Man-Month* and 20 years after the work described in that book. The tone of *Peopleware* is humorous but scolding toward managers who foolishly try to turn software development into production work. Twenty years after *Peopleware,* Joel Spolsky preached the same message in his popular blog:

> Making software is not a manufacturing process … It didn't make any sense then [in the 1980s] and it doesn't make sense now. Shoving a lot of programmers into a room and lining them up in neat rows did not really help get the bug counts down.[49]

Moreover, one explanation sometimes offered for the open-source movement, as it emerged in the 1980s and 1990s, is that programmers who felt the joy of their paid work being managed away—by managers trying to turn it into production work—found that joy again as they began to use newly available personal computers and the Internet to work creatively with like-minded others in their free time.

Several years ago, I attended a lunchtime presentation for engineering students. The speaker talked about her work to automate part of a manufacturing process in which a complex wiring harness was assembled for use in an electric vehicle. The machine used for assembling the harness required a skilled operator to use it correctly. If the operator made a mistake in positioning the components or in the timing of joining them, this could produce an unusable wiring harness that would have to be thrown away. The speaker's work, to automate a part of the process, made it much easier for the operator to get it right, reducing waste and increasing productivity. Still, I wondered how these new features might change the experience of the operator of the machine. Would the operator's work—which was quite repetitive, maybe not very interesting to begin with—become a little more boring, a little less meaningful? Some of the skill that had been required before would now be irrelevant. There would be less reason to try to do the job well, less reason to learn how to do it better. Automation, despite its obvious benefits, would decrease the tractability of the medium. Automation would also decrease the testability of the construct, at least in the experience of the operator. Perhaps some expertise had previously been required to judge whether a wiring harness was usable; perhaps, previously, it would have made sense to say that a particular harness had turned out exceptionally well and to take pride in that. But the improved machine can now produce consistently good wiring harnesses, whether or not the operator is capable of judging their quality.

This is all speculation, of course. It could be that the operator would be thrilled to finally have a machine that does what it is supposed to do. My point in including the story is just to illustrate an idea: that qualities of testability and tractability, and thus the potential for joyful work as I have defined it—creativity, excellence, purpose, and learning—may be found even in a production environment. What makes production work different is not that these qualities are essentially absent but that they are more easily lost. They are more likely to be opposed to increased productivity and are therefore vulnerable, as productivity is what typically motivates innovation.

Now imagine how the story of the wiring harness might have been different: What if the machine for assembling wiring harnesses were designed with tractability in mind? It would be important, then, that the operator have choices about how best to use the machine; perhaps the operator would even have input into the design of the machine or the wiring harness. What if

the machine were designed with testability in mind? It would need to provide meaningful feedback, motivating the operator to do their best and enabling them to learn how to do better. Ideally, there would also be a way for operators of similar machines to interact in order to recognize and appreciate each other's skill.

These suggestions might seem like a quixotic stretch, an attempt to turn a factory-floor production job into a very different kind of work. I had an experience like this, however, in my first job after college. I started in an hourly technician position, spending much of my time doing the tedious work of wiring hundreds of connections on the back of rack-mounted control stations. But since this was a small company, I worked with the engineers as well, helping to prepare the wiring instructions. The process used for preparing the instructions began with a spreadsheet automatically generated from technical (CAD) drawings; this was followed by cumbersome manual translation of the information into a new spreadsheet with a very different format, suitable for creating wiring instructions that a person in manufacturing would be able to follow without understanding the overall design.

Working with the engineers, I was able to suggest improvements to the process—so the work was tractable for me in a way that it was not for others working on the manufacturing side. Working on the manufacturing side, I was motivated to improve the process in a way that the engineers working only on the conceptual design were not—so the work was testable for me in a way that it was not for the engineers. I eventually suggested specific improvements to the process that were adopted by others in the company. Looking back, my suggestions seem simple—obvious things I'm surprised someone else hadn't already thought of (mostly implemented as a set of Excel macros). But I felt very good about what I had accomplished and how it was received by others. For me, at the time, it was joyful work.[50]

Moving beyond these specific examples, might these ideas of tractability and testability inform a more general way of thinking about what makes work interesting and meaningful, joyful for the worker? As mentioned above, Brooks sees the computer programmer's joy of making something new, of expressing oneself through creative choices, as "an image of God's delight in making things."[51] Elsewhere, Brooks references J.R.R. Tolkien and Dorothy Sayers, portraying the creative work of the computer scientist as an example of "the gift of work … the capability and the

call to make things" given by God to all humanity in creation.[52] And Brooks, reflecting years later on the enduring popularity of *The Mythical Man-Month*, considers whether it might be more broadly applicable than he initially imagined: Perhaps the book "is only incidentally about software but primarily about how people in teams make things."[53] What if it were true that all of us—not just software developers but all of us, made in the image of God and living in community together—are called to creative work in cooperation with God and each other? Perhaps the only difference between a field such as software development, in which qualities of tractability and testability are more clearly evident, and supposedly less-meaningful production work is that these qualities, in the latter case, became irrelevant or opposed to productivity and thus were lost as an unintended consequence of innovation.

Albert Borgmann, in *Technology and the Character of Contemporary Life*, describes a technological transformation of work that has taken place in much of the world over the past 200 years.[54] This transformation of "pretechnological" work has made many kinds of work more productive, safer, and more humane. But it has also turned skilled crafts, which provided opportunities for creativity, excellence, purpose, and learning, into something like production work for many people. "The monotonous and endless repetition of one small task is typical of much modern labor and gives it its stupefying and draining character," says Borgmann.[55]

Borgmann may or may not be overstating the case. I have been blessed in my own work experiences, which have been rarely stupefying and often rewarding, especially in my relationships with coworkers. But surely many have not been privileged in this way. Consider "the monotonous and endless repetition of one small task" as opposed to the joys of work in a tractable and testable medium: There is no opportunity for self-expression through creative choices; excellence is irrelevant and would go unnoticed; the worker is disconnected from others who benefit from the work; and there is nothing to learn, only a simple task to be repeated. The joy is gone. Old woes may be gone, too, but there are new and deeper existential woes of boredom, loneliness, a lack of purpose, a lack of hope for the future. Why then do people continue to work? Not for the value of the work itself, but only for payment: Work has been reduced to a mere means.[56]

In response to those who might claim a unique status for software development or other creative design work, as opposed to production work, Borgmann would likely

point out that various kinds of work which we now think of as production work were much more creative and engaging in the past.[57] To summarize Borgmann's view, the long-term trajectory of technology is to transform more and more kinds of work into production work.

Attempts to transform software development into production work may have failed thus far, but they may be successful in the future. In fact, the arrival of generative AI tools appears very likely to be transformative for software development, in ways Brooks might never have imagined. Right now, the capability of such tools seems to be somewhere between that of an entry-level developer (with an undergraduate degree in computer science, for example) and someone with a few years of experience.[58]

For an experienced developer who is able to critically evaluate AI suggestions, there would be no loss in testability (although there might be an increased need for careful testing); and again, for an experienced developer who is able to interpret suggestions within a context of possible alternatives, there is a sense in which the medium becomes even more tractable.[59] However, someone less experienced may assume that the AI tool knows better than they do and may uncritically accept AI suggestions without considering alternatives; for them, tractability and testability (not to mention employability) would be decreased.

As the capability of AI tools continues to improve, the bar gets higher for what one needs to know to be in the "experienced developer" category—to be among those able to critically evaluate the output of the tools and thus work with them creatively and productively.[60] How much better will AI tools get? Assuming there will always need to be a "human in the loop," how many of these humans will continue to be needed? The long-term status of software development (and of other kinds of creative design and "thinking" work) as joyful work available to many people seems to be uncertain. And yet, we believe as Christians that the status of human beings, made in the image of God, is not uncertain. If it is true that we are made to experience the joys of creative work, even as these joys are bound up with the woes and management challenges we experience when we try to work creatively together, we should not accept as inevitable the loss of tractability and testability to innovation and automation.

But what can we do? Where we still have power to influence the quality of our own and of others' work, how

might we promote these joys that flow from tractability and testability? Here again is the list of joys from earlier in the article, this time framed as questions one might ask in order to find ways to promote them.

How might we promote the joys of tractability?

- Are there opportunities for creative choices? What is unique about the worker and how might that uniqueness be expressed in the work?

- How is excellence defined, recognized, and appreciated? Are adequate time and resources provided, not merely to do the work, but to do it well? How might the worker be more directly connected to others who understand the work well enough to delight in its excellence?

How might we promote the joys of testability?

- Will others benefit from the work? How might the worker be more directly connected to those who will benefit?

- Are there opportunities for professional and personal growth? What will motivate the worker to develop greater skill and understanding? What feedback will make this learning possible?

Concluding Reflection: Fred Brooks as a Model for Christian Vocation

Fred Brooks was a pioneer in computer hardware and software design, remembered for his lasting impact on managers, developers, and users.[61] He is remembered also for his wisdom, humility, and kindness,[62] and as an inspiration to Christian professionals and educators working in computing and related technologies.[63] Hank Tarlton, in a tribute to Brooks written shortly after his death in November 2022, shares about Brooks's Christian faith as it informed and enlivened his work:

> Fred was never one to separate his faith from his work. It was integral to all that he did. You see this in his monumental book, *The Mythical Man-Month*, with references to scripture and quotes from C.S. Lewis and Dorothy Sayers. And you would hear it in his public speeches, speaking with clarity about the role of Jesus Christ in his life as a computer scientist before all his colleagues … It was no surprise to those who knew him that Fred only fully retired in 2015 [at the age of 84]. He loved what he did and saw his work as a computer scientist as the outworking of God's call on his life. Fred used to say, if you enjoy what you do, why would you want to stop doing it,

especially if it was what God had created and called you to do?[64]

I wonder what Brooks might have thought of Buechner's advice about choosing a vocation, quoted at the beginning of this essay: "In a world where there is so much drudgery … our gladness in our work is as much needed as we ourselves need to be glad."[65] Reading Tarlton and others' tributes, it seems Brooks may have been just the sort of person Buechner had in mind. To find gladness in one's work, to share that gladness in a public way, as Brooks did, and to recognize joyful work as a gift from God—surely this meets a deep need in our world.

Notes

[1]Frederick Buechner, *Secrets in the Dark: A Life in Sermons* (HarperCollins, 2006), 39–40.

[2]Scott Waalkes points out that ideas attributed to Buechner are easily secularized: "just do what you love," "follow your passion," etc. One's "calling" can be used to rationalize selfish or unrealistic choices, to make an idol of the ideal career, or to denigrate others who settle for "just a job" and a paycheck. I agree, but I don't think this means we should reject Buechner's ideas. Instead, our definition of "gladness" (and "joyful work," in this article) should be grounded in a Christian understanding of the human person, created in the image of God. See Scott Waalkes, "Rethinking Work as Vocation: From Protestant Advice to Gospel Corrective," *Christian Scholar's Review* 44, no. 2 (2015): 135–53, https://christianscholars.com/rethinking-work-as-vocation-from-protestant-advice-to-gospel-corrective/.

[3]Frederick Buechner, *Wishful Thinking: A Theological ABC* (Harper & Row, 1973), 95.

[4]Katherine W. McCain and Laura J. Salvucci, "How Influential Is Brooks' Law? A Longitudinal Citation Context Analysis of Frederick Brooks' *The Mythical Man-Month*," *Journal of Information Science* 32, no. 3 (2006): 277–95, https://doi.org/10.1177/0165551506064397.

[5]Frederick P. Brooks, *The Mythical Man-Month: Essays on Software Engineering, [20th] Anniversary Edition* (Addison-Wesley, 1995), 7.

[6]The word *tractable* is used by computer scientists to describe problems for which it is possible to design an efficient solution algorithm. Tractability, in this sense, might be defined as "technical feasibility," as suggested by a reviewer of a draft of this article. But here I am using "tractability" as I understand Brooks to use it, to describe a medium through which one is enabled to express complex ideas, not limited by the medium but by one's imagination.

[7]A reviewer of a draft of this article said they were reminded "of a former colleague in mathematics, who said that with mathematical theorems, 'by God, you know when you've got it right!'"

[8]Brooks, *The Mythical Man-Month,* xi; and Tracy Kidder says of IBM's announcement that the 360 computers would provide a range of cost vs. performance options but all would run the same system software:

> In the commerce of computers, no single event has had wider significance, except for the invention of the transistor. Part of the 360's importance lay in the fact that all the machines in the family were software compatible. It cost IBM a true fortune and no end of trouble and anxiety to create system software for the 360 line. But all the machines in the family used that same [system] software … Any user program that worked on one machine in the family worked on all of them. (*The Soul of a New Machine* [Atlantic–Little, Brown, 1981], 42–43)

[9]Brooks, *The Mythical Man-Month,* 16–19.

[10]Brooks, *The Mythical Man-Month*, 25. "Brooks's Law" is apparently now so well known that no citation is necessary, as indicated by Bertrand Meyer's 2020 *Communications* article and Michael Ayres subsequent letter to the editor. See Bertrand Meyer, "In Search of the Shortest Possible Schedule," *Communications of the ACM* 63, no. 1 (2020): 8–9, https://cacm.acm.org/blogcacm/in-search-of-the-shortest-possible-schedule; and Michael Ayres, "Where Good Software Management Begins," *Communications of the ACM* 63, no. 3 (2020): 7, https://dl.acm.org/doi/pdf/10.1145/3385399.

[11]Andrey P. Ershov, "Aesthetics and the Human Factor in Programming," *Communications of the ACM* 15, no. 7 (1972), https://softpanorama.org/Articles/Ershov/aesthetics_and_the_human_factor_in_programming_ershov1972.shtml.

[12]Brooks, *The Mythical Man-Month*, 7.

[13]Brooks, *The Mythical Man-Month,* 7.

[14]Brooks, *The Mythical Man-Month,* 7.

[15]Brooks, *The Mythical Man-Month,* 7.

[16]Frederick P. Brooks, "No Silver Bullet: Essence and Accident in Software Engineering," in *The Mythical Man-Month: Essays on Software Engineering, [20th] Anniversary Edition* (Addison-Wesley, 1995), 184.

[17]Brooks, *The Mythical Man-Month,* 9.

[18]Brooks, *The Mythical Man-Month,* 9.

[19]Brooks, *The Mythical Man-Month,* 8.

[20]Brooks, *The Mythical Man-Month,* 15.

[21]Brooks, *The Mythical Man-Month,* 18.

[22]Brooks, *The Mythical Man-Month,* 15.

[23]Brooks, *The Mythical Man-Month,* 74–75.

[24]Frederick P. Brooks, "The Mythical Man-Month After 20 Years," in *The Mythical Man-Month: Essays on Software Engineering, [20th] Anniversary Edition* (Addison-Wesley, 1995), 255–56.

[25]Brooks references Blaauw in support of this idea, which by now is, effectively, dogma among software developers, perhaps in part because of Brooks's persuasive presentation of it in *The Mythical Man-Month*. See Gerrit A. Blaauw, "Hardware Requirements for the Fourth Generation," in *Fourth Generation Computers* (Prentice-Hall, 1970).

[26]Brooks, *The Mythical Man-Month*, 44. The phrase "single user's point of view" should not be taken to refer to any particular user or type of user. The system may have been built by a group working together but needs to be designed so that it is possible for an individual to make sense of it. If it is designed well, diverse individuals will be able to make sense of it, but each will need to make sense of it as an individual.

[27]Brooks, *The Mythical Man-Month,* 32. Brooks credits this idea to Harlan Mills, "Chief Programmer Teams, Principles, and Procedures," IBM Corporation, Report No. FSC 71–5108 (IBM Federal Systems Division, 1971).

[28]The "surgical team" is one of Brooks's ideas sometimes considered outdated today, because specific roles he suggests have greatly changed or are no longer needed. But developers today still make a clear distinction between architecture and implementation, and teams are still divided into distinct roles. An experienced senior developer would be like Brooks's "surgeon"—although the number of senior developers on a team would not be strictly limited to one, as in

Brooks's "surgical" model. Others in supporting roles would be responsible for quality assurance, user experience, deployment and IT infrastructure, etc.

[29]Matthew Crawford makes a distinction between the validation of the marketplace, which assigns monetary value based on utility, and the validation of "peculiar excellence" in one's work, which can only be recognized and appreciated by a peer, someone who understands the craft. See Matthew B. Crawford, *The World Beyond Your Head: On Becoming an Individual in an Age of Distraction* (Farrar, Straus and Giroux, 2015), 159.

[30]Brooks, *The Mythical Man-Month,* 46.

[31]Brooks, *The Mythical Man-Month,* 55.

[32]Brooks, *The Mythical Man-Month,* 47.

[33]Brooks, *The Mythical Man-Month,* 115–23.

[34]Brooks, "The Mythical Man-Month After 20 Years," 267.

[35]Brooks, *The Mythical Man-Month,* 118.

[36]Brooks, *The Mythical Man-Month,* 119–20.

[37]Brooks, *The Mythical Man-Month,* 157.

[38]Brooks, *The Mythical Man-Month,* 119.

[39]Eric S. Raymond, *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (O'Reilly, 2001). This book is about open-source software as a part of "hacker" culture in the 1990s. Raymond's observations do not apply to all developers of open-source software as it exists today, within various management structures and business models.

[40]Raymond, *The Cathedral and the Bazaar*, 73.

[41]Raymond, *The Cathedral and the Bazaar*, 23.

[42]Raymond uses these terms as a sociologist would. "Prestige" is not meant in a dismissive or derogatory way; it simply refers to status or recognition within the "gift culture" community—a "good reputation among one's peers." If you share your work with the community, and others show their appreciation by using it or contributing to it so that your recognition within the community increases, that is your reward.

[43]Raymond, *The Cathedral and the Bazaar*, 72.

[44]Raymond makes a point of distinguishing the emergent open-source structure from Brooks's "surgical team" structure as described in *The Mythical Man-Month*. But Raymond's distinction is based primarily on specific roles in Brooks's description, which I have not considered in this article. See Raymond, *The Cathedral and the Bazaar*, 221.

[45]Brooks, *The Mythical Man-Month,* 16.

[46]Raymond, *The Cathedral and the Bazaar,* 108.

[47]Tom DeMarco and Timothy Lister, *Peopleware: Productive Projects and Teams* (Addison-Wesley, 2013). Brooks's endorsement is on the back cover.

[48]DeMarco and Lister, *Peopleware,* 7.

[49]Joel Spolsky, "Craftsmanship," in *Joel on Software … and on Diverse and Occasionally Related Matters That Will Prove of Interest to Software Developers, Designers, and Managers, and to Those Who, Whether by Good Fortune or Ill Luck, Work with Them in Some Capacity* (Apress, 2004), 119.

[50]I was eventually rewarded with a promotion to a full-time position in engineering. Initially, I was very happy with the change. The pay was higher, and this is what my electrical engineering degree was supposed to prepare me for. But I found the new job much more stressful and quit within a year, eventually going back to school for a degree in computer science.

[51]Brooks, *The Mythical Man-Month,* 7.

[52]Frederick P. Brooks, "The Computer Scientist as Toolsmith II," *Communications of the ACM* 39, no. 3 (1996): 63, https://www.cs.unc.edu/~brooks/Toolsmith-CACM.pdf.

[53]Brooks, "The Mythical Man-Month After 20 Years," 254. See also his later book, Frederick P. Brooks, *The Design of Design: Essays from a Computer Scientist* (Addison-Wesley, 2010), which considers the challenge of conceptual integrity more broadly and in much greater detail.

[54]For Borgmann, "technology" does not refer merely to tools of human making or to scientific knowledge applied to human ends, but to a cultural pattern: the ideal technological device is conveniently available and easy to use; it may be very complex internally and may depend on a complex and interconnected technological machinery working behind the scenes, but all of this is hidden from the user. We are surrounded by and dependent on a multitude of such devices. A smartphone is an obvious example, but other things we might not immediately think of as technological fit the pattern: homes with electricity and central heating, processed foods and their packaging, payment and banking systems, etc. See Albert Borgmann, *Technology and the Character of Contemporary Life: A Philosophical Inquiry* (University of Chicago Press, 1984).

[55]Borgmann, *Technology and the Character of Contemporary Life*, 115.

[56]Borgmann, *Technology and the Character of Contemporary Life*, 114.

[57]Borgmann is ambivalent about the focal (i.e., pretechnologically engaging) significance of working with computers. My own experience, however, confirms Brooks's claim that this work is joyful in its own unique way. See Borgmann, *Technology and the Character of Contemporary Life*, 217.

[58]Matthew Kam et al., "What Do Professional Software Developers Need to Know to Succeed in an Age of Artificial Intelligence?" paper presented at the 33rd ACM International Conference on the Foundations of Software Engineering, June 23–28, 2025, Trondheim, Norway, published in *FSE Companion '25: Proceedings of the 33rd ACM International Conference on the Foundations of Software Engineering* (Association for Computing Machinery 2025), 947–58, https://doi.org/10.1145/3696630.3727251.

[59]According to a 2023 study, developers were happier and found their work more satisfying and meaningful when they used AI tools—perhaps this could be interpreted as the result of an increase in tractability? See Begum Karaci Deniz et al., "Unleashing Developer Productivity with Generative AI," McKinsey Digital, June 27, 2023, https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/unleashing-developer-productivity-with-generative-ai.

[60]The ever-increasing capability of AI tools to complete programming assignments presents a major challenge to computer science educators: How do we motivate students to learn to do things they know AI can do for them, so that they can eventually learn enough to do things AI can't do … and become employable?

[61]Brooks says, for example, "Of all my technical accomplishments, making the 8-bit byte decision is far and away the most important. And the reason was, it opened up the lowercase alphabet …" It would be hard to exaggerate the significance of this decision! See Fred Brooks (Frederick P. Brooks, Jr.), "Oral History of Fred Brooks," interview by Grady Booch, ed. Dag Spicer, recorded on September 16, 2007, Computer History Museum, Cambridge, UK, https://www.computerhistory.org/collections/catalog/102658255.

[62]Simson Garfinkel and Eugene Spafford quote Mary Whitton, "He was an incisive scholar, but also humble and kind"; Pat Hanrahan, "Fred was always highly positive and very supportive … he was deeply insightful … 'wise' in a broad sense

of the word"; and Ivan Sutherland, "Fred was a statesman in the best sense of the word, as well as a great leader, a very kind man, and a fine engineer." See Simson Garfinkel and Eugene H. Spafford, "In Memoriam: Frederick P. Brooks, Jr. 1931–2022," *Communications of the ACM* 66, no. 1 (January 1, 2023): 21–22, https://cacm.acm.org/news/in-memoriam -frederick-p-brooks-jr-1931-2022.

[63]Russ Tuck, for example, in "Computer Science: Creating in a Fallen World," references Brooks's "The Computer Scientist as Toolsmith II," cited earlier in this article. Many Christians in computer science point to *Toolsmith* as an inspiration.

I first read it as a graduate student 25 years ago; I have recommended it to others, including my own students, many times since. See Russell Tuck, "Computer Science: Creating in a Fallen World," *ACMS Conference Proceedings 2019*, 159–71, https://pillars.taylor.edu/acms-2019/21.

[64]Hank Tarlton, *A Tribute to Fred Brooks, Computer Scientist and Christian*, https://blog.emergingscholars.org/2022/12/a -tribute-to-fred-brooks-computer-scientist-and-christian.

[65]Frederick Buechner, *Secrets in the Dark: A Life in Sermons* (HarperCollins, 2006), 39–40.

ASA 2026

Kaye Cook   Fellipe do Vale   Romanita Hairston

John E. Harris   Jimmy Lin

SCIENCE FAITH SYNERGY:
GLORIFYING GOD AND SERVING THE WORLD

80th Annual Meeting | July 24 - 27, 2026

Gordon College, Wenham, MA

Against Restricted Methodological Naturalism

Joshua Lee Harris

Joshua Lee Harris

Restricted methodological naturalism (RMN) is the stipulation that, within the epistemic domain of scientific inquiry, if x explains y, then x is natural *(that is,* not *supernatural). In this article, I argue that RMN cannot do its main job as a stipulation, namely, the job of guarding against present and future "dead-end" explanatory paradigms and encouraging consideration of promising novel explanations. RMN cannot do this job because of two well-known problems: what I call the* intelligibility *and* truth-seeking *problems. My argument proceeds in three basic stages: (1) a brief rundown of RMN, in the interest of clarifying the sort of position I have in mind; (2) a recasting of the intelligibility and truth-seeking problems for RMN in case studies from historical and present science; and finally (3) concluding remarks about the staying power of these problems in light of recent work on the intellectual history of naturalism.*

There is a special prestige afforded to explanations that are reasonably regarded as scientific, and for good reason. The progress of scientific institutions, practices, methodologies, and theories are among the finest achievements of our species' history. We therefore have a special interest in clarifying the conditions under which this progress was achieved, and indeed those under which it might continue in present and future science. The development of methodological naturalism (MN) is one particularly well-regarded attempt to contribute to this venerable, wide-ranging project of delineating the past, present, and future boundaries of science, specifically with respect to the task of *explanation*. But this regard is misplaced—or so I will argue here.

Broadly construed, methodological naturalism (MN) is "the stipulation within a domain of study to offer explanations only in terms of natural phenomena."[1] That is, within MN, for any phenomena *x* and *y* in a given epistemic domain, if *x* explains *y*, then *x* is natural. The doctrine can be stated negatively as well, with reference to its contrary: for any phenomena *x* and *y* in a given epistemic domain, if *x* explains *y*, then *x* is *not* supernatural.

There is a large and growing literature in the philosophy of science on the nature and viability of MN as a stipulation. The distinction between MN and *metaphysical* naturalism is significant, for example, since metaphysical naturalism is (roughly) the view that only natural things *exist*. There is no straightforward logical connection between MN and metaphysical naturalism, given (among other things) the possibility of anti-realist accounts of explanation, although there is considerable debate about the relationship of the former to the latter.[2]

Variations of MN are "strong" or "unrestricted" in direct proportion to the size of

Joshua Lee Harris *is associate professor of philosophy at The King's University in Edmonton, Alberta, Canada. His research concerns problems in metaphysics, philosophy of religion, and the philosophy of science. He is the lead editor of* Philosophical Perspectives on Existential Gratitude *(Bloomsbury) and* Gestures of Grace *(Wipf and Stock), and author of several peer-reviewed articles in philosophy.*

the explanatory domain covered by the stipulation. So, for example, a purely unrestricted methodological naturalism (UMN) is a stipulation governing *all* forms of explanation, whereas "weak" or "restricted" versions of MN govern only certain *sorts* of explanatory enterprises (e.g., *scientific* explanations, in particular).

This article concerns one version of restricted methodological naturalism (RMN): the stipulation that, within the epistemic domain of *scientific inquiry*, if *x* explains *y*, then *x* is natural (that is, not supernatural). I argue that RMN cannot do its main job as a heuristic, namely, the job of (a) guarding against present and future "dead-end" explanatory paradigms, and (b) encouraging consideration of promising novel explanations. The reason RMN cannot do this job is because of two well-known problems: what I call the (1) intelligibility and (2) truth-seeking problems, respectively.[3] While these problems for all forms of naturalism are well known, I sharpen them by reframing them in light of the above-mentioned task of RMN as a heuristic for scientific inquiry. Specifically, I argue that RMN has an intelligibility problem if it is only as heuristically informative as an obviously fatuous alternative—what I call good theory-ism (GT), the stipulation within the domain of scientific inquiry to offer only "good" explanations. Correlatively, I argue that RMN has a truth-seeking problem if there is reason to think that it encourages dead-end explanatory paradigms or serves as an obstacle in the way of promising novel explanations.

My argument proceeds in three basic stages: (1) a brief rundown of different versions of MN, in the interest of clarifying the sort of position I have in mind; (2) a recasting of the intelligibility and truth-seeking problems for RMN in light of pertinent examples in historical and present science; and (3) some final remarks about why the staying power of these problems shouldn't surprise us in light of recent work on the intellectual history of naturalism.

Ultimately, I argue that RMN faces a dilemma: either it is just as uninformative as good theory-ism, or it is a potential hindrance to scientific progress. And if this is right, of course, then RMN should be rejected.

What Is Restricted Methodological Naturalism?

The literature on MN is large and unwieldy, and so it is not easy to say exactly what the view amounts to. While adherents all subscribe to the preference for natural rather than supernatural explanations as previously stated, it is not at all clear what the precise claims are, how they are justified, or what is implied epistemically. Miles Donahue has done a great service to this debate by identifying two relevant categorical distinctions: *intrinsic* (vs. *provisional*) MN;[4] and *restricted* (vs. *unrestricted*) MN.[5] The former distinction features answers to the question of whether MN is an *essential* feature of scientific explanation—past, present, and future (intrinsic)—or instead whether MN simply *happens to have been* a useful stipulation in the past, even if defeasible (provisional). But it is the latter distinction (restricted vs. unrestricted) that interests me here, since it is the particular, restricted domain of *scientific* explanation that I want to consider.

My concern here is to present a renewed case against all forms of RMN. To the extent that the present argument is successful, I will have identified some core reasons to be suspicious of RMN as a heuristic for past, present, and future scientific explanation.

The Intelligibility Problem

As nearly everyone contributing to this literature realizes, RMN as a stipulation requires at least some accounting for the distinction between natural and supernatural explanations. Obviously, if we are going to limit our consideration to natural explanatory posits when doing science, we need to know what the terms "natural" and "supernatural" mean in the relevant contexts. But just how intelligible do these terms have to be, exactly?

Responses to the intelligibility problem

Some have tried to offer definitional accounts. For example, Peter van Inwagen and David Armstrong offer "object-based" definitional accounts of the term "natural" in terms of that which is contained in or constituted by space and time in some way.[6] Others offer "theory-based" definitional accounts in terms of what is postulated by standardized theories in well-regarded scientific enterprises such as contemporary physics.[7]

But there is a well-known problem with definitional accounts that is captured in "Hempel's dilemma"—a notorious one for naturalism and its close relatives, physicalism or materialism:[8]

> If [the natural] is defined via reference to contemporary physics, then it is false—after all, who thinks that contemporary physics is complete?—but if [the natural] is defined via reference to a future or ideal physics, then it is trivial—after all, who can predict what a future physics contains?[9]

This formulation of Hempel's dilemma seems to apply both to object- and theory-based definitions of "natural." In the case of object-based definitions, any account of a unified spatiotemporal domain will require specific content to be meaningful.[10] But the principal sources of this content—that is, contemporary physical theories that are surely at least partially false[11]—countenance explanatory phenomena that are either mischaracterized or fail to exist altogether. In the case of theory-based definitions, the problem is even more straightforward, since (again) what counts as a well-regarded physical theory today could be consigned to the dustbin of scientific history tomorrow.[12] If what we seek is a meaning of the term "natural" that could be useful for the purposes of MN as a stipulation, then these accounts leave much to be desired.

Indeed, the problems posed by Hempel's dilemma for purported accounts of the natural-supernatural distinction have driven many, if not most, recent contributors to this literature to abandon a definitional approach entirely.[13] This is the reason that others adopt a non-definitional approach to making the distinction intelligible. In the non-definitional approach, positive definitions of "natural" are elided in favor of informative contrasts with certain paradigmatically "supernatural" phenomena, such as irreducible or otherwise fundamental mental phenomena,[14] entities of popular mythology, or God.[15] In this non-definitional strategy, natural phenomena are precisely those that are *not* these paradigmatically supernatural entities. Graham Oppy offers one such approach:

> Suppose I give you the following list: angels, animals, atoms, cells, demons, fairies, galaxies, ghosts, goblins, gods, mermaids, molecules, planets, plants, protons, quarks, stars, vampires, werewolves, and zombies. If I ask you to sort these into the natural and the non-natural, …, you will have no trouble producing exactly the same list that other competent ordinary language users produce. This shared competence is all that we need to appeal to in order to justify the claim that the notion of natural reality has substantive content.[16]

For Oppy and other non-definitional strategists, naturalism need not demand more intelligibility from the term "natural" than such exercises of intuitive competence evidence. Even if we can't spell out the differences in a precise and general way, we know that animals, atoms, and the like are natural, since they are obviously *not* like supernatural things such as goblins and mermaids in the relevant respects. And if we can reliably distinguish these things in this intuitive way, then we

have all the intelligibility we need to fund RMN as a heuristic for epistemic ventures such as scientific theorizing. But is this enough?[17]

Good theory-ism and RMN

Unlike metaphysical naturalism, MN does not need to posit that only natural phenomena *exist*; it simply needs to stipulate a limit on what sorts of *explanatory posits* are licit in a given epistemic venture. And, unlike UMN, RMN does not need to stipulate any limitations on non-scientific explanatory posits. What RMN *does* need to do is provide adequate heuristic guidance as a stipulation for properly *scientific* explanatory enterprises.[18] If it cannot even do that, then it is not clear what work it would do as a stipulation. And if this is right, then we have good reason to demand as much intelligibility from the term "natural" as this task requires. My claim, then, is that RMN cannot deliver on this particular task. Here is one way to think about it.

Consider good theory-ism (GT). Like RMN, GT is a stipulation about what kinds of explanatory posits are licit in any given scientific enterprise. GT is the stipulation that, for any x and y in the domain of scientific theorizing, if x explains y, then x is a good explanation. Now, you might ask, what makes an explanation "good"? It is a simple enough matter for apologists of GT: although we can't give necessary and sufficient conditions in a general way, in GT good explanations are made intelligible by contrast with bad explanations, and there are certain paradigmatic cases of each that we can all recognize. Suppose you are given the following list of explanatory posits: phlogiston, kinetic energy, quarks, luminiferous aether, and others. If *I* ask you to sort these into good and bad explanations, you will have no trouble producing exactly the same list as others who happen to be familiar with the relevant terms. This shared competence—reason our GT apologists—is all that we need to justify the claim that the notion of "good explanation" has substantive content.[19]

Obviously, this shouldn't satisfy those who are interested in the task of developing a unifying heuristic for scientific inquiry. GT is fatuous, since it provides almost no such heuristic value. And while this result is not surprising given that GT is a joke rather than a first-order theory with apologists, what I want to suggest is that the above parallel provides a clear and reasonable standard by which we can operationalize the intelligibility problem for RMN. That is, we should demand significantly more content from the terms "natural" and "supernatural" in RMN than are provided by "good" and "bad" in GT. Put another way, if a stipulation is

going to provide heuristic guidance for what sorts of explanatory posits are licit in scientific theorizing, then it should do a better job than GT.

But can RMN meet this standard? The above parallel suggests that it does not, *prima facie*. And this is true even if, at some very trivial level, we should all be advocates of GT. Neither (non-definitional) RMN nor GT says anything about cases that are not explicitly mentioned as paradigmatic, and thus it is unclear why the undefined intuition behind the natural–supernatural distinction in RMN would somehow generalize better than its good–bad counterpart in GT. That is, it is not clear that the RMN stipulation would outperform GT when it comes to guarding against future pseudoscientific explanatory posits or encouraging consideration of promising novel explanations.[20] But, this is precisely the work that such a stipulation is supposed to do.

Now a defender of RMN might reply as follows:[21] even if non-definitional accounts like Oppy's can appeal only to paradigm cases when it comes to the term "natural," this is no problem for RMN as a stipulation, since we understand the meaning of certain terms via paradigm cases all the time—even in stipulations. After all, nobody bats an eye when it comes to stipulations such as "do the right thing" or "believe the best theory," even when it would be difficult or impossible to come up with necessary and sufficient conditions for terms such as "right" and "best." Indeed, comparatively respectable stipulations such as "inference to the best explanation" (IBE) are closer to GT than it might seem at first glance. After all, what is IBE other than a stipulative preference for the *best* (and, therefore, for good) explanations available?

In response, we should note, of course, that this is true: we use terms we can't define all the time, and we do so reasonably well. When someone says that we should "do the right thing," we obviously don't think that this is a *totally* unintelligible thing to say. But it seems equally obvious that such stipulations are not going to offer much in the way of informative, heuristic value for our moral decision-making. The same seems to be true for Oppy's non-definitional RMN account—it is not *totally* unintelligible, but if it purports to be a unifying heuristic for present and future scientific explanation, we are going to need more than just a handful of paradigm cases to do the relevant job, namely, the aforementioned job of (a) guarding against present and future "dead-end" explanatory paradigms, and (b) encouraging consideration of promising novel explanations.

Further, it is important to note that comparatively well-regarded IBE accounts of scientific explanation are not similar to RMN (or even GT!) in this respect: serious developments of IBE appeal to *appropriately general* virtues of scientific explanation such as empirical adequacy, consistency, unification, fertility, and so forth when it comes to lending intelligibility to terms such as "better" and "worse."[22] Such general features are precisely what is missing in non-definitional versions of RMN and precisely what is needed for the relevant heuristic task of the stipulation.

It might also be argued that even if the respective intuitions behind the laundry lists of RMN and GT do not *immediately* seem to differ notably in terms of their heuristic value, RMN enjoys an advantage over GT at least in the sense that the extension of its critical term ("natural") is likely *narrower* than that of GT ("good"). After all, at least in terms of logical possibility, the set of "good" explanatory posits is surely much, much larger than the set of "natural" explanatory posits. And, *ceteris paribus*, a narrower range of logically possible candidate explanations is more useful for heuristic purposes than a broader one. Therefore, at least in this sense, RMN might outperform GT in terms of intelligibility.

But it is difficult to know how to offer a rejoinder to this point in the absence of something *like* a definition or explication[23] of the term "natural." While it might be true that "natural" has a narrower extension than "good," it is not obvious why this narrowness would be especially relevant to the heuristic value of RMN over GT. Indeed, even if we agree for the sake of argument that it *is* relevant, nothing seems to foreclose the possibility that RMN has *barely* more heuristic value than GT. This would hardly be a ringing endorsement for RMN, given that GT is more obviously fatuous.

The intelligibility problem might be enough to call into question the viability of RMN as a stipulation for scientific inquiry, but the case against it builds ever more ominously when it is considered together with another well-known problem for RMN: the truth-seeking problem.

The Truth-Seeking Problem

The truth-seeking problem for RMN pertains not to the intelligibility of its critical terms, but rather its ability to be an aid to scientific progress. Truth-seeking is a *problem* for MN to the extent that the stipulative limiting to natural explanatory posits in the sciences either (a) fails to ward off pseudoscientific or otherwise unscientific

explanatory posits, or (b) closes off consideration of promising novel explanatory posits. As Bradley Monton puts it,

> If science really is permanently committed to methodological naturalism, it follows that the aim of science is not generating true theories. Instead, the aim of science would be something like: generating the best theories that can be formulated subject to the restriction that the theories are naturalistic … I maintain that science is better off without being shackled by methodological naturalism.[24]

In other words, if RMN hurts scientific progress more than it helps,[25] then it is not clear why we should affirm it. Science should be more interested in understanding the world than being acceptably "naturalist."

Responses to the truth-seeking problem

Donahue argues that RMN avoids the truth-seeking problem, since its specified epistemic domain is that of scientific investigation, and "one can only determine the *range* of scientific investigation on the basis of *a posteriori* considerations."[26] The idea is that when we appropriately delimit the epistemic domain of scientific inquiry, it becomes much easier to defend RMN as a stipulation. For example, cosmic fine-tuning is a traditional area of inquiry that regularly features "supernatural" explanatory posits that many take to deserve serious consideration, if not outright adoption.[27] While advocates of UMN have trouble accommodating such a situation without significant revisionist redescription,[28] RMN offers a plausible, accommodative account by acknowledging that such areas of inquiry feature (legitimate) questions that simply go beyond what science can deal with. In RMN, the stipulative limit to natural explanatory posits remains on such a view, but only within the appropriately humble remit of science. Indeed, as John Perry and Sarah Lane Ritchie assure us,

> a scientist will not … invent a naturalistic explanation in order to preserve an overarching metaphysical [or methodological, presumably] naturalist worldview. A good scientist understands that "I don't know" or "I don't know yet" is always a valid answer.[29]

At least one problem with this approach is that it requires some accounting for the remit of scientific inquiry—a task that is difficult (if not impossible) to accomplish in advance of the progress of science.[30] Indeed, a significant part of the success story of the modern sciences is precisely the (unanticipated) *expansion* of its remit, and so any sort of stipulation that requires knowledge of preset boundaries is likely to run up against a different version of the truth-seeking problem—one that arises because of some over- (or under-) confidence about the remit of the sciences.[31]

But there is a more pressing problem with RMN: we have clear examples from the history of science to suggest that relevantly similar stipulations fail to overcome the truth-seeking problem.

Newtonian gravitation and Quinean behaviorism: Case studies of the truth-seeking problem

Perhaps the most obvious problem—and the one that is often cited in the literature on naturalism[32]—concerns the stipulations of the so-called "mechanical philosophy" of the 17th century with respect to the development of Newton's theory of gravitation. According to influential authors representing this prevailing mechanical philosophy,[33] it is impossible for two spatially separated bodies to act causally on one another "at a distance"—that is, without some sort of mediating matter. Yet, the most natural interpretation of Newtonian gravity is that it is a "force" that enables precisely this sort of action at a distance. For example, it is very difficult to make sense of Newton's law of universal gravitation—that every massive object attracts every other massive object in the universe with a force that is proportional to the product of their masses and inversely proportional to the square of the distance between their centers of mass—without the possibility of action at a distance.

As it happens, this very discrepancy between the "mechanistic" stipulation on causal explanation proved to be an important objection to Newton's theory. Andrew Janiak summarizes the situation as follows:

> The mechanist criticisms of the *Principia* are legion and involve numerous philosophical issues. One especially subtle and deep criticism, raised by Leibniz among others, highlights the question of whether forces such as gravity exist. It does so by suggesting that Newton's treatment of gravity saddles him with a dilemma. If Newton contends that gravity exists, he must admit that material bodies act on one another at a distance, thereby violating a crucial norm of the mechanical philosophy (in all its guises). However, if Newton seeks to avoid action at a distance, as all of his contemporaries do, he must admit that gravity does not exist, and that he has therefore failed to discover the cause of the previously disparate celestial and terrestrial phenomena unified by his gravitational theory.[34]

It seems difficult to avoid the implication that this mechanist objection to Newton's theory is precisely an example of a stipulation that is guilty of closing off consideration of a promising novel explanatory posit (in this case, gravity as a fundamental force). Indeed, Newton *himself* rejects action at a distance many times throughout his writing career, creating a rather awkward relationship with his own theory.[35]

But even if we agree that this *a priori* stipulation on causal explanation in the mechanical philosophy turned out to get in the way of scientific progress, its connection to contemporary versions of naturalism might not be obvious. After all, just because one stipulation on explanatory posits (that is, the mechanical philosophy) had a truth-seeking problem at a critical moment in history of scientific progress, it doesn't mean that naturalism must also have a truth-seeking problem.

The point is well taken, as it is clearly true that naturalism and the mechanical philosophy are not identical stipulations. But identity is surely too high a bar when it comes to looking to the history of science for such lessons. After all, contemporary naturalism is *contemporary*, not historical. What we should be looking for instead are *relevant similarities* between past stipulations and contemporary naturalism. If the mechanical philosophy's rejection of the possibility of action at a distance is relevantly similar to contemporary naturalism, then we are in a better position to make judgments about the quality of the latter as a heuristic for scientific inquiry.

And it certainly seems that the mechanical philosophy's rejection of action at a distance is, in fact, relevantly similar to contemporary versions of naturalism. After all, as others have pointed out, the rejection of action at a distance was understood to be a rejection of what we today would call "spooky" physical forces and other explanatory posits—one of the key motivations of naturalism in all of its varieties.[36] Nowhere is the point clearer than in a now-famous letter from Leibniz to Samuel Clarke, which is worth quoting at length:

> But then what does [Newton] mean when he will have the sun attract the globe of the earth through an empty space? Is it God himself that performs it? But this would be a miracle if ever there was any. This would surely exceed the powers of creatures … That means of communication (he says) is invisible, intangible, not mechanical. He might as well have added inexplicable, unintelligible, precarious, groundless, and unprecedented. But it is regular (the author says), it is constant, and consequently natural. I answer that it cannot be regular without being reasonable, nor natural unless it can be explained by the natures of creatures. If the means which causes an attraction properly so called are constant and at the same time inexplicable by the powers of creatures, and yet are true, it must be a perpetual miracle, and if it is not miraculous, it is false.[37]

Now admittedly this is just one letter, but surely it captures something like the spirit of the discrepancy between the mechanical philosophy's account of causal explanation and Newtonian gravitation. Because it is not "mechanical" (that is, it offers no account of local causation), Leibniz reasons, Newtonian gravity is a "perpetual miracle" beyond the scope of intelligible causes. Indeed, remarkably for our purposes, it is *supernatural* in the sense that it lies beyond all possible creaturely natures to explain.

If Leibniz's objection to Newton's theory is not an example of a stipulation that is relevantly similar to contemporary naturalism in the history of science, then it is not clear what would count as such. Had the mechanical philosophy prevailed in its rejection of "spooky" explanatory posits, the progress of science would have suffered. In short, there was a truth-seeking problem with the mechanical philosophy—and for reasons that are suspiciously similar to contemporary naturalism.

But refusing promising novel explanations is only one way to be a bad heuristic for scientific progress. It is also possible that stipulations on explanatory posits could encourage a more positive bias toward flawed theoretical paradigms. Are there examples from the history of science that are guilty on this count and relevantly similar to RMN? Once again, the affirmative position seems inviting.

Although perhaps less striking than the case of the mechanical philosophy and Newtonian gravitation, the late nineteenth and early to mid-twentieth century paradigm of behaviorism in psychology is arguably another cautionary tale when it comes to the truth-seeking problem. Indeed, the motivations behind behaviorism are arguably even closer to those of RMN than the mechanical philosophy with respect to Newton, given the critical influence of the Darwinian revolution on naturalism as a program in the philosophy of science.[38] Indeed, as Gary Hatfield points out in a condensed history of behaviorism, most of the paradigm-making theorists understood Darwinian functionalism as specifying a condition on explanatory posits in psychology: "all forswore introspection and made learned changes in behaviour the primary subject matter and

explanatory domain."[39] Put another way, the "logic of naturalism" stipulates that psychological terms are explanatory or "theoretically valid" to the extent that they have a "behaviorally grounded analysis."[40]

Now it should be noted that at least some important behaviorists did countenance *explanantia* that we might deem supernatural today—for example, irreducibly mental or otherwise non-mechanistic phenomena.[41] Indeed, it suggests the difficulties presented by the aforementioned intelligibility problem. But suffice it to say that the broader history of behaviorism as a paradigm certainly evidences its close kinship with naturalism. To venture a historical generalization, we might say that behaviorism was behaviorism *just to the extent* that it was naturalistic in spirit—with increasingly austere positivist and eventually Quinean banishments of the "non-physical" (often a euphemism for the supernatural) from the explanatory domain entirely.[42]

But, of course, few working psychologists today would fail to recognize that behaviorism—especially in its explicitly naturalistic expressions in positivism and Quine—proved to be a dead end:

> After being the dominant paradigm in American psychology for some decades, behaviorism was overtaken by a variety of research results that yielded anomalies revealing its limitations as an overall account of psychological functioning. These evidential failures led to the "cognitive revolution" and to a resurgence of biological approaches. These anomalies included evidence of complex planful cognitive behavior that is teleologically ordered even in rats let alone humans, the reality and importance of unconscious semantic processing and conscious imagery, and startlingly strong evidence of biological preparedness to learn and to maintain certain kinds of learned behavior in ways not in accord with classic learning theory. The net result was that, rather than being a dominant default view, behavioral accounts had to be demonstrated to be useful in each domain to which they were applied.[43]

To the extent that behaviorism sought to explain cognitive or otherwise mental phenomena armed solely with posits from the Darwinian functionalist domain—and to the extent that it was a theory moved by the heuristic exigencies of naturalism—it is at least plausible to think that we have another relevantly similar example from the history of science. In other words, it sounds a lot like naturalism misleading scientific inquiry.

In response, it might be argued that the eclipse of behaviorism in psychology is evidence not so much of a "wrong path" for science but of a paradigm shift. After all, the history of scientific progress is in many ways a story of such paradigm shifts. Even Newtonian gravitation was eclipsed by general relativity.

I certainly grant that the eclipse of a theoretical paradigm is not evidence of that theory's being a "dead end" for scientific inquiry. $F = ma$ is perhaps the most productive and brilliant generalization in the history of science. Ultimately, the question of whether behaviorism was more like a dead end than a productive theoretical paradigm that was ultimately overcome is not a question I can credibly answer here.[44] But the case for the former seems compelling *prima facie*, especially when compared to its Newtonian counterpart. There is nothing in the history of behaviorism that compares when it comes to explanatory posits that are both novel and productive. Indeed, if anything, the hallmark commitments of behaviorism were precisely to *shut down* theoretically productive lines of inquiry—for example, introspection as a method of data collection, irreducibly mental causation, and others—in the process of extending the Darwinian functionalist explanatory program.[45]

But, again, the point is not to get bogged down in the details here. If these examples show that it is even *plausible* to think that something like RMN as a stipulation could do more harm than good as a heuristic for scientific inquiry, then there is a truth-seeking problem. And it seems quite clear that this is plausible indeed, given these prominent examples.[46]

Heuristic for Science or Reactionary Disposition?

So RMN comes with some deep and abiding problems as a stipulation. It is not clear whether it is sufficiently intelligible as a thesis; even if it is, there are reasons to think that it does more harm than good when it comes to at least certain key episodes in the history of scientific progress. In short, RMN doesn't do its job.

But there is more that we can say here to drive home the point. In his magisterial treatment of the intellectual history of naturalism, Peter Harrison points out that founding figures of the naturalist turn in the philosophy of science such as Thomas Henry Huxley popularized the (vacuous or false) claim that the history of science features a perennial struggle between "naturalism" and "supernaturalism" as competing epistemic dispositions.[47] Riding the Darwinian revolution in biology and, critically, a renewed effort to wrest control of English institutions of knowledge production from the Church

of England,[48] Huxley's "founding myth" of naturalism as an epistemic heuristic gained traction. It is in this fundamentally reactionary context that we have to understand the invention of naturalism as a movement in philosophy and the sciences.[49]

While it is beyond my purposes to rehearse this complicated intellectual history, Harrison's story of naturalism as a fundamentally *reactionary* disposition with respect to contingent historical circumstances is profoundly relevant to contemporary philosophical accounts of RMN. It is remarkable to consider, for example, how prominently the American intelligent design debates feature in this literature.[50] Indeed, some even outright adopt solutions to the intelligibility problem by defining naturalism as a view in which explanatory appeals to God, specifically, are ruled out within the respective domains of special sciences.[51]

Indeed, against the background of Harrison's story, even ostensibly more fair-minded approaches such as Oppy's abovementioned non-definitional strategy for solving the intelligibility problem also seem implicated as reactionary. To see this, consider the possibility that the reason we can all agree that quarks are natural and ghosts supernatural has less to do with some sort of intuitive sense of the scientifically respectable and more to do with contingent historical circumstances given to us by a specific culture's folklore. That folklore could have been different, obviously, and if Oppy's non-definitional strategy is all we have to go on, so would the corresponding heuristic for scientific inquiry.

But this is a bad result. If RMN is what it purports to be—a viable heuristic for scientific inquiry—surely it cannot simply amount to a rejection of highly contingent historical circumstances, such as the Church of England's power in the 19th-century British academy or controversies in American fundamentalist circles in the 20th century. A reactionary disposition toward these very particular episodes in the history of science does not make a viable, unifying heuristic for scientific explanation *in general*. We don't want our understanding of science to depend on such things.

If Harrison is right, it is no surprise that naturalism (and therefore RMN) suffers from the intelligibility and truth-seeking problems. The problems of one episode of scientific inquiry can be quite different from those of others, after all, and so, if a heuristic for science is what is sought, then there is no substitute for something more positive. It is not my business here to give such an account, but if the preceding argument is correct, RMN

is unlikely to look much like naturalism at all—unless, of course, broad appeals to the aforementioned explanatory virtues such as empirical adequacy, explanatory breadth, simplicity, and others, and strategies pertaining to inference to the best explanation (IBE), as, for example, Steve Petersen, count as naturalistic.[52] In other words, RMN might escape the two abovementioned problems, but only to the extent that it abandons its specifically and recognizably naturalistic content. The resulting conclusion is surely something like the following one from Timothy Williamson published in a popular *New York Times* article:

> Naturalism tries to condense the scientific spirit into a philosophical theory. But no theory can replace that spirit, for any theory can be applied in an unscientific spirit, as a polemical device to reinforce prejudice. Naturalism as dogma is one more enemy of the scientific spirit.[53]

For those interested in the project of delineating the boundaries of scientific explanation, RMN ought to be rejected.

Conclusion

I have argued that if RMN as a stipulation purports to offer any heuristic value to scientific inquiry, it cannot avoid two classic problems—what I call the intelligibility and truth-seeking problems. Illustrative examples of relevantly similar stipulations suggest as much, as does the broader history of naturalism as a paradigm in the history of the philosophy of science. We should reject RMN for many of the same well-known reasons that we reject other, less "restricted" versions of naturalism.

Notes

[1]Miles K. Donahue, "Methodological Naturalism, Analyzed," *Erkenntnis* 90, no. 5 (2025): 1981–2002, https://doi.org/10.1007/s10670-024-00790-y.

[2]For an overview of this debate, see Peter Forrest, "Methodological Naturalism Undercuts Ontological Naturalism," *American Philosophical Quarterly* 60, no. 1 (2023): 99–110, https://doi.org/10.5406/21521123.60.1.08.

[3]The intelligibility and truth-seeking problems, respectively, are more or less identical with what Julia de Menezes calls the "interpretation" and "truth" questions, respectively. Julia Telles de Menezes, "On Understanding Physicalism," *Kriterion: Journal of Philosophy* 59, no. 140 (2018): 511–31, https://doi.org/10.1590/0100-512x2018n14009jtm.

[4]For defenses of provisional versions of MN, see Gregory W. Dawes, "Understanding Naturalism," *Australasian Journal of Philosophy* 88, no. 4 (2010): 757–58, https://doi.org/10.1080/00048400903077093; and Yonatan I. Fishman and Maarten Boudry, "Does Science Presuppose Naturalism (or Anything at All)?," *Science & Education* 22, no. 5 (2013): 921–49, https://doi.org/10.1007/s11191-012-9574-1.

[5]Alexander Rosenberg defends a version of "scientism" that would count as unrestricted in this sense. See Alexander Rosenberg, "Scientism Versus the Theory of Mind," *Think* 19, no. 56 (2020): 59–73, https://doi.org/10.1017/S1477175620000214. Mario De Caro and David Macarthur's "liberal naturalism" is an example of restricted MN. See Mario De Caro and David Macarthur, eds., *Naturalism in Question* (Harvard University Press, 2008).

[6]See Peter van Inwagen, *Material Beings* (Cornell University Press, 1990) and David Malet Armstrong, *Sketch for a Systematic Metaphysics* (Oxford University Press, 2010). As others have noted, these sorts of appeals to an all-embracing "spatiotemporal system" as the proper domain of natural phenomena do not seem to help all that much. Indeed, it is hard to see how they escape any sufficiently rigorous rendering of Hempel's dilemma when it comes to the meaning of spatiotemporality. On this point, see Aisling Crean, "Dispositionalism and Modality," *Annals of the Japan Association for Philosophy of Science* 12, no. 2 (2004): 75–88, https://doi.org/10.4288/jafpos1956.12.75.

[7]Examples of this strategy include Robin Brown and James Ladyman, *Materialism: A Historical and Philosophical Inquiry* (Routledge, 2019); Alexander Rosenberg, "Disenchanted Naturalism" in *Contemporary Philosophical Naturalism and Its Implications*, ed. Bana Bashour and Hans D. Muller (Routledge, 2013), 13–17; and Janice L. Dowell, "The Physical: Empirical, Not Metaphysical," *Philosophical Studies* 131, no. 1 (2006): 25–60, https://doi.org/10.1007/s11098-005-5983-1.

[8]In his *Stanford Encyclopedia of Philosophy* article on the subject, David Papineau makes the point that "many ontological naturalists thus adopt a physicalist attitude to mental, biological, social and other such "special" subject matters." David Papineau, "Naturalism" in the *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta and Uri Nodelman (2023), https://plato.stanford.edu/archives/fall2023/entries/naturalism/.

[9]Daniel Stoljar, "Physicalism," *The Stanford Encyclopedia of Philosophy* (Spring 2024 Edition), ed. Edward N. Zalta and Uri Nodelman, https://plato.stanford.edu/archives/spr2024/entries/physicalism/. In this quotation, I have put "natural" in place of "physical," but the core point about the intelligibility problem is unchanged.

[10]On this point, see Janice Dowell, "From Metaphysical to Substantive Naturalism: A Case Study," *Synthese* 138, no. 2 (2004): 149–73, https://doi.org/10.1023/B:SYNT.0000013235.88476.e3.

[11]An important point of contention in debates about scientific realism is that of the meaning and plausibility of "approximate truth." According to proponents of approximate truth, scientific explanations can be *partially* or *approximately* true, i.e., without being the whole truth about a given phenomenon. One might think therefore that current, approximately true theories could serve as positive indicators of the content of a future, completed theory that is exactly true. Without further argument, however, this appeal to approximate truth seems unpromising, since even proponents of approximate truth recognize that future theories that are anticipated by present theories will almost certainly countenance explanatory phenomena that are absent—or even outright rejected—by present theories. Indeed, the attractiveness of approximate truth lies with its ability to preserve continuity between theories that are otherwise radically different in their actual content. See Seungbae Park, *Embracing Scientific Realism* (Springer International, 2022).

[12]For an overview of the problems posed by Hempel's dilemma and similar problems to different variations of MN, see Ian Anthony B. Davatos, "The 'Natural' in Methodological

Naturalism," *Philosophia: International Journal of Philosophy* 25, no. 1 (2024): 98–111, https://doi.org/10.46992/pijp.25.1.a.6.

[13]See, e.g., Alyssa Ney, "Physicalism as an Attitude," *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 138, no. 1 (2008): 1–15, http://www.jstor.org/stable/40208856; and Bas C. van Fraassen, *The Empirical Stance* (Yale University Press, 2002). For a recent criticism of these "attitude" or "stance" versions of naturalism, see Thomas J. Spiegel, "Why Naturalism Cannot (Merely) Be an Attitude," *Topoi* 42, no. 3 (2022): 745–52, https://doi.org/10.1007/s11245-022-09846-6.

[14]See Jessica Wilson, "On Characterizing the Physical," *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 131, no. 1 (2006): 61–99, https://doi.org/10.1007/s11098-006-5984-8.

[15]See, e.g., Daniel C. Dennett, "The Bright Stuff," *The New York Times*, July 12, 2003, https://www.nytimes.com/2003/07/12/opinion/the-bright-stuff.html.

[16]Graham Oppy, "Naturalism," chap. 1 in *Naturalism and Its Challenges*, ed. Gary N. Kemp, Ali Hossein Khani, Hossein Sheykh Rezaee, and Hassan Amiriara (Routledge, 2025). This passage is drawn from his broader defense of *metaphysical* naturalism, but the point about his non-definitional strategy for addressing the intelligibility problem applies to variations of MN (including RMN) as well.

[17]Sandy Boucher, in "Methodological Naturalism in the Sciences," *International Journal for Philosophy of Religion* 88, no. 1 (2020): 57–80, https://doi.org/10.1007/s11153-019-09728-9, considers this exact question and argues for a negative answer, drawing an analogy with Quine's famous critique of the analytic-synthetic distinction:

> When Quine offered his radical critique of the analytic/synthetic distinction, it was not an acceptable response to insist (as some did) that we have an intuitive grasp of which sentences are analytic and which synthetic, since if the critique was cogent, it would cast doubt on the validity of those very intuitions. (p. 67)

I agree with Boucher here, and indeed the problem only deepens when we consider that the sort of intelligibility we need is one that is up to the relevant *heuristic task* for scientific inquiry.

[18]Following E. V. R. Kojonen in "Methodological Naturalism and the Truth Seeking Objection," *International Journal for Philosophy of Religion* 81, no. 3 (2017): 335–55, https://doi.org/10.1007/s11153-016-9575-0, Donahue argues that science should be committed to RMN, but also that "one can only find out which domains of inquiry science is applicable to by going out into the world and seeing where naturalistic methodology works" (Donahue, "Methodological Naturalism, Analyzed," p. 1996). But presumably the whole point of a heuristic is that it provides anticipatory guidance *in advance* of "going out into the world." After all, no scientist is in the business of testing RMN as a stipulation.

[19]Fishman and Boudry, in "Does Science Presuppose Naturalism?," make a similar point when they claim that

> the problems plaguing some supernatural hypotheses are not unique to "supernatural" hypotheses, but may apply also to (now discredited) 'natural' hypotheses, such as the Ptolemaic model of the solar system and the theory of Phlogiston. (p. 942)

[20]Indeed, there is even a sense in which GT actually *outperforms* MN in this respect, since presumably we can generate a larger list of paradigmatically "bad" explanations than we can "supernatural" explanations, and thus we have more to go on when generalizing to future cases.

[21]Thanks to an anonymous reviewer for identifying these objections.

[22]On these points, see Igor Douven, "Abduction," in the *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta and Uri Nodelman (Stanford University, 2025), https://plato.stanford.edu/archives/sum2025/entries/abduction/; and Samuel Schindler, "Theoretical Virtues in Science," in *Oxford Bibliographies Online*, Philosophy (2020), https://doi.org/10.1093/obo/9780195396577-0409.

[23]We should note that terms can be "rationally reconstructed" or otherwise made intelligible without clear and precise necessary and sufficient conditions. For an overview of classical accounts of explication as such a strategy for making theoretical terms intelligible, see Jonas Raab, "Quine on Explication," *Inquiry: An Interdisciplinary Journal of Philosophy* 67, no. 6 (2024): 2043–72, https://www.researchgate.net/publication/356014826_Quine_on_explication. Non-definitional accounts of the natural-supernatural distinction such as Oppy's do not attempt such an explication.

[24]Bradley Monton, *Seeking God in Science: An Atheist Defends Intelligent Design* (Broadview Press, 2009), 58.

[25]While Monton seems to assume a realist account of scientific theories here, the point applies equally to anti-realist accounts that take empirical adequacy (rather than truth) to be the aim of science.

[26]Donahue, "Methodological Naturalism, Analyzed."

[27]As in, e.g., Robin Collins, "The Teleological Argument: An Exploration of the Fine-Tuning of the Universe," chap. 4 in *The Blackwell Companion to Natural Theology*, ed. William Lane Craig and J. P. Moreland (Blackwell Publishing, 2009).

[28]By "revisionist redescription," I mean polemical redescriptions of the motives of, e.g., those who defend fine-tuning arguments for design as irrational or even dishonest inquirers with an "agenda." See, e.g., Gregory W. Dawes and Tiddy Smith, "The Naturalism of the Sciences," *Studies in History and Philosophy of Science* 67 (2018): 22–31, https://doi.org/10.1016/j.shpsa.2017.11.012.

[29]John Perry and Sarah Lane Ritchie, "Magnets, Magic, and Other Anomalies: In Defense of Methodological Naturalism," *Zygon* 53, no. 4 (2018): 1064–93, https://doi.org/10.1111/zygo.12473.

[30]Paul Feyerabend's classic criticism of the unity of scientific methodology bears on this point about the remit of science as well. See Paul Feyerabend, *Science in a Free Society* (Verso, 1978).

[31]Ironically, a restricted MN might be a bad heuristic because it is *not confident enough* about the potential remit of natural science. Swiss biologist and prominent critic of the Darwinian revolution Louis Agassiz echoed a common indictment of *The Origin of Species* when he contended that the existence of distinct species posed a problem in principle for any "transmutation" (read: evolutionary) theory, and that it was a "scientific mistake, untrue in its facts, unscientific in its method, and mischievous in its tendency." See Jean Louis Rodolphe Agassiz, "[Review of] *On the Origin of Species*," *American Journal of Science and Arts* 2nd ser., vol. 30 (July 1860): 142–54 in John van Wyhe, ed., *The Complete Work of Charles Darwin Online*, https://darwin-online.org.uk/converted/Ancillary/reviews/1860_Agassiz_A45.html. This indictment resulted from the fact that, among other things, the existence of distinct species was a phenomenon that was beyond the remit of biology to explain. It was reasoning inspired by something like RMN.

[32]See, e.g., Thomas Raleigh, "The Emptiness of Naturalism," *Philosophy* 99, no. 4 (2024): 597–623, https://doi.org/10.1017/S0031819124000172. Mario De Caro and David Macarthur's "liberal naturalism" is an example of restricted MN. See Mario De Caro and David Macarthur, eds., *Naturalism in Question* (Harvard University Press, 2008).

[33]For an alternative, slightly more expansive account of the core commitments of the mechanical philosophy (i.e., without specific commitments to corpuscular matter and local causation) and its continuity with Newton, see Peter Machamer, J. E. McGuire, and Hylarie Kochiras, "Newton and the Mechanical Philosophy: Gravitation as the Balance of the Heavens," *Southern Journal of Philosophy* 50, no. 3 (2012): 370–88, https://doi.org/10.1111/j.2041-6962.2012.00128.x.

[34]Andrew Janiak, *Newton as Philosopher* (Cambridge University Press, 2008).

[35]Janiak expands on this point:

> Newton's theory of gravity in the *Principia*, of course, is perfectly consistent with the contention that material bodies, such as the planets, act on one another directly across empty space—this might even be the most natural interpretation of the theory, and it was prevalent in the eighteenth century. For Newtonian gravity acts instantaneously, and the *Principia* posits no medium for gravitational interactions. And yet Newton himself appears to reject action at a distance. (Janiak, *Newton as Philosopher*, p. 33)

[36]See, e.g., Raleigh, "The Emptiness of Naturalism." This is not to say, of course, that the rejection of action at a distance by Newton and his critics was motivated by any sort of predisposition to *atheism*. Indeed, as Alexandre Koyré points out, debates about the mechanical philosophy were often debates about which "book of nature" God had decided to write. See Alexandre Koyré, *Newtonian Studies* (Chapman and Hall, 1965). Finally, Steve Clarke also cites Newtonian gravitation as a plausible instance in which supernatural (i.e., divine) activity figured into plausibly scientific explanatory hypotheses. See Steve Clarke, "Naturalism, Science and the Supernatural," *Sophia* 48, no. 2 (2009): 127–42, https://doi.org/10.1007/s11841-009-0099-2.

[37]Gottfried Wilhelm Leibniz and Samuel Clarke, *Correspondence*, ed. Roger Ariew (Hackett, 2000), 64.

[38]Peter Harrison identifies the Darwinian biologist Thomas Henry Huxley as the author of something like a "founding myth" of naturalism (i.e., anti-supernaturalism) as an essential commitment in the history of scientific inquiry. See Peter Harrison, *Some New World: Myths of Supernatural Belief in a Secular Age* (Cambridge University Press, 2024). Dawes and Smith seem to want to affirm something like Huxley's founding myth, but even they acknowledge that various traditions of natural *theology* formed the vast majority of epistemic contexts for the history of the sciences. See Dawes and Smith, "The Naturalism of the Sciences."

[39]Gary Hatfield, "Behaviourism and Psychology," in *The Cambridge History of Philosophy 1870–1945*, ed. Thomas Baldwin (Cambridge University Press, 2003), 640–48.

[40]See N. K. Denzin, "The Logic of Naturalistic Inquiry," *Social Forces* 50, no. 2 (1971): 166–82, https://psycnet.apa.org/doi/10.2307/2576935.

[41]In fact, as Noam Chomsky notes in Language and Mind (Cambridge University Press, 2006), the naturalist rejection of irreducibly mental phenomena also happens to be traceable to the mechanical philosophy: "The reasons for the dissatisfaction of Newton, Leibniz, and the orthodox Cartesians with the new physics are strikingly similar to the grounds on which a dualistic rationalist psychology was soon to be rejected," p. 7.

[42]Hatfield, "Behaviourism and Psychology."

[43]Jerome C. Wakefield, "Is Behaviorism Becoming a Pseudo-science? Replies to Drs. Wyatt, Midkiff and Wong," *Behavior and Social Issues* 16, no. 2 (2007): 170–89, https://psycnet.apa.org/doi/10.5210/bsi.v16i2.919.

[44]For an overview of various ways that behaviorism can be characterized as an important paradigm in the history of the psychological sciences, see Henry L. Roediger III, "What Happened to Behaviorism," *APS Observer* 17, no. 3 (2024): 40–42, https://www.psychologicalscience.org/observer/what-happened-to-behaviorism.

[45]This is not to deny the benefits of asking questions a committed behaviorist might ask about mental life, since, of course, no serious school of psychological research denies that such questions are good and an aid to scientific progress. Indeed, the point is that the good part of behaviorism is not uniquely behaviorist.

[46]Peter Harrison mentions several other examples of (plausibly) super- or otherwise non-naturalistic heuristics or explanatory posits in the history of science that seem to serve the purposes of scientific progress: (1) the thesis of "divine creative activity" as an explanation of classical laws of nature in, e.g., James Clerk Maxwell and Lord Kelvin; (2) divine omnipotence as a condition of possibility for the distinction between empirical adequacy and truth in scientific theories; and even (3) the hypothesis of intelligent design in William Harvey's discovery of blood circulation. See Peter Harrison, "Naturalism and the Success of Science," *Religious Studies* 56, no. 2 (2020): 274–91, https://doi.org/10.1017/S0034412518000574.

[47]For the relevant primary textual evidence here, see Thomas Henry Huxley, *Essays upon Some Controverted Questions* (Cambridge University Press, 2009), https://www.gutenberg.org/files/34698/34698-h/34698-h.htm.

[48]Indeed, for this reason among others, considering naturalism as *ideological* in something like the Marxian sense is an inviting hypothesis. For an explanation of just this hypothesis, see Joshua Lee Harris, "Is Naturalism Ideology?," *Renovatio: The Journal of Zaytuna College* (forthcoming).

[49]It is sometimes claimed that MN has a longer track record in the history of the philosophy and theology of science, extending into the Middle Ages and even antiquity. But this is not quite right—at least not if the abovementioned definition of MN is what we have in mind. As Harrison demonstrates, any rigorous division of the world into categorically "natural" and "supernatural" phenomena—a division that is critical to contemporary naturalism debates—is simply unknown to ancient and medieval authors. To illustrate the point, consider that nothing could be more "natural" to pre-Socratics such as Anaxagoras or medievals such as Aquinas than, e.g., God's intelligent and creative causality in the material world. Harrison, *Some New World*, 232.

[50]To cite just a handful of examples, Davatos, "The 'Natural' in Methodological Naturalism"; Donahue, "Methodological Naturalism, Analyzed"; Kojonen, "Methodological Naturalism and the Truth Seeking Objection"; and Maarten Boudry, Stefaan Blancke and Johan Braeckman, "How Not to Attack Intelligent Design Creationism: Philosophical Misconceptions About Methodological Naturalism," *Found Sci* 15 (2010): 227–44, https://doi.org/10.1007/s10699-010-9178-7.

[51]Gregory Dawes and Tiddy Smith defend an account of RMN according to which individual sciences consider explanatory posits relevant to phenomena characteristic domains. The sciences are naturalistic, then, because God is not found among the various explanatory posits relevant to any of these domains—even if God is a licit explanation in traditional natural theology. Unfortunately, Dawes and Smith do not make much an effort to respond to the intelligibility and truth-seeking problems. Again, if RMN is an interesting stipulation, then it provides heuristic value for scientific inquiry *as a whole*—not just for specific sciences. If RMN is only about excluding God, then another stipulation that simply excludes uniquely astrological explanatory posits would be just as interesting. It is hard to imagine either thesis without precisely the sort of reactionary disposition described above. See Dawes and Smith, "The Naturalism of the Sciences."

[52]Steve Petersen defends a version of "naturalism" centered on the primacy of IBE as an epistemic commitment that constrains all explanatory posits. But if Petersen's account is naturalistic, it is only in the weakest possible sense, as he admits that even distinctively theistic explanatory posits could be licit in principle (i.e., if they satisfy conditions specified by IBE criteria). One wonders whether this is naturalism at all. See Steve Petersen, "A Normative Yet Coherent Naturalism," *Philo* 17, no. 1 (2014): 77–91, https://philarchive.org/archive/PETANY.

[53]Timothy Williamson, "What Is Naturalism?," *The New York Times*, September 4, 2011, https://archive.nytimes.com/opinionator.blogs.nytimes.com/2011/09/04/what-is-naturalism/.

GOD AND NATURE

2025 #4

https://godandnature.asa3.org

"Generational Sin" and Epigenetics

E. Janet Warren

The concept of generational sin, that we inherit sins of our ancestors (based on Exodus 20:5), is popular in some contemporary Christian circles. Recently, the field of epigenetics, which examines the effects of environment on genetic expression, has been used to support this idea. This claim is evaluated by contextually examining relevant biblical passages and the broader theological concept of sin, concluding that there is insufficient biblical evidence to support the concept. Similarly, recent scientific research suggesting epigenetic transgenerational transmission of consequences of adverse experiences, though interesting and informative, does not prove that trauma effects in humans are caused by epigenetic changes. Inherent and experiential factors (nature and nurture) are intertwined and, ultimately, we are each responsible for our own thoughts and actions.

Keywords: original sin, genetics, intergenerational trauma

Introduction

In an expansion on the second of ten commandments given to Moses on Mount Sinai, Yahweh explains the reason why people should not bow down to idols: he is "a jealous God, punishing children for the iniquity of parents, to the third and the fourth generation of those who reject me" (Exod. 20:5).[1] This concept has become known as generational sin and has been expanded upon in some popular Christian literature. More recently, there are claims that the biological science of epigenetics supports this idea.

The concept of generational/ancestral sin or curses was associated with the eugenics movement of the 19th century,[2] but came to prominence with the inner healing movement in the 1980s and 1990s.[3] It has not disappeared. Proponents claim that unresolved issues, weaknesses, or tendencies get passed down through generations, or through the bloodline, of a family.[4] Sin patterns get established, multiply, and can become a stumbling block for four generations of a family, with sinful behaviors repeating themselves. People can also be punished for sins committed by their ancestors. These sin cycles can be broken by Jesus, often requiring a special revelation and an elaborate cleansing ceremony. Proponents emphasize prayer, repentance (for oneself and on behalf of one's ancestors), breaking generational curses, and healing the family tree.[5]

Many authors and practitioners of inner healing associate generational sin with demonic bondage—the assumption that evil spirits, associated with particular sins and/or curses, can also be passed on to the next generation.[6] Families that are cursed may suffer from multiple, repetitive disasters. People affected by inherited demons, such as spirits of trauma, then require deliverance as part of the process of healing from the effects of generational sin.

Interestingly, the concept of ancestral sin and curses is found in other religions, literature, and folklore. Both Shakespeare's *Macbeth* and *Romeo and Juliet* refer to curses or plagues, the first being associated with so many accidents that it is often

E. Janet Warren *(BSc, MD, PhD) is an ASA fellow and former president of the CSCA who works as an independent scholar in theology and a part-time family physician. She has published four books and numerous articles, many related to science-faith integration.*

"protectively" referred to as "The Scottish Play." In contemporary culture, generational sin and generational trauma (such as that experienced by Holocaust survivors) have been associated.[7]

Naturally, these concepts have been critiqued for being unbiblical, simplistic, and absolving people of responsibility (akin to a prosperity gospel or "name it and claim it" approach).[8] From a secular perspective, Paul Lombardo likens contemporary teaching on generational sin to arguments used to support eugenics.[9] From Christian perspectives, David Powlison describes the generational transfer of demons as "occult theology,"[10] and Scott Osenbaugh calls generational curse teaching a pagan and false doctrine that denies the sufficiency of scripture and Christ.[11] To be fair, there are nuances in approaches and many authors acknowledge prayers around generational sin to be based more on anecdotal than biblical evidence, or related to the broader concept of "original" sin.[12] Also note that the ubiquity of sin in families and society is not disputed, only the specific notions of biological inheritance and culpability for the sins of one's ancestors.

More recently, at least in popular Christianity, this concept has been related to the scientific field of epigenetics, with the claim that biological science supports the notion of generational sin. Popular websites state, "we no longer have to be victims,"[13] and "perhaps the serious sins of the fathers have left an epigenetic 'mark' on the children that can last for generations."[14] This idea even appears on reputable science-faith websites: A pastor, writing on how he includes science in his sermons, claims that epigenetics provides a biological context for God's statement that sins of parents are passed on to their children; and a biochemist similarly, though more tentatively, suggests that epigenetic research "may provide a biological basis for passages like Exodus 20:5."[15]

The purpose of this investigation is to thoroughly examine the questions: Is there such a thing as generational sin? If so, can scientific findings inform us as to how to understand and approach it? Can sin be biologically inherited? As science and faith can be mutually edifying, examining biblical concepts and related psychological and biological evidence will allow us to address these questions from a more informed perspective.

Biblical Concepts

Recall that good biblical interpretation requires consideration of context—both biblical and cultural.[16] Therefore, before examining specific biblical passages,

we will review the world of ancient Israel and examine the broader topic of sin.

Ancient cultures

In general, ancient Israel was more communally than individually oriented: Four generations typically lived together; families were members of clans and were united in tribes (e.g., Josh. 7:16–18).[17] Interestingly, the Hebrew term אָב (ʾāb), typically translated "father," can also mean ancestor, forefather, head of clan, producer, and protector.[18] Solidarity was such that Henry Wheeler Robinson famously claimed, "the people are their ancestors."[19]

There is fluidity in the biblical language when referencing groups versus individuals; Psalm 44 transitions between "I" and "we" apparently arbitrarily. Individuals often acted as representatives of a group. This occurred frequently during intercession: Moses asked forgiveness for all of Israel (Exod. 34:9), Nehemiah confessed his own sin as well as that of his family and all of Israel (Neh. 1:6; see also Neh. 9:2), and Daniel pleaded God's forgiveness on behalf of his disobedient people (Dan. 9:15–19). Individuals not only acted as mediators but also appeared to accept responsibility for the sin of others, including their ancestors. With respect to divine action, frequently a group receives favor because of an individual's behavior: Abraham's offspring are blessed because of his obedience (Gen. 12:2; 22:17,18), Jehu's "sons of the fourth generation shall sit on the throne of Israel" (2 Kings 10:30), and Isaiah prophesies God's "salvation to all generations" (Isa. 51:8). The converse is also true: When Achan steals treasures, he and his family are stoned to death, and the Israelites lose a battle (Josh. 7:1–26).

The concept of corporate culture is less evident in New Testament texts. When Ananias and Sapphira sin (Acts 5:1–11), they alone are punished, not their community. However, Jesus called both individuals (Luke 15:7) as well as groups to repentance (Matt. 11:20–24). Interestingly, the Philippian jailer is told that not only he, but also his household would be saved were he to "believe on the Lord Jesus" (Acts 16:31). Paul's metaphor of the body of Christ emphasizes unity over individuality (1 Cor. 12:13); in addition, he calls followers of Christ to function as a community, bearing one another's burdens (Gal. 6:2).

This brief overview of the cultural context of the Bible, being much more communally oriented than Western societies, will help in our understanding of biblical concepts such as generational sin. First, we consider sin more broadly.

Sin

Sin is ubiquitous: "All have sinned and fall short of the glory of God" (Rom. 3:23). It is both individual (e.g., David) and communal (e.g., the apostate people of Israel), an act and a nature, thought and deed, internal and external.[20] The English term does not do justice to the wide array of intertwined biblical metaphors: deceitfulness (Heb. 3:13), disobedience (2 Cor. 10:6), failure (James 4:17), idolatry (1 Sam. 15:23), impurity (Zech. 13:1), iniquity (Ps. 38:18), lawlessness (1 John 3:4), rebellion (Exod. 23:21), and wickedness (Gen. 6:5). At times, it is objectified as a snare (Prov. 5:22) or a weight (Isa. 1:4); it can enslave people (Rom. 7:14, 25), cause death (James 1:15), and can even affect the land (Lev. 18:25).[21] Sin is also associated with evil spirits (Lev. 16): sin makes one vulnerable to demonic influence (Eph. 4:26, 27; 1 Tim. 3:6), and evil spirits incite sin and prey upon it (Gen. 4:7; Acts 5:3; 1 Thess. 3:5).[22] Ultimately, all sin is directed against God (Ps. 51; 1 John 3:1–10).

The term used in Exodus 20 is עָוֹן (ʿāwōn), meaning iniquity, perversity, crime, guilt, or punishment (note the overlap between sin and its consequences). However, the more commonly used terms (Hebrew חַטָּאת [ḥaṭṭāʾt], Greek ἁμαρτία [hamartia]) are best understood as "missing the mark," failing to reach a standard.[23] Although sin as pride, domination, or rebellion has often been emphasized in Western theology, sin also involves sloth, self-abnegation, or despair.[24]

Clearly, sin is much more than simple bad behavior or breaking a law. The multiple metaphors have at their root rejection of God as God and of Christ as our Savior, and both punishment and reparations for sin vary according to intent and severity.[25] Furthermore, sin can be preconditioned by life experiences and context, and can grow to the point where our ability to choose is limited, as well stated by Paul: "I do not understand my own actions. For I do not do what I want, but I do the very thing I hate" (Rom. 7:15).[26]

The broad nature of sin has also been described in terms of systemic or corporate sin. Biblical descriptions point to sin as a superhuman power that grows exponentially (consider the "fall," the fratricide, and the flood in Genesis 3–6), kills innocent people (2 Kings 21:16), damages the land (Hosea 4:3), and taints social structures. This last is well illustrated in the elusive Pauline powers: "authorities," "rulers," "spiritual forces," and other terms that likely refer to both human institutions and evil cosmic entities.[27] Sin ruptures community. It

is structurally embodied, and individual attitudes and actions intertwine with sinful societies.[28] Biblical scholar Mark Biddle defines sin as a "system of organically related phenomena, a nexus of cause-effect-cause," emphasizing its systemic and dynamic nature: It creates a "perverted condition that can twist the perceptions and decisions of subsequent generations"; "sin's afterlife vibrates throughout the system and … will continue to twist existence and limit freedom … until the eschaton."[29]

A final important theological concept is that of "original sin." This doctrine, based primarily on Paul's interpretation of Genesis 3 in Romans 5:12–21, was developed by Augustine and perpetuated in the Reformed tradition. The fourth/fifth-century African theologian emphasized a great fall from original perfection. He not only thought that humans are depraved (plagued by concupiscence and idolatry) and unable to not sin, but also—using judicial, forensic language—that we inherit Adam's guilt. He compared sin to a hereditary disease, suggesting that guilt is passed down from one generation to another.[30]

"Original sin" has received much critique.[31] Though none question the universality and inevitability of sin, the controversy concerns whether it is biologically inherited or not, especially the guilt component. The concept of original sin is not found in the Old Testament, being uniquely Pauline.[32] It is potentially fatalistic, absolving individuals of responsibility. It portrays humanity in a negative light, minimizing or denying any original goodness in beings created in God's image. It ignores socio-cultural influences on sin. Furthermore, it is difficult to believe that God ordained all death because of the disobedience of two people, or that all newborns are culpable by virtue of genetics. Finally, as this article will demonstrate, there is no scientific evidence of sin being biologically inherited.[33]

Many suggest that we avoid the term "original sin" with its unfounded assumptions of genetic inheritance and guilt, and instead view humans as having an innate tendency or propensity to sin, a sinful nature, or (my suggestion using mathematical language) a 100% pretest probability of sinning.[34] It is also important to recall the systemic/structural nature of sin, or its cultural transmission, as per the above discussion. This broad conclusion that sin is not genetically inherited partially negates the concept of "generational sin," but we still need to examine the specific texts that have been used to support this concept.

The context of Exodus 20:1–11

After delivering the Israelites from Egyptian captivity and leading them through the wilderness, God, through Moses, speaks to his people establishing the terms of their relationship. This divine revelation, comprising ten commands, is at the heart of Yahweh's covenant bond with Israel. It emphasizes the exclusivity of the relationship, defines sin as worshiping anything or anyone other than God (in contrast to the Egyptians and other pagan nations), and establishes parameters for communal relationships. Idolatry is identical to covenant violation.

This decalogue continues the covenant relationships of Noah and Abraham. This bond establishes Israel's identity (evident in the frequent refrain, "I am your God and you are my people": e.g., Ezek. 34:30–31; Jer. 30:22), instigates rituals (the Passover, Exod. 12:1–28), and provides boundary markers for covenant faithfulness. There are repeated pronouncements of blessings for obedience and curses for disobedience: for example, "Keep, then, this entire commandment … so that you may live long in the land that the Lord swore to your ancestors" (Deut. 11:8,9), and "Cursed be anyone who does not heed the words of this covenant, which I commanded your ancestors when I brought them out of the land of Egypt" (Jer. 11:3,4).[35] Paul quotes Deuteronomy 27:26, saying, "Cursed is everyone who does not continue to do everything written in the Book of the Law" (Gal. 3:10). It is clear that Yahweh is sovereign, the only true God worthy of worship.

However, many of these "blessings and curses" or "punishments" for disobedience do not necessarily reflect an authoritarian deity who micromanages his world, but can be understood as a natural moral order (similar to the order established in creation: for example, God "appoints the sun to shine by day" [Jer. 31:35, NIV]).[36] Actions have consequences and many statements are simply descriptions of cause and effect. These are often framed as "if-then" observations or "reaping and sowing": "If you pay attention to these laws and are careful to follow them, then the Lord your God will keep his covenant of love with you" (Deut. 7:12, NIV); "those who plough iniquity and sow trouble reap the same" (Job 4:8); "Whoever sows injustice will reap calamity" (Prov. 22:8). Statements relating to moral order continue in New Testament teaching: "If you live according to the flesh, you will die …" (Rom. 8:13); "If you hear my voice and open the door, I will come in to you and eat with you, and you with me" (Rev. 3:20); "the one who sows sparingly will also reap sparingly, and the one who sows bountifully will also reap bountifully"

(2 Cor. 9:6); "sow to your own flesh … reap corruption; sow to the spirit … reap eternal life" (Gal. 6:8).

Biblical scholars note that the creational order requires reliable rules and regularities, such as consequences for deeds, in order for life to have meaning and purpose and for humans to have moral agency. Indeed, the world reverts to chaos when covenant disobedience dominates (Gen. 6:1–7; Isa. 24:1–13; Jer. 4:20–25).[37] Understanding both the primacy of the divine-human relationship, with requisite obedience to divine commands, and the natural moral, cause-effect order in the cosmos provides some background for understanding Exodus 20.

Examination of Exodus 20:5, 6[38]

Once God reminds his people of who he is and what he did, he repeats the prohibition against idolatry three times, and then, unique to the second command in verse five, he elaborates on his character.[39] He is a "jealous" God—the term is used only a few times and always relates to God's love for his people. He "visits" (פָּקַד, pāqad, meaning to attend to or be concerned with)[40] the "iniquity" (עָוֹן, ʿāwōn—recall the multifaceted understanding of this term, the intertwining of sin and consequences) of the "parents" (אָב, ʾāb—not necessarily biological parents as discussed above) on the "third" and "fourth" (generation is implied) of those who "reject" (שָׂנֵא, sa.ne,[41] meaning hate or despise) him. Note that biblical use of numbers is almost always symbolic; here "third or fourth" (one could ask what happened to the second) is likely a literary device, meaning an indefinite number or a final number, not actual great-grandchildren.[42] The point is that there is corporate responsibility; the disobedience of the few affects the many.[43] Also recall that family units in the ancient world were cohesive; sin would affect all those in close relationship with the individual who worships idols.[44] Furthermore, the "generations" need to be interpreted in light of "those who reject" God—it is possible that there is an implicit "if," meaning that only those who continue to sin as their parents did will also receive consequences. Generations that follow the "sinner" do not necessarily suffer passively and automatically.[45]

Verse six is sometimes neglected in discussions on generational sin. Astoundingly, divine mercy vastly outweighs divine justice: God shows "steadfast love" (חֶסֶד, che.sed,[46] meaning kindness, faithfulness, or covenant loyalty) to "thousands" (clearly symbolic, signifying an infinite number). This is echoed in Psalm 105:8: "He is mindful of his covenant forever … for a thousand generations." Interestingly, on the new tablets Moses

makes (Exod. 34:1–28), the order is reversed and God's loving nature is expanded upon: he is compassionate, gracious, slow to anger, abounding in *che.sed.* His justice in holding the guilty responsible seems almost an afterthought. Webb and Oeste point out the lopsided nature of God, with a ratio of six positive adjectives to one negative one, and the effects of his attributes having a ratio respectively of one thousand to four.[47] This adds a helpful perspective to our continuing interpretation of generational sin.

Biblical passages that appear to support or contradict "generational sin"

There are other texts that further our understanding of the concept of generational sin. As discussed above, it is clear that sin and its consequences are broad and systemic in nature, affecting entire communities and their land. However, this does not speak to biological inheritance. More specifically, in addressing Israel's covenantal disobedience, Yahweh proclaims, "those of you who survive [previous penalties] shall languish … because of their iniquities; also … because of the iniquities of their ancestors. But if they confess their iniquity and the iniquity of their ancestors" (Lev. 26:39, 40), then the Lord will remember his covenant and spare them. Later in the Pentateuch (Num. 14:17–19), Moses intercedes for Israel, reminding God of his loving character using the language of Exodus 34:6,7 ("slow to anger," "forgiving iniquity"). Although these verses have been interpreted as supporting the concept of generational sin, they better reflect the corporate mentality of ancient Israel and the lack of sharp distinctions between individuals and groups in the biblical world. They also emphasize divine mercy, although they include discipline for the purpose of restoration.[48]

The prophet Jeremiah also intercedes for Israel: "We acknowledge our wickedness, O LORD, the iniquity of our ancestors" (Jer. 14:20). He frequently states, "we have sinned against you (or the LORD)" (e.g., Jer. 3:25), and he comments on generational connections: "Our ancestors sinned; … we bear their iniquities" (Lam. 5:7). Again, these verses reflect the common practice of an individual interceding on behalf of a group; also note that, although people may suffer as a consequence of the sin of others, they do not bear responsibility.

Many biblical verses directly contradict any notion of individuals bearing consequences for the sin of their ancestors. In an expansion of laws given to Israel, it is clarified that "parents shall not be put to death for their children, nor shall children be put to death for their parents; only for their own crimes may persons be put to death" (Deut. 24:16). Jeremiah clarifies that people may suffer because their ancestors turned away from God, but also because they "behaved worse than [their] ancestors" (Jer. 16:10–12). In other words, consequences for sin are first and foremost applied to an individual.

Both Jeremiah and Ezekiel respond to a popular proverb of the day that claimed, "The parents have eaten sour grapes, and the children's teeth are set on edge" (Jer. 31:29; Ezek. 18:2). They refute this by insisting that "all shall die for their own sins" (Jer. 31:30), and "it is only the person who sins that shall die …" (Ezek. 18:4; in fact, the entire chapter emphasizes individual responsibility for actions). Although an individual's sin can affect future generations, everyone has an opportunity to repent; therefore, they cannot justify their actions by blaming ancestors.[49]

To consider the issue in a broader context, consider the Gospel's emphasis on love, mercy, forgiveness, and inclusion (Luke 13:1–5; 19:1–10; John 3:16; 8:11) with disproportionately few references to sin in the Synoptics.[50] Specific to generational sin, Jesus refutes the suggestion that a man's blindness is caused by his own sin or that of his parents (John 9:1–12).[51] Perhaps more importantly, he assures us that the Son sets us free (John 8:36). Paul somewhat similarly teaches that we are judged only by our own actions (Rom. 2:6; 2 Cor. 5:10). This is demonstrated in the story of Ananias and Sapphira, who alone are punished for their sin, not their community (Acts 5:1–11).

Paul also emphasizes mercy: "where sin increased, grace abounded …" (Rom. 5:10); there is "no condemnation for those who are in Christ Jesus" (Rom. 8:1).[52] Overall, the teaching of the Epistles is that we are redeemed from iniquity, not that we inherit it (Heb. 8:1–13; Tit. 2:14). Peter specifically notes that, through Christ's sacrifice, believers are "ransomed from the futile ways inherited from [their] ancestors" (1 Pet. 1:17–19).

In the New Testament, although sin is depicted as systemic, a cosmic force with wide effects, there is no suggestion of biological inheritance. Instead, we "inherit salvation" (Heb. 1:14) and are "joint heirs with Christ" (Rom. 8:17).[53] The body of Christ is to function as a community, bearing one another's burdens (Gal. 6:2), but not bearing another's consequences of sin.

Generational sin: summary
At this point, we can respond to the first research question, "Is there such a thing as generational sin?," in the negative. Although sin is ubiquitous, complex,

and communal, having effects on both current and future generations, there is no biblical evidence that it is biologically inherited. Specifically, by interpreting Exodus 20:5,6 in its immediate and broader context, we learn that ancient cultures blurred boundaries between individual and community, the terms translated "father/parent" and "generation" do not necessarily have biological meanings, and that exclusivity of worship and covenantal obedience are emphasized throughout scripture, as are natural moral order, personal responsibility, divine love, mercy, and forgiveness.

If generational sin is a dubious biblical concept, then scientific "proof" will not rehabilitate it theologically. However, given the continued popularity of the topic and claims that "science" proves sin is inherited, it is worth examining the relevant scientific concepts. Furthermore, since science at times can raise questions that prompt further biblical/theological exploration, examining some empirical studies may provide further insight into the nature of sin, especially its systemic or corporate dimension. This may also illuminate the broad observation of repeated sin patterns in families and societies. We begin with some relevant data and theories from the field of psychology.

Psychological Concepts

The concept of psychological trauma ("a disturbing experience that results in significant … disruptive feelings intense enough to have a long-lasting negative effect on a person's … functioning"[54]) and its broad effects have been increasingly understood in recent years. Even minor adverse experiences in childhood can have significant deleterious effects on a person's physical and mental health.[55] Although contemporary models for understanding psychological problems are still mostly medical (physical diseases with biological/organic causes, such as genetics and neurochemicals), there is increasing awareness of the effects of psychosocial factors such as gender, race, education, and socio-economic status on mental well-being.[56]

More specifically, the term intergenerational (transgenerational, historical, or multigenerational) trauma has been coined to describe "the transmission of trauma or its legacy, in the form of a psychological consequence of an injury or attack, poverty, and so forth, from the generation experiencing the trauma to subsequent generations."[57] This has obvious implications for the idea that parents' sins affect their children. Many scholars think that trauma is inherited epigenetically (discussed below). Although there is no doubt that children are affected by the behavior and mental-emotional state of their parents, contemporary psychological understanding is that nature and nurture are intertwined (as in the cliché, "biology is not destiny").[58] It is impossible to separate the impact of genetic or inherent factors from that of experiential ones. Systems theory and the concept of developmental trauma are considered to have sufficient explanatory value for psychological problems and "sinful" actions (or more commonly, sinful responses to trauma). A helpful framework is that of biological vulnerability or predisposition, the expression of which depends on environment and agency.[59]

Biological Concepts

There are some well-known cautions regarding scientific interpretation: do not equate correlation with causation, and avoid simplistic conclusions. Biologist Denis Alexander laments the sensationalism surrounding inheritance in the popular press, such as references to "liberal genes," "happiness genes," "binge drinking genes," as well as headlines such as, "blame your DNA."[60] Instead, biological organisms are complex dynamic systems, causation is usually multifactorial and best described using probabilistic terms, and medical science is inexact. In short, life is messy; there are things that happen to us, and things that we make happen.

Genetics is "the study of inheritance and variation of biological traits."[61] Our 23 chromosomes contain about 23,000 genes (the human genome), and development continues throughout life as mutations and consequent genetic variations continue to occur. Contrary to popular belief, the DNA that carries genetic information functions more like a flexible script than a fixed template, similar to differing movie adaptations of the same play.[62] An important concept is heritability: "an attribute of a quantitative trait in a population that expresses how much of the total phenotypic variation is due to genetic variation."[63] Calculating the latter is complex, based on statistics and dependent on definitions, and there is a wide spectrum: some disorders, such as developmental delay, have high heritability, whereas conditions such as depression and obesity have low heritability.[64] Almost all behavioral traits have low heritability; the effects of environmental interaction and free will are high. Alexander notes that "different genomes tend to correlate with different life outcomes in a probabilistic kind of way."[65]

Epigenetics

This leads us to the even more complex field of epigenetics: the study of "the mechanisms by which genes bring about their phenotypic effects,"[66] or "heritable

and stable changes in gene expression that occur through alterations in the chromosome rather than in the DNA sequence."[67] These modifications occur in response to environmental changes and in a sense turn genes on and off; the term genomic plasticity has been used to describe this phenomenon. Genetic expression is affected by intrauterine surroundings as well as by postnatal physical and psychological experiences, such as diet, toxins, and stress. Epigenetic changes help explain the pathogenesis of many diseases, including cancer. Stimuli are often small; for example, short-term vitamin D supplementation resulted in epigenetic modifications at more than 100 sites.[68]

The biochemical mechanisms involved include DNA methylation, histone modification, and non-coding RNA-associated gene silencing.[69] These changes can occur between parent and daughter cells, and can be passed from one generation to the next. The collection of all epigenetic modifications in a genome is called an epigenome, and there is a large diversity of epigenetic differences between individuals. This field of study helps bridge the gap between genotype and phenotype or, more broadly, between nature and nurture.

Of particular interest to our research question is how epigenetics can inform our knowledge of transgenerational trauma. Adverse experiences can leave a chemical mark on a person's genes, which can then be passed down to future generations. This mark does not cause a genetic mutation, but it does alter the mechanism by which the gene is expressed. Epigenetics mediates how early psychosocial experiences affect one's ability to handle stress and one's overall health; changes have even been found in the placenta.[70] Transgenerational epigenetic changes related to psychological health have been discovered in multiple studies, such as effects of parental stress on children, childhood abuse and suicide, aggressive behavior, brain processes in mental illness, and post-traumatic stress disorder.[71]

These effects are also evident at population levels. A well-known study examined grandchildren of those who suffered through famine for an extended period in 1945.[72] They found that men who had been in utero during this time had offspring who were heavier and experienced more chronic diseases than their peers who were unaffected by famine. Another study discovered a specific chemical mark, or epigenetic signature, on one of their genes.[73]

Epigenetic changes have also been found in children of Holocaust survivors (a distinctive pattern of DNA methylation) and in infants whose mothers were pregnant on 9/11. These children also demonstrated heightened emotional arousal (which may decrease their capacity to deal with stress and predispose them to psychological problems).[74]

This research is fascinating, implying that some people have more to overcome because of their genetic inheritance. This, of course, can lead to unhelpful responses in popular thought, such as sensationalism, overgeneralization, fatalism, and neglect of personal responsibility. Interestingly, in criminology (perhaps more closely associated with "sinful behavior"), the science of epigenetics has been deemed inadequate to warrant revisions to criminal law.[75]

Researchers themselves caution that the field is in its infancy, one cannot extrapolate from animal studies, and conclusions should be tentative. Psychiatrist Rachel Yehuda, a pioneer in this area, states that "studies have not yet conclusively demonstrated epigenetic transmission of trauma effects in humans."[76] In particular, it is difficult to prove the role of epigenetics in generational trauma because of the major and unavoidable consequences of current environmental experience and sociocultural inheritance. Biological and psychological effects interact, and epigenetic changes continue throughout the lifespan, including positive ones that overcome effects of developmental trauma.[77] To reiterate, nature and nurture are intertwined; simplistic, reductionistic approaches are to be avoided.

Possible Interactions Between Biblical and Biological Concepts

Thus far, it appears that neither theology nor science definitively support the transmission of trauma, let alone transmission of sinful tendencies or curses associated with some Christian teachers' claims about generational sin. However, we can further consider the broader question of the transmission of sin, as discussed in some academic literature on the relationship between theological and biological concepts, with respect to transgenerational inheritance. Biologists Evan Jones and Blaine Smith title their article "Epigenetics and Pastoral Counseling: The Science Behind What We Preach."[78] Although they rightly note that both nature and nurture are important and that psychological disorders are not simply a result of sin, they state that "one could potentially claim that sinful behaviour no longer needs to be considered a function of something mysterious (Rom. 7:15–25) but something engrained within one's physicality (the flesh)."[79] However, as discussed above,

both sin and biological inheritance are multifactorial processes. Whether or not there are epigenetic (along with genetic and environmental) predispositions to sinful attitudes and behaviors (whether in the form of domination or despair, whether individual or communal), we still bear responsibility for our own thoughts and deeds. Furthermore, in Christian theology (and likely biology too), there is always some uncertainty and mystery, which, of course, encourages dependence on God.[80]

Theologian Walter Sisto takes a more conservative and defensible approach.[81] He suggests that epigenetics offers an analogy for the process of the transmission of original sin, which he defines as humanity's weakened or wounded nature. We are connected to our ancestors biologically, culturally, and spiritually. Generations of sinful persons can amplify the effect of sin, but we are not responsible for epigenetic markers inherited from our parents or their sinful deeds. Both epigenetics and sin (as well as grace!) are dynamic, not deterministic.

Megan Loumagne Ulishney provides a deeper, more nuanced discussion in a paper interestingly entitled "Visiting Iniquity upon the Generations."[82] She employs the approaches of systems biology and the extended evolutionary synthesis, which include non-genetic factors in the evolutionary process. Both epigenetics and systems biology suggest that, although we are shaped by external forces and environments, we are not passive recipients but active participants in the evolutionary process. With respect to Christian theology, sin is inevitable, all encompassing, and transmitted both biologically and culturally; the two work synergistically. We have agency and responsibility but are interdependent beings. Our sinful natures may be considered to be biologically inherited with the proviso that we acknowledge that nature and culture are intertwined. And, of course, biological imperfections are not necessarily sinful or a consequence of sin. Ulishney states:

> The past decisions made by our ancestors, our early childhood experiences, and the forces that came before us—the sinful and the good and everything in between—are always with us, although we are also not completely determined by these histories.[83]

Her emphasis on interconnection and non-determinism is helpful but might be better expressed using the language of predisposition rather than inheritance. Despite her cautions, the latter term carries implications of determinism as well as measurable mechanisms. In contrast, the term predisposition or vulnerability—used in biology, psychology, and theology—is broader,

implying an ability to overcome any propensity for sin or psychological problems. Furthermore, the concept of genetic/epigenetic vulnerability fits with psychological theories of intergenerational trauma as well as theological notions of systemic sin and the sinful nature of humanity—our "guaranteed" predisposition to sin.

Conclusion

In sum, there is no doubt that adverse or sinful behaviors persist through generations. However, this is not a result of "generational sin" or divine curse, and our examination of the key texts showed that such persistent behaviors should not be interpreted in this manner. Neither is this persistence due to epigenetic inheritance, although there are suggestions of biological patterns that correspond to traumatic events, for example. The ubiquity of sin and the concept of generational trauma are best understood as a complex intertwining of biopsychosocial-spiritual predispositions, life experience, creational order, and human agency.

Recall that the Bible depicts sin as complex and systemic, intertwined with culture and with evil spiritual forces. The triune God is primarily concerned with his love relationship with his people; he forgives to the "thousandth" generation, emphasizes grace, and commands us to love him in return as well as our neighbors. These positive concepts are far more often discussed than "generational sin." However, God has created the world such that actions have consequences—he does not need to punish people but can rely on natural moral order. The Bible emphasizes individual responsibility for sin and its restitution.

I suggest we also consider the issue of the "inheritance" of sin more broadly. With respect to God's world, one could argue that pollution is a "sin" passed down through generations, but it would be difficult to attribute this to epigenetic changes. We should also acknowledge contrasts to sin and adverse experiences: the "inheritance" of blessings, and the possibility of divine healing and salvation.

On an individual level, as with pastoral counseling, it is important to consider family history and context when encountering ungodly behaviors and to recognize that sin is often a response to being sinned against. However, it is potentially more harmful than helpful to include the concept of "generational sin," as individual responsibility is more important. Prayer is always helpful but does not necessarily need to be specifically directed against curses, which can lead to simplistic and magical thinking. I don't discount anecdotal evidence,

such as discussed in the introduction, or the concept and practice of deliverance but, as discussed, there are interpretive options other than that of generational sin. We can rely on the Holy Spirit to guide our care of individuals and avoid generalizing—the process is likely different for each person; perhaps the balance, or imbalance, of biopsychosocial-spiritual factors involved in our attitudes and actions is unique to individuals.

With respect to the science-faith dialogue, there are some compatibilities between "generational sin" and biological and psychological findings. This is not surprising, in that science in many ways observes the created order. Theology and science concur that the past affects the present and that actions have consequences. Epigenetic research offers more specifics with respect to how "consequences," such as sensitivity to the stresses of "sin,"—for example, the Holocaust—can affect the next generation, even though sufferers did not commit this sin. This observation accords with the biblical notion of moral order and the cause-effect nexus. However, scientific research cannot address questions related to morality, guilt, punishment, or redemption. I also question whether it is a fruitful endeavor to scientifically determine how the "sins of the fathers" affect their children—at least from a Christian perspective. In fact, I am not convinced that the concept of inherited sin, or even predispositions, has explanatory value or advances our knowledge. It has long been known that there are biological correlates to psychological states and behaviors.

Interestingly, there is perhaps more evidence from science for the inheritance of sinful tendencies than from biblical theology. However, I think that this is a meaningful parallel that is likely coincidental. Although it is tempting to claim that scientific findings prove biblical teachings, this approach is unwise on many levels. Science and Christianity are broadly compatible, but each has different contexts, purposes, and methodologies. I suggest we interpret science through the lens of Christianity rather than looking to affirm biblical teaching with scientific discoveries. Furthermore, if a Christian concept is supported by science, this does not necessarily make the concept "more" true.

However, the possibility of epigenetic transmission of trauma can inform Christian faith. Biology and psychology remind us that humans are holistic beings, with "body-soul-spirit" unity. By reinforcing the importance of considering biblical teachings about the communal dimensions of sin, they add a corrective to the individualism characteristic of Western Christianity. Biology and psychology remind us of the complexity of human behavior and suffering, and the potential for transgenerational healing. In turn, Christian theology can perhaps stimulate scientific research on biological correlates of salvation or "generational blessing."

In the meantime, we need caution to avoid facile conclusions that can be detrimental. It may be more helpful to consider epigenetics as an analogy for systemic sin rather than a mechanism for it. Biological findings perhaps add a dimension to the necessity of covenantal obedience and the call to ethical living as the body of Christ. Ultimately, we are each responsible for our own thoughts and actions. Thankfully, the Bible speaks of a God who shows love to the "thousandth" generation; grace always trumps sin.

Acknowledgment

Notes

[1]All Scripture references are from the New Revised Standard Version, Anglicised (NRSVA) unless otherwise noted.

[2]See discussion in Paul A. Lombardo, "Return of the Jukes: Eugenic Mythologies and Internet Evangelism," *Journal of Legal Medicine* 33, no. 2 (2012): 207–33, https://doi.org/10.1080/01947648.2012.686798.

[3]Like many movements it is difficult to be precise about its origins, though it is often associated with Agnes Sanford, whose work *The Healing Power of the Bible* (Hodder & Stoughton, 1974) influenced others such as Charles Kraft, *Defeating Dark Angels* (Servant, 1992) and Francis MacNutt, *Healing* (Ave Maria, 1974) and *Deliverance from Evil Spirits* (Chosen, 1995). It is predominantly associated with charismatic and evangelical streams of Christianity. Other popular speakers and ministers include Marilyn Hickey, *Break the Generational Curse* (Marilyn Hickey Ministries, 1988); Neil T. Anderson, *The Bondage Breaker* (Harvest House, 1990); and Derek Prince, *Blessing or Curse: You Can Choose* (Chosen Books, 1990). Note that my focus is the North American context.

[4]For example, Ed Murphy defines generational sin as "sin judgment which moves through the family line," in Ed Murphy, *The Handbook for Spiritual Warfare,* Revised and Updated (Thomas Nelson, 2003), 437; and Marilyn Hickey claims it is "hereditary traits or family weaknesses that are passed from generation to generation," in Marilyn Hickey, *Legacy of Faith* (Harrison House, 2011), 43.

[5]For example, note the title of Kenneth McAll's book, *Healing the Family Tree* (Sheldon Press, 1982). McAll recounts multiple anecdotes from his experience as a missionary physician and suggests that many mental maladies are due to control by ancestral curses. "Treatment" involves identifying the problem relative (often deceased) then "cutting spiritual bonds" through a service of prayer and holy communion.

[6]Charles Kraft, for example, refers to the "passing on of generational or bloodline spirits/power/curses" (*Defeating Dark*

Angels, 74). MacNutt refers to spirits of trauma (*Deliverance*, 182–95).

[7]The concept is popular enough to warrant both a Wikipedia and a WikiHow page, the latter including both spiritual and psychological strategies for breaking generational curses, https://en.wikipedia.org/wiki/Ancestral_sin; https://www.wikihow.com/5-Types-of-Generational-Curses.

[8]For a recent review and critique, see Peter Althouse, "Inner Healing, Embodied Emotions, and the Therapeutic Culture of Christian Healing Ministries: SPS Presidential Address 2023," *Pneuma* 45 (2023): 177–99.

[9]Lombardo, "Return of the Jukes."

[10]David Powlison, *Power Encounters: Reclaiming Spiritual Warfare* (Baker, 1995, 2000), 126–27.

[11]Scott E. Osenbaugh, "Generational Curses: Biblically Supported or False Teaching?," *Journal of Biblical Theology* 8, no. 2 (2025): 171–214.

[12]E.g., John Piper, "How God Visits Sins on the Third and Fourth Generation," *Desiring God*, March 6, 2009, https://www.desiringgod.org/articles/how-god-visits-sins-on-the-third-and-fourth-generation; and Murphy, *Handbook,* 437.

[13]Jeremy Wiles, "Epigenetics Reveals Your Habits Are Passed onto Your Children and Grandchildren," Soul Refiner, June 23, 2022; modified, May 12, 2023, https://blog.soulrefiner.com/science-confirms-bible-on-generational-curses.

[14]Jim Virkler, "Epigenetics Offers New Solution to Some Long-Standing Theological Problems: Inherited Sin, Christ's Sinlessness and Generational Curses Can Be Explained," Ankerberg Theological Research Institute (October 14, 2010), https://jashow.org/articles/epigenetics-offers-new-solution-to-some-long-standing-theological-problems-inherited-sin-christs-sinlessness-and-generational-curses-can-be-explained/.

[15]John Van Sloten, "God Speaks Science: Preaching from God's Other Book," BioLogos, September 10, 2018, https://biologos.org/articles/god-speaks-science-preaching-from-gods-other-book; and Fazale Rana, "Epigenetics—Sins of the Fathers," Reasons to Believe, June 1, 2011, https://reasons.org/explore/publications/articles/epigenetics-sins-of-the-father.

[16]For an overview on biblical interpretation, see Henry A. Virkler and Karelynne Gerber Ayayo, *Hermeneutics: Principles and Processes of Biblical Interpretation* (Baker Academic, 2023).

[17]For this section, see Carol Myers, "The Family in Early Israel," in *Families in Ancient Israel*, ed. Leo G. Purdue et al. (Westminster John Knox, 1997), 1–47; Leo Purdue, "The Household, Old Testament Theology, and Contemporary Hermeneutics," in *Families in Ancient Israel*, 223–58; and John Barton, *Ethics in Ancient Israel* (Oxford University Press, 2014), 53–55.

[18]אָב, ʾāb, William Lee Holladay and Ludwig Köhler, *A Concise Hebrew and Aramaic Lexicon of the Old Testament: Based upon the Lexical Work of Ludwig Koehler and Walter Baumgartner* [15th, corrected impression, August 2000] (Eerdmans; Brill, 1988), s.v.

[19]H. Wheeler Robinson, *Corporate Personality in Ancient Israel* (T&T Clark, 1981), 4. He has been critiqued for overstating his case, e.g., Barton, *Ethics*, 53–55.

[20]For biblical and theological treatments of the topic, see Mark Biddle, *Missing the Mark: Sin and Its Consequences in Biblical Theology* (Abingdon, 2005), esp. vii–xix and 115–35; David L. Smith, *With Willful Intent: A Theology of Sin* (Bridgepoint, 1994), 153–309; Gary A. Anderson, *Sin: A History* (Yale University Press, 2009), esp. 3–35.

[21]E.g., Jonathan Klawans, *Impurity and Sin in Ancient Judaism* (Oxford University Press, 2000), 20–45, 119–55; Jay Sklar, "Pentateuch," in *T&T Clark Companion to the Doctrine of Sin*, Bloomsbury Companions, ed. Keith L. Johnson and David Lauber (Bloomsbury T&T Clark, 2016) 3–26.

[22]E. Janet Warren, *Cleansing the Cosmos: A Biblical Model for Conceptualizing and Counteracting Evil* (Pickwick, 2012), 129–38, 215–29.

[23]חַטָּאת, עָוֹן, Holladay and Köhler, *Hebrew and Aramaic Lexicon*, s.v.; ἁμαρτία, Frederick W. Danker and Kathryn Krug, *The Concise Greek-English Lexicon of the New Testament* (University of Chicago Press, 2009), s.v.; Biddle, *Missing the Mark,* 30–33; Anderson, *Sin,* 13–32; and Smith, *Willful Intent,* 289–310.

[24]Summarized in E. Janet Warren, "'I Do Not Do What I Want': Commonalities in Addiction and Sin," *Perspectives on Science and Christian Faith* 70, no. 4 (2018): 252–63, https://www.asa3.org/ASA/PSCF/2018/PSCF12-18Warren.pdf.

[25]E.g., 1 Cor. 8:12; Smith, *Willful Intent,* 301–26; Sklar, "Pentateuch."

[26]E.g., Warren, "'I Do Not Do What I Want.'"

[27]E.g., Rom. 8:38; 1 Cor. 15:24; Eph. 1:21, 3:10, 6:12; and Col. 1:16, 2:10; and Warren, *Cleansing*, 218–23.

[28]Theologian Drew (Andy) Everhart notes that social rules and norms regulate communal interactions; influence is reciprocal, hence, agency and responsibility are both personal and corporate: D. T. Everhart, "Communal Reconciliation: Corporate Responsibility and Opposition to Systemic Sin," *International Journal of Systematic Theology* 25, no. 1 (2023): 134–56, https://onlinelibrary.wiley.com/doi/pdf/10.1111/ijst.12570. Serene Jones similarly claims that sin is simultaneously individual and social and that "we are caught in webs of systemic evil that distort our capacities for good": Serene Jones, *Trauma and Grace* (Westminster John Knox Press, 2009), 37.

[29]Biddle, *Missing the Mark*, 76, 118–20, 130–36.

[30]Found mostly in Augustine, *Confessions,* trans. R. S. Pine-Coffin (Penguin, 1961), especially book II. Augustine's theology was informed by guilt about past sinful behaviors, as well as by his arguments against Pelagius, who held a high view of human goodness. George Murphy suggests that if Augustine had had access to modern science, he may have argued for a "gene for sin," which of course does not exist. See George L. Murphy, "The Twofold Character of Original Sin in the Real World," *Perspectives on Science and Christian Faith* 73, no. 3 (2021): 152–57, https://www.asa3.org/ASA/PSCF/2021/PSCF9-21Murphy.pdf. On Augustine and Reformed theology, see Millard J. Erickson, *Christian Theology*, 2nd ed. (Baker, 1998), esp. 652.

[31]E.g., Terence E. Fretheim, *God and World in the Old Testament: A Relational Theology of Creation* (Abingdon, 2005), 70–77; Biddle, *Missing the Mark*, 3–8; James Taylor, *Sin: A New Understanding of Virtue and Vice* (Northstone, 1997), 183–93; and Ian A. McFarland, "Original Sin," in Johnson and Lauber, eds., *T&T Clark Companion to the Doctrine of Sin*, 303–18. Many classical theologians (Zwingli, Barth, Brunner, Niebuhr) did not accept the concept of biological inheritance or inherited guilt due to the first sin. See, Smith, *Willful Intent*, 64–123.

[32]Many argue that Paul was referring to the common experience of sin in humanity, not genetic inheritance. See, e.g., Gerrit C. Berkouwer, *Sin: Studies in Dogmatics* (Eerdmans, 1971), 485–545.

[33]The scientific investigation of the relationship between sin and human origins is relatively recent. E.g., 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; Oliver D. Crisp, "On Original Sin," *International Journal of Systematic Theology* 17, no. 3 (2015): 252–66, https://doi.org/10.1111/ijst.12107; and Benno van

[33] den Toren, "Human Evolution and a Cultural Understanding of Original Sin," *Perspectives on Science and Christian Faith* 68, no. 1 (2016): 12–21, https://www.asa3.org/ASA/PSCF/2016/PSCF3-16vandenToren.pdf.

[34] Murphy, in "Twofold Character," attributes our sinful state to both nature and nurture; McFarland, in "Original Sin," suggests that we emphasize sin as part of human nature, rather than as an event in the past; and Crisp, in "On Original Sin," retains the language of original sin, an inherited moral corruption, but denies original culpability. He is concerned with protecting those who may not live long enough to sin or those lacking moral properties.

[35] See discussion in Osenbaugh, "Generational Curses," 1–6.

[36] For this section, see Fretheim, *God and World*, 163–65; Barton, *Ethics in Ancient Israel*, 94–126; Nathan Bills, *A Theology of Justice in Exodus* (Penn State Press, 2020), 54–78; Nancey Murphy and George F. R. Ellis, *On the Moral Nature of the Universe: Theology, Cosmology, and Ethics* (Fortress, 1996), esp. 206–10; and Alister E. McGrath, *The Open Secret: A New Vision for Natural Theology* (Wiley, 2008), 292–96.

[37] Ronald Simkins, in *Creator and Creation* (Hendrickson, 1994), summarizes the association between human obedience and order in the cosmos: "When humans follow the covenant, the order of creation is maintained. The established boundaries remain fixed. If humans neglect or reject the covenant, however, the creation itself suffers. The order of creation disintegrates, and the world reverts to its original chaotic state" (p. 198).

[38] The parallel text (Deut. 5:1–22) contains differences not significant for our purposes.

[39] For this section, see discussions in Terence E. Fretheim, *Exodus* (Westminster John Knox Press, 2010), 220–28; Victor P. Hamilton, *Exodus: An Exegetical Commentary* (Baker Books, 2011), 510–25; Peter Enns, *Exodus* (Zondervan, 2014), 338–40; Sklar, "Pentateuch"; and Biddle, *Missing the Mark*, 120–25.

[40] פָּקַד, pāqad, Holladay and Köhler, *Hebrew and Aramaic Lexicon*, s.v.; and Hamilton notes that "when God shows up for a 'visit,' you need to do one of two things: either welcome him, or run for cover" (Hamilton, *Exodus*, 524).

[41] שָׂנֵא (sa.ne), Holladay and Köhler, *Hebrew and Aramaic Lexicon*, s.v.

[42] Hamilton, in *Exodus: An Exegetical Commentary*, also points to several instances in which a fourth occurrence is a final, accurate one; e.g., in 1 Sam. 3:5–10, Samuel hears God's voice correctly the fourth time, after previously mistaking it for Eli's voice (p. 525).

[43] Enns, *Exodus*, 440.

[44] E.g., Mark J. Boda, *A Severe Mercy: Sin and Its Remedy in the Old Testament* (Eisenbrauns, 2009), 45.

[45] Sklar, "Pentateuch," 19–20; and Osenbaugh, "Generational Curses."

[46] חֶסֶד, che.sed, Holladay and Köhler, *Hebrew and Aramaic Lexicon*, s.v.

[47] William J. Webb and Gordan K. Oeste, *Bloody, Brutal, and Barbaric? Wrestling with Troubling War Texts* (IVP Academic, 2019), 56–60.

[48] Sklar, "Pentateuch," 21; Osenbaugh, "Generational Curses"; and Mark J. Boda, "The Prophets," in Johnson and Lauber, eds., *T&T Clark Companion to the Doctrine of Sin*, 27–44.

[49] Boda, "Prophets"; and Osenbaugh, "Generational Curses," 19–20.

[50] C. Clifton Black, "Synoptic Gospels," in Johnson and Lauber, eds., *T&T Clark Companion to the Doctrine of Sin*, 61–78.

[51] Gary M. Burge, "The Gospel and Epistles of John," in Johnson and Lauber, eds., *T&T Clark Companion to the Doctrine of Sin*, 79–96.

[52] Timothy G. Gombis, "Paul," in Johnson and Lauber, eds., *T&T Clark Companion to the Doctrine of Sin*, 97–110.

[53] Osenbaugh, "Generational Curses," 20–25.

[54] "Trauma" in Gary R. VandenBos, ed., *APA Dictionary of Psychology* (American Psychological Association, 2007), s.v., updated on 04/19/2018, https://dictionary.apa.org/trauma.

[55] Vincent J. Felitti et al., "Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study," *American Journal of Preventive Medicine* 14, no. 4 (1998): 245–58, https://doi.org/10.1016/S0749-3797(98)00017-8; and Bessel van der Kolk, *The Body Keeps the Score: Brain, Mind and Body in the Healing of Trauma* (Penguin, 2015), 107–201.

[56] See discussions in A. S. Huda, *The Medical Model in Mental Health: An Explanation and Evaluation* (Oxford University Press, 2019); David N. Elkins, *The Human Elements of Psychotherapy: A Nonmedical Model of Emotional Healing* (American Psychological Association, 2016); and Christopher C. H. Cook and Isabelle Hamley, eds., *The Bible and Mental Health: Towards a Biblical Theology of Mental Health* (SCM Press, 2020).

[57] "Intergenerational trauma," VandenBos, *APA Dictionary*, s.v. See also, Sue Grand and Jill Salberg, "Trans-Generational Transmission of Trauma," in *Social Trauma: An Interdisciplinary Textbook*, ed. Andreas Hamburger et al. (Springer, 2021), 209–15; Gabriele Schwab, *Haunting Legacies: Violent Histories and Transgenerational Trauma* (Columbia University Press, 2010).

[58] E.g., Timothy D. Johnston and Laura Edwards, "Genes, Interactions, and the Development of Behavior," *Psychological Review* 109, no. 1 (2002): 26–34, https://psycnet.apa.org/doi/10.1037/0033-295X.109.1.26; and David St. Clair and Bing Lang, "Schizophrenia: A Classic Battle Ground of Nature Versus Nurture Debate," *Science Bulletin* 66, no. 10 (2021): 1037–46, https://doi.org/10.1016/j.scib.2021.01.032.

[59] Rebecca Broerman, "Diathesis-Stress Model," in *Encyclopedia of Personality and Individual Differences*, ed. Virgil Zeigler-Hill and Todd Shackelford (Springer, 2018), 1–3, https://doi.org/10.1007/978-3-319-28099-8_891-1; and Alan J. Card, "The Biopsychosociotechnical Model: A Systems-Based Framework for Human-Centered Health Improvement," *Health Systems* 12, no. 4 (2023): 387–407, https://doi.org/10.1080/20476965.2022.2029584.

[60] Denis R. Alexander, *Are We Slaves to Our Genes?* (Cambridge University Press, 2020), 4–6.

[61] "Genetics," Robert C. King et al., *A Dictionary of Genetics*, 7th ed. (Oxford University Press, 2006), s.v.; and for an overview, see Ricki Lewis, *Human Genetics: The Basics* (Taylor & Francis, 2016).

[62] Nessa Carey, *The Epigenetics Revolution: How Modern Biology Is Rewriting Our Understanding of Genetics, Disease, and Inheritance* (Columbia University Press, 2012), 2.

[63] "Heritability," King et al., *Dictionary of Genetics*, s.v.

[64] Alexander, *Are We Slaves to Our Genes?*, 55–73.

[65] Alexander, *Are We Slaves to Our Genes?*, 192.

[66] "Epigenetics," King et al., *Dictionary of Genetics*, s.v.

[67] Nora M. Al Aboud et al., "Genetics, Epigenetic Mechanism," updated August 14, 2023, in StatPearls [Internet]. (StatPearls Publishing, 2025), 1, https://www.ncbi.nlm.nih.gov/books/NBK532999/. See also, Alexander, *Are We Slaves to Our Genes?*, esp. 36–54; and Carey, *The Epigenetics Revolution*.

[68]Carsten Carlberg, "Vitamin D Genomics: From *In Vitro* to *In Vivo*," *Frontiers in Endocrinology* 9 (2018): 1–6, https://doi.org/10.3389/fendo.2018.00250.

[69]Al Aboud et al., "Genetics, Epigenetic Mechanism"; and James P. Hamilton, "Epigenetics: Principles and Practice," *Digestive Diseases* 29, no. 2 (2011): 130–35, https://doi.org/10.1159/000323874.

[70]Moshe Szyf et al., "The Social Environment and the Epigenome," *Environmental and Molecular Mutagenesis* 49, no. 1 (2008): 46–60, https://doi.org/10.1002/em.20357; Moshe Szyf, "The Early Life Social Environment and DNA Methylation," *Epigenetics* [the Official Journal of the DNA Methylation Society] 6, no. 8 (2011): 971–78, https://doi.org/10.4161/epi.6.8.16793; and Michael Mortillo and Carmen J. Marsit, "Select Early-Life Environmental Exposures and DNA Methylation in the Placenta," *Current Environmental Health Reports* 10, no. 1 (2023): 22–34, https://doi.org/10.1007/s40572-022-00385-1.

[71]Mallory E. Bowers and Rachel Yehuda, "Intergenerational Transmission of Stress in Humans," *Neuropsychopharmacology* [an Official Publication of the American College of Neuropsychopharmacology] 41, no. 1 (2016): 232–44, https://doi.org/10.1038/npp.2015.247; Patrick O. McGowan et al., "Epigenetic Regulation of the Glucocorticoid Receptor in Human Brain Associates with Childhood Abuse," *Nature Neuroscience* 12, no. 3 (2009): 342–48, https://doi.org/10.1038/nn.2270; Johannes Bohacek et al., "Transgenerational Epigenetic Effects on Brain Functions," *Biological Psychiatry* 73, no. 4 (2013): 313–20, https://doi.org/10.1016/j.biopsych.2012.08.019; Hunter Howie et al., "A Review of Epigenetic Contributions to Post-Traumatic Stress Disorder," *Dialogues in Clinical Neuroscience* 21, no. 4 (2019): 417–28, https://doi.org/10.31887/DCNS.2019.21.4/kressler; and Rotem Leshem and David Weisburd, "Epigenetics and Hot Spots of Crime: Rethinking the Relationship Between Genetics and Criminal Behavior," *Journal of Contemporary Criminal Justice* 35, no. 2 (2019): 186–204, https://doi.org/10.1177/1043986219828924.

[72]Marjolein V. E. Veenendaal et al., "Transgenerational Effects of Prenatal Exposure to the 1944–45 Dutch Famine," *BJOG: An International Journal of Obstetrics & Gynaecology* 120, no. 5 (2013): 548–54, https://doi.org/10.1111/1471-0528.12136.

[73]Elmar W. Tobi et al., "DNA Methylation Signatures Link Prenatal Famine Exposure to Growth and Metabolism," *Nature Communications* 5 (2014): 5592, https://doi.org/10.1038/ncomms6592.

[74]Rachel Yehuda et al., "Holocaust Exposure Induced Intergenerational Effects on $FKBP_5$ Methylation," *Biological Psychiatry* 80, no. 5 (2016): 372–80, https://doi.org/10.1016/j.biopsych.2015.08.005; and Rachel Yehuda et al., "Transgenerational Effects of Posttraumatic Stress Disorder in Babies of Mothers Exposed to the World Trade Center Attacks during Pregnancy," *The Journal of Clinical Endocrinology and Metabolism* 90, no. 7 (2005): 4115–18, https://doi.org/10.1210/jc.2005-0550.

[75]Riccardo Vecellio Segate, "Exposing, Reversing, and Inheriting Crimes as Traumas from the Neurosciences to Epigenetics: Why Criminal Law Cannot Yet Afford A(nother) Biology-Induced Overhaul," *Criminal Justice Ethics* 43, no. 2 (2024): 146–93, https://doi.org/10.1080/0731129X.2024.2376444. For a more general discussion, see Anthony Walsh, "Criminal Behavior from Heritability to Epigenetics: How Genetics Clarifies the Role of the Environment" in Anthony Walsh and Kevin M. Beaver, eds., *Biosocial Criminology: New Directions in Theory and Research* (Routledge, 2009), 29–49.

[76]Rachel Yehuda and Amy Lehrner, "Intergenerational Transmission of Trauma Effects: Putative Role of Epigenetic Mechanisms," *World Psychiatry* 17, no. 3 (2018): 243–57, 252, https://doi.org/10.1002/wps.20568.

[77]Bernhard Horsthemke, "A Critical View on Transgenerational Epigenetic Inheritance in Humans," *Nature Communications* 9 (2018): 2973, https://doi.org/10.1038/s41467-018-05445-5; Edith Heard and Robert A. Martienssen, "Transgenerational Epigenetic Inheritance: Myths and Mechanisms," *Cell* 157, no. 1 (2014): 95–109, https://doi.org/10.1016/j.cell.2014.02.045; and Alexander, Are We Slaves to Our Genes?, esp. 178–195.

[78]Evan Jones and Blaine Smith, "Epigenetics and Pastoral Counseling: The Science Behind What We Preach," *European Journal of Science and Theology* 8, no. 2 (2012): 47–54.

[79]Jones and Smith, "Epigenetics and Pastoral Counseling," 50.

[80]Denis D. Haack, "When Spiritual Growth Involves Discomfort: Disequilibrium in Biblical Perspective," *Presbyterion: Covenant Seminary Review* 41 (2015): 31–49; and Warren, "'I Do Not Do What I Want.'"

[81]He draws from Russian Orthodox theologian Sergius Bulgakov. See Walter N. Sisto, "Sergius Bulgakov, Epigenetics, and a New Analogy for Original Sin," *Logos: A Journal of Eastern Christian Studies* 61, nos. 1–4 (2020): 1–18.

[82]Megan Loumagne Ulishney, "Visiting Iniquity upon the Generations: Epigenetics, Systems Biology, and Theologies of Inherited Sin," *Philosophy, Theology, and the Sciences* 7, no. 2 (2020): 205–26, https://doi.org/10.1628/PTSC-2020-0017.

[83]Ulishney, "Visiting Iniquity," 218.

DIVING DEEPER DISCUSSIONS

THE AMERICAN SCIENTIFIC AFFILIATION

A monthly series of Zoom discussions for ASA members and their friends to think more deeply about an article or book review published in the ASA journal *Perspectives on Science and Christian Faith*. The discussions are held on the second Saturday of every month at 2 pm Eastern time, https://network.asa3.org/page/DivingDeeper.

Book Reviews

BIOLOGY

SEX IS A SPECTRUM: The Biological Limits of the Binary by Agustín Fuentes. Princeton University Press, 2025. 216 pages. Hardcover; $23.84. ISBN: 9780691249414.

The debate over sex and gender shows no signs of subsiding, and numerous books have emerged addressing this issue from philosophical, theological, and scientific perspectives. This book is an addition to the field, coming from an evolutionary anthropological perspective. Agustín Fuentes is a professor of anthropology at Princeton University. He has a longstanding interest in human evolution, having written several books on this topic. In this book, like his others, Fuentes addresses common misconceptions about humans. Here, his agenda is to dismantle the (mis)conception that males and females are fundamentally different kinds of people. Although he acknowledges some fundamental differences between the sexes, he frames them in such a way that they don't seem to matter, leading to his conclusion that sex is not binary but is on a spectrum. On the one hand, I applaud his efforts to dismantle the "men are from Mars and women are from Venus" view, which leads to bias and discrimination. However, although many features of men and women do overlap, the essentials of sex (i.e., reproductive functions) are still binary.

This is not a large book, and it is intended for a lay audience. Fuentes begins by discussing the evolution of sexual reproduction, first with different mating types (yeast), followed by a discussion of anisogamy (large and small gametes), and then devoting most of the book to the human context. Along the way, Fuentes tends to avoid using the terms "male" and "female," instead calling them a "small (or large) gamete producer" or by qualifying the words with the modifier "3G" (genes, gonads, genitalia) when discussing sex in humans.

There is much that is helpful in this book, in which Fuentes dismantles incorrect stereotypes. We see how varied sex determination and sexual development can be, especially in animals. We also see that the extent of variation of many features *within* a sex generally exceeds the differences *between* sexes, so that there is considerable overlap between the two sexes. When we look at humans, the story is even more complicated because the social aspects of humans add more diversity. Although there is some sexual dimorphism in humans, there is a wide range of variation, such that we cannot use body size, physical strength, or even personality to predict whether someone is male or female.

Fuentes spends some time dismantling the idea that there is such thing as a male or female brain, which ironically is an argument used by many to support the existence of transgender persons. The question of brain sex is a complex one because different hormonal environments in males and females do influence the brain and behavior. The spectrum of male and female behaviors largely overlaps, and we must acknowledge cultural conditioning, which affects males and females differently.

Given the amount of attention paid to questions of gender lately, I found it surprising that Fuentes spent little time discussing gender. He defines gender as "a set of expectations, perceptions, and behavior that a social group believes about how bodies and behavior *should be* in relation to aspects of sex biology" (p. 68, italics original). He also describes how those expectations can change over time. This should be a warning to us, especially as Christians, to be careful about assigning gender roles as something that is based on one's sex.

In his desire to describe sex as a spectrum rather than binary, Fuentes includes examples of intersex individuals, those with differences of sexual development (DSDs), i.e., those who are not 3G males or females. Here we get into the question of what constitutes normal variation and what is a disorder. While there is diversity in sexual development, a biological condition that makes it impossible for someone to reproduce (for many different reasons, depending on the condition) should be described as a *disorder* of sexual development, not merely a difference, and thus these cases should not be used to argue that sex is a spectrum.

One intersex example that Fuentes cites is the case of South African runner Caster Semenya, whom Fuentes describes as female, even though only one of Semenya's three "Gs" is female (Semenya is XY, has undescended testes, and produces testosterone in the male range). This leads to a discussion about who may participate in women's sports. Women's sports leagues are typically established separately from men's to ensure fair and competitive environments, acknowledging the average physical differences that arise from hormonal and developmental changes during puberty. Among other things, testosterone enhances muscle mass in men and increases the proportion of red blood cells in the blood. Although Fuentes accepts that point, he then argues that Semenya should be allowed to compete as a woman because defining what a woman is by testosterone production "reflects a social construct of what the 'correct' range of testosterone should be" (p. 144).

Fuentes then discusses transgender athletes competing in women's sports. He rightly points out that athletic training for women is generally underfunded and thus women often do not reach their full athletic potential. Yet even if they did so, they would not be able to

compete at the same level as men in sports that require physical strength. He acknowledges that there are some examples of transgender women who would have a competitive edge but maintains that using such a small proportion of people in an already small population of elite athletes as the "key group to understand human-wide patterns of sex biology is misleading and faulty science" (p. 146).

The major point Fuentes makes in this book is that "sex involves *all* the processes of sexual reproduction—not just gametes" (p. 38). That is true, but despite the overlapping ranges for many sexual aspects of men and women, some aspects of sex biology are inescapably binary. The gametes one produces are either large (eggs) or small (sperm). DSDs notwithstanding, only one sex can gestate a baby. This does not make men and women fundamentally different kinds. After all, most of our genetic inheritance is the same in both sexes, and sexual differentiation does not begin until six weeks of development under hormonal influence. However, when it comes to reproduction, sex is clearly binary. Broadening the definition of sex to include behavioral and cultural aspects (i.e., redefining sex to mean gender), as Fuentes does, gives the impression that sex is a spectrum but, from a biological perspective, sex is first and foremost about reproduction.

Overall, *Sex is a Spectrum* presents many good arguments that dispel the idea that males and females are fundamentally different. However, Christians should be aware of Fuentes's agenda. He focuses on sociological aspects of sex (which are on a spectrum) and minimizes binary biological differences. Moreover, one must be cautious in applying what happens in animals to that in humans. Is sex binary or on a spectrum? Many processes of sex are indeed on a spectrum or bimodal, but the reproductive aspects of sex are inescapably binary.

Reviewed by Tony Jelsma, Department of Biology, Dordt University, Sioux Center, IA 51250.

EVOLUTIONARY THEORY

BEYOND EVOLUTION: How New Discoveries in the Science of Life Point to God by Sy Garte. Tyndale Refresh, 2025. 304 pages, including technical details, glossary, and notes. Hardcover; $19.98. ISBN: 9798400501364.

Sy Garte is an accomplished biochemist who has been a professor at New York University, University of Pittsburgh, and Rutgers University. His work has been widely published in peer-reviewed scientific journals. He is the author of numerous essays and blogs exploring the integration of science and Christian faith, and of two previous books, *The Works of His Hands* (Kregel, 2019) and *Science and Faith in Harmony* (Kregel, 2024), plus a chapter in the book, *Coming to Faith Through Dawkins,* ed. Denis Alexander and Alister McGrath (Kregel, 2023).

Beyond Evolution is his newest book exploring faith and science. Here Garte poses provocative questions and makes many bold claims. He makes it crystal clear that he accepts evolutionary theory but is critical, however, of neo-Darwinism. The author argues that the neo-Darwinian (modern synthesis) form of evolution has been overemphasized in public discourse; this explains why evolution is such a flash point for many Christians. He suggests that too many Christians and scientists treat evolution almost as a metaphysical worldview rather than a tool for understanding life's diversity.

In chapter 2, Garte starts to build his argument by pointing out deficits in evolutionary theory. For example, it cannot frame fitness mathematically, which makes the theory susceptible to misuse, and it is insufficient to explain the origin of life. Furthermore, new research suggests that epigenetic changes are long lasting, perhaps permanent, and mutations are not completely random; bacteria have some degree of control (by mechanisms yet unknown) over where mutations occur, thereby enhancing their survival.

According to Garte, evolution by natural selection is not the most fundamental principle in biology, a claim he explores in chapter 3. Instead, high-accuracy self-replication (HASR), or biological inheritance, provides a more foundational insight into life than simple variation and natural selection. He believes evolution is an inevitable consequence of HASR and claims that HASR could not have evolved by natural selection and is therefore strong evidence for God.

I found the most provocative arguments and claims in chapter 4 in which Garte explores agency, cognition, and teleology in biology (ACT). He claims that all living things are agents (A) or entities that act intentionally in goal-oriented ways. The author refers to teleology (T) as explanations that consider the purpose or end of something. Here he makes bold statements that may require a new understanding of purpose. Garte says that "no rock cares about being eroded … but bacteria, oak trees, and dolphins *do* care" (p. 85, italics in original). Some readers may need to remind themselves that the goal-oriented purpose Garte describes includes simply staying alive and reproducing. Although he blends cognition (C) into his teleology argument, he explores cognition most deeply at the end of chapter 4. He quotes Andreas Wagner in defining cognition as "the mechanisms by which animals acquire, process, store, and act on information from the environment" (pp. 94–95).[1] These mechanisms include perception, learning, memory, and decision-making. The author cites several examples

of simple creatures—bacteria, slime mold, fungi, and plants—that use signal transduction and cellular learning processes to predict and manage future events based on current conditions.

Garte circles back to the origin of life in chapter 5, where he carefully and accurately describes what science does and does not know about abiogenesis. He briefly covers energy requirements for life, the RNA world hypothesis, and more, and includes problems with the hypotheses that attempt to explain how life first came to be. Here the author accurately points out that science is missing a lot when it comes to explaining abiogenesis—most notably laws and theories that explain the transformation of chemistry into living cells. Discovering these laws and theories will require new scientific approaches, but even then, science may fall short of providing a complete explanation for the origin of life, demanding acknowledgment of the existence of a divine designer. In this respect, Garte comes close to, if not fully, embracing a "God of the gaps" argument.

In chapter 6, Garte explores emotions, thoughtful reflection, humor, creating and appreciating art, and non-kin altruism as aspects of human behavior—aspects that cannot be explained by evolution, but by a loving, divine Creator God who made humans in his own image. He also suggests that a clue to consciousness lies in the human propensity to tell stories. After exploring the soul and the mind-body problem, Garte ends this chapter with a discussion of love. He connects love to story, emotions, and beauty and says the existence of love is enough to point us to a divine Creator. Although he mentions artificial intelligence in his discussion of consciousness, a deeper exploration in the context of his argument would have been fascinating.

Garte ends his book with a story to draw his arguments together, attempting to move away from a "God of the gaps" argument by encouraging us to forget about the gaps. He urges scientists to continue to explore "both books": scripture and the book of the natural world. Garte's writing is accessible and his tone generous; he deliberately avoids overly technical jargon and provides an appendix with technical details, as well as a glossary for non-scientists who want more information. The author is deeply committed to both his Christian beliefs and to evidence-based science, inviting both believers and skeptics to follow the evidence wherever it leads. His theological framing could, at times, be stronger, but he readily admits he is not a theologian.

I admire his willingness to take on difficult questions and recommend this book to anyone who wants to hear how a respected scientist uses good, current science, scripture, and theology to explore interesting, provocative questions at the intersection of science and faith.

Readers may want to be on the alert to see if Garte's prediction—that biology is on the verge of major breakthroughs that will incorporate ACT and design into its foundational theories—comes true.

Notes

[1] Andreas Wagner, *Arrival of the Fittest: Solving Evolution's Greatest Puzzle* (Current, 2014).

Reviewed by Sara Sybesma Tolsma, Department of Biology, Northwestern College, Orange City, IA 51041.

FRIGATEBIRDS, SEA LIONS, & DARWIN: Musings on Evolution, Creation, and Ecology by David B. Schreiner. Wipf & Stock, 2025. 140 pages. Paperback; $27.00. ISBN: 9798385203178.

According to the two books model of revelation, God can communicate theological truths through both scripture and the created world. Experiencing nature can therefore stimulate questions about biblical interpretation we might not otherwise have entertained. In *Frigatebirds, Sea Lions, & Darwin*, David B. Schreiner, Associate Professor of Old Testament and Inductive Biblical Studies at Asbury Theological Seminary, recounts several trips to the Galapagos with his wife, daughters, and biologist brother. His family's encounters with the beauty and savagery of nature challenged some of his presuppositions about evolution. The double-edged sword of ecotourism in the Galapagos as both a source of conservation revenue and pressing environmental destruction challenged his understanding of humans as stewards of a land in need of taming. Presented as a mix of travelogue, musings, and biblical hermeneutics, the author has sought to provide "reflections and thoughts…as an inroad to a conversation that remains very difficult" (p. 16). Rather than try to convince through systematic biblical analysis or persuasive rhetoric, his hope is to share his experiences to "possibly produce similar reflections in the minds of my readers" (p. 9). This book is therefore more conversational than many in the science-faith realm, akin to *The Fool and the Heretic* by Todd Charles Wood and Darrel R. Falk (Zondervan Academic, 2019), or *How I Changed My Mind About Evolution,* ed. Kathryn Applegate and J. B. Stump (IVP Academic, 2016) rather than to more systematic treatments of science and faith. Its success, therefore, depends on how thought provoking you find his experiences and reflections.

The author provides three major contributions to the science-faith conversation. First, questions about evolution naturally came to mind when he was confronted by the same species Darwin observed. Schreiner, therefore, spends some time reflecting on his own theological journey within a fundamentalist context, and how major findings in the Ancient Near East and a strong

understanding of literary, linguistic, and cultural context create ways of reading the Genesis text that can reconcile scripture with Darwin. For example, reflecting on Genesis 1:24 ("God said, 'Let the earth produce living creatures …'"), the text records a Hiphil stem (used in Hebrew to express causative action) to the verb translated "produce," implying that it is the earth causing the production of life. Schreiner writes,

> I will never forget the moment when I realized the potential of these statements … To put it bluntly, the semantic framework of the biblical text allows for the attribution of agency upon the created order. By implication, in my mind, the concept of evolution is something that need not be antagonistic to the Christian faith. (p. 62)

However, he is quick to add that God must be the source of Earth's creativity. Failing to recognize this is "one of the severe deficiencies of Darwin's ideas of natural selection" (p. 62). I would suggest the author take a closer look at the frontispiece of *The Origin of Species*, especially later editions, in which Darwin takes great pains to suggest natural selection is not in opposition to, but requires, divine agency. Nevertheless, such statements from a conservative theologian make space for more robust discussion around evolution and faith.

Schreiner's second contribution is a significant and strong rebuttal of young earth creationist rhetoric. He quotes in full, across several pages, a social media post written by Ken Ham of Answers in Genesis. He slowly and methodically exposes the rhetorical strategy Ham employs, and then he shows why a faithful conservative Christian could reject Ham's approach and still be faithful to scripture.

Evolution is only a small portion of this book. More space is given to ecological considerations, Schreiner's third contribution. The Galapagos revealed both the profound harm humans can bring when trying to do good (e.g., invasive species, climate change exacerbated by tourism) as well as the profoundly good (e.g., the success of Galapagos tortoise conservation). The author suggests that this tension can be explained theologically by the concept of the image of God (our capacity for good) and our fallen nature (thus, the brokenness in our solutions). He goes further than I am comfortable with, explaining all interspecies hostilities as a product of the fall. I found this position difficult to reconcile ecologically with scriptures that celebrate God's active participation in feeding the carnivore (e.g., Ps. 104:21). Nevertheless, I can celebrate Schreiner's conclusion "that Christians should not only be concerned with their ecological context, but they should advocate for policies and practices that curb the unnecessary degradation of their ecological contexts and unbridled consumerism" (p. 92). I wish he had engaged more with the negative

outcomes of well-intentioned stewardship, but I am glad to hear another conservative voice add to the call for Christ-centered conservation.

Unfortunately, the value of this book is hampered by obvious errors and poor editing: "like" instead of "think" (p. 95), two separate uses of "that" instead of "than" (pp. 50, 51), "guilt" instead of "guilty" (p. 39) are but a few examples. One chapter is entitled "Seal Lions Bites and Frigatebirds"—I assume it should be "Sea Lion Bites" or "Sea Lions' Bites"; this mistake is replicated on the page headers. Furthermore, some of the language in the book is off-putting; for instance, at one point Schreiner says that scientists believe Christians are "ideologically retarded"—given the context, I cannot tell if he is using that term to mean "halted in growth" or as a pejorative that should be excised from his language.

Nevertheless, the conversational nature of this book may be a breath of fresh air for students who were raised in a fundamentalist household and who need to hear a conservative theologian offer the very questions they have been asking, without fear of undermining the inerrancy of scripture or losing one's salvation. I would be curious to hear where these thoughts take Schreiner in the next few decades. I just hope there is a better editor to help him articulate these important conversations.

Reviewed by Matthew Morris, associate professor of biology, Ambrose University, Calgary, AB T3H 0L5.

MEDICINE AND HEALTH

THE REFORMATIONS OF MEDICINE: Early Modern Beginnings and Contemporary Possibilities by Ekaterina N. Lomperis. Fortress Press, 2025. 250 pages. Paperback; $44.00. ISBN: 9781506491172.

What does Martin Luther have to say to Christians about medical care and suffering in the body today? Ekaterina Lomperis, Richard B. Parker Associate Professor of Theology and Wesleyan Thought at George Fox University, argues that Luther's medical theology offers a surprisingly rich resource for spirituality and contemporary health care. Her book seeks to retrieve and develop Luther's dialectical approach to physical suffering, which she notes hasn't received enough scholarly attention despite the depth of scholarly interest in divine suffering or the "theology of the cross."

Lomperis argues that "for Luther, while internally recognizing the inevitability of afflictions and welcoming their spiritual benefits, Christians also ought to resist suffering by piously utilizing available means" (p. 51). Through close readings of Luther's lectures on the Old Testament, she develops a Lutheran theology of medicine that accepts suffering, not as satisfaction for sin

but as an "alien work of God" that includes physical afflictions that can strengthen and deepen faith. At the same time, Christians should resist that same physical suffering through use of medicines and health care. In addition, Luther teaches, in his lectures on Joseph in Genesis, that it is a sin to recklessly endanger the body, ignore opportunities to alleviate pain, or fail to provide for bodily needs. Lomperis points to Luther's distinction between the inner person (the soul liberated by faith) and the outer person (responsible for action) to highlight that the freedom of the inner person compels the outer person to resist suffering through appropriate means and also to extend care to neighbors in need.

From this foundation, Lomperis develops Luther's "theology of means" and "theology of idolatry." Medicine is a created "means" through which God's Word works healing power. Miraculous faith healings also rely on divine agency; however, Luther believes that God prefers the created means, rather than miracles, for conveying power. As Luther states, "The use of medicine is permitted, yes even necessary, for it is the means created for the preservation of health" (p. 114). Luther's concern surfaces when humans, seeking physical cures, place more trust in the created means (medicine) rather than in the creator God; such misplaced trust constitutes idolatry. Luther's reading of Isaiah 38 illustrates this balance: the prophet prescribes treatment, but healing power resides in the divine Word, not in the remedy itself.

This book fills a notable gap in scholarship on Luther's theology of the cross in relationship to physical and embodied suffering and the proper use of medicine. While Ronald Rittgers explored a *Reformation of Suffering* (Oxford University Press, 2012) and Susan Karant-Nunn a *Reformation of Feeling* (Oxford University Press, 2012), Lomperis extends these trajectories into a "reformation of medicine." Her work situates Luther's theology of the cross within embodied experience, offering a nuanced theological account of how Christians might respond to physical suffering. This well-researched book draws extensively on primary texts such as Luther's biblical lectures and treatises such as *The Freedom of a Christian* and *Whether One May Flee from a Deadly Plague*, while also engaging thoroughly with the historical theology of Luther and of medical care. Lomperis intersperses the chapters with engaging vignettes of Luther's life and story, which place the theological issues within a narrative context.

Lomperis's argument proves pastorally compelling and theologically sound. Luther's dialectic in a theology of medicine—to accept suffering as spiritually formative while resisting it through the created means of medicine—offers a framework for Christian participation in health care that avoids both fatalism and therapeutic

idolatry. The final chapter moves from historical analysis to constructive application, urging Christian communities to advocate for equitable health systems. However, the book could go further in addressing these systems. Concrete examples of justice-oriented initiatives, such as the Black Church's tradition of providing clinics for underserved populations, would strengthen the case. Likewise, naming systemic barriers, such as health insurance monopolies and pharmaceutical pricing, would sharpen the ethical challenge.

Stylistically, the book provides accessible content without sacrificing scholarly rigor. Its organization reflects careful thought, and the bibliography is robust. While primarily suited for theologians and ethicists, pastors and Christian health professionals should also find it valuable. In fact, I plan to encourage my brother, a pediatrician, to consider reading sections on Luther's theology of medicine and its applicability in current health-care contexts.

Lomperis offers a timely and faithful retrieval of Luther's theology of health and health care: "when afflicted by physical suffering, Christians should purposefully and diligently utilize available means to resist it" (p. 87). At the same time, Christians place the power of healing with God, without placing an idolatrous trust in the medicine itself. This book deserves attention from anyone interested in the intersection of theology and health care.

Reviewed by Rev. Dr. Melanie L. Dobson, associate professor, Lefler and Wohltmann Chair in Methodist Studies, Lutheran Theological Southern Seminary.

SCRIPTURE AND SCRUBS: A Christian Calling to Healthcare by Michael E. Sherr, Jason K. Lee, and Angelia M. Mickle. B&H Academic, 2025. 240 pages. Paperback; $27.99. ISBN: 9781087789224.

Frontline healthcare workers see medical dramas unfold before them each day—stories of heartbreak, heroism, compassion and diagnostic dilemma no less vivid than plotlines from *The Pitt* or *Grey's Anatomy*. Daily realities may be either more incredible or somewhat mundane, but for Christian health professionals (CHPs), there is always a deeper story. Each interaction provides opportunities to reveal God's loving grace, to be a divine ambassador in a broken world.

Sherr, Lee, and Mickle have collaborated to write a book for frontline healthcare workers, challenging us to see and understand the spiritual significance hidden in every day's work. Their passion is that CHPs would develop spiritual competencies that strengthen their clinical skills and knowledge, modeling both professional excellence and deep spiritual sensitivies, and being willing to be used by God in each patient encounter.

The three co-authors come from different disciplines, having had diverse professional experiences before filling academic appointments at Cedarville University. Sherr directs the social work program as associate dean and professor. Lee is a professor of theological studies and leads Cedarville's Center for Biblical Integration. After taking a variety of roles in nursing, Mickle is now a professor and dean of the School of Nursing. Together they encourage Christians in medical fields to integrate Christian faith into daily work, understanding how God works through healthcare workers as a means of common grace in the usual course of their professional duties.

The book is divided into two parts. The first, entitled What Are You?, begins by relating stories of Christian healthcare workers in a variety of fields who care for physically and emotionally vulnerable patients. The narrative then paints a portrait of the "God of the Bible," retelling the overarching narratives of God's interactions with humans from Creation to Christ. The divine covenants with Adam, Noah, Abraham, Moses, David, and the New Covenant each illustrate the story of divine grace.

The authors are explicit that God's grace, though expressed both as saving grace and as common grace, is one grace with two expressions. They define healthcare workers as "servants of common grace," caring for people with broken bodies and spirits, conduits for God's love and healing power, even when not speaking.

Part II, entitled What Do You Do?, defines five spiritual competencies that CHPs should cultivate: giving comfort, giving and receiving forgiveness, pointing patients toward permanent glory, becoming a jar of clay, and working as an ambassador of Christ.

This book is rich in biblical references and quotations, with a scripture index listing hundreds of passages. Stories of Augustine of Hippo, Tertullian, Basil of Caesarea, John Calvin, Charles Spurgeon, and many other faithful historical figures enliven the text. Biographical sketches of CHPs fill each section, illustrating the wide variety of professional roles within healthcare and describing encounters, both mundane and memorable. We meet nurses, pharmacists, physical therapists, certified nursing assistants, and medical school professors in various chapters.

One of the CHPs profiled is an Air Force Reserve nurse who managed a skilled nursing facility for COVID-19 patients. She had a small team—one licensed practical nurse and three medics working twelve-hour shifts without interruption—to provide total nursing care for 57 sick patients. She spent Christmas separated from her husband and three children. Another, a physical therapist, worked with an enraged teenager awakening after three weeks in a medically induced coma. The patient had sustained 62 fractures in a motor vehicle accident, limiting his every movement. The therapist persevered despite angry insults, and his patient learned to stand on his own and walk with assistance. When discharged, he was full of joy and gratitude, saying he wants to train as a physical therapist.

The structure of *Scripture and Scrubs* challenges Christ followers in healthcare to identify first as CHPs, a high calling that transforms each job description. The book traces physical frailties to the fall in Genesis and finds spiritual meaning in the basic work of healthcare, reminding patients of their mortality and relieving the suffering that originated as a consequence of disobedience.

Once that dual identity is established—blending professional excellence with Christian mission—the authors outline work specific to this spiritual calling. The section on giving and receiving forgiveness illustrates how essential it is that CHPs practice giving grace in relationships with coworkers and with patients angry at their infirmities. Giving comfort for physical, emotional, and spiritual pain requires us to identify with others and devise methods of relief. This is sacred work.

This book does a good job of casting the vision for Christians in healthcare to understand their holy calling, extending care and mercy to vulnerable patients and families. Each chapter concludes with discussion questions adaptable to students or working professionals in various fields. The topics raised should spur good discussion and application to everyday situations for a wide audience.

Healthcare is a demanding field, requiring physical endurance, emotional strength, integrity and intellectual creativity to meet daily challenges. The book's recommendations for CHPs fall mostly in the realm of practicing spiritual disciplines: the study of scripture, prayer, meditation, and involvement with a local church and with other believers—all strong remedies.

I would have liked more detail on exactly how the authors and the profiled CHPs incorporated spiritual practices into their busy lives. What prompts do they use to pray for patients or coworkers? How do they fit in Bible study or Christian fellowship when they have to pull a double shift? What guardrails do they put in place to assure they give their family members the time and attention needed? How was their faith sustained in troubled times? The profiles at times seemed to focus on professional duties rather than exploring more personal spiritual histories.

Book Reviews

Recent stories of the COVID-19 pandemic illustrate the overwhelming requirements of healthcare under stressful conditions. The book discusses how we can be "jars of clay," conduits of God's grace despite our personal imperfections, but stops short of recommending more holistic care for health workers. Burnout was frequently cited as a consequence of neglecting prayer or Christian fellowship, but this could have been more comprehensively addressed.

Despite being written by academics with teaching credentials, the book is not written with research citations for an academic audience. *Scripture and Scrubs* is intentionally anecdotal with strong scriptural and theological support. Literature might have been cited highlighting the positive association between spiritual practices and resilience or the tangible benefits to organizations when their frontline healthcare workers are well cared for. Pairing scriptural truths with the conclusions of research studying the effectiveness of spiritual practices would have strengthened the book's recommendations, particularly for students.

The theological discussions in the book are rich, but they go beyond entry-level doctrine. Challenging texts such as "Jacob have I loved, Esau have I hated" might be off-putting even to experienced Christians, especially if they read the book individually rather than discussing it with other CHPs. There is good material here, but it is best suited for mature Christians.

I would recommend this book for group discussion. As an encouragement to Christian believers, either studying or working in healthcare, it can be an inspiration to deeper understanding of our calling. Jesus practiced a healing ministry as he spread news of the kingdom of God. We have the mandate and the privilege of continuing what he began.

Reviewed by Ingrid Mason, MD, internal medicine physician, affiliated with Ascension St. Vincent Hospital, Indianapolis, IN 46260.

PHYSICS

THE ESSENTIAL EINSTEIN: Scientific Writings by Diana Kormos Buchwald and Tilman Sauer, eds. Princeton University Press, 2025. 560 pages. Hardcover; $35.00. ISBN: 9780691131078.
and
THE ESSENTIAL EINSTEIN: Public Writings by Diana Kormos Buchwald and Tilman Sauer, eds. Princeton University Press, 2025. 400 pages. Hardcover; $35.00. ISBN: 9780691272191.

This two-volume collection of Einstein's writings covers 38 of Einstein's most important scientific papers and 96 selections written for non-specialists and the general public, translated where necessary from German to English. These papers span over 50 years, from the four breakthrough publications of his *annus mirabilis* in 1905 all the way to his final ill-fated attempt to unify gravity and electrodynamics in 1955, the year of his death.

The thicker and more challenging book, *Scientific Writings*, has a cover picture of the less familiar young Einstein; the more accessible *Public Writings* has the familiar elderly Einstein of popular imagination, all wrinkles and wispy white hair. This is symbolically appropriate, in that 22 of the 38 scientific papers (including all of Einstein's most famous and revolutionary ideas) have dates *before* 1919, while 89 of the 96 public writings were written *after* 1919. These book-end photographs tell the story of Einstein's explosive transformation from an obscure patent clerk into a universally recognizable icon (and iconoclast) of the radical new world of modern physics.

From 1903 to 1919, Einstein is madly eclectic, firing off papers in a half-dozen different fields: kinematics, optics, gravitation, statistics, thermodynamics, and magnetism. Anyone with an undergraduate physics major (or an equivalent self-education) will wander this period like the visitor to a well-tended and well-labeled garden, recognizing familiar landmarks that appear in any modern textbook. Here are the Lorentz transformation equations, written with Einstein's original convention of using Greek letters for the new coordinate system—and (confusingly) the name "beta" for what today we call the gamma factor! Around this corner, there is a discussion of radioactive decay that first mentions that it is "natural to consider any inertial mass as a reserve of energy" (*Scientific Writings*, p. 125), and derives that energy as mc^2. A few steps further along the path, the first (and initially quantitatively incorrect) prediction of the slight deflection of rays of distant light passing close to the sun. Then the forest turns darker and thicker: 1915 leads into a mysterious thicket of differential geometry that expresses his new theory in notation radically unlike anything that had come before.

At this point, the *Public Writings* timeline begins to run in parallel with the *Scientific Writings,* creating a fuller story of Einstein's travels, interests, and audiences. Cambridge's Arthur Eddington, a Quaker inspired as much by Einstein's pacifism and cosmopolitanism as by the novelty of relativity, now steps forward as a tireless public-relations agent for Einstein, scoring him numerous opportunities to give lectures, write magazine articles, and give press interviews. Here are several of the articles that laid the foundations of Einstein's legend in England and America, culminating in Eddington's Southern-Hemisphere expedition—originally proposed to extend Eddington's conscientious objector status on the grounds of its indispensable importance.

During the war years, Einstein describes patriotism, nationalism, and militarism as a malign spirit gripping the German nation. Within the first year of WWI, he calls for a union of all European nations that will put an end to "fratricidal war," with a prescient warning that "the terms of peace must not become the wellspring of future wars" (*Public Writings,* p. 9). When the war ends, we see his reputation in Germany begin to suffer as reactionary rivals and agitators start to question relativity as a degenerate and outlandish project to undermine traditional scientific virtue. At first, Einstein is good-humored, writing a tongue-in-cheek dialogue in 1918 to refute various objections in invented conversation with an imagined friendly critic. Within a few years, he has lost all patience with speakers "unworthy of an answer from [his] pen," who have "motives other than a search for truth," and who would give him a better reception if he were "a German nationalist, with or without the swastika, instead of a Jew with liberal, international persuasion" (*Public Writings,* p. 60). This Einstein is a savage, withering polemicist with a tone far removed from his popular image as a kindly eccentric.

As Einstein's scientific papers become more mathematically impenetrable, there are fewer familiar landmarks to orient the reader. By 1917, we have stumbled upon Einstein's first controversial philosophical commitment, one he would later himself disavow, the idea that an additional term (the "cosmological constant") ought to be incorporated in the general relativistic field equations to uphold "Mach's principle," the idea that space-time itself must be *created* by mass in all cases and cannot exist without it. In the mid-1920s, we get the famous pair of papers that lay out Bose-Einstein statistics (and imply the existence of an associated form of exotic matter, the Bose-Einstein condensate). From this point onward, our once-familiar garden of flowers and monuments becomes a twilight labyrinth of twisted vines and cyclopean architecture, with so many maddening dead ends as to be scarcely worth the effort to hunt for the few rare fruits hidden among them.

But by this time, Einstein's ever more prolific popular writing has given him a new name to replace his initial identity as a "German man of science": Zionist. Einstein's attitude toward the political prospects for German Jews takes a tough-love tone. He chastises them for a "servile mentality" (*Public Writings*, p. 45), for their boundary policing of non-religious Jews, and for exclusion of lower-status Eastern Europeans displaced by war. His most common recommendations are for self-reliance, a greater sense of cultural pride, a vigorous resistance to materialism and hedonism, and deep investment in science and the arts. For Einstein, the ideal project to unify these concerns (and awaken European Jewry from its complacency) is the settlement and ecological restoration of Palestine. His vision for "Israel" is an enlight-

ened localism: agrarian communes on land purchased fairly from the "Arabs" and supported by a world-class Hebrew University. Repatriation to Palestine offers a sense of cultural unity (to recapture the loyalty of assimilated upper-class Jews) and hope (for the downtrodden lower classes).

Einstein's Zionism stands in constant tension with his distaste for nationalism. At times, he praises nationalism as a temporarily useful force in Jewish culture until it reaches greater maturity; at other times, he decries it as a sullying of his ideal of universalist international humanitarianism. By the late 1930s, Einstein has turned from youthful utopianism to an increasing anxiety that his idealistic vision for Israel will be replaced by "a Jewish state with borders, an army, and a measure of temporal power" (*Public Writings*, p. 246), recreating all the ugly pathologies of the Europe it sought to escape. He calls on his people, in hindsight perhaps naively, to resist becoming "a nation in the political sense" rather than a voluntary spiritual community.

In a review of this length, it is nearly impossible to communicate the breadth of topics that concerned Einstein late in his life. However, of interest to this readership are the half-dozen or so articles on science and religion. Various endnotes in these articles reveal instances in which Einstein edited harsh criticism of faith ("the God idea seems to be childish simplicity"; *Public Writings,* p. 215) in favor of more diplomatic language. Einstein consistently advocates for the replacement of supernatural religion with a sense of cosmic wonder and confidence in the knowability of natural laws. One might be forgiven for seeing his identification of the highest of three stages of religious development with imagination-driven science as a gambit shrewdly designed to deflect him from the criticism of being an atheist. But no reader can deny that Einstein is entirely sincere in his conviction that only this mystical and spiritual devotion to the order of the cosmos (whether labeled as "religion" or "philosophy") can adequately stir the hearts of history's greatest scientists. Later in life, in some autobiographical notes, Einstein touchingly remarks on his maturation out of "the religious paradise of youth" and into the maturity of skepticism, with the pathos-laden comment that scientists (unlike the heroes in his discarded childhood Bible stories) were "the friends who could not be lost" (*Public Writings*, p. 314).

Simply on the basis of the diversity of topics covered—and the intimacy that the editors offer with Einstein's original text through introductory commentary and end notes—I can highly recommend this pair of books to anyone in search of an extended primary-source encounter with Einstein's work. The editing and layout are excellent and the translation is consistently readable. I would warn that anyone interested in reading

the *Scientific Writings* collection should be prepared to tackle some lengthy and equation-heavy papers with minimal handholding. Given that every paper is written by the most famous theoretical physicist in all of history, this warning hardly seems necessary!

Readers daunted by the length of these two volumes should be certain not to miss the final paper of the *Public Writings*, Einstein's "Recollections." Here, uniquely, Einstein drops his formal tone and his focus on external issues and allows himself to become a character in his own scientific narrative. We see the sole brief mention of his youthful, but troubled, marriage to Mileva described as a natural outgrowth of the social environment of his early self-education. Einstein, writing just three weeks before his death, also takes special care to credit his good friend Marcel Grossmann, the Swiss mathematician whose meticulous class notes carried the scatterbrained Einstein successfully through university and whose training in differential geometry provided Einstein with the crucial mathematical insights to properly formulate general relativity. Einstein's final words of the essay express growing pessimism that his unpopular approach toward a unified field theory would ever replace quantum mechanics, but the weight of this failure is eased by his closing quote from the Enlightenment philosopher Gotthold Lessing: "The striving for truth is more delicious than its assured possession" (*Public Writings*, p. 400).

Reviewed by Edward Hamilton, professor of physics, LeTourneau University, Longview, TX 75602.

SOCIAL SCIENCE

THE PURSUIT OF SAFETY: A Theology of Danger, Risk, and Security by Jeremy Lundgren. IVP Academic, 2024. 312 pages. Paperback; $41.99. ISBN: 9781514008010.

Lundgren, professor of theology at Wheaton College, has written a beautiful and accessible book on a subject that has received surprisingly little attention from Christian authors. It frames a theology of danger, risk, and security around the idea of safety and its tokens, which have become central facets of modern society.

The book starts with a series of vignettes to demonstrate to the reader the pervasiveness of a culture of safety in modern (Western, Global North) life. It then defines and distinguishes some of the key terms around safety—harm, danger, risk, security, and others—and establishes the terms of reference for the work. An interesting question that emerges early on is why the author focusses on safety rather than risk as the central topic of the book. Risk is a far more nuanced concept than safety but, arguably, safety is a more tangible object for

a theological study. It also raises interesting and important questions about the nature of a safety that should be pursued under God and in fulfilment of his promises.

The second part of the book moves on to consider the historical emergence of risk and safety as it is now understood. Initially, it considers the premodern period, giving examples of how likelihood has long been assessed in a variety of mathematical and non-mathematical ways. Here, premodernity is characterized as a universe in which natural and supernatural are intertwined in a "porous cosmos." Charting the historical development of modern risk discourses is a challenging endeavor, because humanity has always faced threats, been multicultural in its interpretations of these, and possessed widely diverging capacities to counter any threats. As Lundgren notes, there are different philosophical traditions that significantly influence the interpretation of relationships between humanity, nature, and God at different times and in different places. Although he uses the terms premodern, modern, and late-modern, he also acknowledges the problems with such divisions, such as simplicity and generalization.

The third part of the book, Avoiding Harm in a Fallen World, seeks to provide some pointers for Christians seeking to place the pursuit of safety within a wider biblical life—acknowledging that the Bible itself regards safety as a good thing. The issue is the idolization of that pursuit. However, there are certain discussions in this section that perhaps say more about the author's own priorities and experience than about risk and theology. For example, he describes a study showing that children's chances of dying while crossing the road decrease as the child ages. Lundgren argues against the use of this for public guidance on allowing small children to cross the road unaccompanied (on the grounds that this is "societally burdensome," a phrase that arises many times). Yet, while his points about the limitations of the statistical analysis are valid, there are other good reasons for restricting what children may and may not do—not least, the pace of brain development and abilities to make judgments of different kinds. Furthermore, he appears to suggest that accompanying children across the road somehow precludes simultaneously training them to do so by themselves. Like other examples in the book, this seemed decidedly arguable and culturally narrow.

The section goes on to provide a detailed theological discussion of the links between the pursuit of safety and Jesus's commands about not worrying. It acknowledges the subjectivity and complexity involved in individual decisions about risk—whether crossing roads or taking medications that have side effects—suggesting that what matters is not the decision made, but the attitude of the heart that makes it. Similarly, the life-enhancing

role that technology has taken in modern society has to be recognized as being under Christ. Finally, in this section, the author covers the challenges that arise from a safety culture that renders accidents immoral—and therefore requires the taking of any and all actions to prevent them, potentially at great cost in other ways. In general, the discussion is balanced here, but there are a few exaggerations. Most risk management literature focusses on minimizing risk, not eliminating it; this is widely acknowledged as impossible even where desirable. The discussion then turns to the importance of forgiveness as a principle when accidents do happen, and the points at which procedural management of risk becomes idolatrous. Finally, this section examines the role of wisdom in navigating the "pursuit of safety," using a detailed and useful discussion of Ecclesiastes 10, highlighting again that the problem is not the pursuit itself, but the idolatry of making it total and absolute.

Part Four, the final two chapters of the book, discusses living under the Lordship of Christ. These chapters are pastoral, considering the call to discipleship to understand the role of safety under Christ in the Christian life. This section balances the pursuit of safety with the pursuit of life in Christ, and leads into the final chapter, "Putting Safety in Its Place," which returns to earlier critiques of how modern safety discourse excludes God and religion. It then discusses the dangers in the denial of the fallen human condition that have sometimes emerged in future-anticipating dialogues and attempts to control risk. Ultimately, the gospel has great explanatory power for the failure of risk management to bring about safety: the world is in need of redemption.

There are some elements that I would add to this discussion; I will outline three. The first concerns the locus of responsibility. Part of the rationale for "tokens of safety," such as warnings, is that they protect public services—for example, healthcare—from being overwhelmed. Thus, while failing to observe a safety notice may enhance individual freedom in some respects, any harm that results not only affects the individual but has consequences for other people too. Relatedly, some people carry more risk than others because of circumstances not only beyond their control but also imposed upon them. For example, the actions of those in rich countries, in failing to curb carbon emissions, inflict additional threats on those in poorer countries. They also, therefore, critically enable identification of injustice in the distribution of risk and in the protection of the vulnerable—which itself is a biblical activity. There is an irony for me as a geographer that "putting safety in its place" might also be interpreted as pointing to the nuances of (geographical) "place" in the generation or removal of safety for particular groups, with or without their own voices being heard.

Secondly, there is relatively little acknowledgement here of the importance of stewarding knowledge—though there are strong hints of this in the chapter on technology. Indeed, Lundgren accuses Bacon (in a footnote) of putting us on a path to secularization in his call for humanity to increase its knowledge of the universe. That this call was itself driven by an interpretation of Scripture in which we are called to know about God's world—to better understand God himself through it—is sadly not discussed in detail. Knowing creation and having faith are surely not opposed; indeed, there are instances in Scripture in which God's people are criticized for failing to heed warnings or knowledge. The focus on safety, rather than risk, allows the author to spend a lot of time arguing against a "zero-risk" culture, but this is a rarity. Most procedural and calculative risk assessments are intended to reduce, not eliminate, risk.

Finally, there is a relative paucity of references to the role of economics in the generation of safety culture—particularly, the extensive role that the insurance industry has played and continues to play in the definition, calculation, and management of risk. Indeed, litigation and selfish accumulation of wealth has driven a considerable industry around risk that is worthy of consideration and evaluation in a book like this.

Overall, this is a rich and detailed discussion, particularly strong when it is closely reading the biblical texts; like the secular "all-inclusive" theories of risk, it struggles to contain the topic effectively where the discussion is more sociological. In part, of course, this is caused by the author writing from a particular place with particular experiences and particular politics. However, it is a compelling, well-researched and scholarly book that will provide non-specialists with an interesting and thorough overview of this important topic.

Reviewed by Amy Donovan, professor of environmental geography, University of Cambridge, Cambridge, UK CB2 3EN.

TECHNOLOGY

MORE EVERYTHING FOREVER: AI Overlords, Space Empires, and Silicon Valley's Crusade to Control the Fate of Humanity by Adam Becker. Basic Books, 2025. 367 pages, index. Hardcover; $32.00. ISBN: 9781541619593.

As I sit down to write this review using Microsoft tools, a temptation beckons: shall I go to that emergent oracle, Copilot? After all, my editor has stressed the importance of a snappy first sentence—and Clippy-on-steroids promises snappy! Hardly a day goes by when my online news feed does not suggest, alongside the latest adventures of the British royal family and culture war performances of American politicians, the antics

Book Reviews

of Big Tech leaders who, via symbolic praxis, betray a worldview thick with high divine claims for the marvels tech has wrought. (Once, my health insurance provider quite literally sent me an ad referring to its app as "All-Powerful!") It is to this *zeitgeist* that Becker has penned this fascinating work of recent tech history and cultural critique.

Becker, physicist and scientific philosopher, has an elegantly simple organizing principle. First, he introduces a guru of the sort that makes waves inside the tech sector but is unlikely to be well known outside of it. His opening example is Eliezer Yudkowsky, and he later spills a good amount of ink to explore Ray Kurzweil. Becker next draws out some of the eccentricities of whoever is currently his example, some of which strain acceptance from anyone operating within the more-usual plausibility structures (e.g., Kurzweil's dream of utilizing AI-based algorithmic necromancy to call up the shade of his late father), only then to offer a defense of their intellectual integrity by pointing out the influence of their thought on the tech giants whose creations undergird our entire global economy. This defense, however, is rhetorical. Becker's design is to convince his reader to take whatever guru he has introduced seriously *enough* that the next step makes sense: to delve into their philosophy and the influences flowing into it. From there, he turns away from biography to critique of tech culture, showing how philosophical influences blind its partisans both to the limitations of their art and to its real-world ethical implications.

The effect is a cumulative argument against Big Tech's oft generously entertained, and yet undemonstrated and quite possibly toxic, claims: for example, that the dawn of artificial *general* intelligence (AGI) is upon us, that the need to work will soon be relegated to the past, and that "the Singularity" is about to emerge and will prove either boon or bane to civilization, depending on how we have managed to align its values. It is here where the first strength of the book lies. Who in computer science or tech-sector-adjacent fields has not been affected along the periphery of their consciousness by claims of precisely this sort? These claims are explored in my "Ethical, Social, and Legal Implications of Computing" course. My students—along with a few of my colleagues—are transfixed by some of the claims about what sorts of societal transformations are possible, even likely. Meanwhile, transformations have already happened and are accelerating in pace; the undeniability of these lend credence to the claims of imminently emergent AGI.

These are claims of practically religious significance, a fact not lost on Becker, who spends some of his time tracing current trends back to sectarian Christian interests of an albeit unorthodox and non-mainstream character.

This is the second strength of his presentation. To illustrate by way of contrast: years ago, I attended a pastors' conference where a major topic was theological anthropology, particularly applied to the discernment of modern-day idols. Over the course of the conversations, some of the presenters submitted that much modern technology has become precisely that—a focus for idolatry. However, this claim was not defended or even explored in depth. Reading Becker, I feel I have now seen just such an explorer in action. He shows that the oft-grandiose claims of tech utopians speak to the heart of human spiritual longings for immortality and actualization, only then to show themselves unable to deliver what they promise. Meanwhile, real human needs are left unmet.

The work has, in my view, one limitation (perhaps as a function of the price that must be paid to attempt its rhetorical strategy). At many points the big picture he paints comes across as so severely negative in its depiction of Silicon Valley that it becomes hard to imagine redemptive engagement with it. The fact remains—the implausibility of so many of Big Tech's claims aside—that since the Industrial Revolution, tech has utterly transformed society. Much of that transformation is occurring now through the strategies of Silicon Valley. It cannot be doubted that social media has transformed politics, that ubiquitous (and AI-embedded) smart devices change how we work and play and even think, and that now large language models and related tools are transforming research and communication. These changes are not merely negative; intuitively, there is promise as well as peril. A more irenic argument than Becker's might do more to get at that rubber-meets-the-road reality. However, strident polemics can often effect what irenicism cannot, which, in this case, is to disenchant readers bewitched by many of our time's empty claims about tech's power. Becker has opted for that more strident option and, while I note its limitation, I admire his rhetorical decision as well. I will be seriously considering giving his book to my undergraduates for them to engage his arguments and, hopefully, stimulate some important conversations.

Reviewed by Matthew Bell, instructor of computer science, Whitworth University, Spokane, WA 99251.

THE ARTIFICE OF INTELLIGENCE: Divine and Human Relationship in a Robotic Age by Noreen Herzfeld. Fortress Press, 2023. 208 pages. Paperback; $34.00. ISBN: 9781506486901.

The Artifice of Intelligence offers a timely theological examination of artificial intelligence (AI) at a moment when rapid technological development often outpaces careful moral reflection. In this volume, Noreen Herzfeld—

Reuter Professor of Science and Religion at St. John's University and a computer scientist—provides readers with a thoughtful, accessible account of AI's promises and perils while grounding the discussion in a robust moral theology. Her central concern is not whether AI will become "human," but whether human beings may compromise their own humanity through the ways they design, deploy, and depend on intelligent machines.

Herzfeld frames her exploration around two fundamental questions: What is AI? and What is humanity? The book's argument unfolds primarily through the second question, with Herzfeld drawing heavily on Karl Barth's trinitarian understanding of personhood. Humanity, she argues, remains fundamentally relational and embodied. This conviction shapes her approach throughout the volume and becomes crucial to her eventual conclusion that "AIs are machines, not living things … precious resources when used well, but tools and nothing more" (p. 174).

Rather than treating AI as a monolithic entity, Herzfeld moves through a series of theological-ethical considerations that probe how AI reflects, imitates, or distorts human relationality. Herzfeld first introduces the problem and names Barth's relational organizing principle. She then explores the relationship between AI and human existence as (1) "seeing and being seen" (humanity as distinct but fully present), (2) "being heard" (possessing mutual communication), (3) "lending assistance" (exhibiting agency and ability to give and receive), and finally (4) "offered gladly" (authentic encounters freely and intentionally given). These discussions afford Herzfeld opportunity to explore the limits of AI while also introducing several thorny ethical challenges that occur through human use of artificial intelligence for personal gain or social engagement. While each chapter varies in approach, the general flow moves from speculation around AI's seeming ability to possess human qualities to analyzing how using this technology influences human behavior for good or ill. The final two chapters provide the opportunity to situate the discussion against a larger theological horizon on what constitutes the eternal destiny of humanity (flourishing in light of the resurrection) and, lastly, what distinguishes humanity in relationship to God and faith. In each case, AI provides opportunities for creativity and service but also introduces ethical pressures. Herzfeld includes interesting case studies such as the dramatic consequences of militarized technologies such as Lethal Autonomous Weapons (LAWs), and emotional or sexual companionship through robotics; examples offer compelling material for classroom debate or general conversations.

One of the book's strengths is its holistic understanding of human embodiment. Herzfeld frequently draws on neurophysiology to illustrate both the complexity of the mind and the brain's interdependence with the body. While her engagement with neuroscience may surprise readers expecting a more purely theological approach, it ultimately reinforces her claim that human beings cannot be reduced to information processors—and that AI, as disembodied software, cannot replicate the fullness of human life. This emphasis becomes especially significant in the final chapters, where she situates AI within a broader theological horizon of resurrection hope and lifelong formation in relationship with God.

Although the book provides rich examples, its organization occasionally feels exploratory rather than thesis driven. Herzfeld withholds her central conclusion until the end, guiding readers through a series of reflections before drawing them together. Some readers may find this inductive method engaging; others may wish for a clearer roadmap from the outset. Nonetheless, her approach mirrors the method of a researcher testing a hypothesis, allowing readers to grapple with the complexities of AI before receiving her final assessment.

Herzfeld's work complements other contemporary Christian engagements with technology, such as Brian Brock's *Christian Ethics in a Technological Age* (2010) or Andy Crouch's *The Life We're Looking For* (2022), while offering her own distinctive emphasis on relational and embodied theology. Readers interested in the societal implications of AI may also appreciate the broader analyses offered by Kate Crawford or Ruha Benjamin, though Herzfeld's book remains more explicitly theological in orientation.

The final chapter proposes a set of guidelines inspired by the Rule of Saint Benedict: technology must always serve love of neighbor, it should be valued as a gift without being idolized, and its creation should be approached with reverence as an extension of human creativity within God's world. These principles provide a constructive vision for Christian engagement with AI—neither alarmist nor utopian but grounded in theological wisdom.

The Artifice of Intelligence succeeds as an accessible introduction to AI for readers in theology, ethics, ministry, and computer sciences. Herzfeld invites thoughtful discernment rather than hasty judgment, reminding readers that the deeper question beneath every technological innovation is what it means to be human. In a rapidly evolving technological landscape, her reflections offer a moral compass for Christians seeking to navigate the promises and challenges of artificial intelligence.

Reviewed by Dean G. Blevins, professor of practical theology, Nazarene Theological Seminary, Kansas City, MO.

Letters

Let's Not Underestimate the Complexities of Sin and Sickness

I appreciated Madueme and Cho's article on the theology of medicine (Hans Madueme and Joel Cho, "Every Square Inch: A Brief Theology of Medicine," (*PSCF* 77, no. 4 [2025]: 246–56), particularly their reminders about the Christian roots of medicine and the goodness of creation, and their "big picture" approach demonstrating compatibility and integration of faith and science. There is no arguing their point that sickness and suffering should not be accepted and that we should work to alleviate it. However, I do question their assumption that "all diseases and … death itself … result from the fall of Adam and Eve." I also wonder if they pay insufficient attention to the complexities of disease in both medicine and theology.

First, although none question the ubiquity and inevitability of sin in the world, the concept of an original and dramatic fall from perfection is being increasingly questioned in theological discourse (which the authors briefly acknowledge in an endnote). The Hebrew term translated "good" is usually interpreted as functional goodness rather than something akin to Western perfectionism. "Death" is often interpreted as spiritual, not physical (evidenced by the continued existence of Adam and Eve outside the presence of the Lord). It is also likely that the first humans suffered as a result of the goodness of creation—they might have fallen from a height, injured themselves and experienced pain and suffering (gravity and pain both being good but having unwelcome side effects).

Furthermore, the concept of sin in the Bible is complex, with references to communal as well as individual sin, and conceptual intertwining of sin and its consequences and of sin and demonization. Although there are some associations between sin and sickness in the Bible, these are inconsistent. Indeed, Jesus does not explain why people are unwell, he simply heals them. On occasion he points out that sin is not a cause of disease (John 9:3); quite often he notes that evil spirits are a cause of disease (Matt. 9:33, 17:15–18). Given Jesus's teaching on compassionate care for one's neighbor, one does not need a doctrine of the fall to validate medical care.

From a scientific perspective, disease, disorder, disability, illness, and injury are all complex, and it is helpful to distinguish between them, especially in academic discussions. Not all such conditions are bad: fever aids healing, pain reminds us of a need to rest, allergies are a protective response exaggerated in some people, and anxiety reminds us of our need to give our burdens to Christ. Most disorders have subjective as well as objective elements, and I appreciate the article's support of holistic approaches. Interestingly, the authors, despite claiming that all disability is due to the fall, suggest that not all "should be treated," implying, as is common in disability studies (especially the social model), that some disabilities may be a result of creational diversity (e.g., ADHD, autism, deafness) or societal limitations. However, they then confusingly state that not all disabilities should be treated because medicine has its limits; this is a capacity rather than a moral/ethical statement.

Although the article's title acknowledges its "theology of medicine" is "brief," I do think it is helpful to emphasize the multifactorial nature of disease in both medical and biblical teaching. We can appreciate the complexity of God's good creation and care for it without assuming all problems are a result of the "fall."

E. Janet Warren
ASA fellow

Authors Respond to Janet Warren

We're grateful to Janet Warren for taking the time to read and comment on our brief theology of medicine (Hans Madueme and Joel Cho, "Every Square Inch: A Brief Theology of Medicine," (*PSCF* 77, no. 4 [2025]: 246–56). While we will be clarifying some misunderstandings and areas of disagreement, we appreciate this opportunity to engage with a fellow physician, theologian, and sister in Christ in the spirit of cordial dialogue. What follows is our attempt to address some of Warren's concerns.

First, Warren writes: "the concept of an original and dramatic fall from perfection is being increasingly questioned in theological discourse." That's true, but we disagree with such theologians and hold to the historic doctrine of the fall. In our opinion, modern scholars who reject a historical fall seem to be driven more by scientific metanarratives than by the text of Scripture (for discussion, see Hans Madueme, *Defending Sin: A Response to the Challenges of Evolution and the Natural Sciences* [Baker Academic, 2024]). In addition, we purposely avoided "perfection" language in our article, preferring to emphasize the absence of sin in the prelapsarian state.

Incidentally, although Augustine is usually the one in the crosshairs, it is worth recalling his belief that the prelapsarian situation had ample room for growth—after all, Augustine held that glorified saints will be unconditionally immortal and incapable of sinning, neither of which was true of Adam and Eve before they fell. In other words, even if Augustine sometimes used

"perfection" language, his actual theology was more nuanced.

Second, Warren points out that most OT scholars interpret "good" (Gen. 1:10, 12, 18, 21, and 25) and "very good" (1:31) as "functional goodness." However, our argument does not hinge on the exegesis of the Hebrew word *tov* alone. Rather, our claim that original creation was without sin or evil flows seamlessly from the doctrine of *creatio ex nihilo* (creation from nothing). Since God created the world from nothing (Gen. 1:1; John 1:3; Rom. 4:17; Heb. 11:3), the original creation must have been sinless because it necessarily reflected his holy character. Hence, the Christian tradition historically insisted that the causal origin of sin lies in the creature rather than the creator (the presence of the serpent points to the reality of the devil, but that's a separate issue—sin entered the world because of Adam's sin, not the angelic fall).

All this is crucial for a theology of medicine: if we say that pathology and disease are built into creation from the outset, then sickness would simply be part of how God made the world from the beginning. If that's the case, then we are implying that the Eternal Son created pathology as part of the goodness of creation and then turned around in the incarnation to heal those same pathologies he instigated—pitting Jesus the Creator against Jesus the Healer! Affirming the historicity of the fall avoids such theological incoherence.

Third, Warren's argument that "death" in Genesis 2 and 3 is spiritual, not physical, is common in evangelical literature on science and faith. Exegetically, however, we believe that "death" was both spiritual and physical. Moreover, Paul writes in Romans 5:12 that "sin came into the world through one man [Adam], and death through sin"—and from the context of vv. 12–21, death is meant primarily in the physical sense (though spiritual death is implied too). Paul removes any ambiguity in 1 Corinthians 15:21 when he contrasts Adam's death with Christ's resurrection: note, crucially, that both are physical.

Fourth, Warren suggests that Adam and Eve "likely suffered as a result of the goodness of creation." While Scripture is not explicit, there is experiential and exegetical evidence against the presence of any prelapsarian suffering or illness. In our view, accidental injury or death would have been impossible in the world of Genesis 1–2, where Adam and Eve existed in perpetual shalom (injuries and illness clearly disrupt shalom). We do not know how God would have maintained such a state of being, but the fact that everyone East of Eden dreads illnesses and injuries implicitly harks back to a time of shalom when there was no sin. Exegetically, too, Scripture promises an eschatological future when we will live forever in the new heavens and new earth where "death shall be no more, neither shall there be mourning, nor crying, nor pain anymore, for the former things have passed away" (Rev. 21:4; cf. Isa. 25:8). Why would God make such promises if illness and injury were part of the original goodness of creation?

Fifth, we agree that the Bible's teaching on sin is multifaceted. Warren states that, "Given Jesus's teaching on compassionate care for one's neighbor, one does not need a doctrine of the fall to validate medical care." We take her point, but we respectfully suggest that this perspective is incomplete. Once we recognize Adam's fall and its implications, patient care becomes that much more poignant, its significance even more glorious. Medicine is eschatologically charged, a fight against the effects of Adam's sin, waiting for Jesus to return in glory. This distinctive contribution of a Christian theology of medicine is lost if we jettison a historical fall.

Sixth, Warren is correct that we could have stated our position on treating disabilities more clearly. Here's Take 2: We do not hold the view that disabilities such as autism and deafness ought to be accepted merely as "creational diversity." Autism and other such disabilities result from the fall; it is therefore a worthwhile endeavor to advance medical technology and to actively pursue efforts to treat all such disabilities. However, while we are open to the possibility that certain "official" medical diagnoses are simply misclassifications of creational diversity, we firmly hold the principle that all disabilities originated from the fall. Our position also recognizes our creaturely and technological limitations, cautioning against a treatment-at-all-cost mentality that can have unintended consequences and cross ethical boundaries (e.g., experimenting with the embryonic stem cell treatment of autism).

In conclusion, while we recognize that our position on the fall is controversial in modern academia (as we acknowledged in the article), we maintain that this historic and biblical position is vital to a Christian theology of medicine. Herman Bavinck remarked, "The two truths or facts by which all of Christian dogmatics is governed are (1) the fall of Adam and (2) the resurrection of Christ."[1] Just so. Although it may be tempting in the Western intellectual milieu to downplay or deny the role of the fall in medicine, we demur. The cure is worse than the disease.

Note

[1] Herman Bavinck, *Reformed Dogmatics*, ed. John Bolt, trans. John Vriend, vol. 3, *Sin and Salvation in Christ* (Baker Academic, 2006), 38.

Respectfully,

Hans Madueme and Joel Cho

Letters

What About Us?

In the December 2025 issue of *PSCF*, there is a book review of *Science and the Sacred: Beyond the Gods in Our Image* by C.S. Pearce and Philip Clayton (*PSCF* 77, no. 4 [2025]: 287–88). The review was written by Samuel Powell, former professor of philosophy and dean of the School of Theology and Christian Ministry at beautiful Point Loma Nazarene University in San Diego, where the ASA has sometimes had its annual meeting.

Powell introduced his review thus:

> Protestants for whom neither atheism nor fundamentalism is an option face a declining menu of choices. On the American scene, there was a time when evangelicalism claimed a spot on that menu; however, its generation-long alignment with reactionary politics has rendered it unattractive for some Protestants. For the latter, the only thing left is some species of liberal theology. (p. 287)

I suspect that many educated Americans share such a sweeping analysis. But I, my church friends, and many of my friends in the ASA would not align with any of the four options Powell offers. Those of us in the ASA have always sought to carve out another way. As early *PSCF* editor Richard Bube used to put it, we affirm both "authentic science and authentic theology."[1] Fundamentalism rejects key findings of science, while liberal theologians, discouraged by higher criticism from a deeper study of the Bible, have turned to other sources such as Whitehead and Teilhard for their theology. But my friends and colleagues in the ASA affirm both. They are practitioners of cutting-edge science, enjoy discussing the Bible at length, and don't hesitate to acknowledge Jesus Christ as Lord and Savior.

Furthermore, this has been done by thousands of ASA members and fellows, continuing in their scientific work despite the rise and fall of various political and theological movements over many decades. The word "evangelical" has an ancient history, but as Powell noted, it has recently been co-opted.

Let the labels go. Regardless, I see ASA members serving as boundary workers, bridge builders, and peacemakers across artificial divides. Jesus said, "My kingdom is not of this world" (John 18:36). God's world—creation—transcends the world of political boundaries. This is an understanding that is affirmed by traditional creeds as well as by modern science.

Of course, the biblical texts require scholarly interpretation. Early Christians had to wrestle with the dilemma of Christ as God and man; after a struggle of a few centuries, they formulated concepts such as hypostatic union to clarify how the Bible presented Christ's two natures. This was a successful achievement of boundary-work, and in fact, I believe all good theology is dialogical. This approach allows ASA members to listen and learn from each other while avoiding polarization and labeling. In short, the ASA is a place for Christian fellowship within the scientific community.

Careful hermeneutical work should be an aspect of Christian scholarship. But interpretation of the revealed Scriptures should not lead to their abandonment, as liberal theologians do when they replace the God of the Bible with vague conceptions of a Deity, as with many formulations of process theology.

I am disappointed that even some professors of theology have apparently failed to notice the exemplary work of the ASA and other such ministries in the United States. Maybe it would help to carve out a new category other than evangelical, but then it would probably just turn into another label.

Note

[1]Bube, Richard, personal communication. This topic is also discussed in Richard Bube, *Putting It All Together: Seven Patterns for Relating Science and the Christian Faith* (University Press of America, 1995).

Paul Arveson
ASA fellow

American Scientific Affiliation

The American Scientific Affiliation (ASA) is a scholarly and professional society. We are an international community and fellowship of Christians engaged in the interface of vital faith-science questions. Founded in 1941, the mission of the ASA is interpreting, integrating, and communicating the discoveries of science with insights of scripture and Christian theology. *Perspectives on Science and Christian Faith* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community. The ASA Statement of Faith is at www.asa3.org → ABOUT → Statement of Faith.

Executive Leadership, ASA

PSCF Discussions

Diving Deeper Discussions (DDD) is a monthly series of Zoom discussions for ASA members and their friends to think more deeply about an article or book review published in *Perspectives on Science and Christian Faith*. The discussions are held on the second Saturday of every month at 2 pm Eastern time. Recordings are stored on the ASA YouTube channel. Upcoming DDD are at www.asa3.org → Resources → Programming → Diving Deeper.

Canadian Scientific & Christian Affiliation

The Canadian Scientific and Christian Affiliation is the expression of the ASA in Canada. It was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science and Christian Faith* and the *God and Nature* magazine). The CSCA subscribes to the same statement of faith as the ASA; however, it has its own governing body with a separate annual general meeting in Canada.

Canadian Scientific and Christian Affiliation, PO Box 63082, University Plaza, Dundas, ON L9H 6Y3. Website: www.csca.ca.

CSCA Executive Council

How Do I Join the ASA?

Anyone interested in the objectives of the Affiliation may have a part in the ASA. Membership and subscription applications are available at www.asa3.org → MEMBERSHIP → Join ASA or Subscribe to PSCF.

Regular Membership: Open to all persons who give assent to our statement of faith and meet at least one of these criteria: (1) have attained a bachelor's or higher degree in a science-related discipline, where science is interpreted broadly to include any disciplines of natural and social science, health sciences, technology, engineering, and mathematics (such as but not limited to, anthropology, archaeology, economics, history, medicine, political science, psychology, and sociology), or (2) are philosophers, historians, Bible scholars, theologians, or other professionals whose vocational activity contributes to the intersection of faith and science. Regular members receive all member benefits and publications and take part in all the affairs of the ASA, including voting and holding office.

Associate Membership: Available to those interested who may not meet the criteria of a regular member but can give assent to our statement of faith. Associates receive all member benefits and publications and take part in all the affairs of the ASA except voting and holding office.

Student/Early Career Membership: Available to anyone enrolled in an undergraduate or graduate program, or to advanced high school students as well as to early career professionals (defined as the first three years from the last degree). Student/early career members are eligible to participate in all the affairs of the ASA except voting and holding office.

Friend: An individual or student wishing to participate in the ASA without giving assent to our statement of faith may become a Friend. All benefits apply with the exceptions of voting rights and holding office. Friend dues are the same as the selected membership type.

Subscriptions to *Perspectives on Science & Christian Faith (PSCF)* are available at $55/yr. (individuals), $110/yr. (institutions), and $20/yr. (student premier).

How Do I Find Published *PSCF* Articles?

Articles appearing in *Perspectives on Science and Christian Faith* are abstracted and indexed in the *ATLA Religion Database; Christian Periodical Index; EBSCO; ESCI; Gale: Cengage Learning; Religion Index One: Periodicals; Religious & Theological Abstracts*, and *Guide to Social Science and Religion in Periodical Literature*. Book Reviews are indexed in *Index to Book Reviews in Religion*.

Contents of past issues of *PSCF* are available at www.asa3.org → PUBLICATIONS → PSCF Academic Journal → Browse Issues.

"Upholding the Universe by His Word of Power"   *Hebrews 1:3*

Volume 78, Number 1   **March 2026**