PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In This 75th Anniversary Issue ...

Women in the American Scientific Affiliation: Past, Present, and Future

Twenty-Five ASA Fellows and Editors Tell of *PSCF* Articles That Changed Their Lives

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

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Manuscript Guidelines

The pages of *Perspectives on Science and Christian Faith (PSCF)* are open to original, unpublished contributions that interact with science and Christian faith in a manner consistent with scientific and theological integrity.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

1. Authors must submit **an electronic copy of the manuscript formatted in a version of Word** as an email attachment to james@asa3.org. Typically 2–3 anonymous reviewers critique each manuscript considered for publication.
2. Use endnotes for all references. Each note must have a unique number. Follow *The Chicago Manual of Style* (16th ed., sections 14.1 to 14.317).
3. While figures and diagrams may be embedded within the Word text file of the manuscript, authors are required to also send them as individual electronic files (JPG or PDF format). Figure captions should be provided as a list at the end of the manuscript text.

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

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- **Arie Leegwater** (leeg@calvin.edu): cosmology, history of science, mathematics, and physical sciences.
- **Derek Schuurman** (dschuurman@calvin.edu): computers, engineering, and technology.
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LETTERS to the Editor concerning *PSCF* content may be published unless marked not for publication. Letters submitted for publication must not be longer than 800 words and will be subject to editorial review. To be as timely as the medium of Letters to the Editor is intended to be, letters are to be submitted electronically within six weeks of the publication of the article they address.

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James C. Peterson

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Our 75th Anniversary at *Perspectives on Science and Christian Faith*

The first issue of *Perspectives on Science and Christian Faith*, then called *Journal of the American Scientific Affiliation*, was gathered in 1948 and mailed at the start of 1949. So the journal is numbered now in its 75th volume year. The cover and first inside page of that 1949 issue follow this editorial. The journal DNA is there, starting with the prominent quote of Psalm 111:10 that still appears on each cover, but my, how far we have come building on that foundation.

Bryan Sutton sings that "the more I learn, the more I learn that I sure have a lot more to learn." That certainly has been the experience at *PSCF*. A plethora of new and important insights have been proposed, and argued, and often developed to wide acknowledgment. There has been striking progress in our understanding, that reveals how much more there is to learn. We have been like a camper in a night wood, who has turned up the brightness of her lantern to see with an extended pool of light. More is revealed in that larger pool of light, yet the larger circumference of light also reveals a larger circumference of unknown edge, not yet illuminated. Looking at 75 years of this journal, we are encouraged by realizing what has been accomplished, and motivated by seeing yet more of what is left to do. We seek to do some of both in this 75th anniversary issue.

Our lead article describes the development of ASA from an association with a handful of "members," and eventually a few "lady members," to now an organization where women comprise half of the board of directors and executive leadership, including the current president and executive vice president. How was that achieved, and what more is there to do in that regard?

We next turn to twenty-five ASA/CSCA Fellows and *PSCF* editors each describing an article in *PSCF* that changed their life when it was published, and why it still warrants attention today.

Twenty book reviews of the latest developments across our fields then follow, plus a letter exchange between a journal author and critic.

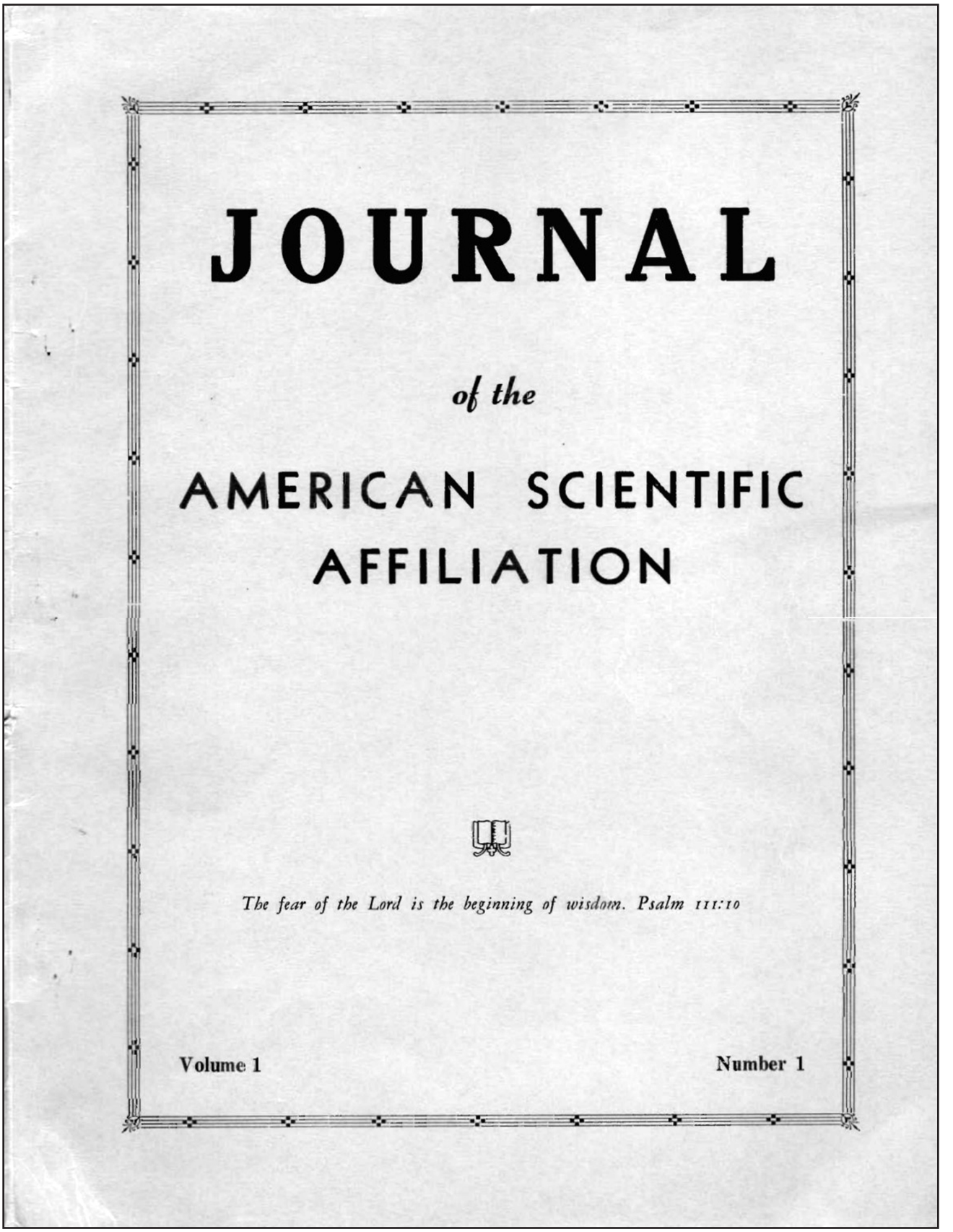
It has taken hundreds of scholars, freely giving of their time and expertise, to accomplish this 75-year conversation. Their names have been attached in the journal to their telling contributions. We should remember as well how so many have worked behind the scenes to make the journal possible, and highlight the current staff. Esther Martin rigorously checks our grammar, clarity, and references that Lyn Berg further proofs and typesets. Mark McEwan creates our digital presentations. ASA/CSCA provides the crucial financial context from printing to membership mailings. Stephen Contakes ably leads our team of book review editors: Chris Barrigar on theology and philosophy; Se Kim on biology, ecology, and origins; Arie Leegwater on cosmology, history, mathematics, and physical sciences; Derek Schuurman on computers, engineering, and technology; and Lauren Seifert on the social sciences.

Over the 75 years, ten editors-in-chief have prayerfully taken on this responsibility. That prayer has been essential is clear from the magnitude of the relentless challenges in developing each issue, and what has been quite evidently accomplished. Of these editors, Roman Miller (1999–2007) and Arie Leegwater (2008–2011) have survived the experience to still be with us!

To all, our deepest thanks.

Looking forward to what I will get to see of our next 75 years,

James C. Peterson
Editor-in-Chief


JOURNAL

of the

AMERICAN SCIENTIFIC AFFILIATION

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

Volume 1 Number 1

Cover of the first issue of the *Journal of the American Scientific Affiliation (JASA),* now titled *Perspectives on Science and Christian Faith (PSCF).*

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BULLETIN

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Janel M. Curry

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Article

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Women in the American Scientific Affiliation: Past, Present, and Future

Janel M. Curry and Dorothy F. Chappell

Roles of women in STEM fields, including social and natural sciences, have changed significantly since WWII. Studying the inclusion of women in the American Scientific Affiliation (ASA) provides a distinctive gender-based case study related to Christian mission and the evangelical Christian community. Analysis of fifty years of newsletters, leadership statistics, and membership numbers illuminates the story of women over time. The history of women in the ASA parallels the larger advancement of women, while also illuminating unique challenges within the evangelical Christian context.

Keywords: American Scientific Affiliation, women and science, scientific professional associations, intersectionality, gender equity, feminism, Christianity and science, religion and science

American Scientific Affiliation History and Mission

Established in 1941, the formal objectives of the American Scientific Affiliation (ASA) center on investigating the relationships between faith and science and disseminating these research results to both Christian and scientific communities.[1] The statement of the first national convention in 1946 called the ASA "a group of Christian scientific men" who advanced this mission.[2] Telling the story of how women advanced within the ASA offers a unique case study of the history of women in science in North America, with an emphasis on the United States, because of its ties to the Christian, and particularly evangelical, communities.

Janel M. Curry, *PhD (University of Minnesota), is President of the American Scientific Affiliation. She taught geography at both Central College and Calvin University. She also served as dean at Calvin, provost at Gordon College, and interim Vice President for Academic Affairs at Medaille College.*

Dorothy F. Chappell *has served as president of the ASA and holds the PhD in botany from Miami University of Ohio. She has served on the faculty of Wheaton College (IL), as Academic Dean at Gordon College, and as Dean of Natural and Social Sciences at Wheaton College.*

A History of Intersectionality

The ASA and its members sit distinctively at the intersection of American culture, the professional scientific community, and the Christian community. Gender adds another element to this intersectionality as Janel Curry-Roper alluded to in her essay, "A Christian Woman in Academe" in 1996.[3] Intersectionality is a framework that allows insight into the ways that multiple institutions and identities combine to shape people's experience of society and culture.[4] Nuanced analysis and understanding is needed when bringing together American culture, professional scientific community, Christian community, and gender in order to illuminate how cultural change takes place.

Margaret Rossiter has written definitive works on the history of women in science in the United States.[5] Recent work by Karen Foss, Sonja Foss, and Alena Amato Ruggerio has outlined the cultural history of feminism and its phases in the United States.[6] Sally Gallagher traces the development of feminism and its relationship to the evangelical community.[7]

More broadly, Kristin Du Mez's recent book, *Jesus and John Wayne*, analyzes the intersection of evangelical culture and patriarchy associated with American nationalism.[8] Research on the role of evangelical women within the larger social sphere is more limited, with the most research done on Christian higher education and why women involve themselves in institutions that restrict the use of their gifts.[9] Brad Christerson, Elizabeth Hall, and Shelly Cunningham, in a study of job satisfaction among women in such institutions, found that inequalities were greater than at secular institutions. However, women also exhibited higher satisfaction at evangelical universities than their secular counterparts, citing close mentoring relationships with students, friendly noncompetitive relationships with colleagues, and an ability to integrate faith with work.[10] These institutions, like the ASA, lie outside the church, while promoting professional and Christian mission and fellowship for those working within the organization. This article explores relationships among a distinctive set of institutions: American culture, professional scientific community, evangelical Christian community, and the women that live in all of them within the ASA.

The ASA was formed to promote community among scientists of faith who often faced tensions within evangelical church culture over issues of science. Simultaneously, shifts toward fundamentalism in the evangelical church that affected views of science also reflected theological shifts related to appropriate roles for women. Relevant questions include: Did men of the ASA understand the issues of women differently than men in the broader evangelical church? How did the ASA compare to the general trends in professional scientific societies across the country? How did these various lenses and institutions shape the story of women in the ASA?

Methodology

This research drew on multiple data sets from 1941 to 2020 to reveal the presence of women in various roles in the ASA, alongside discussions within the ASA related to gender climate. The goal of this project is to locate the advancement of women in the ASA within the intersecting contexts of historic waves of feminism across the country, within women's advancement in STEM fields more generally, and within theological discussions.

Data on women drawn from the ASA included membership data compiled by the percentage of women members from 1941 through 2020, as well as records of the number of ASA Fellows. The ASA newsletters from 1961–2008 provided data on the "lived" experience within the organization. Entries under the Personals section, with individual entries that were generally under the heading of "Personals" but evolved into headings such as "What ASAers Do" or "Doings of ASAers," were computed as a percentage of these entries for women as a measure of the visibility and engagement of women. In addition, all newsletter texts that referenced a woman in the ASA were compiled over the time period and content analysis was carried out, tracking changes over time for the following variables: discussions that exhibited a lack of self-awareness on the status of women; discussions that purposefully advocated for the advancement of women; use of labels for women that are not comparable to labels for men (such as "ladies," "wives," and the husband's name after the address of "Mrs."); and use of the terms such as teacher, wife, or housewife specifying women's vocational callings that reflect the balance of vocations at a particular time period.

The newsletter commonly recorded the meetings, leadership, and activities of regional chapters. From these records, the number of different women that were mentioned in regional leadership were computed for each year. National roles such as speaking at annual meetings, committee service, or annual meeting leadership were computed for each year. Finally, major articles on specific women that focused on their scientific work were noted over time. The analysis of these data sets and their overall pattern of alignment led to identification of six separate eras of the involvement of women in the ASA.

Marginal Involvement: Pre-1961

Post-WWII culture emphasized traditional gender roles which valorized the role of housewife for women. Women whose work mattered during WWII found themselves and their work marginalized afterward.[11] By the 1950s, women scientists who had standing during WWII lost ground.[12] The ASA was born in the midst of this era. Margaret Rossiter calls this the golden age of science that was generally a very dark age for women. At its beginning, the culture of the ASA had been one of families of (male)

members coming together at its annual meetings. The culture and language of the organization was one of informality in spite of its professional goals. The ASA showed no women members until 1949 but grew to as high as 5.5% of the membership by 1956[13] (fig. 1 and fig. 2). Women can be seen as early as 1946 in photos of conference attendees.[14] In the 1950s, four women published a total of seven articles out of about 250 appearing in the *Journal of the American Scientific Affiliation* (*JASA*).[15]

The ASA newsletter used language such as "lady members" during this period. The use of "lady" called attention to these persons as being marked cases. Members who were men were "members," while members who were women were marked as "lady members." Identifying women as "marked" members and men as members leads into the next era, in which women took the status as "honorary men" who stand as exceptions to the rule.[16]

Honorary Men: 1961–1968

The 1960s were characterized by many of the same elements of the previous era. The ASA newsletter's language was one of a family, where the members and their wives came together. For example, a 1961 newsletter states:

> In June they will hold their annual Ladies' Night banquet. More power to this group who have not only solved the monthly meeting problem, but also have advanced to the refined stage of involving the wives.[17]

Figure 1. Women as a Percentage of ASA Membership

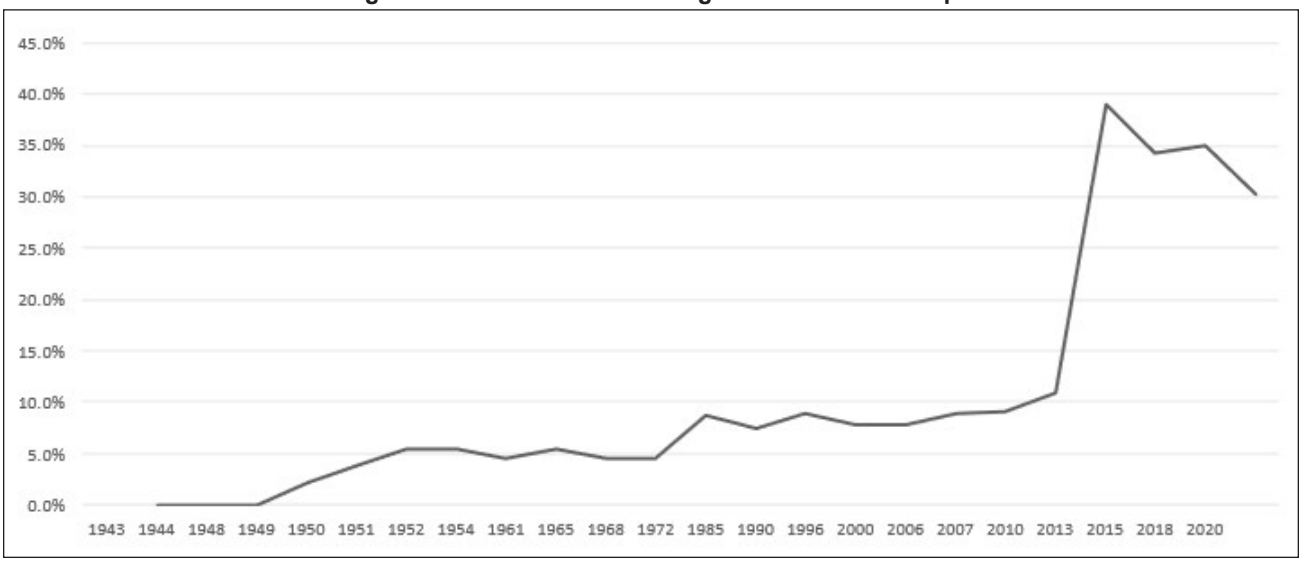
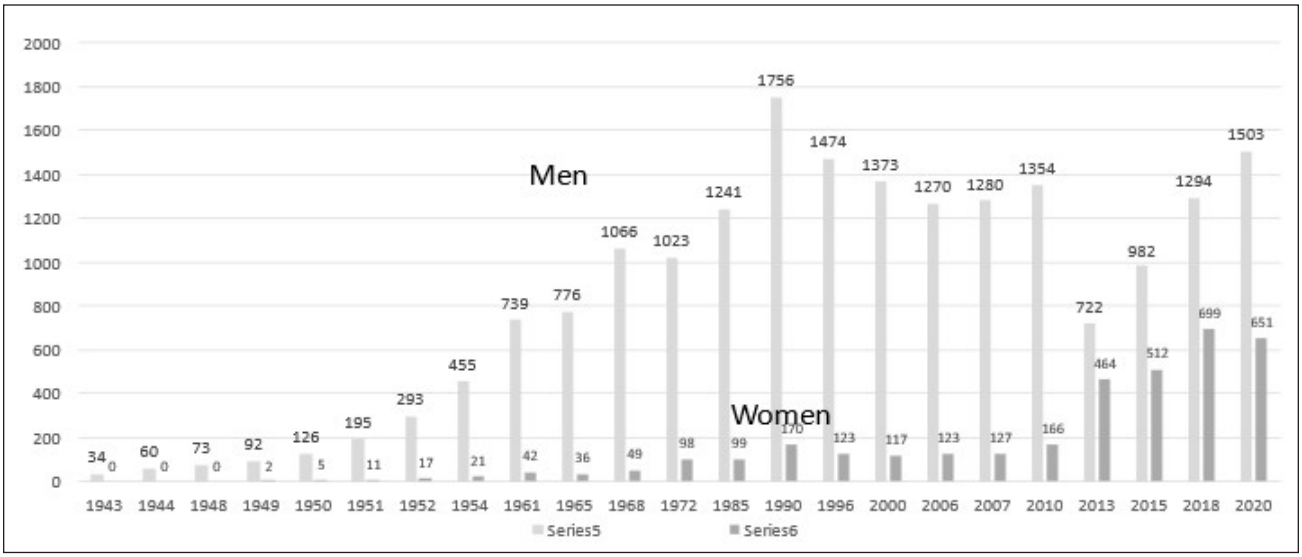


Figure 2. ASA Membership Broken Down by Men and Women



Some initial signaling of the generational shift to come appears in a 1963 newsletter with the juxtaposition of wives, ladies, and the daughter of a member who desired to be a member.

> Sights not easily forgotten: … Helen Moberg and Eva Everest knitting and crocheting and plotting, like Madem LaFarge [sic] in *The Tale of Two Cities*; Dick Hendry's new blonde wife (nice going, Dick!); … Dr. Howitt brings the nicest ladies to the conventions, this time his niece, Mrs. Barbara Ferguson; Ann Boardman, daughter of Donald Boardman of Wheaton College, submitting her application for membership—the FIRST second generation ASA member …[18]

Gendered labels for women continued to dominate the newsletter during this era (table 1). When mentioned in the newsletter, most women were associated with gendered vocations. The text of the newsletter showed a high level of sexist language applied to female members and to male members' wives, showing a general lack of reflection on the role of women in the organization.

In the 1960s, 4 out of 53 elected Fellows were women (7.6%) (table 2). This percentage of Fellows mirrored the percentage of women members which remained between 4% and 5% overall.[19] Two women served on national boards during this period, one on the editorial board in 1960 and one on the membership committee in 1967.

Rossiter found that few scientific professional societies collected data on women prior to 1968. And even if women were present, they held lower positions (non-Fellows, associate members).[20] This makes it difficult to compare the ASA with other scientific societies, especially because of the ASA's interdisciplinary nature. Rossiter found data that showed women made up 12% of the American Association of Anatomists in 1960 and 13% of the Association of American Geographers in 1964. While the percentage of women in the ASA appears to be lower than in other organizations, women Fellows of the ASA reflected the same percentage as women members. This was in contrast to Rossiter's findings of great disparity between the percentage of women who were members and the percentage of women who were Fellows in this period.[21]

Analysis of Personals in the newsletter illustrates the minimal presence of women, falling far below their percentage level as members. Of the more than 778 Personals listed in the newsletter from 1961–1968, only 22 referred to women (2.8%) (fig. 3). Likewise, Joseph Spradley and Dorothy Chappell found only one paper out of 130 was given by a woman at the annual meeting (0.8%) and only three out of 350

Table 1: Newsletter Content Analysis by Eras: Counts over Fifty Years

	1961–1968	1969–1977	1978–1988	1989–1998	1999–2008
Gendered Labels	6	1	0	0	0
Gendered Vocation	14	21	34	11	0
Women in Regional Leadership	8	14	9	6	6
Women in National Leadership	1	2	8	21	39
Major Article on Woman Scientist	0	1	1	2	1
Self-Reflection on Role of Women	0	7	6	1	2
Lack of Self-Reflection on Women	2	3	0	0	0

Table 2: Appointment of Fellows by Decade

	1960–1969	1970–1979	1980–1989	1990–1999	2000–2009	2010–2019
Men	49	59	50	20	20	49
Women	4	4	6	7	9	17
Total Fellows	53	63	56	27	29	66
% of Women Fellows	7.6%	6.4%	10.7%	26%	31%	26%

JASA articles and communications during the 1960–1969 time period were authored by women (0.9%).[22]

The 1960s brought about the second wave of feminism. One of the triggering events was the publication of *The Feminine Mystique* by Betty Friedan. She identified systematic sexism as that set of assumptions that left women unfulfilled because it was thought that women should aspire only to motherhood and homemaking. A protest at the Miss America pageant in 1968 increased the visibility of the movement in the public eye. Equal opportunities for women in education, economics, and employment were an emphasis in this second wave. Language was also emphasized which brought about the use of Ms. in place of Mrs. or Miss. Title IX also gave women equity in the area of education.[23] In June 1972, Title IX finally extended the Equal Pay Act of 1963 to higher education and banned sex discrimination.[24] The effects of societal change began to be seen in the rise of the number of women in the sciences. Women in scientific fields rose to about five percent between 1960 and 1970, with the greatest rise in the biological sciences.[25]

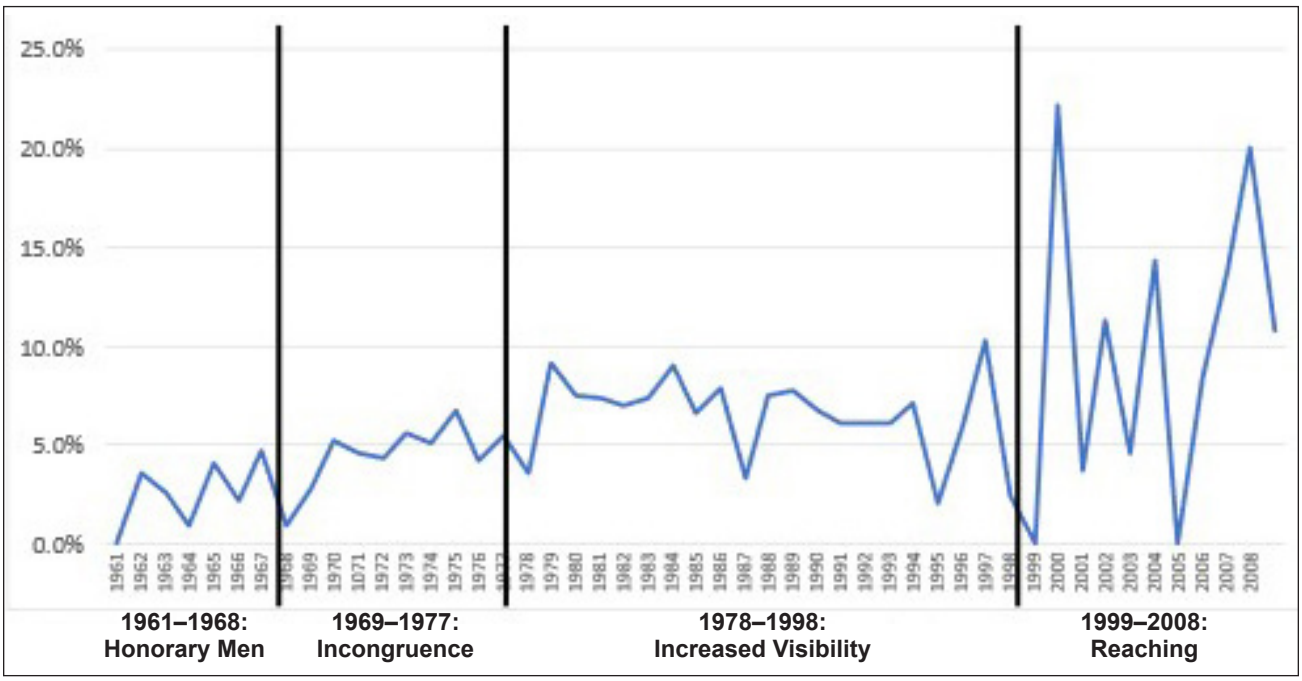
Incongruence: 1969–1977

The end of the 1960s through the 1970s saw change in the ASA. Incongruence characterized the organization as it tried to correct language and be sensitive to the presence of women members, while remaining embedded in a culture that assumed all members were male and had wives. In March 1969, the purpose statement of the ASA was changed to "an association of men and women."[26] This recognition of women scientists remained incongruent with the culture as illustrated by an article in the ASA newsletter in October 1970:

> ASA Conventions are always more fun because of the ladies present. Besides many wives who come just for the fellowship and firecrackers, we're seeing a growing number of women scientists, too … We also got to meet a wife or two who is a scientist in her own right …
>
> In honor of women's long-suffrage in this country, we thought we'd publish a list of all the husband-wife scientist teams within ASA, but we hit a snag. The list Hazel sent us from Mankato came with the names listed only as 'Mr. and Mrs. So-and-so.' WOW! We wouldn't dare publish such a list these days without giving the wife's very own first name.
>
> So, why don't more of you gals drop us a line now and then? Not your hem-line, please![27]

The newsletters of this era clearly supported an egalitarian position in the church and organization rather than the theological arguments for male headship that were pervasive within the evangelical church

Figure 3. Percentage of Personals about Women in the ASA Newsletter: 1961–2008



at the time. In June 1974, the newsletter included an extensive article on an event that debated the role of women:

> After dinner (roast chauvinist boar with its foot in its mouth?), theologian Gleason Archer … surveyed Old Testament passages … He concluded from Gen. 1–2 that women have a special role of "helper-complement" but man has the collective leadership role, "captain of the family team." He argued that for Eve's sin in the Garden, God "expressly subordinates woman to her husband." He talked about O.T. culture and law and exposited Proverbs 31 about the virtues of a good wife. "She might even engage in business activities," he conceded, "but only with her husband's approval."
>
> … the final speaker was no "token female." She was Nancy Hardesty, who had taught at Trinity last year but is now at the U. of Chicago Divinity School working toward a Ph.D. in church history. She has written a book with Letha Scanzoni … entitled *All We're Meant to Be: A Biblical Approach to Women's Liberation*. She also has a chapter on "Women and Evangelical Christianity" in Clouse, Linder, and Pierard's *The Cross and the Flag …* Her "Biblical gynecology" didn't exactly coincide with Gleason Archer's. She said we must be willing to read the Bible with the possibility of discarding traditional interpretations. (After all, Galileo was right and traditional Biblical interpretations weren't.)
>
> She reminded the audience that "he" is no more descriptive of God than "rock," "bread" or "vine," pointing out that "she" is actually used in such passages as Isa. 42:14; 46:3; 49:15; 66:13; and Luke 15. In the N.T., *anthropos* rather than *aner* is used in depicting the Incarnation; Christ became human, not specifically male. And He died for women, too. Genesis has both male and female made in God's image, receiving the same commission, and equally "blowing it" in the fall. In general, Hardesty disagreed with Archer on whether certain passages are descriptive or prescriptive. She pointed out that the Holy Spirit dealt directly with Mary, not through her father or Joseph. She concluded by suggesting that the church is hurting because we've denied and bound and stunted the growth of half the church's members, half the body.
>
> Wow. That must have been some meeting. With the dominance of males in ASA and in particular in positions of leadership, this topic ought to be taken up by many local sections, and probably at a national meeting. Do scientists prefer female lab assistants because they're more submissive? Do we think of our own sons as potential doctors, our daughters as potential nurses? Would we welcome more women into our departments on an equal footing?[28]

In this article, Walt Hearn, newsletter editor, refers to parallels with the science-faith debates (reference Galileo), draws on professional credentials, summarizes Hardesty's description on inconsistent arguments among her opponents, and then asks questions of ASA members.

The first major article featuring a woman and her scientific contributions, Marie Berg, appeared in 1975.[29] The newsletter also showed increased effort around language related to women and awareness of their presence or lack thereof at meetings of the organization.[30] This effort included news items about the Evangelical Women's Caucus which was a Christian feminist organization.[31]

Personals in the newsletter that were about women increased to a 5% level and stayed there throughout the time period (fig. 3). Much more sensitivity and awareness of gendered language emerged with gendered labels virtually disappearing by the end of 1977 (table 1). Women outside of more-gendered vocational positions were still rare but attention was being paid to women scientists. Women in leadership at the regional levels were much more recognized and present with fourteen individuals mentioned across the regions. This mirrored other professional societies across the USA.[32] Women's involvement tended to settle at the local level.[33]

The number of women appointed as ASA Fellows grew by four from the previous decade while numbers of men appointed increased from 49 to 59, leaving the number of women elected as 6.4% over the previous 7.6% (table 2). Being a Fellow was a requirement for election to the Executive Council. The number of women Fellows elected continued to mirror the percentage of women members. Spradley and Chappell estimate women's ASA membership in 1972 to be 6.4% though the number of papers given at the annual meeting remained lower at eight out of 240 (3.3%) and only 16 out of 390 *JASA* articles and communications (4.1%).[34]

The decade of the 1970s experienced the steepest increases in the number of women in STEM

occupations.[35] In spite of these increases, the number of women in the ASA did not see a comparable increase.

Increased Visibility: 1978–1998

The 1980s are often referred to as the post-feminist period.[36] At this point, many people believed feminism was no longer necessary and equality had been accomplished. Within the ASA newsletter, arguments continued to be made for the need to advance the cause of women. The newsletter article, "Now Let's Hear It for the Men," reported on an ASA member who was doing research on men to counteract male behaviors that were detrimental to women.[37] In 1980, the ASA publicly recognized its failures and tied that recognition to being a positive witness to the gospel:

> Any organization in our culture dominated by white males is bound to look racist and sexist to outsiders. It may take us a long time to turn things around to a positive witness to the impartiality of the gospel, but the way to get there is to begin. For years women scientists were included in American Men of Science. Why didn't anybody think of changing it to Men and Women of Science long before that was done? ... As Christians we shouldn't shy away even from hard things when they're the right thing to do. We certainly don't want to overlook any simple, sensible actions that would show the world that in the Christian family brothers and sisters are valued equally.[38]

In this newsletter, the editor committed to writing more stories about women and noted the increase of women in leadership in local sections.

The December 1979/January 1980 newsletter announced the first woman candidate for the ASA Executive Council, Marie Berg.[39] In spite of this advocacy, Berg failed to be elected to the Executive Council, and the February/March 1980 newsletter lamented the general lack of women in ASA leadership and other spheres, including the church.[40] A subsequent newsletter issue, in its response, made it clear that some members pushed back on the notion that being a woman was a characteristic to consider in voting. The response was quick in turning the issue around:

> At least one reader misread our comment … He thought we must be implying that "being female is the most important criterion for election" (to the ASA council). Our comment referred to past history in society as a whole, in the church, and in science—as well as in our Affiliations. The fact is that in all those realms "being female" has long been "the most important criterion" for underdevelopment of intellectual gifts and leadership capacity.[41]

The rhetorical argument in support for women then turned to the authority of one of the founders of the ASA, Alton Everest, and reported on how he and his wife Elva had sent the leadership a paper that pointed out that in 1976 less than 2 percent of U.S. engineers were women, although female enrollment in engineering schools was up to about 10 percent nationwide. The paper analyzed the historical structure of the discrimination against women as a more recent phenomenon, illustrated by data that showed that well into the Industrial Revolution, women had worked side by side with men in most areas of work.[42] The end of the article then moves to the authority of scripture, drawing on Acts 2:

> Well, it does say in Acts 2 that only "in the last days" will God pour out his Spirit lavishly and indiscriminately on both "your sons and your daughters." God says "on my menservants and my maidservants in those days I will pour out my Spirit; and they shall prophesy." Come to think of it, though, Peter said that those wonders were what was beginning to happen right then—and that was almost 2,000 years ago.[43]

The argument for inclusive language continued in this era. The position of biblical feminism was assumed in the newsletter, with statements such as, "Even though the logic of "biblical feminism" seems clear, some sexist habits are deeply ingrained."[44] The article goes on to advocate for inclusive language, pointing to the professional standards in publishing as well. The article asks readers not to trivialize the issue and used humor to engage:

> If you're giving a paper, don't assume that "man" or "men" obviously includes everybody—unless you think women shouldn't respect a door with "MEN" written on it. Feedback helps us develop linguistic sensitivity. Ask a local EWC (Evangelical Women's Caucus) member—or even a secular feminist—to read a draft of your paper, and follow her (or his) suggestions …[45]

The editor draws on research on the issue, giving members references such as linguist Robin Lakoff's *Language and Woman's Place*. The editor also quotes

male members from the annual meeting who were asking why the organization could not make progress in its presenters using inclusive language.[46]

Both theological and scientific arguments were used in this era to support the advancement of women, as well as using the authority of leaders within the ASA. More articles on women as scientists and scholars appeared as promised.[47] However, the structural barriers within the ASA were not clearly analyzed. For example, when lamenting the lack of women Fellows, the editor wonders whether the designation of Fellows should be changed rather than ask the question about the process by which they were chosen or the barriers to their identification.[48] The ASA was not unique in its dearth of women Fellows. For example, in 1984 the American Psychological Association's membership was 43.8% women but only 16.2% of Fellows were women. And in 1994, women were 15% of the American Geophysical Union with only 3.1% of Fellows being women.[49]

The 1980s were characterized by the assumption of equality and a desire for it. From 1978 through 1988, Personals reached a stable level of around 7–8% for women (fig. 3). Gendered vocational occupations still dominated in spite of the extensive self-reflection going on in the organization (table 1). Clearly the emphasis on inclusive language was operationalized because gendered labels disappeared entirely from the newsletter. Women were present in regional leadership; women in national leadership rose, in contrast to the previous decade.

Ann Hunt was the first woman elected to the Executive Council in 1983. The success of finally getting a woman on the Executive Council paralleled other professional scientific organizations in which women began to move into national offices.[50] Hunt moved into the presidency of the organization in 1986. The ASA followed a rotation so that once elected to council each member rotated up to the presidency, ensuring, in this case, that a woman would become president. The timing of the first woman president of the ASA was comparable to other such organizations.[51]

During the decade of the 1980s, the number of women elected to Fellow rose from 4 to 6 while the number of men dropped from 59 to 50 (table 2). The result was an increase in the percentage of women Fellows during the decade from 6.4% to 10.7%. Spradley and Chappell recorded twenty papers out of a total of 400 given by women at the annual meeting (5%) and 13 out of 340 *JASA* articles and communications (3.8%).[52] These numbers do not indicate significant change during the decade. The lack of progress is especially evident when measured against the national trends of women in STEM fields. By 1990, women held 42% of the positions in the biological sciences on the high end, and 9% of the positions in engineering on the low end.[53] In contrast, the percentage of women members of the ASA essentially remained flat between 1972 and 1990 at around eight percent.

Rossiter describes this time period as one of intense legal confrontation, in which women undergraduate and graduate students in the sciences increased, while the number of women science faculty members did not change significantly. Women were also discovering that they were often paid less than men in comparable positions.[54]

In 1993, Kenneth J. Dormer, President of the ASA Executive Council, called upon the ASA to recruit and appoint women to leadership roles in the ASA.[55] He stated:

> We need to increase our membership with an emphasis on young scientists and women … [W]omen need special encouragement since they often experience discrimination in science in subtle ways. I would like for the following to occur: Appoint more women to the commissions, panels and nominating committee, have at least one woman on the Council, and have female members write to female prospects to encourage them to join the organization.[56]

These efforts in the decade that followed began to bear fruit and coincided with the third wave of feminism that arose in the early 1990s. The third wave emphasized analysis of power dynamics, valorized individual responsibility, and celebrated difference, recognizing women's multiple identities.[57]

Women's gains in the ASA were mixed from 1989 to 1998. Personals in the newsletter remained stable from the previous decade (fig. 3). References to gendered vocational occupations declined dramatically (table 1). Likewise, women who were referenced in national leadership rose while women in leadership at the regional level remained stable. Several major articles on women scientists were published

while commentary on the issue of women was minimal, particularly in contrast to the previous decades. Women scientists continued to be highlighted in the ASA/CSCA newsletter.[58]

In spite of increased visibility, numbers of women did not significantly change. Between 1990 and 1999, seven women were elected as Fellows out of 27—an increase of one woman from the previous decade (table 2). The ASA leadership was intent on electing more women to the ASA Executive Council during this period. Ann Hunt was the first elected in 1983. The next several women elected were run against other women to ensure the representation of women. This appears to be an intentional strategy to get women on the Executive Council, given the greater number of men running for office. The percentage of women members declined between 1990 and 2000 at a higher rate than the overall general decline in ASA membership (fig. 1 and fig. 2).[59]

During the 1990s, women in STEM fields continued to rise except for women in math/computer science.[60] Between 1970 and 2000 the number of women completing doctoral degrees in science and engineering had quintupled to almost 10,000 with psychology and biology dominating.[61] The question remains as to why the ASA did not significantly benefit from this increase of women in STEM fields across the United States.

The roots of change in the ASA began in the late 1990s through the efforts of Sara Miles, Dorothy Chappell, and Mary Stewart Van Leeuwen, who organized a conference for women in science at the Center for Christian Women in Leadership, at Eastern College in June 1997.[62] Several women who later became leaders in the ASA and other faith-based and secular organizations point to the importance of this conference in their professional development.[63] This movement had parallels within the professional scientific community.

Starting around 1997, new voices began to emerge to articulate the need for institutional transformation.[64] MIT issues related to gender equity gained national press after MIT women worked together to produce a report in 1999, and soon gender equity of women in science became a national issue that resulted in a new atmosphere that called for concrete goals and accountability.[65] The number of women appointed to the National Academy of Sciences has dramatically risen since that time.[66]

Reaching: 1999–2010

A second conference for Christian women in science was held in 2000.[67] The conference addressed a variety of issues that ranged from workplace challenges, to balancing work and home, to difficult biblical passages, to research and grant-writing. The 2000 ASA Annual Meeting included a session addressing the challenges of women.[68] The importance of the professional work of women scientists in the ASA gained visibility.[69]

The change in the status of women in the ASA was evident across the organization. In the newsletter, the number of references to women in Personals between 1999 and 2008 doubled from the previous 20 years (fig. 3). The number of women elected as Fellows steadily increased to 31% elected between 2000 and 2009 (table 2). The number of men elected remained at a relatively low number, leading to an increase in the representation of women. The number of women members began to rise significantly at the end of this decade (fig. 1 and fig. 2). This increase was represented in absolute numbers with 117 women in 2000 and 166 by 2010. Women were also more consistently being elected to the Executive Council and eventually women began to run successfully against men.

Structural Change: 2011–2020

The fourth wave of feminism began around 2008. The emphasis in this era was on addressing the structures that had failed to advance or protect women.[70] Karen Longman and Patricia Anderson, in their review of the literature on barriers facing women in leadership, provide insight into the general range of structural barriers facing women in organizations like the ASA.[71] Among the list of environmental or organizational barriers, they cite studies revealing the often male-normed organizational cultures can be unappealing to women: the difficulties faced by women in maintaining work-life balance due to lack of flexible structures; the challenges of tokenism; the exclusion that women still face from professional networking opportunities and access to mentors or role models.[72] Robin J. Ely and Deborah L. Rhode noted in a comprehensive encyclopedia article defining the challenges facing women in leadership that

"the problem of exclusion is compounded by organizational structures and practices that tend to reflect and support men's experiences."[73]

Barbara Kellerman and Deborah L. Rhode describe the assumptions built into the pipeline theory that assumes that the number of women will increase as they increase at the bottom of the pipeline:

> This [theory] presumes, first, that women and men have similar qualifications, once women are in the system, they will ascend to the top at a rate similar to that of men. It presumes, second, an absence of gender bias—namely, that no gender stereotypes will impede women's progress. The pipeline presumes, third, that in spite of the differences in gender, organizational systems and structures work as well for women as they do for men. Finally, it presumes patience—that women's equal representation at the top is simply a matter of time.[74]

In addition to these structural or environmental barriers for women, they also face internal barriers. Studies suggest that women may be less likely to act in self-promoting ways and to take the kinds of risks that lead to visibility.[75]

In addition to these environmental and internal barriers, Longman and Anderson noted "the influence of deeply held theological convictions about gender roles that overtly or subtly can deter women from considering or aspiring to leadership."[76] They suggest that role congruity theory can shed light on the nature of the challenges faced by women in the Christian organizational context. Role congruity theory attempts to explain how deeply embedded social patterns and assumptions about the roles of men and women can influence perceptions of individual performance and shape expectations that people have of themselves and others.[77] According to Longman and Anderson, this theory helps to explain the challenges faced by women attempting to navigate possibly conflicting role expectations, whether those be expectations stemming from their theological worldview or from the male-normed workplaces which they are trying to enter.[78] Thus women have to do double work to manage all the challenging internal and external barriers while progressing professionally.

Women need models whom they can identify with; and women need organizational programming that can let them bear the weight of family pressures, which fall disproportionately on women.[79] Barbara Reinhold says that, in her experience, "women inconvenienced by a company's rigidity of insensitivity to family-life issues are more likely to quit a job than to speak up and ask for what they need to make that job manageable."[80] The same is true for organizational membership, involvement, and service. For example, the Ecological Society of America found that when women organized sessions, the percentage of women presenting correlated with the percentage of women members and also led to the representative rate of publication in their journal.[81] The lack of childcare at their scientific meetings made it difficult for young mothers.[82] The challenge is reaching the critical mass needed to begin to change the culture of the organization. The consensus is that the percentage of members who have been marginalized needs to reach 25–30 percent in order for change to begin.[83]

The first major structural change in the ASA, the establishment of the Christian Women in Science (CWiS) affiliate, took place in 2013. CWiS invites women to join, and encourages women in their careers in STEM. This move was part of an overall directional change in the ASA that led to the re-emphasis on affiliate groups and regional chapter development. Lynn Billman was the pioneer whose visionary efforts led to the establishment of CWiS. One of her goals included being certain that at least one woman was elected to serve on the Executive Council of ASA making it "more diverse and more effective for twenty-first century leadership."[84] She also was diligent to establish links in CWiS between early and later career women in the ASA.

CWiS provides recruitment efforts, especially of graduate students and early career females, as well as supportive programs and mentors for women to consult as they undertake successful STEM careers.[85] The CWiS Board's vision included establishing special programs at the ASA annual meetings and initiating a CWiS blog and Facebook page for the ASA that became a reality with the founding of CWiS. The move to the online environment was a fundamental shift in accommodating the lives of women. The mission of CWiS, as restated in the 2022 strategic planning process, is to support Christian women who are interested in the integration of Christian faith and science, and to encourage them in their professional development and spiritual growth.[86]

The impact of CWiS on the number of women in the ASA was dramatic. Women members of the ASA made up 10.9 percent of the membership in 2010 with 166 individual women (fig. 1 and fig. 2). In 2013, the percentage grew to 39 percent, partially as a result of a decrease in the number of men as well as an increase of the number of women to 464. By 2020, the number of women in the ASA rose to 650, or 30 percent of the membership. While the percentage of women Fellows elected from 2010 to 2019 dropped from 31% to 26% from the previous decade, the absolute number of women increased from 9 to 17, or almost 100% (table 2).

The second structural change within the ASA related to the process for selection of individuals for the ASA Executive Council. Members of the executive council had traditionally been through an election process of two candidates running against each other, a practice not required by the bylaws. A change in practice was made starting in 2017 through an election process without multiple candidates. The decision was made to build a council based on the range of experiences that individual would bring to the council. This strength-based approach involves seeking a range of gifts that best serve the whole. An additional change, which did involve a change in the Constitution, was to increase the number of members on the council and to allow non-Fellows to serve on the executive council. The majority of council members are required to be Fellows. This change was adopted April 18, 2019. In 2020, after these changes, with multiple openings on the executive council, three women were elected to the executive council, making that executive council the most diverse in its history. It was in this same period that the ASA had its first female executive director, Leslie Wickman, who served in that role from 2016–2020.

The third structural change within the ASA that benefited women came with the pandemic. Traditionally, the ASA Annual Meeting had dominated programming. The move to multiple events and online programming created more opportunities for women to participate. This flexibility has been reinforced with the increased vibrancy of regional chapters.

Early in the history of the ASA, women were referred to as "lady members." The underlying database for membership continued to reflect this linguistic "marking" of women. In 2010, only women were marked in the database: they were listed as F for female. The column was blank for men. By 2013 and 2014, it appears that new members of both genders were being marked as either M or F. Only in 2015 did both get marked consistently, removing the final practice related to gender-marked cases.[87]

The dramatic increase of women in all aspects of the ASA between 2010 and 2020, primarily since 2013, is late in terms of the overall presence of women in STEM fields. Most of the growth nationally occurred in earlier decades. In fact, of all the science and engineering (S&E) degrees awarded in 2016, women earned about half of the bachelor's degrees, 44% of master's degrees, and 41% of doctorate degrees, about the same as in 2006.[88] Women in the ASA made up 30% of its membership by 2013.

Findings

This article explored the intersectionality of American culture related to women, the professional scientific community, the evangelical Christian community, and the history of women in the American Scientific Affiliation. This research explored how the ASA and its leaders saw and understood the challenges of women in the ASA and its parallels to issues of theology around women in the evangelical church. The research also compared the timing and data related to women in the ASA with general trends across the country and in professional scientific societies.

The history of women in the American Scientific Affiliation tracks very closely with the larger societal movement of feminism. The trends in the ASA around the status of women paralleled the larger societal trends, for example, in the use of inclusive language (table 3).

Rossiter's work on the growth of women in professional scientific societies also shows the parallels of the ASA with these institutions. The ASA appointed the first woman to its executive council, and then as its president, within the similar time period of many of these organizations. In contrast to these organizations, however, the ASA lagged behind by more than a decade in its attempts to increase women members, not making significant gains until after 2010. Structural barriers were also addressed much later than in other professional societies.

ASA newsletters illustrated arguments for the advancement of women that reflected the unique nature of the ASA, which sits at the intersection of faith and science. These arguments drew on empirical evidence, the professional credentials of individual scholars, historical evidence, and theology, showing parallels to the science-faith dialogue. In a few cases, the historic debates over science and faith were referenced when addressing the issue of women in the church and society, illustrating the parallel framing of the argumentation of the two issues.

The question remains as to why the late date for the increase in women members and the removal of structural barriers. What was there about the nature of the ASA that led to this? Several possibilities, unique to evangelical religious lenses, present themselves.

One explanation for underrepresentation of women so late in the history of the ASA is that the incongruence between the profession of science and the evangelical subculture was greater than that of the general society. We have virtually no research on the intersection of employment of women in science and the evangelical community over time. Could possible incongruence between scientific careers and the evangelical community have led to fewer women from within the evangelical sector of society going into science, or into the science-related workforce after higher education? If trained scientists, might these women have found little support for pursuing a profession? Likewise, might those who did pursue science, given this subculture, have been hesitant to associate with an organization that was confessionally Christian, choosing higher status societies, given their experiences as a professional woman in the church in general? Such incongruence could have been further exacerbated by the topical dominance of some issues—origins, for example—that might be of less interest to women. Some research shows that women tend to focus on topics with more direct impact on lives and communities.[89]

In comparison to secular professional science societies, the ASA was late in addressing structural issues that were barriers to the advancement of women. Research on evangelical culture finds that those in this tradition tend to be individualistic in perspective and worldview. The result is that evangelicals tend to see imperfections in society as the result of individual sin rather than structural in nature. Solutions to these imperfections are then also viewed through the lens of individual change, as opposed to institutional change.[90] This theological lens may have contributed to the late assessment of structural barriers within the ASA.

One unique aspect of the ASA, in comparison to other professional societies, is the element of "fellowship." The ASA Constitution includes the objective, "to provide a community of fellowship for Christians involved in science and related fields."[91] The ASA, along with the evangelical community, often ties this to the concept of "family." For example, in 1986 an article in the ASA newsletter reported:

> … many people of both sexes turned out for the showing of slides from last year's Oxford meeting and the two ASA tours of Europe. Taking that trip together introduced wives and families to other ASA members and perhaps gave them a greater sense of participation in ASA … It's one thing to arrange "something for the wives" as many groups do while husbands are busy at a meeting; it's another to think of ways to draw the whole "ASA family" together. But the latter seems a more ap-

Table 3: Summary of Women's Involvement in the American Scientific Affiliation

Marginal Involvement Pre-1961	Honorary Men 1961–1968	Incongruence 1969–1977	Increased Visibility 1978–1998	Reaching 1999–2010	Structural Change 2011–2020
No women members until 1949 5.5% women in 1956 Photos show early involvement of women Language of women members as exceptions	Gendered labels First Fellows, 4/53 Personals, 22/778 Pubs/Papers under 1%	Number of women members doubles, 50 to 100 Gendered labels disappear Regional leaders Personals up to 5% Pubs/Papers to 3-4% Fellows flat	Advocacy in the ASA newsletter Rise in national leadership Lack of progress in membership and Fellows	Women find each other Personals double Fellows and membership steadily increase Consistent presence on executive council	Fellows increased in absolute numbers Membership rose to 650 or 30% of membership First woman executive director Executive council with three women

> propriate goal for members of the Lord's family. We'll probably even learn something from each other. [92]

David Horn, in his book *Soulmates: Friendship, Fellowship & the Making of Christian Community*, makes the argument that evangelicals have not been careful about the use of language around different types of relationships. He says that relationships are different in the specialized language that characterizes them, in the conventions that define distinct patterns of behavior, and in their physical settings and contexts.[93] For example, Horn argues that the synonymous use of friendship and fellowship leads to misunderstandings and a failure to understand the true nature of fellowship. While friendship is exclusive, preferential, reciprocal, and involves a deep knowing of the other, Christian fellowship is nonexclusive, nonpreferential, and not necessarily mutual but, rather, self-giving.[94] The language and contexts in which friendship is lived out are different from that of fellowship. Someone may be part of your fellowship and become a friend, but to be in Christian fellowship with another does not require that they are a friend.

The synonymous use of the terms "family" and "fellowship" has some of the same problems, as described by Horn. The language of family implies a certain informality, obligation, and preferential status as friend. Likewise, in the evangelical community, especially since the 1970s, its use has been tied to an increased focus on the nuclear family and traditional gender roles. Thus, the use of family as synonymous with fellowship may have different emotional meaning for men and women.

Beth Barr traces the emphasis on family as a spiritual unit to the Reformation, when monasteries were dissolved. Within these pre-Reformational communities, women found agency; afterward, the family unit became paramount, and women were limited in their agency through their need to be under the protection of a family.[95] Thus, there are many ways in which the use of "family" is tied to the loss of agency for women, and a growth in the assumption that they must be married to be a whole person. Gallagher states that ordinary evangelicals place a high value on autocratic decision making, and resist careerism in an effort to prioritize family over work.[96]

This connotation of family with restrictions in professional advancement has not been confined to evangelicals. Rossiter reported how, in the 1950s and 1960s, record numbers of women obtained doctorates but were caught in anti-nepotism rules that restricted them to lesser positions.[97] Rossiter states, "One such woman described the scientific laboratory and its resident staff as a 'patriarchal household.'"[98]

The words "family" and "friendship" both present challenges to women as they try to construct professional relationships that are appropriate across gender lines. Research has shown that women thrive in contexts where a professional culture is evident because of the lack of ambiguity in trying to navigate relationships.[99] This professional culture helps construct clear boundaries around language and expectations, clarifying the context in which everyone is operating. The use of the term "fellowship" does not have the same challenges as family and friendship, according to Horn. Thus, the use of "family" language in the ASA may represent an incongruence with the lives of professional women, who already struggle to manage expectations within the evangelical subculture.

The use of "family" language also implies a highly relational institution. Organizations that are highly relational have been shown to inhibit the growth of diversity because they are organized by whom individuals know, as opposed to having clear institutional pathways to engagement. In other words, relationships are of value, but if they supplant policies and procedures, they impede engagement by those outside the known network; typically, those "outside" would be women if the network is male dominated historically. Thus, women thrive where there are high levels of professionalism, clear policies and procedures, and the intentional recognition of the diversity of their needs.[100] Reflection and a clear and renewed understanding that the members of the American Scientific Affiliation are a "fellowship of Christians involved in science," might be helpful for the development of a culture of radical hospitality.

Conclusions and Implications

This research explored the experience of women in the ASA who live at the intersection of American culture, the professional scientific community, and the Christian community. This history illustrates

how their experiences reflected the larger patterns of women in both American culture and the scientific community, while also uniquely exhibiting features that may be elements of North American evangelical Christian culture. Whether women are thriving or not in any organization or sphere, has been described as serving as the "canary in the coal mine," telling us whether the climate is safe and comfortable for all. If women are thriving, then a diverse group of individuals are usually thriving—men with spouses who are professionals, underrepresented groups, single parents, and others.

An essential element to all groups being able to enter and thrive in an organization is that the organization has clear policies and procedures and thinks about how to make structures inviting to everyone.[101] The ASA is an organization that desires to engage a broad range of perspectives. This research illustrates how the variety of demographic backgrounds and experiences needs to be incorporated into the organizational strategy to achieve its mission, a mission to create a fellowship of those curious about the natural world and amazed at God's creation; a fellowship of people who are courageous about asking hard questions about faith and science; and a fellowship that embodies intellectual humility, in which individuals stand in their beliefs with an attitude of willingness to reconsider opinions and evidence.

Notes

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[2]Program of The First Nationwide Convention THE AMERICAN SCIENTIFIC AFFILIATION of Wheaton College, Wheaton, Illinois, August 28, 29, and 30, 1946.

[3]Janel M. Curry-Roper, "A Christian Woman in Academe," *Priscilla Papers* 10, no. 1 (Winter 1996): 9–12, https://www.galaxie.com/article/pp10-1-03.

[4]Doyin Atewologun, "Intersectionality Theory and Practice," in *Oxford Research Encyclopedia* (2018), accessed February 16, 2023, https://doi.org/10.1093/acrefore/9780190224851.013.48.

[5]Margaret W. Rossiter, *Women Scientists in America: Struggles and Strategies to 1940* (Baltimore, MD: Johns Hopkins Press, 1982); Margaret W. Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972* (Baltimore, MD: Johns Hopkins University Press, 1995); and Margaret W. Rossiter, *Women Scientists in America: Forging a New World since 1972* (Baltimore, MD: Johns Hopkins University Press, 2012).

[6]Karen A. Foss, Sonja K. Foss, and Alena Amato Ruggerio, *Feminism in Practice* (Long Grove, IL: Waveland Press, 2022).

[7]Sally K. Gallagher, "The Marginalization of Evangelical Feminism," *Sociology of Religion* 65, no. 3 (2004): 215–37, 222, 226, https://doi.org/10.2307/3712250.

[8]Kristin Kobes Du Mez, *Jesus and John Wayne: How White Evangelicals Corrupted a Faith and Fractured a Nation* (New York: Liveright Publishing, 2020).

[9]Brad Christerson, M. Elizabeth Lewis Hall, and Shelly Cunningham, "Women Faculty at an Evangelical University: The Paradox of Religiously Driven Gender Inequalities and High Job Satisfaction," *Religion & Education* 39, no. 2 (2012): 202, https://doi.org/10.1080/15507394.2012.648574.

[10]Ibid., 220–21.

[11]Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972*, xiv.

[12]Ibid., 49.

[13]Joseph L. Spradley and Dorothy F. Chappell, "Wheaton Women in the Early ASA," *Perspectives on Science and Christian Faith* 44, no. 1 (1992): 23, https://www.asa3.org/ASA/PSCF/1992/PSCF3-92Complete.pdf; and ASA directories show no women in 1943, 1944, and 1948 directories. In 1949, there were 2 women and 94 men (2.1%); 1950, 5 women and 126 men (3.8%); 1951, 11 women and 195 men (5.4%); 1952, 17 women and 293 men (5.5%); and 1954, 21 women and 455 men (4.4%).

[14]Everest, *The American Scientific Affiliation: Its Growth and Early Development*, 39, 170, 43, 45, 179, 49, 52.

[15]Ibid.

[16]Anne Curzan, *Gender Shifts in the History of English* (Cambridge, UK: Cambridge University Press, 2003). This book is an extensive work on the history of language; it includes a discussion of the culturally or ideologically biased ways in which people treat supposedly "neutral" language.

[17]Francis D. Houghton, "News from Northern Delaware Section," *Newsletter of the American Scientific Affiliation* 3, no. 3 (May 1961): paragraph 4, https://www.asa3.org/ASA/topics/NewsLetter5960s/MAY61.html#VOL%203%20NUMBER%203.

[18]F. Alton Everest, ed., "Convention Depressions," *Newsletter of the American Scientific Affiliation* 5, no. 5 (September 1963): paragraph 3, https://www.asa3.org/ASA/topics/NewsLetter5960s/SEP63.html.

[19]The 1961 ASA directory listed 739 men/42 women (5.4%); the 1965 directory listed 776 men/36 women (4.4%); and the 1968 directory listed 1066 men/49 women (4.4%).

[20]Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972*, 307.

[21]Ibid.

[22]Spradley and Chappell, "Wheaton Women in the Early ASA," 23.

[23]Foss, Foss, and Amato Ruggerio, *Feminism in Practice*, 25–28.

[24]Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972*, 282.

[25]Anthony Martinez and Cheridan Christnacht, "Women Are Nearly Half of U.S. Workforce but Only 27% of STEM Workers," United States Census Bureau (January 26, 2021), Graph titled: Percentage of Women in STEM Jobs: 1970–2019, accessed February 28, 2023, https://www.census.gov/library/stories/2021/01/women-making-gains-in-stem-occupations-but-still-underrepresented.html; Catherine Hill, Christianne Corbett, and Andresse St. Rose, "Why So Few? Women in Science, Technology, Engineering, and Mathematics," *AAUW: Education and Training* (2010): 15, Figure 11: Women in Selected STEM

Occupations, 1960–2000, accessed February 16, 2023, https://www.aauw.org/resources/research/the-stem-gap/.

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[27]Walter Hearn, ed., "Our Tribute to Women's Lib," *Newsletter of the American Scientific Affiliation* 12, no. 5 (October 1970): 1, https://www.asa3.org/ASA/topics/NewsLetter70s/OCT70.html.

[28]Walter Hearn, ed., "Local Section Activities: Chicago," *Newsletter of the American Scientific Affiliation* 16, no. 3 (June 1974): 7, https://www.asa3.org/ASA/topics/NewsLetter70s/JUN74.html.

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[30]Walter Hearn, ed., "Local Section Activities: Southeastern Michigan and North Central," *Newsletter of the American Scientific Affiliation* 17, no. 3 (June 1975): 9, https://www.asa3.org/ASA/topics/NewsLetter70s/JUN75.html; Walter Hearn, ed., "Basic Integration vs. Piecemeal Reporting," *Newsletter of the American Scientific Affiliation – Canadian Scientific and Christian Affiliation* (hereafter, *Newsletter of the ASA & CSCA*) 18, no. 5 (October 1976): 2–4, 10, https://www.asa3.org/ASA/topics/NewsLetter70s/OCT76.html; and Walter Hearn, ed., "How to Start Something No. 27. Miriam Ross," *Newsletter of the ASA & CSCA* 18, no. 4 (August 1976): 2–3, https://www.asa3.org/ASA/topics/NewsLetter70s/AUG76.html.

[31]Walter Hearn, ed., "We Can't Read 'Em All ...," *Newsletter of the ASA & CSCA* 18, no. 4 (August 1976): 5, paragraph 6, "Finally a new little magazine …," https://www.asa3.org/ASA/topics/NewsLetter70s/AUG76.html.

[32]Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972*, 309.

[33]Ibid., 309.

[34]Spradley and Chappell, "Wheaton Women in the Early ASA," 23. Our more recent analysis estimated for 1992 showed 8.7%.

[35]Hill, Corbett, and St. Rose, "Why So Few?," 15, Figure 11: Women in Selected STEM Occupations, 1960–2000.

[36]Foss, Foss, and Amato Ruggerio, *Feminism in Practice*, 29–30.

[37]Walter Hearn, ed., "Now Let's Hear It for the Men," *Newsletter of the ASA & CSCA* 21, no. 1 (February/March 1979): 6, https://www.asa3.org/ASA/topics/NewsLetter70s/FEBMAR79.html.

[38]Walter Hearn, ed., "Male and Female He Created Us," *Newsletter of the ASA & CSCA* 21, no. 6 (December 1979/January 1980): 1–2, https://www.asa3.org/ASA/topics/NewsLetter70s/DEC79JAN80.html.

[39]Ibid.

[40]Hearn, ed., "The One that Got Away: Marie Berg," *Newsletter of the ASA & CSCA* 22, no. 1 (February/March 1980): 1–2.

[41]Walter Hearn, ed., "Balancing Act," *Newsletter of the ASA & CSCA* 22, no. 3 (June/July 1980): 3–4, https://www.asa3.org/ASA/topics/NewsLetter80s/JUNJUL80.html.

[42]Ibid.

[43]Ibid.

[44]Walter Hearn, ed., "But We're Also Feminists," *Newsletter of the ASA & CSCA* 23, no. 3 (JUN/JUL 1981): 7–8, https://www.asa3.org/ASA/topics/NewsLetter80s/JUNJUL81.html.

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[48]Hearn, ed., "Male and Female He Created Us."

[49]Rossiter, *Women Scientists in America: Forging a New World since 1972,* 236.

[50]Ibid.

[51]Ibid. See table 12.1 which lists women presidents of selected scientific organizations, 1971–2000.

[52]Spradley and Chappell, "Wheaton Women in the Early ASA," 23.

[53]Hill, Corbett, and St. Rose, "Why So Few?," 15, Figure 11: Women in Selected STEM Occupations, 1960–2000.

[54]Rossiter, *Women Scientists in America: Forging a New World since 1972*, 32, 36, loc4589.

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[57]Foss, Foss, and Amato Ruggerio, *Feminism in Practice*, 32–35.

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[82]Ibid., 245.

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Twenty-Five ASA Fellows and Editors Tell of *PSCF* Articles That Changed Their Lives

Every breath counts, as does every article that has appeared in the 75 years of *PSCF*. Each article has convinced the author, peer reviewers, and editor that it is clear, well informed, new, and important. Reading them consistently has been like breathing. One does not necessarily remember every specific breath, but each one adds to sustaining and forming and empowering life and service.

We do sometimes remember, though, a particular breath that was bracing and exhilarating such as salt air when arriving at an ocean beach, fresh-baked bread in the winter, the first mown grass in the spring, or a waft of honeysuckle in the summer. As individuals in different disciplines, living in different contexts, different articles have meant the most to each of us. I have asked each of the ASA Fellows and editors to remember one such article that struck them at the time, and if it still speaks to them vividly now.

No doubt, different contexts over the coming years might bring to mind other articles, but the following is a snapshot of what today they remember as particularly noteworthy in their own walk. It should be noted that Fellows, who all have marked accomplishments to be named Fellows, will of course tend to be well into their years of service. Many articles they cite as most influential were often read in their most formative decades. We do not know which articles now being read by current members in their 20s, 30s, and 40s will be cited as most important to them when they reach the life achievement level of Fellows.

The articles that follow are listed in chronological order—from sixty years ago, right up to 2022.

As editor, I am partial to every piece that has been published in *PSCF*. But what follows is an opportunity for ASA Fellows and editors to celebrate particular essays that have piqued their interest, even changed their lives, and no doubt the lives of other readers too.

James C. Peterson
Editor-in-Chief

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1964, 1976

V. Elving Anderson, "Christian Commitment and the Scientist," ***JASA*** **16, no. 1 (1964): 8–9;** and **Richard H. Bube, "The Philosophy and Practice of Science,"** ***JASA*** **28, no. 3 (1976): 127–32.**

As a researcher, reading the scientific literature in my field is routine. It is a necessary part of mastering the current paradigms in order to allow one's own work to build upon and improve upon what is established. This same approach has applied to my posture toward *Perspectives on Science and Christian Faith (PSCF)* since first encountering it. *PSCF* has been a constant in my desire to be current in the science and faith conversation.

As a biology undergraduate and a follower of Jesus Christ, in the 1980s I struggled to find resources supportive of a high view of scripture, and a responsible approach to scientific evidence. The *Journal of the American Scientific Affiliation* (*JASA*) was in existence, but I didn't find it. Instead, I was inundated with young earth creationist literature that did not make sense to me scientifically.

This longing remained with me when I began graduate studies in cell and developmental biology at the University of Minnesota in 1988. In God's providence, at that time I had the privilege of meeting Dr. Elving Anderson, nationally known neuroscientist and brain and mind researcher, who was also a member of the ASA. Elving introduced me to the ASA, and generously shared his books and his complete set of paper copies of *JASA* with me. I still recall sitting on the floor of his office, poring over past issues of the journal. I had finally found answers to my questions about science and faith.

As I read through the issues, I took note of a series in the journal titled "Science and the Whole Person," by then *JASA* Editor Dr. Richard Bube. In those essays, Bube teased apart paradoxes, and apparent contradictions, in the science and faith dialogue, with the skill of a literary surgeon. His essays touched on topics as wide ranging as miracles, determinism, abortion, predestination, and prayer. He typically included topics for discussion at the end, demonstrating that he didn't have all the answers, thus modeling an open posture toward the beliefs he advanced. The series ran in every quarterly issue for seven years.

Richard Bube was professor in the Department of Material Science and Electrical Engineering at Stanford University, with over three hundred scientific publications to his credit. During that time of such prolific scientific productivity, he served as editor for the then *Journal of the American Scientific Affiliation* (now *Perspectives on Science and Christian Faith*) for fourteen years. One essay that left the most lasting impression on me was "The Philosophy and Practice of Science" (September 1976), in which Bube expounded on his view of the integration of what he termed "authentic science" and "authentic theology." I have referred to that essay or some aspect of it continually ever since first reading it over thirty years ago. It has become a science and theology paradigm for me.

After familiarizing myself with the ASA through the journal, and becoming a member, Elving Anderson went on to encourage me, as a young graduate student, to submit an abstract for the upcoming ASA meeting, the 50th anniversary meeting at Wheaton College (1991). At that first meeting, at one of the evening meals, I suddenly realized that the man whose essays I had been reading, Dick Bube, was in attendance. I was awestruck. Eventually I screwed up the courage to introduce myself to him, and in his gracious manner, he invited me to join him for the meal. This began a friendship that lasted until he died. Through the journal, and eventually through his life, Dick Bube had changed my life.

Perspectives on Science and Christian Faith is one of the premier journals in the science and faith scholarly world. From the time Elving Anderson introduced me to the journal, it became a source of information and inspiration. When I began, I had a lot of catching up to do, so from 1990 to 2012, I read every issue in its entirety. To the present, I read at least a few articles in every issue in detail and skim all the rest. This is how the ASA became one of the most important organizations in my life, and *PSCF* became one of my must-read journals.

Mark Strand, North Dakota State University, Fargo, North Dakota.

Article

Twenty-Five ASA Fellows and Editors Tell of PSCF *Articles That Changed Their Lives*

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1971

Bernard Ramm, "Evangelical Theology and Technological Shock," *JASA* 23, no. 2 (1971): 52–56.

As a young Christian in the early 1960s, the framework for my thinking on the relationship between science and faith was molded by Bernard Ramm's book, *The Christian View of Science and Scripture* (1954). Consequently, when several years later I encountered his article "Evangelical Theology and Technological Shock" in the ASA journal (*JASA* 23, no. 2 (1971): 52–56), I was eager to see how he coped with the burgeoning new technologies.

I was immediately struck by his comment that, in the past, the evangelical response to any new scientific idea had gone through the same pattern: following its announcement, it was denounced, but was eventually absorbed into evangelical theology. For Ramm this was tragic. Evangelicals should seek to anticipate what is coming and formulate theological responses in advance of new scientific developments.

In undertaking this task, Ramm admits he is a theologian and has to rely on scientists for the requisite information and prognostications. This takes him into a plethora of areas, many of which have been assessed, and in some cases dismissed, over the intervening fifty years. Ones that caught my attention included cloning, sperm and ovum banks, organ transplantation and brain (mental) death, genetic engineering, chemical and surgical alteration of behavior, and biologically generated increases in life expectancy.

Looking at this 1971 article today, I was struck by the state of the science and the manner in which science popularizers expected them to influence society. Ramm's dependence upon them meant he had to place too much store by their interpretations. And so, helpful as Ramm was, his lack of scientific nous proved a disadvantage. If only more Christian scientists had been available to dialogue with him. Nevertheless, Ramm was a sterling example of a theologian who takes scientific activity and thinking seriously. He paid it respect and regarded it as a legitimate contributor to Christian thinking in the contemporary world.

Ramm, very perceptively, wanted the church to be prepared for forthcoming developments and their implications. Inevitably, though, there is danger in this type of forward thinking since it is associated with speculation and on occasion with grandiose claims. This is where dialogue between theologians, and scientists seeking to be informed by Christian values, comes to the fore.

It is fascinating to reflect on the optimism of those commenting on the scientific developments, and how ill-founded some turned out to be. We are told that people will shop for the kind of child they want; during reproduction, they will be able to eliminate all unwanted genetic traits; and they will have at their disposal chemical bullets to control love, hate, and morality. While it is easy to dismiss these claims as extravagant, each of them contains a grain of truth and we live with their heirs. Ramm was correct in taking them seriously, but a critical eye informed by scientific reality and biblical directives is essential.

At certain points Ramm pushed the theological implications too far. For instance, he argues for the need for a new theology of the Holy Spirit, based on developments in the behavioral sciences and psychiatry. This is because he sees no ceiling to the control, shaping, and modulation of human behavior in a future technologically dominated world. His aim is to understand the continuity of the work of the Holy Spirit with human technological control over nature. While his intentions are good, he may have been giving too much to optimistic interpretations of technological innovations.

And yet Ramm is far from smitten by technology, since he is concerned that it will lead to excessive degrees of automation that, in turn, will usher in a society where people retire at 50. Technology will, he argues, plunge us into a pandemic of apathy and a loss of meaning of life. The answer for Ramm is the Christian Church with its message of life's meaning in Christ.

While there is much in Ramm's analysis that suffers from the passage of time and his undue reliance upon science writers with their unalloyed pleasure at the marvels of the technological bliss to come, he is prepared to engage with this world. Some of the future possibilities will not come to pass, and some may seriously lead us astray. But it is important to keep in contact with the claims and counterclaims.

Otherwise, Christians will be on a path of blissful ignorance, ignoring the trends and challenges around them, and failing to cast a Christ-centered eye over them. Ramm is to be congratulated for showing the relevance of theology and that some theologians are open to ongoing debate over science and its implications.

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1973

Carl E. Armerding, "Biblical Perspectives on the Ecology Crisis," *JASA* 25, no. 1 (1973): 4–9.

I first ran into the journal in a college library. I have long been something of a library hound, enjoying a fine collection and walking the shelves to see what might look interesting. I was a transfer to a Christian college from two secular colleges, and had not even heard of any such thing as "Christian scholarship" or "faith and learning," being a recent convert to Christianity from a background in math and physical sciences. The *JASA/PSCF* ("the journal" herein) was displayed in the new issues rack near the entrance. Imagine how wonderful it was for a young Christian with my background to run into an entire *journal*, a whole *association*, devoted to this new idea that robust Christian faith and serious, academic and scientific research and inquiry can and should belong together! While I could not afford to go to any conferences, I did read each new issue with great interest, and perused the back issues in the serials collection. The library had the entire print set, I was happy to discover.

I used the journal as a kind of introduction to the field of science and Christian theology. Often I would find an author introduced, or a footnote to a standard work, in its pages. That would send me to the card catalog (!) (soon to be the computer terminal), to seek other works by the same author. Sometimes I would find the book itself in the good old Southern California College library (now Vanguard University). The librarians were friendly and helpful, offering to order books from other libraries if they did not have it. Looking back, I am sure they found it odd to find a student who would come across a journal, and start to read it right away. I did that a lot with the journal, new issues and old volumes alike.

It was in the pages of the journal that I was introduced to important topics. Serious and learned debate about origins and evolution was there, to be sure, but also discussion about a range of scientific issues I simply had never thought of from a faith perspective. Looking back at those issues in the 1970s and 1980s, I see some old friends and much respected scholars and authors I first discovered there. Bernard Ramm, Ron Numbers, Richard Bube, Al Plantinga, J. W. Haas, George Murphy, and Mary Stewart Van Leeuwen were scholars I would learn from for a long time, in articles and in important books. New areas of science and theology were also found in its pages, or at least, new to me! Grounded in the physical sciences, I first learned about the Bible and our ecological crisis in an article from 1973 by Carl Armerding (a fine OT scholar as I later discovered). Then of course I had to go back and read the articles he was responding to (by Kenneth Hare and Richard Wright).

In the journal I also discovered that the social sciences, too, can and should be integrated or in dialogue with Christian theology and sacred scripture. In short, reading the pages of the journal was an access point for theology and the sciences. Thinking back to those days, I am grateful to God, and to these early Christian authors, scholars, editors and others, who created in the journal a forum for scholarly, thoughtful, engaging, and respectful dialogue in an area of research and learning I would spend many decades enjoying. Thank you!

Alan G. Padgett, Luther Seminary, St Paul, Minnesota.

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1979

Davis A. Young, "Flood Geology Is Uniformitarian!" *JASA* 31, no. 3 (1979): 146–52.

A coworker at the major oil company where I worked handed me a dog-eared and underlined copy of an article from the *Journal of the American Scientific Affiliation*. It was not my introduction to the author, Davis Young, whose book *Creation and the Flood* (Baker, 1977), I had recently read. But "Flood Geology Is Uniformitarian!" was my introduction to the ASA and its journal. Now, uniformitarianism presumes that Earth history can be interpreted from the study of rocks having formed by presently

observable geologic processes, or otherwise by processes conforming to natural laws and conditions. Young Earth Creationism and flood geology presume unfamiliar catastrophic and often miraculous (unnatural) interventions.

The relatively short article provided both philosophical and historical contexts to the propositional concerns that mainstream geologists, including Christians like me, have with flood geology as promoted by its advocates. Using their examples, Young explained how flood geologists misunderstood the practical meaning and application of uniformitarianism in their rejection of mainstream geological interpretations and their catastrophist re-interpretations. He also responded to their theological proposition that uniformitarian was, at its base, unbiblical. His historical review distinguished methodological uniformitarianism, as practiced by mainstream geologists, from substantive uniformitarianism, a variant that would presume no catastrophic processes in the formation of rocks or landscapes. Young states,

> The fact of the matter is that flood catastrophists spend considerable effort in beating a dead horse, because it is highly questionable whether any significant number of geologists has held to anything like substantive uniformitarianism for a number of years. (p. 149)

Of historical note, the discovery of the global deposit of meteoric "dust" attributed to the mass extinction of the dinosaurs some 66 million years ago would be published in 1980. The Chicxulub Impact has become the posterchild for methodological uniformitarianism that embraces the possibility of natural catastrophe, even worldwide.

Finally, Young provides examples of how flood geology is full of uniformitarian applications, in its advocates' interpretations of various geological features, such as fossil graveyards and submarine debris flow deposits (turbidities). And when all else fails, Young points out the biblical catastrophists' regular appeal to miracle, in order to compress the geologic timescale from billions to thousands of years duration.

This article appears to be Davis Young's first in *JASA*. His articles effectively advanced earlier journal contributions pertaining to the geosciences by Laurence Kulp (1950s), William Tanner (1960s), and Daniel Wonderly (1970s). More recently, Keith Miller and Carol Hill are geologists who have written provocative *PSCF* articles that advance the geoscience-faith dialog yet further.

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1984

Conrad Hyers, "Dinosaur Religion: On Interpreting and Misinterpreting the Creation Texts," *JASA* 36, no. 3 (1984): 142–48, and **Conrad Hyers, "The Narrative Form of Genesis 1: Cosmogenic, Yes; Scientific, No," *JASA* 36, no. 4 (1984): 208–15.**

I still remember when the September 1984 issue of what was then called the *Journal of the American Scientific Affiliation* arrived in my mailbox. We had just moved to Nashville for my first academic job after defending my dissertation at Indiana University in August. My initial thought was, I'm glad the ASA got my address change processed in time for this issue. On the way back to our apartment, I glanced at the table of contents on the back cover and quickly noticed an article called "Dinosaur Religion: On Interpreting and Misinterpreting the Creation Texts," by an author I did not recognize, Conrad Hyers. Oh well, I thought, an article attacking creationism. I was hoping for something different. Maybe I'll read it, maybe I won't.

I decided to read it—and I couldn't put it down. It was all new to me, and it transformed my thinking right down to this day. Once I started teaching students at Messiah about science and the Bible a few years later, I assigned it in every course where it topically fit.

As it happens, I never met Hyers, a Presbyterian minister with a doctorate from Princeton Seminary who taught religion for many years at Gustavus Adolphus College. If I had, I would have told him how important his article was to me and my students—many of whom responded to it just as I did: these ideas are really important. Why haven't I heard this before? Although he did not use terminology associated with the "Framework View" of Genesis, that is basically what he believed (a second article of his published in the next issue nails this down). What

struck me most, was his emphasis on what Genesis is really about:

> … a radical and sweeping affirmation of monotheism vis-a-vis polytheism, syncretism and idolatry. Each day of creation takes on two principal categories of divinity in the pantheons of the day, and declares that these are not gods at all, but creatures—creations of the one true God who is the only one, without a second or third. Each day dismisses an additional cluster of deities, arranged in a cosmological and symmetrical order. (p. 147)

To borrow words from St. Luke, scales fell from my eyes. Suddenly I understood that all the commotion about the day-age theory, the gap theory, and recent creation in six literal days was just so much noise. None of that had anything to do with what God was telling us here.

I still don't know why I hadn't heard that before. Bernard Ramm, whose seminal book, *The Christian View of Science and Scripture* (1954), had hitherto been the single most important guide to my thinking about origins, had advocated the "pictorial-day interpretation," a type of "moderate concordism" in which "geology and Genesis tell in broad outline the same story." That's about as close as I could remember to Hyers's view. It's not all that close. For Hyers, Genesis does not even attempt to tell anything remotely like a scientific story: it's about religion, not science.

In nearly forty years since that moment of discovery, I've learned that historical and literary context are crucially important for understanding any text, especially a biblical text. Hyers placed Genesis fully within the worldview of the Ancient Near East. God told the Hebrews exactly what they needed to hear, embedding the crucial message of monotheism in a type of literature they already understood, tweaking elements of existing creation stories to proclaim a profound message that denied the common claims of all those other stories: nothing you see is divine, not even the Sun, the Moon, or the stars overhead. I made them all. Worship me, not them.

What about "dinosaur religion," the words that first got my attention? Here's how Hyers used that term: "When certain scientists suggest that the religious accounts of creation are now outmoded and superceded by modern scientific accounts of things, this is 'dinosaur religion'" (p. 143). He wrote this before Richard Dawkins became the devil's chaplain, before Stephen Hawking was world famous, and before people started talking about the "New Atheism." Once again, Hyers was spot on target. If dinosaurs evolved into birds, they are in some sense still around. Dinosaur religion certainly is. My debt to Conrad Hyers is ongoing.

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1985

COLIN J. HUMPHREYS and W. GRAEME WADDINGTON, "The Date of the Crucifixion," *JASA* 37, no. 1 (1985): 2–10.

One of the more delightful papers that I encountered in *PSCF*—and one that I still recall from time to time—was a paper by Colin Humphreys and Graeme Waddington on dating the crucifixion of Christ.

This interesting paper made use of celestial mechanics, in conjunction with biblical texts and with what is known as reliable history, to propose that Jesus's crucifixion took place on Friday, 3 April, AD 33. Other dates had been suggested in the past, and (until this paper) there seemed to be no reliable means of further adjudicating between them. What Humphreys and Waddington did was to break this logjam by taking seriously a phrase in the book of Acts quoting the prophet Joel and seeing if our knowledge of celestial mechanics could shed any further light on this issue.

The passage, quoted by Peter at Pentecost, refers to the sun turning to darkness and the moon turning to blood before the great and glorious day of the Lord will come. Rather than interpreting this metaphorically, Humphreys and Waddington note that this is a good description of a lunar eclipse, and that such phraseology (moon turning to blood) appears in other historical documents (for example, after Alexander the Great crossed the Tigris River in 331 BC). The two authors then use celestial mechanics to determine all lunar eclipses between AD 26–33 (the largest range of years during which Jesus could have been crucified) and determined that only one lunar eclipse was visible at Passover time from Jerusalem, and that it occurred on Friday, 3 April, AD 33.

Why do I like this paper? This novel interdisciplinary conjunction of various lines of research provides us with important additional evidence of the historicity of Jesus's crucifixion. The specificity of the date highlights the reality of the crucifixion, reminding me (and I hope all Christians), that our faith is based not only on abstract ideas, but on actual historical events. It is also a reminder that while the perils of taking scripture too literally are well known, sometimes we perhaps don't take it literally enough!

Robert Mann, University of Waterloo, Ontario, Canada.

DOI: https://doi.org/10.56315/PSCF9-23Miller

1990

George L. Murphy, "Chiasmic Cosmology as the Context for Bioethics," ***PSCF*** **42, no. 2 (1990): 94–99.**

One of the things that I appreciate most about the journal is its breadth of coverage. It provides insight into disciplines outside of my specialization that nonetheless have important bearing on broader theological and philosophical questions. As a paleontologist and evolutionary creationist, my studies raise important questions about the place of suffering and death in the created order, the nature of humanity as God's image bearers, and how we view the lives and bodies of human persons.

I will highlight three individuals whose writings in the journal have been important in my own thinking. Early in my involvement with the ASA, I found the perspectives of George Murphy to be very helpful in providing a theological context for understanding the evolutionary process. His focus on a Christ-centered cosmology provided a very helpful way to understand the ubiquitous presence of death throughout creation. The Creator is the Crucified, and all of creation reflects the pattern of life out of death. This emphasis on the cross also resonates with Murphy's understanding of *creatio ex nihilo*. God brings about new things where there seems to be no possibility—out of nothing.

I have always been very impressed with the honesty and faithfulness with which Gareth Jones has dealt with the very difficult and intensely emotional questions that surround the beginning and end of life. These ethical and theological questions are rooted in how we understand our humanity and the image of God. Evolution forces us to think more deeply about how humans image God, and the biology of human development and the impairments at the end of life, challenge us to think how to honor that image in individual persons from conception to death.

More recently, the work of Malcolm Jeeves in neuroscience and evolutionary psychology has been very helpful to me in working through the relationship between our "soulishness" and our physical bodies. Central to this is the debate between a dualistic or monistic understanding of persons. I have found his "non-reductionist physicalism" provides a way to acknowledge the growing understanding of the role of brain activity in what we perceive as aspects of our souls, while avoiding a reductionist view that our spiritual experience is "nothing but" the firing of neurons.

The writings of these three individuals, with very different disciplinary expertise, have all contributed to my growth as a scientist and as a Christian.

Keith B. Miller, formerly of Kansas State University, Manhattan, Kansas.

DOI: https://doi.org/10.56315/PSCF9-23Seifert

1994, 1995

James Patton Clark, "Fact, Faith, and Philosophy: One Step Toward Understanding the Conflict between Science and Christianity," ***PSCF*** **46, no. 4 (1994): 242–52;** and **Nate Olson, "On Clark,"** ***PSCF*** **47, no. 2 (1995): 148.**

I began teaching psychological science courses in 1990 at a secular university in Ohio, and then headed over to Malone University as an Assistant Professor in 1994. There, Provost Ronald G. Johnson (who is a physicist by training) was keen to foster my integration of faith with scholarship. So, he introduced me to the American Scientific Affiliation's (ASA) *Perspectives on Science and Christian Faith (PSCF)*.

As a research methodologist, my focus has been on helping students and other researchers develop and refine techniques to test predictions. Early in my days as a professor, I commenced by asking them two questions: (1) "What's the research question?," and (2) "What is your hypothesis?"

In 1994, an essay by James Patton Clark in *PSCF* catalyzed a two-decade transformation in my manner of teaching science. A reply by Nate Olson in 1995 fostered my understanding about some of the big mistakes that scientists make (whether of faith, agnostic, or atheist) when approaching a research question. As Clark asks when considering the strife between science and Christian faith, "Hasn't science explained the things that used to be explained by invoking God?" (attributing this question to secular scientists). He explores part of the "speaking past each other" that scientists of faith, and those without, do. They fail to apprehend the presuppositions of "the other." At my first reading of Clark's paper, I thought, "There you go. We are talking past each other."

My students were learning and demonstrating acumen for research; we began with a research question. They generated hypotheses, tested them, and analyzed the data … just as the best textbooks suggest. Nevertheless, many of them did not care about their research findings, and it became commonplace for students to negate their own results in their final reports. "Well, my study was well-constructed, but my findings were not statistically significant. However, I think this is just an accident, because I really do believe my prediction that [BLANK] is true."

Year after year, I have had this experience and some feelings of failure as a science professor. How could students master the careful, stringent techniques of behavioral research without trusting them? They learned about Kuhn's protestation against all science as "normal science" and epiphany that some advances come about through paradigm shifts. I taught them about good research and the nature of change in science from slow advances to paradigm shifts. They were versed in the terms and how to apply them. So, why didn't they have faith in their own findings?

At some point, I went back to Clark's and Olson's essays and began to think that my folly was in *starting at the beginning* of the research study with my students, rather than *starting before the beginning*. According to Clark, naturalism rules science and includes the assumption that all things commit to the natural laws of the natural world. Adding Olson's view, not only do we need to understand each other's pre-suppositions (à la Clark), but we must comprehend that *everyone has a creation story*, i.e., a set of ideas about what exists and how it came into being. After years piloting various pedagogies, around 2014 I had a moment of clarity about this as it pertains to teaching: *start before the beginning and learn what your students believe about the world.* What do they think is real? Why do they think it is real? Explore this with them, and it will help them (and you) to capture the essence of their orientation to life … and to research. Once this happens, help students find the best research orientation for their own investigations (whether traditional/conventional, action research, phenomenological, or other).

This opens the door for trusting research. Having a foundational understanding of varied epistemologies may open Christian minds to more fully comprehend an atheist's perspective, and this may improve communication between those of faith and those without. As a bonus, it seems to open students' minds to the possibility that there are other ways of knowing, and this can add willingness in those who do not have faith to hear that God may actually exist outside of natural laws, and may have created them.

I am thankful to Ron Johnson for introducing me to the ASA. Moreover, I am grateful for the quality of *PSCF* and the opportunity to learn from other scholars of faith.

Lauren S. Seifert, Malone University, Canton, Ohio.

DOI: https://doi.org/10.56315/PSCF9-23Jelsma

1996

Meredith G. Kline, "Space and Time in the Genesis Cosmogony," *PSCF* 48, no. 1 (1996): 2–15.

It was the spring of 1996. I was transitioning from full-time research to undergraduate teaching. I was visiting the campus of the institution where I would be their first biology professor, starting up a new program. During my visit, I had some down time, so I went to their small library to see what they had. I noticed the spring issue of *PSCF*, so I picked it up, leafed through it, and found Meredith Kline's article outlining his Framework interpretation of Genesis 1. At the time I had been struggling to reconcile my literal interpretation of Genesis 1 with the science that seemed to point to an old earth. What was so

impactful about this article was that it shattered my impression that a nonliteral interpretation simply dismisses what the Bible says in these early chapters of Genesis. Instead, I found a far deeper and richer explanation of the text than I had ever seen.

I ended up getting the position and one of the courses I developed dealt with evolution. This Kline article was one of the readings for the class. Over 25 years later, I am still teaching a course on origins and the Kline article is still on the reading list, along with several other *PSCF* articles. I have found *PSCF* to be a tremendous resource for Christians navigating their way through difficult topics in a way that attempts to do justice both to scripture and science, God's two ways of revealing himself in the world.

Tony Jelsma, Dordt University, Sioux Center, Iowa.

DOI: https://doi.org/10.56315/PSCF9-23Gonzalez

1997

Keith B. and Ruth Douglas Miller, "Taking the Road Less Traveled: Reflections on Entering Careers in Science," ***PSCF*** **49, no. 4 (1997): 212–14.**

I learned about the American Scientific Affiliation in 1997, three years after graduating as a biologist from a state university in Peru. At that time, I worked as a science professor in a high school in Lima and volunteered at a nature conservation association. There were few opportunities for biologists, so I wasn't sure if I should either pursue graduate studies that would enhance my research abilities, or dedicate my life to children's education. After becoming an ASA member, I loved reading about evolution, astronomy, human origins, and other topics Christian scientists wrote about in the *PSCF* journal. One of the first articles I read was a short reflection in the young scientists' corner, "Taking the Road Less Traveled: Reflections on Entering Careers in Science," by Keith and Ruth Miller. Their road less traveled was pursuing careers in science as a Christian calling.

As a Christian, I always have had a passion for God and nature. But at that time, I struggled to see the connection between my faith and the academic world. The only connection available between my evangelical faith and science in the church was the teaching of the young earth creationists (YEC). As the Millers described in their article, I saw in my local church how science was considered an apologetic tool to contradict evolution and not for proper stewardship of creation. I had much comfort in doing this stewardship of creation because that was a better connection between science and faith than YEC, and I had failed miserably trying to be a YEC apologist. It was good that ASA changed my mind!

As the Millers, I was part of the equivalent of the InterVarsity Christian Fellowship at the university where I earned my undergraduate degree in Peru. I also had a role model, a Christian professor who taught botany. I was able to do research with him. "How good and pleasant it is when God's people live together in unity!" (Psalm 133:1). That unity of mind means for me knowing that God is the creator and that he is not just in our religious life but in all aspects of our lives. I lived this experience at Bible study groups at the university and the first time I attended an ASA meeting in 1999. The Millers also mentioned that graduate school studies are more focused and serious. The eager pursuit of truth in a holistic sense that they described, motivated me to start graduate studies in 1998. Even though I was very busy as a graduate student, I found Christian community that honors the life of the mind. As the authors narrated, I also learned about the diversity of the body of Christ, considering different theological positions.

Almost at the end of their article, the Millers place three challenges for the evangelical church in the United States: (1) Let the youth be professionals and serve God with their talents, (2) Value divergent viewpoints that are tangential to the core Christian beliefs, and (3) Encourage reflection about faith and the current world situation. These challenges could be applied well to the church in Latin American countries and elsewhere. I welcome these challenges and hope our churches now accept them, too.

The final words of encouragement in the Millers' article were vital to make my decision to pursue graduate studies and get more into research. "In studying the processes of the natural world, you are watching the hand of God at work. By striving to understand the workings of creation, you are equipping yourself to fulfill the stewardship mandate given to us by God."

After 26 years, I am honored to be part of ASA, a scientific and Christian community that honors Jesus

and the study of his creation. I am still working in education at a university level and researching natural sciences. I thank God and the Millers for all their essay meant to me.

Oscar Gonzalez, Anderson University, Anderson, South Carolina.

DOI: https://doi.org/10.56315/PSCF9-23Greuel

2001

Peter Rüst (Ruest), "Creative Providence in Biology," *PSCF* 53, no. 3 (2001): 179–83.

Ever since I came to faith in Christ as a sophomore in high school, I have been convinced of God's loving care for me, his provision for my needs, and his guidance in my everyday life. At specific moments in my life, the timing of certain events, the awareness of key insights at the right time, or the provision of specific resources or opportunities just when they were needed were so extraordinary that I knew without a doubt that they were "God things" rather than just the products of my own wisdom and resourcefulness, the generosity of others, or blind luck. No violations of natural law characterized any of these cases—just an impeccable timing that convinced me these were the product of divine actions. There are many passages of scripture I could point to that are consistent with this conclusion (e.g., Prov. 3:5–6; Matt. 6:25–34; Matt. 7:7–11; Phil. 4:19).

I have long held the view that God, as Creator and Sustainer of all that exists, designed the universe so that physical structures (galaxies, stars, planets) formed and complex biological organisms (bacteria, amphibians, reptiles, humans, etc.) evolved by natural processes according to the very laws he created. But exactly how do we describe the mode of divine action in this evolutionary creation (i.e., theistic evolution) model for God's creation of living things? Were the physical properties of matter and the natural laws that God created enough to account for the emergence of life on this planet and its subsequent diversification and complexity? Or was God's ongoing activity required to guide the entire process? In 2001, Peter Rüst published a communication in *Perspectives on Science and Christian Faith* that addressed these questions. This paper resonated with me based on my training as a biologist and my observations of God's providence in my personal life and the lives of others.

Rüst proposed, on both theological and scientific grounds, that God's creative and providential activities have *not* ceased after his initial creation, but that they are continuous, and usually hidden. God's divine actions in creation, or "hidden options" as Rüst called them, may include "quantum uncertainties, randomness in elementary events, unpredictability due to minute parameter value deviations in nonlinear systems liable to produce deterministic chaos, and coincidences." According to Rüst, these "hidden options" do not represent violations of any natural laws, but they are "specific acts of *selection* among distributions of many different naturally possible values for stochastic variables." He cited, as a hypothetical example, the spontaneous occurrence of specific *combinations* of mutations required for the emergence of a certain enzyme activity that may be "transastronomically improbable" in the context of strictly *undirected*, random processes alone.

Rüst argued effectively in this paper that the proposed "hidden options" model did not represent "God-of-the-Gaps" type speculation that may be a shortcoming in other models for divine action in creation. He maintained, for example, that there are no gaps in "creation's economy," to use language similar to Howard Van Till, "as all materials and their properties were fully in place and well equipped to proceed anywhere in development ("Basil, Augustine, and the Doctrine of Creation's Functional Integrity," *Science and Christian Belief* 8 [April 1996]: 21–38)." It is more an issue of the limited time available for "random-walk trials." Sometimes specific direction by God is required to guide the process of evolution through the virtual infinitude of "possibility space."

The beauty of Rüst's "hidden options" proposal is that it is consistent with scriptural teaching on God's role as Creator and Sustainer of the universe and all living things while explaining *how* God may have used the evolutionary process as a means for creating the diversity of life on this planet. At the same time, it does not contradict the abundant evidence for evolution that has been obtained by scientific investigation. Moreover, it accords with our experience of God's providential work in our everyday lives and in history.

Brian Greuel, Emeritus John Brown University, Siloam Springs, Arkansas.

DOI: https://doi.org/10.56315/PSCF9-23Clouser

2003, 2010

Carol A. Hill, "Making Sense of the Numbers of Genesis," *PSCF* 55, no. 4 (2003): 239–51; and **Dennis R. Venema, "Genesis and the Genome: Genomics Evidence for Human-Ape Common Ancestry and Ancestral Hominid Population Sizes," *PSCF* 62, no. 3 (2010): 166–78.**

Carol Hill's article documents the extensive use of symbolic numbers ascribed to people in the ancient near east as though they were their chronological age, when in fact they were intended to be symbolic of their character and/or accomplishments. The documentation shows that this information was in the *Jewish Encyclopedia* for 1903! What a pity this has been kept a secret for over a century! Think of all the churchgoers who have puzzled over the ages ascribed to Adam or Noah, and how helped they would have been by this simple explanation.

I have also found especially helpful, Dennis Venema's "*Genesis and the Genome."* I am not a biologist, but I found his clear explanations of the findings of contemporary genetics in relation to human evolution, both enlightening and compelling.

Roy A. Clouser, Emeritus, The College of New Jersey, Ewing, New Jersey.

DOI: https://doi.org/10.56315/PSCF9-23Hollman

2005, 1991, 2022

Perry Phillips, "The Thrice-Supported Big Bang," *PSCF* 57, no. 2 (2005): 82–96; Fred G. Van Dyke, "Ecology and the Christian Mind," *PSCF* 43, no. 3 (1991): 174–84; and **Alan Dickin, "The Design of Noah's Ark," *PSCF* 74, no. 2 (2022): 92–105.**

The current scientific model of the beginning of the universe is clearly described in an article by Perry Phillips in the 2005 *PCSF* article "The Thrice-Supported Big Bang." Perry describes the history of the universe from 1×10^{-43} second onward, highlighting the three key elements supporting the hot Big Bang. The descriptions in this article are understandable to individuals with a good understanding of high school science. Knowing that the universe has a beginning in time neatly agrees with a God external to the universe. Perry concludes by debunking "alternative theories" of young earth creationists. I have been able to use this article when sharing with my young earth friends including some pastors in my Southern Baptist Church.

Another article I have referred to colleagues is Fred Van Dyke's article documenting the important shift in attitudes in ecology. Secular scientists no longer regard Christians as the cause of the ecological crisis but realize the important contributions of ecology science in Christian Colleges. A secular ecologist who believes in an accidental and random creation of life on Earth does not have a philosophical teleology to argue that humans should sacrifice for the environment. A proper understanding of the biblical concept of stewardship gives a logical philosophical reason as to why we should care for creation.

I recently shared a *PSCF* article by Alan Dickin on the design of Noah's ark with a friend who is on the board of trustees of the Ark Experience in Kentucky. There was no conversion, but hopefully better understanding of the diversity of perspectives within the Christian community. *PSCF* allows us to share insights on what it means to take biblical revelation and science seriously.

Jay Hollman, Baton Rouge, Louisiana.

DOI: https://doi.org/10.56315/PSCF9-23Sikkema

2007, 2008

Randy Isaac, "Assessing the RATE Project," *PSCF* 59, no. 2 (2007): 143–46; The RATE Group (Larry Vardiman et al.), "RATE Responds to the Isaac Essay Review," *PSCF* 60, no. 1 (2008): 35–36; Randy Isaac, "Isaac Replies," *PSCF* 60, no. 1 (2008): 36–38; Kirk Bertsche, "Intrinsic Radiocarbon?," *PSCF* 60, no. 1 (2008): 38–39; and **Robert Rogland, "Residual Radiocarbon in an Old-Earth Scenario," *PSCF* 59, no. 3 (2007): 226–28.**

I grew up in a religious context, including school, church, and home, where young-earth creationism was standard fare. When I went off to study science at university, it was implicitly, and in some cases explicitly, indicated to me that my mission was to expose the scientific establishment for its anti-God and anti-Bible views, and to identify its scientific errors. After all, when done correctly, science would no doubt confirm the truth of the Bible, meaning the universe, earth, life, and humanity were created around 4000 BC.

I encountered significant challenges while an undergraduate student research assistant of cosmologist Werner Israel, finding the evidence for an ancient cosmos overwhelming enough for me to switch into the safer, less faith-impacting (or so I thought), field of theoretical condensed matter physics for my doctorate. I marked that transition with a silly little claim that "cosmology can rightly deal only with the present and future."

Over the next ten years, while completing my graduate studies, a postdoctoral position, and the early years of a faculty position, I read relevant theological and philosophical literature, including from within my Reformed tradition, and also engaged informally with some in the young-earth creationist community who were attempting to resolve cosmological questions. As a result, I became less convinced that the Bible clearly taught on the age of earth and cosmos, more convinced of the integrity of the fields of cosmology, astrophysics, and geology, and increasingly concerned about the claims of "scientific creationists."

The RATE project ("Radioisotopes and the Age of the Earth") of the Institute for Creation Research and the Creation Research Society caught my interest, and I was even involved in a bit of the early peer-review process. It was not hard for me to tell that much of what was being claimed was not particularly scientific, and based on the kind of science-related interpretation of scripture of my youth. But I didn't study the entire project in detail. I was therefore grateful for a helpful and thorough essay review by Randy Isaac in the June 2007 issue of *PSCF*, as well as his reply to the RATE Group's response in the March 2008 issue, coupled with a reply by Kirk Bertsche in that same issue to a related article.

While I had been a member since 1996, this all helped me understand and appreciate more than before the nature, ethos, and value of ASA, with expert scientists who are committed Christians helping one another through respectful dialogue. These exchanges, along with many other important articles in *PSCF*, have been invaluable as resources to provide to students as well, to connect them with our network as they develop as scientists and as Christians.

Arnold E. Sikkema, Trinity Western University, Langley, British Columbia, Canada.

DOI: https://doi.org/10.56315/PSCF9-23Bishop

2008

Timothy Larsen, "'War Is Over, If You Want It': Beyond the Conflict between Faith and Science," *PSCF* 60, no. 3 (2008): 147–55.

Over the years there have been many thoughtful, engaging, and insightful articles published in *Perspectives on Science and Christian Faith*. It is difficult to choose what has been the most impactful piece for me, but one that ranks up at the top of my list is Timothy Larsen's "'War Is Over, If You Want It': Beyond the Conflict between Faith and Science."

Not only has Larsen's article helped me to articulate more clearly how the metaphor of warfare or conflict between the sciences and faith is a myth, but I have also found it helpful with students. Assigning it as reading for a class and then sitting down with students to discuss Larsen's arguments and evidence has been very fruitful. Getting students to compare this article with the typical things they have heard in churches, schools, the media, and so forth, has proven to be very clarifying for them.

I would recommend Larsen's article as a go-to piece to put in anyone's hands who seems to think that Christianity has been at perennial war with the sciences. The article clarifies well how there may be some people who pursue conflicts between the sciences and faith—perhaps for atheistic or religious reasons—but there is no necessary conflict between scientific inquiry and good theology. This is an article I return to time and again.

Robert C. Bishop, Wheaton College, Wheaton, Illinois.

DOI: https://doi.org/10.56315/PSCF9-23Bebej

2011

Keith Miller, "'And God Saw That It Was Good': Death and Pain in the Created Order," *PSCF* 63, no. 2 (2011): 85–94.

Perspectives on Science and Christian Faith has been absolutely instrumental in my own development as a Christian paleontologist. I grew up in a community in which it was simply assumed that Christian faith was incompatible with the notions of an ancient universe and an evolutionary history for life on Earth.

However, the more I studied biology and geology in college, the more I became convinced that living things had a long, complex history on this planet. As I explored these scientific ideas, my professors at Calvin College (now Calvin University) also helped me to see that this did not necessitate a loss of faith—that I could continue to be a strong, committed Christian, even as I studied evolution.

But as I began to intentionally integrate my faith and scientific studies, I began to encounter difficult biblical and theological questions that I was not quite sure how to deal with. My professors were immensely helpful as I thought about these issues, and one of them steered me toward *Perspectives on Science and Christian Faith*. I found the section in the library where back issues of the journal were shelved, and I spent countless hours poring through articles related to evolution and Christianity. These articles helped me to see that I was not alone in having these hard questions—that, in fact, many Christians were thinking through some of the same things that I was, which was an immense encouragement to me as I graduated from Calvin and went on to do a PhD at the University of Michigan.

During my first year as a graduate student in paleontology, I joined the American Scientific Affiliation as a student member and attended my first ASA meeting. I looked forward to each issue of *PSCF* that arrived in my mailbox, and I can honestly say that the ASA and *PSCF* were helping my faith to continue growing alongside my development as a scientist. But that did not mean all of my questions went away. In fact, some of them even became more acute, particularly questions related to the predation, death, and extinction that were so evident in the fossil record. How could those things be part of a God-ordained and God-sustained process? These questions nagged at me as I completed my dissertation and prepared for my first faculty position, but I simply had not had the time or space to devote as much careful thought to these questions as they deserved.

It is in this context that I remember receiving the June 2011 issue of *PSCF*. I had just defended my dissertation, my wife was pregnant with our oldest son, and we were preparing to move to Illinois. Despite all the busyness, I couldn't help but flip through *PSCF* when it arrived. There I found an article from Keith Miller called "'And God Saw That It Was Good': Death and Pain in the Created Order." Keith's earlier work had been very helpful to me in my undergraduate years as I wrestled with the compatibility of evolution and Christianity, and I remember having a brief (but very encouraging) conversation with him at the first ASA meeting I attended. I knew that he had spent a lot of time wrestling with many of the same questions that I had, and in this piece, I encountered such thoughtful engagement with several immensely difficult questions related to the goodness of creation, the effects of sin, and the roles of pain and death in God's creation.

Over the years, I have thought about these questions fairly often, and I even had the chance to explore these issues more deeply through a program sponsored by Scholarship and Christianity in Oxford back in 2018–2019. I have lost count of how many times I have returned to Keith's article to refresh my memory on some of its most salient points, but even as I read it today, with some questions answered to my satisfaction and some that may never have explanations on this side of eternity, I see this piece as a resplendent example of what Christian scholarship can be: careful, thoughtful, and humble, yet courageous in engaging with some of the most difficult questions that Christians can ask.

In its 75 years of publication, *PSCF* has published so many examples of this kind of scholarship; I look forward to what will come in the next 75 years. I imagine that I will continue to find articles from issue to issue that clarify things for me, stretch me, and invite me to consider various topics in new ways. But I also know that there are all kinds of questions that we haven't even thought about yet, and I cannot wait to see what the next generation of Christian scholars has to teach us through the pages of *PSCF*.

Ryan Bebej, Calvin University, Grand Rapids, Michigan.

DOI: https://doi.org/10.56315/PSCF9-23Contakes

2011

Arie Leegwater, "A Brief Excursion in Chemistry: 'God-Talk' in Chemistry?," *PSCF* 63, no. 3 (2011): 145–46.

The challenge that I found most perplexing, when I began my career as a chemistry faculty member at a Christian college, was that of how to "integrate"

my Christian faith into my teaching. The issue wasn't so much that there wasn't a connection between Christianity and chemistry. Rather, it was that the resources I found assumed that chemistry was either unimportant or only useful as a resource for apologetics. This contrasted sharply with my own perception of chemistry as a rich source of insight into how the world works; a resource that contributes to human welfare in ways that reflect Jesus's teachings about what humans are called to do. Chemists produce medicines, polymers, and biochemical knowledge to heal the sick; fertilizers and other agricultural chemicals to feed the hungry; solar energy and green chemistry technologies to care for the environment; and a myriad of synthetic and semisynthetic materials that are used to clothe, house, and feed the needy. Further, chemists sometimes have to navigate problems such as pollution, toxicity, climate change, and disease in the course of their work, which call for wise Christian discernment.

Arie Leegwater's September 2011 editorial, "A Brief Excursion in Chemistry: 'God-Talk' in Chemistry?," helped enlarge my understanding of science and faith to include more of what chemists do. Building on the work of Hans-Jörg Rheinberger and twentieth-century historians of science, and elucidating factors which shaped science's development, Leegwater suggested that scientists' religious beliefs and commitments (which all scientists possess, whether theistic or not) are evident in what scientists do. In other words, a perspective on science does not just involve questions of ethics and the compatibility of propositional truths, it also takes place through the "problems [scientists choose], how they are formulated, the experimental evidence marshaled, and [how theories are perceived]."

Although Leegwater did not say so directly, his examples suggest that chemists' "God-talk" also includes their scientific efforts to benefit humanity, navigate tradeoffs associated with chemical hazards, and shape the character of their communities. Each of the chemists he discussed was both a scientific pioneer and an activist who sought to align human society with his vision of the good. The physicalist Wilhelm Ostwald led the German Monist League and promoted the renunciation of church membership; the secular humanist Linus Pauling became an antinuclear peace activist; the devoutly Methodist Charles Coulson conscientiously objected to war research, served as a lay minister, cultivated scientific talent in the developing world, and served as president of the poverty-relief charity Oxfam.

Subsequently, I discovered that Leegwater's point was somewhat foreshadowed by Willem Drees's earlier suggestion that science and religion relate along more dimensions than the propositional, cognitive, and ethical (*Religion, Science, and Naturalism* [Cambridge, UK: Cambridge University Press, 1996]). It was also echoed and amplified by Peter Harrison's 2011 Gifford Lectures, in which Harrison demonstrates objective and propositional understandings of "religion" to be a product of the Enlightenment that distorts. To help ensure that our perspectives represent science and Christian faith well, we might take Leegwater's editorial to heart.

Stephen Contakes, Westmont College, Santa Barbara, California.

DOI: https://doi.org/10.56315/PSCF9-23Schuurman

2012, 2019, 2020, 2013

Theme issues: Responsible Technology, *PSCF* 64, no. 1 (2012); Artificial Intelligence, *PSCF* 71, no. 2 (2019); Transhumanism *PSCF* 72, no. 2 (2020); and James K. A. Smith, "Science and Religion Take Practice: Engaging Science as Culture," *PSCF* 65, no. 1 (2013): 3–9.

I recall when I first encountered *Perspectives on Science and Christian Faith* as a young professor. I had observed that integrating faith and technology was not trivial, and that it was sometimes done in a shallow and unconvincing manner. But *PSCF* provided evidence that Christian scholarship in science and technology could be done in a deep and thoughtful way.

Some *PSCF* articles that stand out to me are the ones found in special issues dealing with technology, specifically the issues on Responsible Technology (March 2012), Artificial Intelligence (June 2019), and Transhumanism (June 2020). An example of one such article is by David Winyard titled "Transhumanism: Christian Destiny or Distraction?" I found this article an important corrective to recent voices that seek to place transhumanism within a Christian context. I am grateful that the mission of ASA and *PSCF* includes engaging topics in computer science,

engineering, and technology for those of us working in those disciplines.

Another article that stands out to me is one by my colleague, philosopher Jamie Smith, who wrote an article titled "Science and Religion Take Practice: Engaging Science *as* Culture" (*PSCF* 65 , no. 1 [2013]: 3-9). In this paper, Smith makes the crucial point that science is a human cultural activity with important implications for the dialogue between faith and science.

I do not always agree with the articles I read in *PSCF*. Even so, I appreciate how the very title of the journal captures a form of intellectual humility. It is not *The Perspective on Science and Christian Faith,* but rather *Perspectives* (plural) *on Science and Christian Faith*. The journal exhibits "faith seeking understanding" and provides a forum for Christian scholars to humbly interact and sharpen each other, as iron sharpens iron (Prov. 27:17).

May *PSCF* continue to serve the ongoing dialogue about faith and science—as well as technology, modelling both intellectual rigor and humility, for many more years to come.

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2013

HEATHER LOOY, "Psychology at the Theological Frontiers," *PSCF* 65, no. 3 (2013): 147–55.

With increasing frequency, my conversations with colleagues turn to recent studies illuminating the magnitude of the mental health crises facing Americans, especially students. Although my stripes as a psychologist are as a researcher, not a mental health care professional, I engage these conversations within the broader academic discipline of psychology, a field within which promised solutions to these mental health problems lie. Admonitions to improve mental health with self-care or mindfulness abound; moving beyond pop psychology deepens and nuances these admonitions in ways that highlight well-researched pathways toward (and away from) mental wellness. Yet, the question remains: with all we know about mental health, why can we not seem to do anything to improve it for more people in more places?

Although the cultural and educational landscapes seem different than in 2013 when Heather Looy published "Psychology at the Theological Frontiers," I find myself bemusing the reality that her argument is fundamental to this question. She critiques psychology's penchant for *bad reductionism,* an assumption that the answer to a specific empirical question is a complete articulation of all that is important. She underscores the position that knowledge, like the people who generate it, is situated and embedded within contexts and cultures that shape the production, interpretation, and meaning of that knowledge. She asks how we can engage biological mechanisms without reducing individuals to their biology—or even to an overly atomistic view of persons, separated from relationships with others and the world. Importantly, Looy reminds us that serious engagement with these critiques, positions, and questions does not threaten potential contributions of psychological science, but instead invites distinctly Christian reflections in and on psychology.

I thought of this need for Christian reflection throughout psychological science in a recent conversation about student mental health with a colleague who wondered, as Looy did, how we can use our psychological and theological knowledge to find "ways to live well and faithfully in our current context" (p. 154). Psychology has tools to offer individuals and communities who are suffering. But do those tools trace the boundaries within which human flourishing occurs? Said another way, if Christianity is true, then there are particular ways of being and living in the world that align with our creatureliness, and there are ways of being and living in the world that do not. I assume that flourishing is not possible when living outside the boundaries of our creatureliness, that these boundaries trace the range of possibilities for mental wellness and flourishing, and in doing so, also articulate the limits.

As *Perspectives on Science and Christian Faith* celebrates its 75th year, I reflect on the value of its contribution. *PSCF* empowers and equips Christian thinkers to collaboratively articulate the boundaries of flourishing, boundaries that benefit from empirical, psychological, and theological excavation.

Looking back on Looy's 2013 contribution, I see an example of how we, as Christians, can use all the tools in our epistemological toolbelt to leverage the contributions of science and theology humbly and confidently for the benefit of our neighbor and our world.

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2014

Owen Gingerich, "Do the Heavens Declare the Glory of God?," *PSCF* 66, no. 2 (2014): 113–17.

A scientist once mentioned to me that he didn't want to tell his young son that God created the universe. If he did so, the scientist explained, it would take away the awe and wonder he wanted his child to feel. I was taken aback when I heard this. I have given many talks where I showed beautiful images from space, motivated in part by my role—albeit modest—on the Voyager spacecraft sent to the far reaches of the solar system. I always assumed that they are a wonderful illustration of God's creation, never considering the possibility that anyone could come to the diametrically opposite conclusion.

My experience made me think more carefully about what the psalmist meant when he wrote, "The heavens declare the glory of God." Owen Gingerich frames the passage in the form of a question in the title of his *Perspectives on Science and Christian Faith* essay, and I immediately sensed that Gingerich appreciated my challenge by its very first lines. "[A] congregation would be shocked if [Gingerich] simply said 'yes' and sat down. On the other hand, [they] would all be even more stunned if [he] said, 'No, the heavens do not declare the glory of God,' and sat down. So, [he thinks] you can safely deduce that there is something more to be said about the psalmist's ancient declaration."

Gingerich begins by reminding us that our predecessors did not see the universe as we do. From reckonings made in the sixteenth century, the sun was estimated to be much closer than it actually is. The "shell of stars" just beyond that encloses our solar system is impressive, but God, to quote Gingerich, was "not so far away." We now know that our universe stretches to a horizon nearly 14 billion light years away. Such a vast distance would have been inconceivable to the psalmist. Perhaps only modern science then, and not the faith of the ancients, can let us appreciate how truly awesome our universe is.

Not so fast, Gingerich warns us. Modern science also tells us what we need for our existence. For example, carbon and oxygen are the building blocks of life as we know it. The so-called energy levels in the carbon nucleus, however, are just right for oxygen to be formed in stars and end up on Earth. Similarly, physical constants also have be constrained within very tight limits for life to exist in our universe. To a physicist like me, such details are as awe-inspiring as the starry skies in displaying what God has done.

Fred Hoyle, the famous cosmologist and "public skeptic" as Gingerich calls him, writes, "There are very many skeptics of the universe where you either have to say there have been monstrous coincidences, where there might have been, or, alternatively, there is a purposive scenario which the universe confirms" (*The Origin of the Universe and the Origin of Religion* [Wakefield, RI: Moyer Bell, 1993], 83). Unlike Hoyle, Gingerich asserts that he isn't "sitting on the fence" when it comes to purpose behind the universe. He concludes by simply saying that "the sheer beauty of the heavens declares the glory of God!" I still lecture on how the majesty of God's universe reflects this, but thanks to Gingerich's essay, with a richer and more humble understanding of why.

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2018

Alan Dickin, "New Historical and Geological Constraints on the Date of Noah's Flood," *PSCF* 70, no. 3 (2018): 176–93.

Alan Dickin's article about Noah's flood filled in the last opening of a puzzle for me. I have viewed this flood as a local one for a long time. But there was a problem. If it was local, why are flood stories found globally? Alan explained this convincingly. Briefly, there was a flooding of the Euphrates River brought about by a combination of a rising sea level

in the southeast and excessive rain in the northwest (southeast Turkey), the location of the head waters of the Euphrates River. The rising sea level was due to snow melt after the last glacial period. It backed up into the Euphrates from the southeast. Excessive rain fall produced massive flow from the northwest down river. The flood occurred where the two effects met.

The point is that this is a common phenomenon around the world. That explained why flood stories are found globally.

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2018, 2021

Walter Bradley, "The Fine Tuning of the Universe: Evidence for the Existence of God?," *PSCF* 70, no. 3 (2018): 147–60; and **Terry Gray, "Pronuclear Environmentalists: An Introduction to Ecomodernism," *PSCF* 73, no. 4 (2021): 195–201.**

I have been around the ASA for more than 40 years. I have found the journal to be a very important part of my spiritual and academic walk. The journal has helped me to refine my thinking: sometimes changing it and sometimes reinforcing it.

Two examples illustrate this. The first one is Walter Bradley's article in September 2018, entitled "The Fine Tuning of the Universe: Evidence for the Existence of God?" I largely came to Christian faith through apologetics. This article reminded me again of why I became a Christian. It was encouraging to read of newer developments in this area that was so important to my coming to faith.

Among more recent articles, the one by Terry Gray in December 2021 is particularly important. I have taught engineering ethics for more than thirty years. During the last ten years of my academic career, I have become very interested in sustainable engineering. This article deals with both topics. It is an interesting discussion of how some people who are concerned about the environment have come around to the conclusion that nuclear power may be acceptable after all. It is clear from this discussion that Gray (and myself) tend to be technological optimists, believing that many of our environmental problems can be helped through the appropriate use of technology. I heartily agree with his conclusion:

> When scientists, engineers and technologists use their minds, and the resources found in creation, to accomplish good, it is to the glory of God and to the furthering of his kingdom. Ecomodernists point to a great Anthropocene as the eschatological goal. Christians point to a different eschatological goal brought about by the Second Coming of Christ. Nonetheless, there is overlap between the two, and Christians can partner with ecomodernists to do the work God is calling us to do. (p. 199)

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2021

Roy Clouser, "Three Theological Arguments in Support of Carol Hill's Reading of the Historicity of Genesis and Original Sin," *PSCF* 73, no. 3 (2021): 145–51.

I want to highlight Roy Clouser's paper as providing key insights toward solving a major impasse between earth and heaven, science and faith—the nature of Eden.

As Christians who are scientists, we tend to think of the major story of reality as creation—God's providential control of the evolutionary process, the eons-long struggle between competing individuals and cooperative groups, culminating in human societies. Creation within an entropic universe builds complexity through the negentropic collection of energy, even though guided by God's providence. Human intelligence develops "in the flesh," rational and social, "completed" through multiple inflection points in the hominin line as competition (contest) is displaced by cooperation (love).

But as Christians who are theologians, we tend to think of the major story of reality as redemption—through Jesus, God reclaiming and reconciling fallen sinners, societies, and all of creation, ending in the new Jerusalem, in the new heavens, and new earth. As Paul sees it, creation is bound up in resurrection. All creation is from and for the *Telos*, the New Jerusalem. In eternity's endless moment, planning and action are simultaneous, and thus creation unfolds backwards through time, from the future

Telos. The plot of the story is "resurrection," the transformation from the "fleshly" earth to the "spiritual" earth. N. T. Wright points out that this process has already begun (e.g., *Surprised by Hope* [2008]). It was revealed in Jesus's resurrection, and continues via the work of the Holy Spirit within God's people.

The two stories have a foundational difference—one tells the story of the forming of the earth, the other, the story of the transforming of the earth to receive heaven. The essence of the second story is resurrection—and that cannot happen through the "natural" forces that science studies. How do the two stories fit together? I think Eden is a key. But understanding Eden and evolution is a problem. If the fall of humanity is considered the explanation for evil—human sin, animal / human death and natural disasters—the long history of evolution does *not* look like paradise, but rather, business as usual.

The debate over the meaning of Eden is certainly hot. Is an event in "real" history necessary? Or is Eden a "mythic" story representing the plight of *Ha'adam*—of all humanity? Must we go back close to a million years to find a common ancestor, or did Eden happen a few thousand years ago? Do we need a common genetic ancestor, or will a common genealogical ancestor do? Is a Fall in Eden necessary to explain human sin, natural disasters, and the need for salvation? Or could the event have another meaning?

The following insights from Clouser seem particularly important in this debate. First, the word "*neshamah*," God's breath into Adam, means the Holy Spirit infilling the mortal flesh—it is God's Spirit. It is the word used for filling Old Testament prophets and New Testament believers, and thus for filling an already living, but mortal, Adam as well. It is the same Spirit breathed into the disciples by the resurrected Christ.

Second, the apostle Paul says that sin was not imputed before the law, but sin *was* imputed to Adam, to the people in the flood, to those of Sodom and Egypt. All those judgments for sin happen before the Torah which was given on Mount Sinai. Thus, the first "law" was given to Adam, and therefore unimputed sin must have existed before Adam.

Third, Augustine misinterpreted Paul—and Genesis. The first misunderstanding was due to a bad translation of Romans 5:12 from the Greek (yielding inherited "original sin"), and the second, to his Platonic understanding of the "good" as ultimate perfection, rather than the Hebraic understanding of "*TOV*" as completeness. Hence, Adam was offered redemption, and thus potentially had eternal life. That is what Adam lost in the "Fall." He became mortal again.

Within this view, Eden becomes the hinge in creation, the first injection of heaven into earth, the physical creation seeded with the life of heaven. Eden was a potential inflection point between creation and consummation. Through creation, *Ha'adam* had become *TOV*, complete, ready to be filled by the Holy Spirit, equipped to be commissioned as God's agent / image to spread heaven's life across the earth.

Of course, God was not taken by surprise by Adam's choice to build the city of man rather than the city of God. Human civilization subsided into the morass of Babylon, enslaved by the earthly authority Adam had ceded to the *Ha'satan*. But God continued divine contact, made covenant, filled the temple with *shekinah* glory, and brought redemption through Jesus the Messiah, the cross, and resurrection. The eternal plan was put back on track—the beautiful but aching old creation could hope to be fulfilled / reborn as the glorious new creation. And we, along with it.

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2022

Fred Cannon, "Acts 17:26: God Made *of One [Blood]*—Not *of One Man*—Every Ethnic Group of Humans," *PSCF* 74, no. 1 (2022): 19–38; and **William Horst, "From One Person? Exegetical Alternatives to a Monogenetic Reading of Acts 17:26," *PSCF* 74, no. 2 (2022): 77–91.**

Acts 17:26 is often claimed as a key proof text in the New Testament that a person named Adam was the first anatomical human being. In this study, Fred Cannon shows exhaustively that the words "Adam" or "Man" are not even in the original Greek text of Acts 17:26, despite translations such as the NIV, NEB, and ESV that add "Adam" or "Man" to their English versions of the text. KJV, NKJV, RSV ... are all more accurate translations on this point. "One flesh," "one

blood," and "one" are found in the ancient copies of Acts 17:26, but not "Adam" or "Man."

In the following issue of *PSCF*, William Horst pursues the next step of asking whether as often claimed, "Adam" does not appear in the actual text, but is implied. With utter fairness and clear exposition, he shows that there are multiple justified interpretations of the Greek text of Acts 17:26 that do not imply "Adam." Whatever the New Testament evidence might be for understanding the history and role of Adam, Acts 17:26 should not be misrepresented as a proof text about Adam. Making that clear, is a substantial contribution to listening carefully to what the New Testament does indeed actually teach.

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2022

Tony Jelsma, "An Attempt to Understand the Biology of Gender and Gender Dysphoria: A Christian Approach," *PSCF* 74, no. 3 (2022): 130–48.

Gender dysphoria is a highly controversial topic in society, and particularly vehement viewpoints have been taken and expressed across the Christian spectrum. I applaud Tony Jelsma and the ASA for sharing a very well-researched and presented article on this topic.

It is personally of interest to me in having a grandchild with whom I am very close, who struggles mightily with gender issues. The article helped me understand some of the broader issues and considerations.

Lynn Billman, Lakewood, Colorado.

Bioethics and Transhumanism

DOI: https://doi.org/10.56315/PSCF9-23Guerrini

EXPERIMENTING WITH HUMANS AND ANIMALS: From Aristotle to CRISPR, second edition by Anita Guerrini. Baltimore, MD: Johns Hopkins University Press, 2022. viii + 208 pages. Paperback; $28.95. ISBN: 9781421444055.

There has been a haunting thought ever since I began to use live mammals for my research in neurophysiology: "Will my descendants accuse me of cruelty towards animals as much as we do to the scientists under the Nazis?" A number of neurophysiologists have been threatened and attacked to stop their research, and, as a consequence, there are few neurophysiologists left using rhesus monkeys along the West coastline of the US and Canada. Research with rats is increasingly of concern to some, and mice might be the next subject of attention. Research staff and students, who are required to remain on budget with their projects, are put under increasing pressure and stress in order to take better care of their laboratory animals without receiving compensation or support. In the meantime, almost nobody seems to care to know how many animals were sacrificed to develop the celebrated COVID-19 vaccines. Are we, biomedical researchers, ever going to have a resolution to this ethical tension around us? Are we going to be viewed by future historians as the heroes of science—or as abusers of living creatures?

Anita Guerrini's *Experimenting with Humans and Animals: From Aristotle to CRISPR* does not answer the question. As the author states in the beginning of her book, her objective is to tell the history of "trial and error, prejudice and leaps of faith, clashing egos and budget battles," to help us evaluate "the value, and the values, of Western science," and to "influence the future." In other words, the purpose of the book is not to make ethical arguments or to appraise a certain aspect of historical development, such as the progress of ethical care for human and animal subjects. It is, rather, to reveal the reality that ethical views and sentiments have changed, collided, merged, and contradicted each other across time and political landscapes.

This text poses questions, implicitly and explicitly, to enable us to address some of the issues and challenges we are facing at present. A first question arises from the history of vivisection (chap. 1). Vivisection refers to experimenting with (mostly dissecting) live animals, and sometimes even humans. This appears for the first time in recorded history back in ancient Greece, meaning it was practiced for two millennia without anesthesia, a discovery not made until the eighteenth century. More strikingly, vivisection was done as part of "edutainment" shows in ancient times. Criticism of the practice was not necessarily about the cruelty but rather about the usefulness of the knowledge obtained from dying or dead animals. The rights or well-being of animals were not much of an issue in the ancient age as human dominion was a firmly held belief. Such an ethical view continued to be dominant until early Modernity (seventeenth-century Europe) when human and animal bodies alike were viewed as machines, and animal experimentation began to be accepted as a cardinal method for biomedical sciences (chap. 2). At that time, ethical concerns on the use of animals did arise, but the concern lay rather in the human virtues of kindness and compassion rather than the rights of animals.

Eighteenth-century Europe slipped into a new stage of biomedical science after Queen Mary II of England died of smallpox, from which experimentation with humans becomes central (chap. 3). Inoculation, adopted from the Eastern world with initial suspicions, was slowly gaining credibility through parents who were unwilling to put their children at the risk of falling ill to smallpox. The validation of its effectiveness eventually came about upon testing with the socially marginalized, including prisoners, orphans, patients, and slaves. Yet criticisms around the "science" of inoculation were not made for using the marginalized as test subjects but rather for superseding God's authority to cause one to be ill or healed. While an increasing number of animal experiments were conducted routinely, and mathematical descriptions of the body became of greater interest to scientists, the emerging utilitarian ethics began to awaken Europeans, especially the British, to the suffering of animals. While elevated sensitivity to animal suffering led to "antivivisection" movements in England, experimental medicine and physiology were established as scientific fields. During this period nation-states also began to be involved in science. This was also the time when anesthesia was discovered, and pain perception became an important topic in physiology. Eventually, common beliefs about racial or sexual differences in pain perception were also tested, by experimenting with women and black slaves.

In the late nineteenth century, animal experimentation made a strong comeback as the germ theory of disease was solidly validated by scientists such as Pasteur, Koch, and Ehrlich (chap. 5). As scientists began to conquer many diseases such as anthrax, rabies, syphilis, and tuberculosis, the victory of science quenched the antivivisectionist movement. A number of animals, including rabbits, guinea pigs, dogs, and monkeys, were used to test theories, vaccines, and drugs during

this period. At the same time, human experimentation begins to be regulated by states, but the regulation was so elementary that practices were allowed that would not be tolerated in our time. Concerns with animal experimentation reemerged in the twentieth century when polio research, strongly advocated by Franklin Roosevelt, a victim of polio himself, claimed a striking number of rhesus monkey lives (chap. 6). As an example, in the 1950s, the United States imported from India 200,000 rhesus monkeys per year for polio research. Despite the polio vaccine's success, primate research appalled the public, especially when behavioral research on primates revealed the emotional depth and social intelligence of these animals. Animals came to be seen no longer just as machines, but as our cousins who, like us, have consciousness.

The last chapter begins by depicting the Nuremberg War Crimes Tribunal of 1946, which led to the first written set of guidelines for human experimentation. Up until this time, there had been little consensus or regulation in using humans for experiments, let alone with the requirement that they must be mentally competent, uncoerced, and fully aware of possible consequences. It is hence not surprising that scientists under the Nazis defended themselves against charges of abuse and euthanasia of human subjects by paralleling their conduct with the practices of contemporary American scientists. American practice was exemplified by the Tuskegee Study of Untreated Syphilis in the Negro Male, conducted from the 1930s to the 1970s, in which the United States Public Health Service left four hundred black syphilis-infected males untreated, without telling them that their treatment had been stopped, in order to study the natural development of untreated syphilis. More than one hundred died as a result. Inconsistency in research ethics can also be found in the case of Japanese scientists, who, in contrast to Germans, were pardoned for their research conduct during World War II in return for providing information to the United States. Nonetheless, through the twentieth century until today, the level of public awareness and national regulations on the use of animal and human subjects has been progressively elevated. Yet, accelerated advances in research technology, including the latest breakthrough of gene editing, and expansion of research fields, continue to add complexity to ethical discourses.

I was impressed by Guerrini's vast knowledge of the historical development of biomedical science, including the events that matter to ethical issues around use of animal and human subjects in research. At the same time, she manages to make the book concise. While the book concerns the ethics of animal and human experimentation, it is certainly not an ethics or philosophy book but rather a story book. That is, while the book raises ethical questions in an unbiased manner, the chronological organization of this story does not conveniently lend itself to efforts to systematically examine or establish ethical principles on these matters. Nonetheless, a deeper understanding of the historical background to the different perspectives encountered in these stories enables one to make more-informed assessments of present-day perspectives. The book can be particularly helpful for those who do not have a biomedical background but wish to engage in contemporary ethical discourses, as well as for those who have rarely thought about the issues at all, often under the assumption that science has justly treated human or animal subjects. Finally, reading these accounts from ancient to contemporary times will certainly help one realize that what is the norm today was not necessarily the norm in the past, nor will it be in the future. Therefore, scientists like me need to humbly accept that we will someday be judged; I believe this knowledge will help us use our best conscience in the present.

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HUMAN TECHNOLOGICAL ENHANCEMENT AND THEOLOGICAL ANTHROPOLOGY by Victoria Lorrimar. Cambridge, UK: Cambridge University Press, 2022. 300 pages, bibliography, index. Hardcover; $120.00. ISBN: 9781316515020.

In her introduction, Victoria Lorrimar states that

> The goal of this book is to deepen our understanding of human creativity from a theological perspective, and to resource Christian theology (and more broadly the church) for reflecting on the possibilities for enhancing human capabilities through (plausible or far-fetched) technologies. (p. 8)

Given the contemporary relevance of this topic, and that she writes "within an (assumed) understanding of salvation as effected by God and not by us" (p. 6), her work will be of special interest to a number of readers of this journal.

Lorrimar addresses the movement known as transhumanism and major themes associated with it: radical life extension, hedonic recalibration (replacement of pain and suffering by an abundance of "good" feelings), moral enhancement by technological or pharmacological means, and mind uploading. She notes that there is considerable diversity of aims within the transhumanist movement, and that not all those that endorse some of these enhancements would identify as transhumanists.

So how should Christian theology respond to technological enhancement of human beings? Lorrimar argues

that the key is an understanding of human creativity in the context of the doctrine of creation, under the metaphor of "co-creation." She rejects the view prevalent in many Christian circles that human technological enhancement constitutes "playing God" and should therefore be dismissed out of hand. Instead, she explores two broader models that might assist with developing an appropriate theological response.

The first model she discusses is the "created co-creator" model proposed by Philip Hefner. After explicating the model through citations from Hefner's works, she observes that "his particular model contributes enormously to contemporary accounts that explicitly address questions of human technological enhancement" (p. 133). Yet, while acknowledging the fruitfulness of Hefner's model, Lorrimar also notes a number of places where Hefner's model diverges from traditional Christian understandings regarding God and the nature of sin and evil. She also critiques his model for "an overemphasis on rationality and neglect of the imagination" (p. 134).

Lorrimar devotes a chapter to the importance of the imagination, and also refers to fiction works—especially science fiction—throughout her book. She contends that because "the imagination takes a central place in … transhumanist visions of the future … a theological response will require attending to the imagination also" (p. 135), and later states "the central question of the present work is to consider how a greater focus on imagination might equip and expand current theological responses to the challenges of human enhancement" (p. 169).

She then proceeds to discuss a second theological model by drawing on the writings of J.R.R. Tolkien, who created imaginative worlds within a framework which regarded each person as a "sub-creator." Lorrimar contends that this model provides a foundation for addressing questions that are rarely addressed in discussions of human enhancement such as "What is the good life?" and "What ought human flourishing to look like?" At the same time, the use of Tolkien's model is complicated by his overall negative view of humanity's preoccupation with technology, seeing it as tending to destroy virtue (exemplified, for example, by a character like Saruman in the *Lord of the Rings* trilogy). She cites with approval the assessment of Gregory Peterson:

> To sub-create is to imitate or to work on what has already been thought out. It may imply initiative on the local level, but it reminds us that the master task always belongs to God. The implication of co-creator, however, is radically different, for it suggests that we are as much in control or responsible for creation as God is. It suggests that there is no blueprint for the future; the future is open, not determined. (p. 201)

In the last part of the book, Lorrimar develops a synthesis which draws on the strengths of both models as well as the work of others. "If a theology of humans as co-creators is to contribute to reflection on human enhancement technologies, it must be embedded within a context that attends to virtue" (p. 217). Lorrimar calls this synthesis "a vision of moral co-creation," which she develops in the form of ten commitments (stated in summary fashion on p. 297):

1. Humans are products of a creative "evolutionary" process.
2. Creativity is central to human agency and responsibility.
3. Human creativity is modeled on divine creativity.
4. Scientific insights should be respected and incorporated into an understanding and description of what it means to be human, without reducing theological and philosophical claims to scientific ones.
5. Technology is a legitimate exercise of human co-creativity.
6. Humans are storytellers and myth makers at their core, with narrative central to the way in which we understand the world.
7. The formation of the moral imagination requires our attention, including the diversity of stories which shape our moral imaginary.
8. Embodiment is crucial for imagination and understanding.
9. Technology must not instrumentalize non-human nature.
10. Elements of the vision of transcendence inherent in transhumanist thought can be reclaimed as central to a Christian imagination.

She then applies this synthesis to the various themes listed earlier that arise from human enhancement technologies.

This book grew out of the author's doctoral research under Alister McGrath at Oxford University, and that is arguably the source of a major weakness for the general reader. Of necessity, a doctoral dissertation must interact broadly with existing literature in the field; but for the reader who is not a specialist this can obscure the central ideas—at least that's what I found when reading the book, and one which I suspect other readers would be likely to experience as well. That having been said, the general question the book addresses is an important one, and Lorrimar's exploring of issues foundational to the development of a fruitful theological approach would likely be relevant to someone wishing to develop

a theological response to some aspect of human enhancement. In my opinion, the Christian public would benefit more from a second book by this author that seeks to make the central ideas more accessible to the nonspecialist, perhaps drawing on emphases in her first and final two chapters.

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REACHING FOR IMMORTALITY: Can Science Cheat Death? A Christian Response to Transhumanism by Sandra J. Godde. Eugene, OR: Wipf & Stock, 2022. 98 pages. Paperback; $18.00. ISBN: 9781666736748.

This short book considers what it means to live in a world in which transhumanism has taken root. Written from a Christian perspective primarily for a general Christian audience, it is nonetheless also for others who, the author hopes, will be "inspired by the invitation of Christ to find true and everlasting life in him" (p. xiv).

Exploring the importance of embodiment (especially from a biblical perspective), the nature of personhood in the technological future, as well as the convergences and divergences between transhumanist and Christian visions, Sandra J. Godde—an artist and lecturer in Christian Studies at Christian Heritage College in Brisbane—takes up the following guiding questions: "Will cybernetic immortality ever trump the Christian hope of resurrection from the dead and the life of the world to come?," and "Is [transhumanism] desirable for human flourishing, or consistent with faith in biblical redemption?" The overall objective, here, is "to resource Christians to think deeply and respond to the transhumanist agenda regarding death and immortality" (p. 6) as advances in technology continue to form us as human beings (pp. 18–19).

The author begins with a quick and very general overview of transhumanism, summarized as "man improving himself by merging with technology" (p. 2). Godde pays particular attention to technological immortality and to the larger question of what, exactly, we ultimately desire for ourselves as individual human beings and, collectively, as a species.

In the first chapter, Godde speaks to how transhumanist ideas have infiltrated popular culture, "endowing technology with a religious-like significance bordering on worship" (p. 8). As cases in point, the author goes on to highlight a number of movies and literary pieces, hardly any of which are favorable depictions of technological use by human beings. In the chapters that follow, she goes on to compare and contrast Christian and transhumanist worldviews, looking primarily at the nature of humanhood and creatureliness, the value (or not) of being limited, eschatology, deification, the concept of the *imago Dei*, and the necessity (or disposability) of the body.

This last point frames much of the discussion. The Christian tradition's affirmation that "we are our bodies" (with emphasis here on the centrality of the body in Christian teaching on the Incarnation and the Resurrection) is completely at odds with the transhumanist quest to technologically transform the biological body (or, very simply, to do away with it altogether). Working toward a more perfect, as it were, expression of the *imago Dei* is quite different, the author notes, from striving to become *Homo cyberneticus* (p. 19).

Although the penultimate chapter ("Towards a Christian Ethical Framework") does not really take up the constructive, balanced, or critical ethics discussion that I was hoping for (the title itself suggests that the chapter was meant to be preliminary), it offers a helpful list of those aspects of human nature that we ought to preserve and defend. This is great fodder for Christian readers, who will want to continue mulling over the question of what is valuable and indispensable about being human.

The overall brevity of the book (there are only about 73 pages of text), which is punctuated by some degree of repetition, means that the author does not dive into a rigorous analysis of the pressing and important questions that she asks throughout. For example, I would have liked to read a more nuanced representation of the diversity that exists in transhumanist thought regarding a number of issues raised here; I would have liked a deeper engagement with how transhumanists handle the concept of the "transcendent and intangible soul," especially if it is, as the author says, "the essence of who we are" (p. 10); and I would have liked to learn more about Godde's understanding of how, in the Incarnation, Christ validates "the good design" of the unenhanced human body (p. 26).

The author's aim, here, is to introduce Christian readers to the conversation, which she does in an insightful and accessible way. In the end, she wants to help equip the Christian reader to think about the big, existential questions that are brought to the fore in the pursuit for immortality that is shared by Christians and transhumanists alike. Although Godde is unreservedly critical of transhumanism, I very much appreciated her perception of transhumanists as a "new breed of fellow travellers who also see a promised land" (p. 2).

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Divine Action

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THE GOD OF CHANCE AND PURPOSE: Divine Involvement in a Secular Evolutionary World by Bradford McCall. Eugene, OR: Wipf & Stock, 2022. 156 pages. Paperback; $24.00. ISBN: 9781725283831.

Bradford McCall is a young but prolific scholar, having completed his PhD in 2022 at the Claremont School of Theology, yet having published five books and about fifty articles. In this slim volume of six chapters, McCall proposes the elements of a complementary relationship between science, particularly evolutionary biology, and Christian faith. His proposal is rooted in a panentheistic theology of God that I will consider further below. On a first reading, I confess that I often lost the thread of McCall's argument amid his dense prose and fascinating tangents. On my rereading of the book, I distilled from the concluding chapter an outline of McCall's argument, so as to maintain a sense of direction throughout chapters 1–5.

The relation between science and theology is broadly considered in chapter 1, using the typology of Mikael Stenmark. McCall then proposes that science and theology overlap in terms of both social practice and subject matter. A metaphysical monist, he does not distinguish between mental and physical processes. This connects with the assertion (via Arthur Peacocke) that there is no "causal joint" to look for, either in solving the mind-body problem or in a theory of divine action. McCall is influenced by process philosophy and proposes panexperientialism—the idea that everything, from people to fundamental particles, has experience, a "subjective interiority." This is not to say that electrons think, nor does McCall tend toward anthropomorphism, but his is not the disenchanted universe of Jacques Monod. His theology of God is "intermediate between the omnipotent God of classical theism and the absentee god of deism" (p. 9). God, in this view, is "persuasive, not coercive" toward the creation. McCall views complex phenomena as emergent, invoking John Haught's notion of "layered explanations" that operate simultaneously without conflict.

The second chapter offers a consideration of evolutionary thought and the philosophy of biology—common ancestry, selectionism, adaptationism, and units of selection. Subtle controversies are investigated, such as the falsifiability of adaptationism, pluralism as an alternative, and the concept of spandrels introduced by Stephen Jay Gould and Richard Lewontin. This was deep and informative reading. In some ways, it was my favorite chapter; yet it seems disconnected from the thread of McCall's overall argument.

McCall's third chapter is entitled "The God of Chance," but oddly contains no discussion of God. Rather, he investigates how scientific thought has developed the idea of chance. As a twenty-first-century scientist, I take statistical reasoning for granted. It had never occurred to me that biologists in Darwin's time would lack this category of reasoning. Let me digress for a moment to make a connection with physics, since that is my own area. The theory of statistical mechanics developed rapidly between 1857 and 1905. In 1859, the same year Darwin published *On the Origin of Species*, James Clerk Maxwell presented a paper in which he described the random motions of gas molecules with the distribution that now bears his name. This history is well summarized in a 1997 paper by Dieter Flamm.[1] It should therefore not have surprised me to learn from McCall that, in Darwin's time, statistical thinking had as yet gained no purchase in the biological sciences.

Darwin introduced chance as shorthand for undirected variation within a species, the raw material upon which selection acts. He used the word "chance" 67 times in *On the Origin of Species*. Darwin's writing reflects an inner struggle over how to conceptualize random phenomena. Like the pre-quantum physicists, Darwin did not think of chance as a cause in itself; rather, it reflected the ignorance of a human observer attempting to describe a dauntingly complex natural world, with too many moving parts to track—be they molecules or finches. Nevertheless, in many places Darwin appears to ascribe causal power to chance. This is an apparent break with the thinking of his contemporaries. By the time Gould and Niles Eldredge articulated the theory of punctuated equilibria, random processes were commonplace in all the sciences.

Relying heavily on Grant Ramsey and Charles Pence,[2] McCall summarizes the development of thought about chance, contingency, probability, and the variability (or fixity) of species. Working from Democritus to Aristotle and up to Darwin's time, he sketches the context in which Darwin's ideas took shape. Darwin's innovation was to show how selection bridges from what seems purposeless (chance variation) to what seems purposeful (adaptation). In this regard, Darwin's writing over time increasingly appropriated the language of purpose. Nonetheless, Darwin adopted the agnosticism of Huxley, and he resisted the attempts of Asa Gray to pull him toward natural theology.

From Darwin, McCall traces the outlines of the modern synthesis in the first half of the twentieth century and thence to Gould. Contingency, operating at a host of levels from large environments to small populations and microscopic mutations, has played a growing role to the present day. McCall raises the question of

whether chance is "fundamental and irreducible," but he addresses this question more through the lens of twentieth-century philosophy than twentieth-century science, quoting, for example, Bertrand Russell's 1913 essay "On the Notion of Cause." To me, this was a surprising choice. Critiques of the sort raised by Russell and others have exerted little influence on scientific discourse, as a search for recent mentions of causal(ity) in contemporary journals will show. McCall seemingly returns to a more typical picture of causation in chapter 5 (e.g., in the conclusion of his discussion of teleology on p. 113).

In chapter 4, McCall invokes Philip Clayton and Jürgen Moltmann to set forth a scientifically informed theology of God. The journey begins with the question of how God relates to the universe. McCall adopts panentheism, in which the universe is within God, but God is more than the universe. God's role as creator argues for the universality of what scripture teaches. The monist approach of panentheism entails that God works in and through the creation. On this view, natural law is divine action by which the universe is sustained. Yet McCall acknowledges the need for a theory of divine action, at least to account for miracles. Some have proposed that randomness (quantum or classical) leaves room for a "bottom up" style of divine influence in the world. McCall eschews any such "causal joint," preferring to "leave the notion of divine involvement in the world ambiguous, nebulous, and indefinite." He prefers "top-down causation," à la Arthur Peacocke and Jaegwon Kim. I longed for a deeper dive into why McCall rejects divine omnipotence and why he posits that God works exclusively through secondary causes. I perceive unresolved tension between these assertions and McCall's acknowledgment of miracles and his expressed eschatalogical expectation of re-creation.

This chapter may aim at an audience already immersed in Philip Clayton's work, which I am not. I found myself repeatedly puzzled. For example, quoting Clayton, arguing for panentheism: "The infinite may without contradiction include within itself things that are by nature finite, but it may not stand outside of the finite" (p. 99). A counterexample sprang immediately to mind: the (infinite) set of rational numbers is outside the finite set {π, e}. Perhaps infinite is here understood to mean entirely comprehensive, containing everything; but on that interpretation, Clayton's words would be a definition of panentheism rather than an argument for it.

Traditionally, Christian theology has employed a dualist metaphysics in which God is distinct from creation. Faced with McCall's adoption of a monist panentheism, one might wonder how created beings who are part of God have freedom or moral agency. Do scriptural themes such as sin or judgment belong in a universe that is conceived as a strict subset of God's being? McCall does not address such potential inconsistencies. The answers may depend on what McCall (via Clayton and Moltmann) actually means by panentheism, a category that has perhaps expanded beyond its original definition. See, for example, Roger Olson's perceptive essay on panentheism and relational theology.[3]

McCall turns to natural theology in chapter 5. Following Alister McGrath, the task of natural theology is to read nature from a Christian theological perspective. Natural theology should engage in constructive "sense-making," not to convince the unbeliever, but to perceive the divine within and behind nature. McCall articulates but peremptorily dismisses Aquinas's teleological argument for the existence of God from regularities in nature. This form of natural theology and its modern analogues McCall abruptly denigrates as "notoriously ambiguous, conceptually fluid, and imprecise" (p. 105). This illustrates a shortcoming of the book: McCall revels in intellectual history, but his assessment of the ideas is frequently unclear or incomplete.

There follows a detailed summary of McGrath's *The Open Secret*, but this summary makes too little contact with McCall's argument. Better is his engagement with *Darwinism and the Divine*, which leads into a critique of Paley's natural theology and a contrast with T. H. Huxley. Often quoted as a categorical denier of purpose in evolution, Huxley saw incontrovertible teleology in some "primordial molecular arrangement"—an initial condition from which the present state of the world would inexorably develop. McCall likens this to Ernst Mayr's observation that "the occurrence of goal-directed processes is perhaps the most characteristic feature of the world for living systems" (p. 113). The thread of natural theology is then reintroduced, proposing a picture in which divine purpose manifests in the world through natural processes. I was left wanting a deeper consideration of this idea. For example, when viewed through a Christian lens, what specific purposes are implicit in the evolutionary process, and how does natural history resonate with the character of God revealed in scripture? Finally, considering that McGrath sees no conflict with orthodox Christian theology, why should the reader opt for McCall's monist panentheism?

Chapter 6 seemed too brief a conclusion. I wanted to see the implications drawn more clearly from the first five chapters, and their integration into a coherent picture. For example, how does the foundation laid in chapter 4 for a theology of God connect to the importance of chance investigated in chapter 3? Do the imperatives for natural theology that emerge in chapter 5 support the

theology of God proposed in chapter 4? The work also makes scant contact with scripture, leaving important themes and obvious questions unconsidered. The form of the conclusion colors this work as a project proposal, rather than the project itself. Nevertheless, the book was thought provoking, made connections with a galaxy of important thinkers, and gave me a host of provocative ideas to follow up. This made it worth my (repeated) engagement.

Notes

[1]Dieter Flamm, "History and Outlook of Statistical Physics," paper presented at the Conference on Creativity in Physics Education, on August 23, 1997, in Sopron, Hungary, https://arxiv.org/pdf/physics/9803005.pdf.

[2]Grant Ramsey and Charles Pence, "Chance in Evolution from Darwin to Contemporary Biology," in *Chance in Evolution*, ed. Grant Ramsey and Charles Pence (Chicago, IL: University of Chicago Press, 2016), 1–11.

[3]Roger E. Olson, "Relational Theology Yes; Panentheism No," The Patheos Evangelical Channel, September 26, 2022, https://www.patheos.com/blogs/rogereolson/2022/09/relational-theology-yes-panentheism-no/.

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DIVINE AND HUMAN PROVIDENCE: Philosophical, Psychological and Theological Approaches by Ignacio Silva and Simon Maria Kopf, eds. New York: Routledge, 2022. 156 pages. Paperback; $52.95. ISBN: 9780367632267.

This volume of nine essays seeks to clarify the meaning of divine providence by employing the analogy of human providence, understood here as the prudent execution of deliberation and planning. Although the contributors cover fields as diverse as philosophy, natural and social sciences, and theology, this review covers only the chapters that engage with contemporary scientific research.

In the fourth chapter, Ignacio Silva is concerned with the ways in which contingent events provide a challenge to our conceptions of divine providence. He develops the thought of Aquinas in contrast to those who locate God's providential acts in the causal gaps in our current scientific understanding of creation (e.g., in quantum mechanics and evolutionary theory). The latter view is taken by those who subscribe to an approach called NIODA (non-interventionist objective divine action). An example of the NIODA approach to divine providence is Thomas Tracy's view that God acts through the structures of nature "non-miraculously," a view which Silva thinks effectively renders God as one cause among countless other causes. Another example of the NIODA approach is Robert Russell's view that at the quantum level God may be seen to act as a cause of both general features and specific events alongside purely natural causes. Silva's primary critique here is that it compromises God's transcendence by making God's causal activity ontologically indistinguishable from natural causation.

To draw out what he thinks are the implications of Aquinas's view of contingent events for our understanding of divine providence, Silva first clarifies Aquinas's understanding of contingency. Indeterminism exists because of the hylomorphic composition of being—that is, matter establishes the range of possibilities for how it will be integrated by the organizing principle called "form," even though the intelligibility of form is irreducible to the material it integrates. Silva provides a brief but helpful analogy from human providence, showing how contemporary military strategy accommodates contingencies by building the occurrence of both foreseen and unforeseen events (the "material") into the overall battle plan (the "form"). He also finds that Aquinas's understanding of indeterminism is congenial to our new understanding of physical reality. Noting how Heisenberg himself used Aristotle's concepts of potency and act, Silva explains that differently actuated potency explains the existence of indeterminism without the need for complementary (i.e., divine) causation. The indeterminism that permeates the created order is part and parcel of the secondary causes through which God, the primary cause, achieves his intended effect.

In the fifth chapter, Connie Svob examines current findings in psychology on the cognitive mechanisms of memory, judgment, and decision making and how our cognitive (in)capacities might provide a series of metaphors or models for human providence that finds its end in God. Svob begins by highlighting recent psychological research that suggests a great deal of human cognition is irrational (though sometimes beneficially so). Svob summarizes the "dismal picture of the rational human mind" with a list of seven "cognitive illusions"—including over-confidence, magical thinking, and the tendency to reduce probabilities to certainties—and a note on the unreliability of memory. Perhaps the most interesting insight Svob discovers in the research is how both bottom-up and top-down theories of memory contribute to a model of human providence directed toward finding its end in God: the events that shape our sense of identity can reveal God's providential action, while our sense of self can direct us toward specific ends, including the end of friendship with God.

Another possibly fruitful avenue of research is how involuntary and unconscious memory retrieval might provide a model for how the cultivation of virtues such

as prudence can take place even when the subject is not conscious of such cultivation. The tip-of-the-tongue phenomenon provides for Svob an analogy for our dependence on God. Just as we find ourselves helpless when facing the inability to recall a forgotten name and thus must wait upon some external aid, so too we find ourselves helpless in discovering God and so must wait passively upon God's help. Similarly, Svob suggests that as human cognition reaches a limit of self-definition, it may thereby find itself wholly dependent upon God: "to will consistently to live in the truth requires the grace of God" (p. 87). In short, Svob's chapter is peppered with fruitful insights into how the life of the mind in relation to its natural objects provides ample analogies for the life of the mind that has God as its supernatural object.

In the sixth chapter, Emily Burdett approaches divine providence from the perspective of developmental psychology, pointing out that despite millennia of writing on divine providence little attention has been given to how individuals develop their understanding of God's action and providence. Burdett's method is to examine how children develop their understanding of God's involvement in the world, finding that from an early age children conceive of God as engaged in the world in active, responsive, and (possibly) benevolent ways. This research suggests to Burdett the existence of an intuitive notion of divine providence among humans that God should act benevolently in the world. By measuring the time infants look at different animate and inanimate objects, psychologists have been able to verify that infants are able to distinguish between agents and non-agents and can grasp the existence of intention motivating observed acts. By the time the child is 3–5 years of age, they can distinguish between ordinary agents (e.g., a parent) and extraordinary agents (e.g., God). Burdett then shows how children distinguish between human and supernatural agency through reference to a fascinating set of studies on children and prayer, which finds that as children grow older, they tend to place greater restrictions on the types of prayers that are acceptable or answerable. Still further research confirms that children at a relatively young age can discern between human and supernatural agency, including Burdett's own research that children believe God can perform acts that they think impossible for humans. Burdett then describes how research has shown that infants and children are drawn to benevolent actors and are averse to malevolent ones, leading Burdett to hypothesize that children are likely to conceive of supernatural agents as benevolent. Burdett concludes with some intriguing suggestions for further research, outlining potential methodologies for testing the above hypothesis.

As is often the case in volumes that incorporate a wide variety of disciplinary approaches, the editors' promise of a cohesive argument—in this case, that human providence functions as an effective analogy of divine providence—is not entirely met. However, this is not a significant weakness of the volume, as many of the essays are in themselves helpful contributions to an understanding of divine providence. What stands out to this reviewer is that, regardless of disciplinary perspective, both the thought of Thomas Aquinas and the method of analogical understanding continue to be rich resources to mine in the development of our understanding of providence, human and divine.

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General Science

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NAVIGATING FAITH AND SCIENCE by Joseph Vukov. Grand Rapids, MI: Eerdmans, 2022. 179 pages. Paperback; $19.99. ISBN: 9780802879615.

Joseph Vukov, Assistant Professor of Philosophy at Loyola University Chicago, takes on the relationship between sciences and Christian faith in his engaging book *Navigating Faith and Science*. Written for a popular audience, Vukov discusses three models for the sciences-faith relationship: conflict, independence, and dialogue.

Ongoing conversation always takes place in the context of a relationship, and I like to think of the sciences-faith relationship as such an ongoing conversation. Conversation in any relationship can be challenging. Similarly for the sciences-faith relationship. Human conversations are dynamic, full of surprising twists and turns, frustrations, joys, and pains. Similarly for conversations among sciences and faith.

Intellectual arrogance negatively affects sciences-faith conversations. Vukov's helpful starting point in chapter 1 frames intellectual humility as crucial to navigating the sciences-faith relationship. He argues that intellectual humility involves "a cognitive aspect (accurate self-assessment), an emotional aspect (not being caught up in one's own desire to be right), and most importantly, a purposeful aspect (aiming at the truth)" (p. 15). Vukov has insightful things to say about intellectual humility as a human virtue reflecting appropriate appraisal (Rom. 12:3) of our finitude. He rightly points out that a confident faithful Christian "is not intellectually arrogant," but trusts deeply in God's promises and wisdom (p. 25). How does this help with

the sciences-faith relationship? Practicing intellectual humility avoids intellectual arrogance in the sciences-faith relationship.

Vukov discusses conflict in chapter 2, following Ian Barbour in christening a conflict model for the sciences-faith relationship. While Vukov identifies intellectual arrogance as an important source of conflict, this does not explain why conflicts arise. Conflict is possible only on concordance models for the relationship. A concordance model presupposes that along with whatever principles of biblical interpretation we adopt, we also demand that there necessarily must be a correspondence or implication between scientific and faith statements. Think of a jigsaw puzzle, in which scientific and faith statements contribute pieces to the puzzle but also function as constraints for what can fit into the puzzle.

For instance, modern young-Earth creationism presupposes that the statements of Genesis 1 constrain or correct any scientific statements about the age of the earth. In contrast, day-age interpretations presuppose a correlation between the days of Genesis 1 and geological ages. When one reads Genesis 1, assuming that its statements necessarily have correspondence to or implications for scientific statements, conflicts between the sciences and faith arise. The above statement explains why conflict models are concordance models. Concordance models almost always pitch a battle between taking sciences or faith as primary in setting the constraints on what goes into the puzzle. But this is a false forced choice. The concordance assumption demands we choose between what God reveals to us through the detailed study of his good creation and what God reveals to us through the study of scripture.

Vukov claims, "According to the Conflict Model, science and religion compete to answer the questions we have about ourselves and the world around us … science and religion are (more or less) playing the same game" (p. 32). Although he never discusses it, this is the concordance assumption: there is only one puzzle, sciences and faith can contribute pieces to the puzzle, but only one of them can constrain what pieces are acceptable. Every example of conflict Vukov gives turns on interpretation of biblical texts and scientific research and the assumption of necessary concordance between the two.

Note that conflict is a form of relationship and a form of conversation. As the concordance assumption highlights, conflict conversations often take the form of "Our dialogue has to be on my terms, not yours!" or the incessant repetition of "Well, what about this piece of the puzzle …?" Are these productive relationships or good conversations carried out well among conversation partners? No.

Vukov is right that embracing intellectual humility leads to recognizing that all relationships involve incomplete, limited knowledge. In this context, conversation partners are not always open to hearing what the other has to say because they underestimate how incomplete their own knowledge is. Intellectual arrogance leads to stunted conversation: one partner assumes that faith is the best authority on all questions about the natural world while the other assumes the sciences are. As Vukov notes, both parties insist their approach is "right at all costs," and end up undermining "the pursuit of truth that guides both religion and science" (p. 51). Yet, this only happens because of the concordance assumption.

Maybe the best way to approach the sciences-faith relationship is dropping the concordance assumption. But there are better and worse ways of doing this. An example of the latter is the independence model (chap. 3), in which sciences and faith are separate, nonoverlapping domains. Independence models assume that sciences and faith contribute pieces to separate puzzles.

While Vukov's discussion of independence is helpful and engaging, to think that this model is not a form of sciences-faith conversation is too quick. Think of two people saying they will not talk due to irrelevance, lack of interest, or not seeing the point. Indeed, advocates of independence models cannot stop themselves from reiterating that there is no intersection, no relevance to any ongoing conversation between sciences and faith. Often, such advocates will repeat to each other they are both better off having no substantial conversation, repeating their reasons why (e.g., Michael Ruse).

A third way for understanding sciences-faith relationship is allowing that sometimes scientific and religious statements have an overlap. Nevertheless, we never force these connections; instead, we let them arise organically as we continue the work of exploring nature and plumbing the depths of faith. What do we do when overlap is found? We talk it through, hashing out the nature of the overlap and its meanings. This is Vukov's dialogue model (chap. 4). His emphasis on intellectual humility as a Christian virtue pays off most in this chapter because genuine conversation, in which we honestly seek to learn from each other and build relationship, is hard work! But it is necessary work if we are to honor Christ in the sciences-faith relationship aiming to exhibit how everything coheres in Christ (Col. 1:17). It is much easier to invoke the hubris of "I'm

right; you have to agree with me"—concordance; or to tell each other, "Look, we're better off if we stay out of each other's hair"—independence.

These latter approaches assume that the sciences-faith relationship is fixed and settled once for all. Yet, like any human relationship, the sciences-faith relationship is always ongoing and dynamic, involving navigation and renegotiation. Try treating your relationship with your spouse or best friend as fixed and unchanging and see where that leads! The sciences-faith relationship cannot be healthy and growing unless we take the multiple perspectives involved seriously, as contributors to the ongoing conversation of how to do life together. *PSCF* readers interested in pursuing that adventure will be rewarded by a close reading of chapter 4 and its examples.

In chapter 5, Vukov attempts to show that we need the conflict, independence, and dialogue models to do different jobs at different times. But this leads to an incoherence in his discussion. I think taking the ideas of relationship and conversation more seriously could remedy the incoherence. For instance, Vukov critiques the dialogue model by pointing out that some proponents only have dialogue as a goal. But this is a failure to grasp that the sciences-faith conversation is always in service of learning more about each other and growing in how to get along as partners coming to understand God's world. In a marriage, little gets accomplished if partners simply focus on dialogue for the sake of dialogue. Likewise, little gets accomplished if partners engage in conflict or independence. Understanding the relationship, when we can mutually help each other, when it is appropriate to encourage the other to "do your thing!," and how to productively engage those times when we find ourselves in a conflict are all part of working out healthy ongoing relationship. Similarly for the sciences-faith relationship.

If sciences and faith are aiming at truth, as Vukov correctly argues, then the focus should be on developing the healthiest relationship enabling sciences and faith to pursue that aim. Arguing that the relationship is best modeled sometimes as conflict, sometimes as independence, or sometimes as dialogue, undercuts the aim for truth. A marriage or a family would not work well if partners are constantly shifting their relationships among these options. Instead, one always needs to understand how conflicts arise and how to address them within the ongoing relationship of a marriage. One always needs to understand what appropriate forms of independence are in the ongoing relationship of the family. And these understandings always need to take place in the context of humble, open conversation. Good dialogue is central to any healthy human relationship. The same is true for the sciences-faith relationship.

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History and Social Studies of Science

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WHO TO TRUST? Christian Belief in Conspiracy Theories by Nigel Chapman et al. Victoria, Australia: ISCAST, 2022. 164 pages. Paperback; $12.99. ISBN: 9780645067156. ebook/discussion paper. https://iscast.org/conspiracy/.

Conspiracy theories (CTs) have existed for as long as humans have been able to record them for posterity; however, due to the exponential growth of electronic media, the proliferation and popularity of CTs have made them ubiquitous. Western societies have been particularly affected by CTs in recent decades through our ability to communicate unfiltered diatribes at the speed of light, by the seductive influence of CTs as a form of mass entertainment, and by unabashed populists who use them to tar their political rivals. Though they still frequently draw ridicule, conspiracy claims are now a mainstream form of grievance, spread by people—rich, poor, weak, and powerful—across the political spectrum. This is largely why academics in the behavioral and social sciences, concerned by the harmful impact of CTs on public discourse and social behavior, have begun to treat them and the people who promote them as objects of serious study.

Sadly, committed Christians are no strangers to the conspiracy mindset, and not only those who belong to fringe communities obsessed with end-times prophecy and creeping authoritarianism. Hence, learning to identify the common elements of conspiracist thinking and guarding themselves, their relationships, and their faith communities against its corrosive influence, is a timely and urgent issue for those who claim to be followers of Christ.

This short book (or long "discussion paper," as its authors describe it) is the product of fifteen science and theology authors who are committed Christians and associates of the Institute for the Study of Christianity in an Age of Science and Technology (ISCAST), an Australian organization that promotes dialogue on the intersection of faith and science. The central goal of this work is to harmonize the academic research on conspiracy thinking with biblical ethics in order to help Christian leaders and their communities address the

phenomenon of conspiracism in a socially constructive and spiritually uplifting manner.

The book contains five main chapters—two of a theoretical nature and three of a practical nature. The first two summarize the ideas of leading academics (Barkun, Brotherton, Douglas, Dyrendal, Uscinski and Parent, van Prooijen, etc.), with a special focus on political polarization and populism, and the ways these shape, or are shaped by, conspiracy theories. The third chapter examines popular vaccine and COVID-19-themed conspiracy theories in Australia, North America, and Europe, and it highlights the exaggerated suspicions many Christians harbor toward government, media, academia, and other mainstream epistemic authorities. The last two chapters discuss the ethical, psycho-social, and organizational challenges that conspiracism poses on the way Christians live and think, admonishing them—as individuals and faith communities—to examine conspiracy claims in an epistemically responsible, socially constructive, and biblically grounded manner.

This book presents several strong arguments. First, because some conspiracy claims turn out to be true (Watergate, Iran-Contra, etc.), there is need to exercise careful discernment, engage in charitable exchanges, and consult appropriate expert sources when considering the credibility of specific CT claims. Real conspiracies generally turn out to be less ambitious in scope than the more elaborate theories that flourish in alternative media (JFK, "deep state," flat earth, deadly vaccines, etc.) and are usually the product of organized criminal networks, political graft, or fraudulent business deals.

Second, implausible CTs are often promoted by fringe media, non-experts, and subversive political movements, all of whom habitually traffic in speculation rather than hard evidence, blame vague or invisible enemies who cannot be prosecuted, berate official narratives rather than present a consistent counter-theory, ask rhetorical questions that invite the hearer to distrust experts, and make bombastic claims that reinforce anxieties of impending doom, furtive enemies, secret patterns hiding in plain sight, social marginalization, and political alienation.

Third, CTs negatively affect social relations by "building isolation, paranoia, anxiety, or depression in some individuals, […] splitting friends, families, churches," disrupting communities, and "undermining [legal, political, and academic] institutions through cynicism and mistrust" (p. 6). Not only is the impact of strong conspiracy beliefs detrimental to healthy social relationships and responsible citizenship, CTs also undermine the New Testament's instructions not to slander, not to proffer angry judgments and insults, nor to engage in strife and partiality but rather to live in harmony, love, respect, patience, and forbearance in accordance with Christ's example.

Fourth, these considerations should lead Christians who feel drawn to conspiracist explanations to exercise humility in their search for truth, and to nurture a predisposition to healing rather than attacking relationships and institutions. "A Christian conspiracy theorist should understand themselves to be seeking truth and justice" (p. 6), cultivating awareness of the biases and self-victimizing tendencies that especially affect Christians (e.g., through divisive biblical and pseudo-biblical doctrines), and fostering dialogue rather than fractious debate. "Conspiracy theories may be true or false. But if we want to avoid spreading untruths, injustices, and strife, then we must cultivate a reasonable and peaceable impartiality in the way that we assess or discuss them" (p. 114).

Finally, "inoculation is better than cure" (p. 131). By sensitizing believers to the challenges of cognitive biases and disinformation, we can help them guard their hearts and minds against disruptive CTs and the unhealthy behaviors they elicit.

> We should train Christians to hear diverse views; have good conversations; debate ideas; hear from Christians who work as experts or authorities in public life; demand consistent democratic values in public life; and have the emotional maturity to be generous in spirit toward their opponents. (p. 6)

This book/discussion paper serves as a useful and well-rounded survey of academic literature on conspiracism and as a primer for practical discussions on trust, responsible research, and Christian ethics. It contains useful definitions, summaries, and suggestions for further reading that make the text easy to read and to follow. Its language is accessible to most, though its content is less balanced in its accessibility to a mass audience. The information presented in the first two chapters may be complex to those with little knowledge of psychology and political science, while the second half, strong in biblical references, requires the reader to have some level of familiarity with the scriptures and (it goes without saying) a belief in their moral authority. Inversely, well-versed readers may find that the overview presented in the first half of the work lacks depth of analysis. Readers will also notice a lack of cohesion (and some repetition) between chapters, but this is unsurprising in a 163-page discussion paper written by fifteen authors divided into four working groups. Like the old adage that a giraffe is a racehorse designed by a committee, so too does this work end up lacking some

unity. Nevertheless, it still serves as a useful guide for church leaders seeking greater theoretical and/or practical understanding of conspiracy thinking, and for small groups wishing to improve communications, counselling services, and ministry to the politically and socially disaffected within their church or wider community.

If we reformulate the title of this text to "Whom Should Christians Trust?," and distill it through the clichéd but effective rhetorical question "What would Jesus do?," we might then ask ourselves, "Whom would Jesus fear?" The answer to this question, of course, is "no one," because his kingdom is not of this world. This maxim encapsulates the central message of this discussion paper, which admonishes its readers not to fall prey to worldly anxieties but to have—and to guide others toward—the confidence that Christ has already won the battle against all evil plots. His followers need only guard their hearts against despair and pursue the truth with love.

Reviewed by Michel Jacques Gagné, a historian, podcaster, and the author of Thinking Critically about the Kennedy Assassination: Debunking the Myths and Conspiracy Theories *(Routledge, 2022). He teaches courses in critical thinking, political philosophy, and ethics at Champlain College, St. Lambert, QC.*

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ILLNESS, PAIN, AND HEALTH CARE IN EARLY CHRISTIANITY by Helen Rhee. Grand Rapids, MI: Eerdmans Publishing, 2022. 367 pages. Hardcover; $49.99. ISBN: 9780802876843.

> *"The practice of medicine is an art, not a trade; a calling, not a business; a calling in which your heart will be exercised equally with your head."* —William Osler (1849–1919)

Helen Rhee, professor of the History of Christianity at Westmont College, has encapsulated this famous saying in her recent book, *Illness, Pain, and Health Care in Early Christianity* by demonstrating how partially objective medicine as an early science co-evolved with subjective religious thought throughout early Greek, Roman, and Christian history. Indeed, even today, a patient's pursuit of relief from suffering often involves the clinical science of medicine occurring arm-in-arm with spiritual care. Such examples include use of hospital chaplains, visitation and assistance from members of a congregation, and personal prayer. This book is comprehensive in nature and academic in tone, and Rhee has found some fascinating continuing threads of healthcare occurring in these aspects of Western civilization.

The book begins with general ideas of illness in all three cultures. Greek culture considered the importance of the Hippocratic ideas such as humoralism (defined as various body fluids and their effect on human illness) as well as prioritizing an individual's health to be a societal priority. The emphasis placed on one's individual health inherently makes sense when one considers Greek culture's lack of modern medicine, the absence of understanding public health, the high mortality rate of pregnant women and young infants, and the constant presence of death in their society (pp. 1, 2). A Greek athlete was considered the exemplar of health with the expectation that their health attributes, like all humans, would decline over time.

Roman ideas followed, led by Galen, in which each part of the body was defined simply by its usefulness and its ability to work together in concordance with every body part to make up a healthy human. Thus, Galen believed that all human function descended from a divine design; this was in sharp contrast to the ideas of Epicurus who believed nature's design had random underpinnings. This early philosophical debate involving Roman medicine still continues almost 2,000 years later with regard to a potential purpose versus a lack of purpose in biological evolution. Typically, suggestions for changes in diet and exercise were the main Roman recommendations in the setting of illness, in that medicine and public health would not be viable study areas for many centuries. The author brings up the stark reality of terrible sanitation in ancient Rome which exacerbated many of the infectious pandemics. In fact, pandemics often were considered a part of divine punishment possibly for unknown sins. We can consider the parallels of pandemics of our time, such as those associated with HIV/AIDS or COVID-19, which unfortunately have been incorrectly associated with societal sin.

Subsequent early Christian ideas regarding health and illness received significant influences from both Greco-Roman and Hebrew society. Illness was considered more holistic—encompassing both the physical and the spiritual. Specific cultural influences affecting early Christian society's views on health included the importance of caring for others (for example, Deut. 15:10) and the Levitical dietary restrictions which probably had some health benefits (p. 3). A healthy person would benefit from overall shalom; a decline in one's health could be considered demonic. Jesus was seen as the perfect healer through his miracles, and stories of healing in the Gospels were added to the already-present Greco-Roman influences such as the balancing of humors. Mental illness, which is still under-appreciated and considered an individual "weakness" in much of today's society, was evaluated and treated using the entire gamut of early Christian thought: from being a disease of the soul, to being a result of divine judgment, to being a physical problem (perhaps not yet understood during that time period).

The next section of the book contains ideas of physical pain utilized in all these early societies. Greeks used pain as an essential part of determining a physical diagnosis: pain is still an important concept utilized in modern healthcare. Romans expanded such thinking to consider pain as a disruption of the body's natural state; thus, they emphasized the importance of bringing the body back to its natural order. As an example, Galen felt that patients were not able to explain pain well. and this meant that the final opinion of pain resided solely with the medical provider. Such thoughts have had disastrous effects right up to today, when one considers healthcare's role in causing the recent opioid crisis in the United States (p. 4). Written pain narratives in Roman history were extensive and often seem to model the current history and physical examination process taught to modern medical students. Early Christian ideas of pain were somewhat parallel to Stoic belief structures in which human pain could be used as a learning tool. Early Christian writers often considered the imitation of Christ's suffering through the suffering of an individual as a learning, holy experience. Such ideas eventually led to the concept of the "martyr," which the author describes using examples in wonderful detail.

The last section of the book deals with healthcare in the ancient world, and I found this part of the book most fascinating when considering how healthcare is practiced in modern society. Both Greeks and Romans utilized their temples as places of healing, utilizing prayer and purification rituals. Treatments were extremely limited, mainly due to a lack of understanding the scientific method. Dangerous bleeding, purging, and cauterization were common ancient practices. The author points out that the Romans did build hospitals for a time, but the hospitals were used simply for preserving the health of property (slaves) and soldiers.

Early Christians considered medicine as a gift from God, and their building of early hospitals (in reality, often homes to provide rest and nutrition for the sick) during times of recurrent plagues likely marked a significant advancement in early healthcare as such simple but essential therapies do have healing benefits. It is fascinating to see early writers, such as Origen, believe that more spiritual people would be healed by God while not necessarily requiring medical care from a physician. These propositions parallel pseudo-scientific ideas that still percolate in modern society; the rise of the anti-vaccination movement in some religious movements is a good example. Regardless of the writing of early Christian writers, it is understandable that many patients would continue to follow some of the pagan medical therapies of Greco-Roman society, since good treatment options were limited, while the writing of the ancient Greeks and Romans in essence provided a "second opinion" in care.

I have many good things to say about this book. Rhee goes into great detail regarding the writings of healers in ancient Greek, Roman, and Christian societies. Examples of patients and therapies used to heal in these early historical periods are provided in extensive detail. Many of the medical aspects of prevention continue to echo in today's society, including the emphasis on exercise and diet to improve health, using pain to determine a cause of illness, and the building of hospitals to improve care. Unfortunately, there is also the continuation, in some religious systems, of the idea that illness is due to sin in which prayer alone can cure. Such beliefs are unfortunate; a better belief is that God has provided modern medicine as a gift to improve humanity's well-being. I highly recommend this book, not only for people interested in early healthcare in Greco-Roman and early Christian society, but also for people looking at the evolution of healthcare over time as it began to slowly progress into today's scientific, evidence-based, modern medicine.

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OF MAYBUGS AND MEN: A History of Philosophy of the Sciences of Homosexuality by Pieter R. Adriaens and Andreas De Block. Chicago, IL: The University of Chicago Press, 2022. 246 pages. Hardcover; $105.00. ISBN: 9780226822426. Paperback; $32.50. ISBN: 9780226822440. Electronic; $31.99. ISBN: 9780226822433.

Pieter Adriaens and Andreas De Block offer a substantive analysis of the science of sexual orientation as it relates to male homosexuality. As a psychologist who has been involved in research[1] in the areas of sexual orientation and sexual identity, I found the concepts in the book helpful in thinking through the evidence for what I believe and why. For example, although I have critiqued animal models as inadequate to explain the complexities of human sexual orientation and behavior, Adriaens and De Block challenge the reader to think more deeply about such a response and how it matches up with existing theories and the scientific support for each theory. They are even handed and largely dispassionate in their accounting of both theories and evidence to support various theories.

The authors note in the introduction that the book will be about male homosexuality rather than homosexuality in general; that is, they purposefully exclude female homosexuality as it has been far less attended to in the scientific literature and what is known suggests female homosexuality appears to be different than

male homosexuality in important ways.[2] The introduction also frames the goals of the authors: speaking of homosexuality, to "increase its familiarity" and, by so doing, "reduce homonegativity" (p. 15). Interestingly, the word "homonegativity" is frequently used by the authors throughout the book although, surprisingly, not as carefully defined as many other terms. The authors prefer the term to "homophobia," which they view as too clinical or psychiatric. Homonegativity captures other negative emotions apart from fear, "such as disgust and anger" (p. 196). This is perhaps a small point, but I find the term too imprecise and frequently wielded against any formed judgment about what is morally impermissible behavior.

Chapter one, "Not by Genes and Hormones Alone," addresses the question of innateness. Psychologists such as myself tend to be rather casual in their use of terms like "innate" and the authors help all of us here by defining terms and examining key findings related to the etiology of homosexual orientation. They are measured and judicious in their treatment of twin studies, direct genetic evidence, the maternal immune hypothesis, and prenatal hormonal exposure. They conclude that male "homosexuality is at least somewhat heritable and somewhat canalized" (p. 41). Indeed, the complexity of the research here leads the authors to conclude that no one theory will account for the variety of experiences even among male homosexuals that exist today, let alone expressions noted throughout history and across cultures. I could not agree more with this conclusion.

Christians may wonder about other theories of etiology that are popular mostly in conventionally religious communities, such as traumatic experiences (e.g., childhood sexual abuse) or the sexualization of emotional deprivations due to a failure to identify with one's same-sex parent. These theories are not directly engaged and, while Freud is discussed, the emphasis in this chapter is on the biological bases of homosexuality, which is where so much of science is today and with good reason; there is insufficient scientific support for these other theories and little interest in psychopathology-based accounts of homosexuality. The authors are more interested in examining the broader essentialist versus constructivist debate and whether or to what extent biological data inform that debate.

Chapter two, "Sham Matings and Other Shenanigans," addresses research on animal homosexual behavior. This chapter content speaks to the title of the book, as the sexual behavior of maybugs, dolphins, sheep, and many other animals is discussed. As I mentioned above, I have been rather dismissive of animal research, but the authors present a more comprehensive and compelling case for animal models that at least has to be engaged and cannot be simply dismissed as irrelevant. I think ultimately the Christian does not look at animal behaviors as being sufficiently complex to be analogous to human sexuality, orientation, identity, and behavior, but there is more research and more thought behind the research; it is important to be familiar with this research for those who work in this area.

Chapter three, "Beyond the Paradox," looks at evolutionary theory and homosexuality. Evolutionary theory is another topic that many Christians might not find particularly compelling when it comes to thinking about sexual orientation. They might be more likely to simply disregard modern homosexuality as largely incompatible with evolutionary theory. This chapter challenges such a maneuver and, again, invites the reader to consider how evolutionary theory may provide a reasonable account of modern male homosexuality.

Chapter four, "Values, Facts, and Disorders," considers the relationship between homosexuality and psychiatric nosology. This was a helpful chapter that provides the reader with more of the history and cultural context out of which homosexuality was viewed as a disorder and how it was viewed prior to that—from crime to disorder, from behavior to instinct—and how views of heredity and other important concepts initially played into early and developing conceptualizations. This chapter also briefly addresses the question of reorientation or conversion therapy.

There is also an epilogue that raises the question of whether there are risks associated with future research on the etiology of sexual orientation. Such questions are tied to prevention and to some extent conversion or reorientation. Interestingly, the mainstream LGBTQ+ community and more conservative Christian communities might actually have a superordinate goal, to not screen or select in utero for sexual orientation preferences because of the contemporary Christian commitment to valuing the *imago Dei* in all persons from conception. The epilogue surprised me the most because it came across as outside of the scope of what the authors had been addressing in the history and philosophy of science. But, again, it was well considered and thoughtful. The authors concluded that the risks should be managed in a way that protects the LGBTQ+ community but also does not preclude such research from taking place. The authors are more concerned with the "morally questionable biases" (p. 191) behind the research. Again, such a statement does not make an argument for ethical conclusions about homosexual behavior, nor does it engage formed judgments that reach conclusions other than those of the authors.

Christians interested in the history and philosophy of science related to male homosexuality will not be disappointed by this book. It is in depth and even handed in its treatment of research and competing theories. I would not describe it as anti-religious in its presentation of ideas and historical context. In fact, the authors do not really engage religion as such; rather, they engage some of the ideas derived from or contemporaneous with religious thought at the time, particularly if those thoughts were evident in science, but, again, they do so in a measured way. They primarily engage arguments and the conclusions derived within science (e.g., genetics, zoology, psychiatry) itself.

Notes

[1]M. A. Yarhouse and D. C. Haldeman, "Introduction to Special Section on Current Advances in the Intersection of Religiousness/Spirituality and LGBTQ+ Studies," [Editorial], *Psychology of Religion and Spirituality* 13, no. 3 (2021): 255–56, https://doi.org/10.1037/rel0000438; and M. A. Yarhouse et al., *Listening to Sexual Minorities: A Study of Faith and Sexuality on Christian College Campuses* (Downers Grove, IL: InterVarsity Press Academic, 2018).

[2]See W. H. James, "Biological and Psychosocial Determinants of Male and Female Human Sexual Orientation," *Journal of Biosocial Science* 37, no. 5 (2005): 555–67, https://doi.org/10.1017/S0021932004007059.

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NATURALISM IN THE CHRISTIAN IMAGINATION: Providence and Causality in Early Modern England by Peter N. Jordan. Cambridge, UK: Cambridge University Press, 2022. 218 pages. Hardcover; $99.95. ISBN: 9781009211987.

How should religious conviction shape scientific thought? This is the question many early moderns asked themselves, and which Peter Jordan explores in his book. In a close analysis of prominent early modern English theologians and scientists, Jordan weaves together a coherent intellectual outlook that provides important commentary on the relationship between science and religion.

Jordan's selection of early modern Protestantism will not be new to those interested in the relationship between science and religion. Jordan's PhD advisor, Peter Harrison, who oversaw the dissertation from which this book developed, has left his mark on this topic for the last three decades in books such as *The Bible, Protestantism, and the Rise of Natural Science* (1998), *The Fall of Man and the Foundations of Science* (2007), as well as *The Territories of Science and Religion* (2015). As a consequence Jordan's guiding assumption, that Christian thought created a context within which early modern science was explained, is not anything novel. What is unique is his recognition that early modern theology was not entirely static or homogenous in its relationship to science. By focusing on shifting ideas of the Christian doctrine of providence, what Jordan highlights is the way in which certain thinkers accommodated the doctrine of providence to embrace new scientific developments, such as mechanism and atomism. As a result, this work reminds us that the area of early modern science and religion, while well studied, still has areas of investigation that may bear important fruit.

The book itself, which contains an introduction, conclusion, and five chapters, is organized into four parts. The first part introduces his analytical term of "providential naturalism," by which he means a perspective on the natural world that integrates Christian commitments to providence and explanations of the natural world. It is because he is analyzing the doctrine of providence that his selection of English Protestants makes sense. As he explains in chapter two, English Protestants developed a well-structured formulation of providence, which explained the wide variety of ways in which God acted within the world, activities which could contain—though were not entirely constrained by—the natural world. The important implication of this, which Jordan explores later in the work, is that the newer developments of science, which did not fit the expected patterns of Aristotelianism, and hence of the expectations of how the natural world should function, could nevertheless find an articulation within a world that was believed to be fundamentally controlled and shaped by God.

The second part provides important contextualization for the development of the theories of providence. In a work looking to interrelate theology and science, this section is particularly interesting because it serves as a reminder that the doctrine of providence itself was influenced by unanticipated aspects. The topics he addresses here are chance-based games, such as dice and lots, as well as prodigies. Both games and prodigies provided frequent opportunities for early moderns to develop their definitions of providence. Games of chance became popular in the early modern period; they raised all sorts of questions about how providence related to the natural world, and whether all outcomes, including games of chance, were necessarily providential.

Similar questions about the boundaries of providence show up in John Spencer's thoughts on prodigies, which Jordan analyzes in chapter four. Spencer, a clergyman at the University of Cambridge, became quite critical of the large number of prodigies that were believed to occur on a routine basis within the world. In Spencer's estimation, while it is indeed the case that nature com-

municates the will of God, the supernatural existence of prodigies occurs less frequently than many of his contemporaries assumed. As a consequence Spencer, who assumes that God maintains an ordered universe, is slow to ascribe divine inspiration to prodigies; instead, he looks toward ways in which presumed prodigies could be interpreted with natural explanations.

The third part applies the question of providence to some of the more prominent new developments within science—that of atomism and theories of the earth. As he notes, oftentimes these new scientific developments are heralded as a shift toward a mechanistic and deterministic cosmos. What Jordan contends, however, is that this was not necessarily the case. For instance, with regard to atomism, Jordan analyzes the Epicurean Walter Charleton and shows how Charleton simultaneously upheld atomism and God's providence. Among many important points, Jordan highlights Charleton's view that God providentially moved atoms in creation to establish an order to the universe which operated according to the patterns that God desired. The task of the natural philosopher, then, was to interpret God's ordered universe. A similar emphasis of establishing God's providence in the created order is noticeable in Thomas Burnet's explanation of creation, in which Burnet minimizes the miraculous nature of creation, opting instead to emphasize the providential foresight which God had from the beginning.

In the final part Jordan offers his conclusions. It is here that one clearly recognizes the merit of Jordan's work, as he articulates a significance for the study that locates it not merely within the world of the seventeenth century, but also today. For, as he explains, the explanations of providential naturalism that he analyzed in the early modern period challenge contemporary notions that science and religion exist as two distinct subjects. Instead, as his book argues, naturalistic explanations flow from an understanding of providence, which depends on who God is and how God maintains the world. As a result, this book will prove useful not merely to specialists in the history of early modern science and religion, but also to those interested in the same questions today.

In a book of such merits, and there are many, it is worth noting one important limitation: the scope of the study. As mentioned above, the question of providence and science proves particularly interesting among English Protestants on account of the importance of the doctrine of providence for this religious group. Yet, the world of early modern science and religion was diverse, and it is important to remember that this book provides a window into only one part of this world, but by no means the entirety of it. So, while the topic of providence proved influential in early modern England, it should be remembered that this line of thought does not necessarily represent all early modern thinking on the topic of science and religion. As a consequence, it is hoped that future research will pursue Jordan's framework across geographical and denominational divides to determine the degree to which his general thesis might be extended even beyond early modern England.

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MAKING SENSE OF DISEASES AND DISASTERS: Reflections of Political Theory from Antiquity to the Age of COVID by Lee Trepanier, ed. New York: Routledge, 2022. 248 pages. Hardcover; $170.00. ISBN: 9781032053950. E-book; $47.65. ISBN: 9781003197379.

Political theorist Lee Trepanier has assembled a collection of scholars to address the political—and human—questions that arise from what he describes as "liminal events" such as pandemics, natural disasters, and the like. In this book, "disaster" includes not only natural but humanly generated disasters, such as the Sack of Rome. Such liminal events can generate considerable political uncertainty, significant social change, and even political collapse. Trepanier states that "These events offer us lessons about the nature of political order and illuminate what political theory can offer in our understanding about politics itself" (p. 1). How do societies respond to these events? Do these events create (or reveal) solidarity or the lack of it? Do governments gain or lose legitimacy based on how they handle these events? More deeply, what do these events reveal about human nature and human behavior when political structures are under strain or broken? Trepanier and contributors work with an expansive, more classical conception of politics; in this conception political theory explores the broad questions of how we live together and how the political order both reflects and shapes our human nature.

The book is organized into Trepanier's introduction and four sections. Section I, "In the Time of COVID," engages the recent pandemic. Section II, "Modern Solutions, Modern Problems," moves to the early modern period with studies of key figures such as John Locke and Francis Bacon. Section III, "God, Plagues, and Empires in Antiquity," moves to the ancient world engaging authors such as Augustine, Thucydides, and Sophocles. The final section, "Reflections on Surviving Disasters," brings us forward again to the present day with studies of how contemporary authors grapple with early twenty-first century disasters such as the Fukushima Earthquake of 2011 or Hurricane Katrina.

Aside from the introduction, there are twenty chapters. Some chapters are densely written, while others are quite accessible. The authors come at their topics from a variety of methodological angles, such as historical analysis, literature, and post-modernist theory. All chapters are quite short, rendering them as tasters for exploring the ideas in greater depth. A particular point of interest is the extensive use of works of literature as a lens for exploring these liminal events; several chapters use this lens.

One takeaway of the book is that dealing with diseases and disasters is not just a matter of "following the science"—we need to understand the political, social, cultural, and intellectual context of the society in question. Disease and disaster reveal human interconnectedness in its physical, social, and spiritual aspects.

A recurrent theme in the collection is the ambiguity of globalization: not only does globalization enable the spread of ideas, people, goods, and services, but it also enables the spread of disease and the movement of terrorists. Furthermore, given that this is so, how should polities deal with these problems? Are they best dealt with at a more local level or more at the national level?

Arpad Szakolczai's lead-off chapter, "The Permanentisation of Emergencies: COVID Understood through Liminality," may be the most challenging for readers, both in the sense of the difficulty of its prose and in its challenge to what he sees as a pernicious attempt at rule by technocratic "experts." By "experts," Szakolczai does not simply mean those who are knowledgeable about a particular topic, but additionally those who have been intellectually shaped by a problematic conception of nature, a conception that does not adequately grasp what capital-N Nature truly is: a gift. He notes that this does not rule out a God who is doing the giving, but he doesn't explicitly affirm one either. Either way, we receive Nature, but, he claims, the experts fail to respect Nature as a gift; they are actually hostile to Nature and the natural. Szakolczai seems to be gesturing at "technology-as-idolatry" critiques of contemporary society: our experts have been detached from a true notion of the natural. Because of this, the experts see the COVID epidemic as an opportunity to expand their influence. His argument is provocative but extremely compressed and hence to me unclear.

Jordon Barkalow uses James Madison's concept of faction to analyze the varied reactions to government efforts to respond to COVID. A faction as Madison defines it is a group that has an interest or passion adverse to the interests of the whole political community. In "Federalist No. 10," Madison famously argues that a large republic will dilute the power of factions by way of multiplying them.[1] However, Barkalow suggests, "The ability of personal factions to negatively affect national efforts to combat the spread of COVID suggests that the benefits Madison associates with the extended size of a republic might no longer apply to a technologically advanced 21st century" (p. 41). Factions have become national in scope.

Another common theme is that of apocalypse, in the sense of unveiling; diseases and disasters rip away veils and expose aspects of human nature and behavior that ordinarily lie under the surface. The chapters involving literature do a particularly good job of exploring this area. For example, Catherine Craig discusses James Lee Burke's 2007 novel *The Tin Roof Blowdown*, set in New Orleans in the aftermath of Hurricane Katrina.[2] Craig contends that

> the novel shows hope for the possibility of redemption and the presence of goodness even when all established order is brought to chaos. This possibility depends on human freedom to choose and pursue a transcendent good. While this freedom can be fostered or neglected by political institutions, it ultimately precedes and transcends them. (p. 198)

The hardcover edition of this book is unfortunately ludicrously expensive, apparently priced only for library collections. (The e-book version is less expensive.) That being said, I would recommend this book as a source book for beginning to explore the political and social implications of disease and disaster.

Notes

[1]James Madison, "Federalist No. 10," in *The Federalist*, ed. George W. Carey and James McClellan (Indianapolis, IN: Liberty Fund, 2001), 42–49.

[2]James Lee Burke, *The Tin Roof Blowdown* (New York: Simon & Schuster, 2007).

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IN THE SHADOW OF THE PALMS: The Selected Works of David Eugene Smith by Tristan Abbey, ed. Alexandria, VA: Science Venerable Press, 2022. xii + 155 pages, including a Glossary of Biosketches. Paperback; $22.69. ISBN: 9781959976004.

David Eugene Smith (1860–1944) may not be a household name for readers of this journal, but he deserves to be better known. An early-twentieth-century world traveler and antiquarian, his collaboration with publisher and bibliophile George Arthur Plimpton led to establishing the large Plimpton and Smith collections of rare books, manuscripts, letters, and artefacts at Columbia University in 1936. He was one of the founders (1924) and an early president (1927) of the History

of Science Society, whose main purpose at the time was supporting George Sarton's ongoing management of the journal *ISIS*, begun a dozen years earlier. Smith also held several offices in the American Mathematical Society over the span of two decades and was a charter member (1915) and President (1920–1921) of the Mathematical Association of America (MAA).

Smith is best known, however, for his pioneering work in mathematics education, both nationally and internationally. In 1905, he proposed setting up an international commission devoted to mathematics education (now the International Commission on Mathematical Instruction) to explore issues of common concern to mathematics teachers on all levels, worldwide. He was actively involved in reviving this organization after its dissolution during the First World War and served as its President from 1928 to 1932. Nationally, Smith was instrumental in inaugurating the field of mathematics education, advancing this discipline professionally both in his role as mathematics professor at the prestigious Teachers College, Columbia University (1901–1926) and as an author of numerous best-selling mathematics textbooks for elementary and secondary schools. These texts were not focused solely on mathematical content; they also dealt substantively with teaching methodology, applications, rationales for studying the material, and significant historical developments.

Throughout his life Smith championed placing mathematics within the wider liberal arts setting of the humanities, highlighting history, art, and literary connections in his many talks, articles, and textbooks. For him there was no two-cultures divide, as it later came to be known. While acknowledging the value of utilitarian arguments for studying mathematics (he himself published a few textbooks with an applied focus), he considered such a rationale neither sufficient nor central. For him, mathematics was to be studied first of all for its own sake, appreciating its beauty, its reservoir of eternal truths, and its training in close logical reasoning. But again, for him this did not mean adopting a narrow mathematical focus. In particular, given his wide-ranging interest in how mathematics developed in other places and at other times, he tended to incorporate historical narratives in whatever he wrote.

This interest led him later in life to write a popular two-volume *History of Mathematics*. The first volume (1923) was a chronological survey from around 2200 BC to AD 1850 that focused on the work of key mathematicians in Western and non-Western cultures; the second volume (1925) was organized topically around subjects drawn from the main subfields of elementary mathematics. His *History of Mathematics* was soon supplemented by a companion *Source Book in Mathematics* (1929), which contained selected excerpts in translation from mathematical works written between roughly 1475 and 1875. Smith wrote at a time when the history of mathematics was beginning to expand beyond the boundaries of Greek-based Western mathematics to include developments from non-Western cultures (Egyptian, Babylonian, Indian, Chinese, Japanese, and Arabic), a trend he approved of and participated in professionally.

Smith's interest in broader issues extended even to exploring possible linkages between religion and mathematics. His unprecedented parting address to members of the MAA as its outgoing President is titled "*Religio Mathematici*," a reflection on mathematics and religion that was reproduced a month later as a ten-page article in *The American Mathematical Monthly* (1921) and subsequently reprinted several times. Smith's article "Mathematics and Religion" appearing in the National Council of Teachers of Mathematics' sixth yearbook *Mathematics in Modern Life* (1931) touched on similar themes. These two essays maintain that mathematics and religion are both concerned with infinity, with eternal truths, with valid reasoning from assumptions, and with the existence of the imaginary and higher dimensions, "the great beyond," enabling one to draw fairly strong parallels between them. Thus, a deep familiarity with these facets of mathematics may help one to appreciate the essentials of religion. Mathematics itself was thought of in quasi-religious terms, as "the Science Venerable." Smith's farewell address partly inspired Francis Su in his own presidential retirement address to the MAA in 2017 and in its 2020 book-length expansion *Mathematics for Human Flourishing* (see *PSCF* 72, no. 3 [2020]: 179–81). Su's appreciation of Smith's ideas also led him to contribute a brief Foreword to the booklet under review, to which we now turn.

First a few publication details: *In the Shadow of the Palms* is an attractive booklet produced as a labor of love by someone obviously enamored with his subject. Tristan Abbey is a podcaster with broad interests that include being a "math history enthusiast," but whose primary professional experience up to now has been focused on the environmental politics of energy and mineral resources. This work is the initial (and so far the only) offering by a publication company Abbey set up. Its name, Science Venerable Press, was chosen in honor of Smith's designation for mathematics.

One might classify this work non-pejoratively as a coffee-table booklet. It contains 50 excerpts (Su terms them "short meditations") from a wide range of Smith's writings, selected, categorized, and annotated by Abbey, along with full-page reproductions of eight postcards mailed back home by Smith on his world travels, and

two photos, including Smith's Columbia-University-commissioned portrait. Smith's excerpted writing occupies only 109 of the total 167 pages, nearly two dozen of which are less than half full. The amply spaced text appears on 3.25 inches of the 7 inch-wide pages, the outer margins being reserved for Abbey's own auxiliary notes explaining references and allusions that appear in the excerpt. This gives the book lots of white space; in fact, eighteen pages of the booklet are completely blank. Another nine pages contain 75 short biographical sketches of mathematicians taken from Smith's historical writings; these are unlinked to any of the excerpts, but they do indicate the breadth of his historical interests. Unfortunately, no index of names or subjects is provided for the reader who wants to learn whether a person or a topic is treated anywhere in the booklet; the best one can do in this regard is consult the titles Abbey assigns the excerpts in the Table of Contents.

The booklet gives a gentle introduction to Smith's views on mathematics, mathematics education, and the history of mathematics. The excerpts chosen are more often literary than discursive. Smith was a good writer, able to keep the reader's attention and convey the sentiments intended, but these excerpts do not develop his ideas in any real length. They portray mathematics in radiant—sometimes fanciful—terms that a person disposed toward the humanities might find attractive but nevertheless judge a bit over-the-top: mathematicians are priests lighting candles in the chapel of Pythagoras; mathematics is "the poetry of the mind"; learning geometry is like climbing a tall mountain to admire the grandeur of the panoramic view; progress in mathematics hangs lanterns of light on major thoroughfares of civilization; and retirement is journeying through the desert to a restful oasis "in the shadow of the palms." Some passages are parables presented to help the reader appreciate what mathematicians accomplished as they overcame great obstacles.

While the excerpts occasionally recognize that mathematics touches everyday needs and is a necessary universal language for commerce and science, without which our world would be unrecognizable, their main emphasis—in line with Smith's fundamental outlook—is on mathematics' ability on its own to deliver joy and inspire admiration of its immortal truths. These are emotions many practicing mathematicians and mathematics educators share; Smith's references to music, art, sculpture, poetry, and religion are calculated to convey to those who are not so engaged, some sense of how thoughtful mathematicians value their field—as a grand enterprise of magnificent intrinsic worth.

In the Shadow of the Palms offers snapshots of the many ideas found in Smith's prolific writings about mathematics, mathematics education, and history of mathematics. It may not attract readers, though, who do not already understand and appreciate Smith's significance for these fields. Abbey himself acknowledges that his booklet "only scratches the surface of [Smith's] contributions" (p. 4). A recent conference devoted to David Eugene Smith and the Historiography of Mathematics (Paris, 2019) is a step toward recognizing Smith's importance, but a comprehensive scholarly treatment of Smith's work within his historical time period remains to be written.

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Origins

DOI: https://doi.org/10.56315/PSCF9-23Loke

THE ORIGIN OF HUMANITY AND EVOLUTION: Science and Scripture in Conversation by Andrew Loke. New York: Bloomsbury, 2022. viii + 200 pages. Paperback; $39.95. ISBN: 9780567706409.

On the cover of its June 2011 issue, readers of *Christianity Today* were greeted by the portrait of a distinctly ancient yet still remarkably human figure. Hovering nearby stands the intriguing title, "The Search for the Historical Adam." What had been a mostly academic debate had burst onto the popular scene. This article, arguably more than anything else, revealed the state of the scholarly debate, which, in a word, was not looking promising for traditionalists. A litany of high-profile figures, such as Peter Enns, Dennis Venema, and Scot McKnight, had struck successive blows to the long-cherished view of an original couple.

Just over a decade later, it seems a crisis may have been averted. Biologists and theologians have since offered not just one but multiple competing models that preserve both the genetic data and a doctrine of inerrancy. The debate has now shifted from "*if* Adam and Eve can be squared with contemporary science" to "*how* we ought to pair the two." The two most prominent attempts have been the recent pair of books by Joshua Swamidass and William Lane Craig, yet with the publication of *The Origin of Humanity and Evolution* by the accomplished philosopher Andrew Loke, a third major model has entered the discussion.

However, it would be a mistake to assume that Loke's work focuses solely or even chiefly on the question of the historical Adam. Rather, his more ambitious project is to provide a comprehensive interpretation of Genesis 1–9 in conversation with contemporary science. In chapter 1, Loke distinguishes between three different projects that are often conflated: (A) interpreting the

Bible, (B) showing the Bible to be true, and (C) showing there is no incompatibility between science and the Bible. Loke's project primarily undertakes Task C; as such, he is not suggesting the model he proposes is conveyed by scripture or would have even been known by the authors of the Genesis text. Rather, his more modest proposal is that the truths communicated by the early chapters of the Bible can be shown to accord with current biological data. Consequently, the much-exaggerated claims of conflict between science and scripture have yet to be justified.

Yet before Loke ventures to substantiate this claim, chapter 2 outlines his hermeneutical strategy. Loke affirms the reality of divine accommodation: God's revelations in the scriptural texts were communicated in a fashion his listeners would understand. However, Loke resists a strong view of accommodation that would deny a doctrine of inerrancy concerning scripture's statements regarding the physical world, defending the place of the latter doctrine in church history. What scripture says about both God and the natural world, he claims, is wholly accurate if interpreted correctly. How, then, does one square the creation account with the reality of an ancient cosmos? The task of the third chapter is to accomplish this reconciliation. Loke posits the interesting proposal that God ensured that the Genesis account was left intentionally vague to interpretation so that it might accommodate the cosmological understandings of people from different eras. Nevertheless, the core historical facts are still discernable, and Loke provides two possible interpretations for the creation account. While John Walton's functional view consumes the bulk of the discussion (though not without some minor disagreements by Loke), Loke offers C. John Collins's analogical interpretation as a possible alternative.

Chapter 4 then defends the compatibility of Loke's view with an evolutionary account, and the Garden as a localized area safeguarded from an imperfect outer world. Adam and his descendants were tasked with subduing the whole of creation by extending the boundaries of the Edenic paradise; they failed due to their sinful acts. This leads to the climactic fifth chapter that outlines Loke's model for the historical Adam. Loke notes the similarity between his model and the *Homo divinus* model offered by John Stott. According to this model, other anatomically modern *Homo sapiens* were present during Adam's time; however, only Adam and Eve were truly human since they alone possessed the image of God with all its substantial, relational, functional, and eschatological properties. In other words, only Adam and his descendants bore all the necessary traits, including a special election by God, that would qualify one as fully human. However, Loke grants that it is virtually certain other hominids contributed to the genetic diversity through intermarriage with Image-Bearers. Nevertheless, it is wholly possible for Adam to be a genealogical ancestor to all modern humans as Joshua Swamidass's research has shown. Thus, Loke's model preserves the much-valued claim that all humans today are, in fact, truly human.

When, exactly, did this original couple live? Loke takes no strong stance on the timing, and in his final chapter, he addresses these possibilities in conversation with the Flood narrative. Like Swamidass's model, it is entirely possible to place Adam and Eve in the near past (around 6,000 years ago). However, the presence of cave art—a remarkably human talent—predating this period moves Loke to opt for an earlier, far more ancient date. The Flood account poses no problem for either option if one accepts that a literal interpretation of the account does not demand a global interpretation.

Thus, Loke provides a model that, in his own words, escapes the Charybdis of young earth creationism without sailing headlong into the Scylla of biblical minimalism. Similar efforts have always risked a Procrustean amputation of either the theology or the science, cleaving off whatever is necessary to arrive at some violent and unnatural fit, yet Loke cautiously guards the most precious doctrines central to the theology of humanity's primordial progenitor without sacrificing solid scientific evidence. It is an impressive task, to say the least, and it is one that can confidently stand next to celebrated competing models. However, many might be offended by the assertion that pre-Adamite hominids were not truly human, and even Loke's suggestion of universal salvation for such beings may not soften the blow. The idea that God would deny full humanity to such beings will still seem like an unjust (or, at the very least, unfair) divine act. While Loke does an admirable job defending his stance from this difficult theological objection, one minor critique is that, while Loke's view seems motivated by a commitment to scriptural truth, his position lacks a sufficient defense of its biblical foundation. Why assume Adam must be the first human? Other models have argued differently, and the scriptural reasoning for Loke's position is relatively short and somewhat undeveloped. In fact, Loke spends significant time only on Acts 17:26, and, even here, he does not address many other proposed interpretations. Thus, the most controversial claim of the book lacks what Loke undoubtedly would regard as its most robust support: the biblical justification for Adam as the first human. Unquestionably, Loke has proven himself more than worthy of this hermeneutical task with his

other publications, yet the interested reader will have to search elsewhere for an answer on this topic.

But perhaps the most generous critique is one that asks for more. Brimming with Loke's customary brilliance and eloquence, it is difficult to deny this title's place among the best to emerge from the debate about Eden's infamous couple. By no means has the dispute ended, but contributions by Loke and others have helped to stabilize the ground so fiercely shaken just a few years ago.

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Philosophy of Science

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NATURAL PHILOSOPHY: On Retrieving a Lost Disciplinary Imaginary by Alister McGrath. Oxford, UK: Oxford University Press, 2023. 256 pages. Hardcover; $39.95. ISBN: 9780192865731.

In this book, Alister McGrath provides an intellectual history and critique of what is now referred to as natural science, as well as a proposed re-conception of science going forward. The modern conception of science has its roots in something much older, referred to in the premodern world as "natural philosophy," and this older conception—McGrath argues—is one which was both richer and much more integrated with the rest of knowledge than is natural philosophy's contemporary stepchild, "science." The book has two parts. In Part 1, McGrath successfully labors to give an accessible introduction to the historical conception and development of natural philosophy and its trajectory/transformation towards contemporary "science," followed in Part 2 by a proposed direction *out* of the predicament which he and others see modern/postmodern science to be in.

In Part 1, over the course of five chapters, McGrath first lays out this history. In chapter one, he starts with natural philosophy as an intellectual enterprise finding its origins in the pre-Christian Greeks via Aristotle. In chapter 2, McGrath outlines how natural philosophy then underwent significant development and enrichment through what McGrath calls the "consolidation" of natural philosophy up through the high Middle Ages. On this scheme, a study of the natural world was guided first and foremost by a reverence for God, and an impulse to find the operations of the natural world as understood and explained by principles which were consistent with what God has revealed through both scripture and the church. Natural philosophy was therefore seen as but one chapter of a much larger story, in which understanding this story could be had only if one's heart were grounded in religious piety and one's intellect governed by proper theology (as handed down by church hierarchs).

Chapters 3 through 5 outline the ways through which natural philosophy underwent fundamental metamorphosis for the worse. In stages brought about by the sociological effects of the Copernican revolution, the Protestant Reformation, the scientific revolution, the Enlightenment, and finally the Darwinian revolution, natural philosophy became disenchanted and dis-integrated from the cohesive place it once held as part of a totalizing theological-cosmological worldview of the premoderns; it devolved into a dis-integrated, compartmentalized, and fragmented version of itself, as evidenced by the ever increasing creation of new "subdisciplines" of modern science, which are all largely closed off from one another and which do not enjoy any kind of real synthesis as the premodern intellectual enterprises once did. This modern endeavor, furthermore, seems to be more concerned about extending human's domination over nature (*technē*) than it is about truly understanding (*episteme*) the world that God created. Thus, devoid of a "disciplinary imaginary" which serves as an organizing principle, the study of natural philosophy has become a shell of what it once was. This shell is the "science" that we speak of and study today.

In Part 2, McGrath spends the last five chapters of the book offering scientists and philosophers of science a proposed way forward, a way which might recover at least some of the integration and richness that natural philosophy once enjoyed. He does this by employing a heuristic that comes from Karl Popper's conception of what Popper called the "three worlds," which Popper saw as distinct but related "realms" that encompass the scope of what can be known. On this scheme, the first world is that of objectivity or mind-independent objects, the world of "physical objects or physical states." The second world is that of person or mind-dependent entities—the world of subjectivity, such as emotion, affect, and aesthetic value. The third world is one that acts as a sort of bridge between the first two, one which contains "human intellectual constructions and artefacts" such as scientific theories, moral values, and social constructions. McGrath points out that Popper's own development of this idea is not "entirely satisfactory" (p. 129), and McGrath proceeds to build his own conception using this framework of the "three worlds" as a heuristic tool, borrowing from Popper little else other than the basic idea itself.

McGrath begins his proposed "disciplinary imaginary" with an outline that builds from this third world, the world of *theoria*. This is the world of mental models and

theories which serve to represent and organize bodies of data and evidence. For example, McGrath cites Dmitri Mendeleev's Periodic Table of the Elements. With this kind of organization in view, a certain "beauty" and "coherency" emerges, a kind of simple elegance that can inspire both (subjective) awe and enable further scientific (objective) investigation. It is in fact through these mentally constructed theories that we "see" and make sense of the external world, and these "imaginaries" should aim to engage *both* the intellect and the affect.

In chapter 8, McGrath visits the "first world" of objectivity, with the primary concern to show that, since humans are part of the very cosmos that objective science seeks to explain, there are inherent limits to the reach of a detached, person-neutral, objectivity. McGrath seeks to safeguard against a totalizing scientific reductionism by pointing out that a new natural philosophy will recognize that there are *several* aspects or layers of meaning to any given object of inquiry, and one needs to consider them all to get behind what's really there. He posits neo-Confucianism as one potential example of this kind of engagement with the external world.

Chapter 9 is about the importance of subjective experience, where McGrath seeks to show how aesthetic value and affective engagement are more than arbitrary states of mind. Instead, they often reflect true and proper responses to a world that *really* is pregnant with "beauty and wonder." McGrath then wraps up the book by surveying what he has done and emphasizing the need for a retrieval of natural philosophy, a retrieval that can be enabled through a newfound imaginary or imaginaries.

I will offer two points of praise and two points of criticism. First, McGrath's keen ability to clearly explicate a very complex subject is on full display in this book. McGrath covers an impressive amount of historical ground in the first half of the book in a surprisingly small space (about a hundred pages), complete with explanatory and exploratory footnotes which enable the reader to delve deeper into subtopics. In this way, and like McGrath's many other monographs, the volume is worthwhile if for no other reason than that it acts as a sort of brief yet rich handbook to the subject at hand. Secondly, McGrath's effort is worth considerable praise because he not only seeks to give an intellectual history and critique of the modern epistemic predicament concerning science, but he also delivers up a thought-provoking proposal on what can be done to begin to *address* the problem. His re-conception of Popper's "three worlds" model is, I think, worthy of serious consideration. The broader point, however, is that McGrath is unafraid to wield both a critical acumen and a hopeful positivity regarding this issue, and such constructive attitude from a mind like his is welcome.

On the other hand, in Part 1, McGrath ends his historical survey and critique of natural science with the nineteenth-century secular Darwinists. It is, in fact quite arguably, the horrors and figures of the twentieth century which serve to hammer home the point concerning the consequences of abandoning the disciplinary imaginary for an elevation of (fragmented) scientific knowledge and scientific goals above most everything else. Thus, the first five chapters could have served as a setup for a polemical slam-dunk, but without this survey of the twentieth-century consequences, Part 1 left me with the feeling that McGrath proceeded a bit too prematurely.

Secondly, in Part 2, the way in which McGrath approaches the problem of modern science and his laying out a potential solution gives the impression that he views the issue, fundamentally, as an intellectual one. Is it perhaps more likely, as C.S. Lewis believed, that the problems which plague the modern scientific establishment (including the epistemological problems that stem from fragmentation) are fundamentally *moral*, not intellectual (see *The Abolition of Man*)? On this idea, civilization requires first and foremost a turn back toward God, in repentance. Only then can our institutions—knowledge producing and otherwise—begin to function properly. Moreover, given that our current state of scientific and technological advancement has far outstripped our moral scruples, one is left wondering what a scientific establishment could be capable of with the *wrong* (morally speaking), yet effective, disciplinary imaginary in place. The lesson from the biblical story of the Tower of Babel comes to mind, where an unprecedented attempt at evil was made possible only *because* corrupt humanity enjoyed a cohesive and integrated knowledge base, and the subsequent fragmentation of knowledge through the dispersion of languages acted not only as a divine judgment, but also as a paternal guardrail.

In all, nevertheless, McGrath's contribution to the topic is a timely and welcome addition, one which is sophisticated while remaining accessible, critical while remaining constructive. It is well worth picking up.

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THE POETRY AND MUSIC OF SCIENCE: Comparing Creativity in Science and Art by Tom McLeish. New York: Oxford University Press, 2022. 414 pages. Paperback; $16.95. ISBN: 9780192845375.

In this tour-de-force book, British physicist Tom McLeish finally comprehensively argues, in one dense volume, what so many scientists have been claiming

piecemeal for centuries: that doing science often looks and feels like doing art. That is a broad, amorphous statement, of course, and scientists have not done a very good job of fully understanding this idea or selling it to the rest of the world. This carefully crafted volume must be the most exhaustive work in this area, treating the notion that the creative work of scientists and artists is extraordinarily similar, in that they both fundamentally involve an intimate passion for describing and representing the world around us.

This is not a book about beauty or wonder in science, but rather it examines how scientific ideas and theories come to a scientist's mind and find fruition as publishable science. The entire book juxtaposes literature and art with science and mathematics to help understand the creative process. One important impetus for writing the book, according to McLeish, was recent evidence that smart, capable high schoolers in England were choosing not to go into science because they believed it would not be nearly as fulfilling, creatively, when compared to work in the arts or humanities. McLeish, a Christian, succeeds in this book in showing that not only is creative thinking and experimenting necessary and "part of the chase" in science, but that it is also a natural fulfillment of our creative mandate as human beings made in the image of God. McLeish is also careful to give examples of "more-regular" science, rather than relying solely on the popular accounts of the creativity of exceptional geniuses; he tries to show that all scientists participate in this artistic-like creativity no matter what they are studying.

The first two chapters introduce the concepts of creativity and inspiration in science. McLeish begins an interaction with several important works that he draws on throughout the book: William Beveridge's *The Art of Scientific Investigation* from 1950, Henry James's *The Art of the Novel*, and Howard Gardner's 1993 work *Creating Minds* (one of many surveys of particularly creative individuals). Chapter 3, "Seeing the Unseen," is about visual imagination and its role in theory creation, artistic design, and general problem solving. Visual imagination is seeing things in the mind's eye, but it is obviously linked to actual sight and seeing the world, too. Surveying the history of thought in this area, McLeish ranges from Plato to Gregory of Nyssa, to the thirteenth-century polymath Robert Grosseteste, to the Italian painter Giotto, to Einstein, who said his theory creation and problem solving started with visual images in his mind, which often led to his famous *gedanken* experiments. Grosseteste is one of the main interlocutors for McLeish throughout the book, being an exemplar of someone having a broad view of thought and creative exploration, not just compartmentalizing a premodern understanding of the physical world from his theological and philosophical commitments.

Chapters 4 through 6 sequentially juxtapose each of the three main areas of scientific work (experiment, theory, and mathematics) with their natural counterpart in literature and music. Experimental science is akin to writing a novel (!?) in that both set up artificial worlds that are tested against the real world and help illuminate the real world. Theoretical science is akin to writing poetry, in that both re-imagine the universe within fixed constraints: poetry within a certain shaping but constraining form, and theoretical visions of what goes on "under" the natural world constrained by a necessary conformity to that world. Chapter 6 compares mathematical creativity with composing and listening to music—the two "wordless" human endeavors in the world of the abstract.

The book is ultimately a treatise on creativity, and as such applies not just to science and art, but to all human endeavors that require creativity. In the final two chapters (7 and 8), McLeish develops what he describes as an "Ur-narrative of creative experience." Starting with a four-step creative process taken from Graham Wallas's 1926 work *The Art of Thought*, he adds in three more important stages that emerge from his analyses. The seven steps are: vision, desire, industry, constraint, incubation, illumination, and verification. (McLeish has added in desire, industry, and constraint, along with switching Wallas's *ideation* to *vision*.) Chapter 7 deals with emotion and drive in scientific creation, and chapter 8 ponders the purpose of human creativity, the telos that ultimately drives scientists and artists to such great lengths in pursuing their creative work. McLeish brings the *imago Dei* front and center, drawing on the two great hymns in the Book of Job, "Voice from the Whirlwind" (Job 38–42) and "Hymn to Wisdom" (Job 28), as guides to understanding the creative impulse to understand creation. In this he draws on his previous volume with Oxford, *Faith and Wisdom in Science*.

I believe that listing all the scientific works that McLeish describes in detail with regard to the creative elements behind the works is a good way to convey the magisterial scope of this intellectually rich book. Topics that get 2–10 pages each of description include Feynman's theory of beta decay, McLeish's own considerable contribution to viscous flow in branched polymer melts and his idea of entropically based allostery in biology, Belgian scientist Jan Vermant's work in mesoscale properties of "living matter" (which involves cellular-based material science), "collective phenomenon" and its original invocation by Pierre Weiss in 1907 to explain ferromagnetism, the centuries-long premodern

controversy over the nature of sight (*intromissive* vs. *extramissive*, etc.), the recent evidence of a star being destroyed by a black hole, Boyle's contributions to the founding of modern experimental science, Alexander von Humboldt's important contributions to the value of a wholistic, multilevel vision of nature and science, Emmy Noether's astonishing discovery of the theoretical origin of conservation laws in physics, the discovery of the all-important fluctuation-dissipation theorem over 30 years (inaugurated by Einstein in 1905, applied to electrical noise by Nyquist in 1928, and fully generalized by Callen and Welton in 1951), the recent development at Caltech of a jet fuel polymer additive that greatly inhibits explosions of jet fuel (motivated in part by the horror of the fuel explosions on 9/11), and finally the full discovery of what causes rainbows by Theodoric in ca. 1310. The descriptions of these historic achievements are each fascinating in their own right and very readable—they alone, for me, would justify an investment in this book. When they are paired with a similar creative work from art, poetry, or fiction, the juxtaposition is extremely fruitful, though the philosophical/psychological analyses get much denser.

Many other discoveries are given much shorter treatment (less than one page), including Andrew Wile's solution to Fermat's Last Theorem, Dirac's mathematical discovery of spin and anti-matter, Poincaré's discovery of a new class of Fuchsian functions, Royer's recent proof of the Gaussian Correlation Inequality in statistics, and Heisenberg on discovering quantum matrix mechanics. The explorations into artistic and literary creativity are typically much shorter, but are nearly as numerous; they include a painting conceptually representing a string-quartet performance by English artist Graeme Willson, Virginia Woolf's *To the Lighthouse*, Robert Schumann's orchestral work *Konzertstück*, and Picasso's masterpiece *Guernica*.

At nearly four hundred pages, this is not light reading and takes some patience and time to get through. It is written at a very high level of sophistication, and therefore one is often "bogged down" trying to make complete sense of what one is reading. (However, if one is not writing a review of the book, one need not spend quite so much time disentangling every dense sentence to get the main gist of the passages.) Also difficult are the many references to previous parts of the book. While these references are entirely appropriate, they are quite demanding of the reader given the sheer number of names and amount of material covered. I had to do quite a bit of flipping back and forth, checking the index to remember exactly what so-and-so said that is now being referenced 100 pages later. In other words, this is a thoroughly academic text.

This is a revised edition of the book, which was first published in 2019. The overwhelming positive response, according to the new preface, prompted the author to immediately answer some of the initial reviews and friendly critiques, which I believe made the book quite a bit better (initially there was not nearly as much about poetry; the comparison of poetry with theoretical science now became a separate chapter, enabling McLeish to more logically and thoroughly cover the territory he had staked out). McLeish sadly died very recently (February 2023) at age 60, while holding the newly created chair in Natural Philosophy at University of York. He was a lay preacher in the Anglican Church and a Fellow of the Royal Society.

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EMERGENCE IN CONTEXT: A Treatise in Twenty-First Century Natural Philosophy by Robert C. Bishop, Michael Silberstein, and Mark Pexton. Oxford, UK: Oxford University Press, 2022. 363 pages. Hardcover; $103.65. ISBN: 9780192849786.

Reductionists dream of a day when all scientific truths can be derived from fundamental physics. Bishop, Silberstein, and Paxton show that dream is now dead, or at least it's quite ill. But what will replace it? One answer is "emergence," although that term is ambiguous. In its weak sense, it merely expresses pessimism about our ability to fully understand how microphysics produces all other phenomena. In its strong sense, it means that some entities have a kind of autonomy from physics, with their own "causal powers," including downward causation. Bishop et al. seek to replace strong and weak emergence with "contextual emergence."

Let's start with an example (sec 2.4). Rayleigh-Bénard convection occurs when a fluid is trapped between a heating plate below and a cooler one above. Convection cells emerge as warmer fluid rises toward the top and cooled fluid sinks. While molecular interactions play a part in this, sustained convection is impossible without the macroscopic plates. This behavior is not wholly determined by the fluid's constituent parts but rather by the context in which the fluid exists.

What this and scores of other examples show is that phenomena at a given scale often depend on a host of "stability conditions" at other scales—sometimes higher, sometimes lower. *Contra* the reductionist, the authors argue that the behavior of entities, properties, and processes at a given level is never wholly determined by events at a lower level. Macroscopic conditions (among other things) play an essential and ineliminable

role. If we knew all the truths of nature, we would see that not all dependence is bottom-up.

"But the plates in your example are made of matter," says the critic, "We can reduce those to the behavior of atoms as well." A complete mathematical description without idealizations? "Well, it can be done in principle." Let's consider another example while we wait. Physicists in the Newtonian era devoted much time to the study of planetary orbits. One surprising stability condition is three-dimensional space. In four dimensions, regular orbits that resist small perturbations would be impossible (p. 29). Note that spatial dimensions are not part of the system. They are the context in which the system exists. Three dimensions are a necessary condition for stable orbits but cannot be reduced to the system's constituents even in principle. The properties of the parts do not determine the properties of the whole. This example illustrates why emergent properties are often inexplicable or unpredictable given complete knowledge of lower-level constituents: stability conditions are typically not at some lower level. While some stability conditions are causal and mechanical, like the plates in the convection examples, others are acausal, like conservation laws and least action principles. Still more are abstract properties of dimension and the geometry of mathematical spaces. Whichever the case, the authors consider those conditions to be as real or "fundamental" as anything at the level of elementary physics—something that sets this book apart from both reductionism and many other versions of emergentism.

Emergence is often associated with novelty, such as when a new and unexpected higher-level property emerges from its base. The authors believe this attention is misplaced. They focus instead on how stability conditions either open or close off areas of "possibility space." A possibility space is an abstraction in which each point represents a possible state or behavior of the system. For example, one point in the possibility space of a baseball represents its being in orbit—a possibility that will likely never be actualized. In Newtonian mechanics, the ball might also travel at the speed of light. Under special relativity, on the other hand, that part of possibility space is closed to the ball. As a result, no material object can reach that speed. The more interesting and neglected case occurs when stability conditions *create* access to parts of possibility space. For example, lasers do not exist in nature. Their stability conditions include the existence of a resonance cavity in which atoms can be electrically stimulated and isolated from their environment and putting those atoms in the proper state to begin the process (sec 4.9.1). When these conditions are in place, the area of possibility space representing coherent light becomes accessible. Such light has always been physically possible, but without the requisite context, it cannot become actual.

The authors make several applications to perennial questions in the philosophy of science that I do not have space to elaborate on. These include modality, dispositions/causal powers, properties, the laws of nature, causation, and determinism. Each of these has a relation to stability conditions that is often overlooked. The authors show how progress can be made on each question with less metaphysical baggage than many analytic metaphysicians assume.

Chapter 7 includes several possible objections, but one stands out. While we might need to use multiscale modeling in order to make predictions, that's because of our own epistemic limitations. Stability conditions are important, a critic might grant, but they are ultimately grounded in fundamental physics just like everything else. If we only knew enough about the system and its contexts, we would see how it's all due to the behavior of fields, particles, or whatever resides at the lowest level.

Bishop et al. reply that emergence has the evidence on its side, including an entire book with dozens of examples that cannot be reduced in the manner the critic envisions (p. 313). Nonetheless, the ontological reductionist continues to claim that while these examples have not yet been reduced to lower-level phenomena, it's just a matter of time. One wonders how long such promissory notes will be accepted.

My only concern is that contextual emergence might be *too* commonplace. Emergentists, especially of the strong variety, sometimes have difficulty providing convincing examples. Consciousness and quantum entanglement always make the list, but neither is fully understood. Contextual emergence, in contrast, is ubiquitous. Many examples are from biology and neuroscience, as one might expect, but most come from physics itself. Consider one more. Whether a dying star forms a white dwarf, neutron star, or black hole depends on its context, specifically how much mass the star had prior to collapse (sec 4.4). All three are therefore contextually emergent. But our hypothetical critic will surely complain that there's nothing *emergent* about this. The context is just mass, and mass is fundamental. Even some fellow emergentists might wonder whether calling every example that relies on necessary conditions "emergence" diminishes the significance of the term. Whatever the terminology, the book highlights a neglected aspect of what science tells us about the world. The objects and properties science studies depend on stability conditions, and those conditions are not typically found at smaller scales. Contextual

emergence, therefore, stands in stark contrast to what reductionists had led us to expect.

Insofar as reductionism is incompatible with theism, this is the main takeaway for Christian academics. Science still tends to operate under a reductionist narrative that can deal with religious belief only in terms of psychological predispositions and sociological pressures. But if this narrative is false even in the physical sciences, then religious beliefs need not be restricted to such cramped corners. One might even wonder whether some of those beliefs are true.

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Physics

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THE PRIMACY OF DOUBT: From Quantum Physics to Climate Change, How the Science of Uncertainty Can Help Us Understand Our Chaotic World by Tim Palmer. New York: Basic Books, 2022. 297 pages. Hardcover; $30.00. ISBN: 9781541619715.

Tim Palmer, a distinguished physics professor at the University of Oxford, has authored a captivating popular science book exploring chaos in complex systems. Early in his career, he switched fields from mathematical physics to weather forecasting and made significant developments in ensemble weather prediction, revolutionizing our understanding of weather patterns. The author discusses how delving into this realm reveals a chaos geometry, describing difficult-to-understand real-world phenomena. He takes the reader through various complex systems that exhibit a marked sensitivity to initial conditions, like the renowned "butterfly effect." Chaos geometry describes a system that is predictable and stable for a long time, but occasionally veers into new directions. The study of chaotic complex systems challenges traditional notions of predictability.

The book is divided into three parts. Part 1: The Science of Uncertainty explores the concept of chaos geometry. Palmer captivates readers from the start by sharing a true story about a renowned BBC weather forecaster. In 1987 this forecaster infamously failed to predict the most severe storm in 300 years, striking England. This incident highlighted the unsettling truth that complex systems can deviate significantly from historically stable patterns. As a polymath, Palmer generously shares captivating examples and illustrations from fields such as history, philosophy, and art. Part I is solid science and mathematics, but without equations.

Part II: Predicting Our Chaotic World explores Palmer's influential technique to forecast inherently uncertain systems, running models multiple times with slightly different initial conditions. Chaos geometry offers a powerful description of the behavior of these systems. The author focuses on Lorenz's idea that even with infinitesimally small uncertainty, we cannot predict beyond a finite horizon in time. The author extends the concepts from Part I from well-established domains such as climate, to emerging areas such as disease, economics, and conflict.

Part III: Exploring the Chaotic Universe and Our Place in It delves into speculative realms and may appeal to readers of *PSCF* as it engages with metaphysical inquiries regarding Christian theism. Palmer grapples with perplexing intellectual dilemmas, including free will, consciousness, and the nature of God. In his pursuit to unravel nature's workings, he confronts philosophical and theological quandaries. At its essence, he posits that the universe operates under determinism and challenges the notion that uncertainty in nature is primarily ontological as Bohr espoused, rather than epistemic as advocated by Einstein. Raising a thought-provoking query, the author asks, "Could there be something fundamentally flawed with quantum mechanics itself?" He asserts we must face the fact that the violation of Bell's inequality can be explained only by either abandoning the concept of definite reality or considering the equally dreadful notion of quantum action-at-a-distance. Subsequently, Palmer presents a naturalistic explanation involving counterfactual worlds and puts forth two conjectures.

Conjecture A suggests that the universe operates as a nonlinear dynamical system, unfolding within a cosmological state space defined by a fractal attractor. In simpler terms, a fractal invariant set is a mathematical idea in which a set demonstrates self-resemblance at various magnitudes, containing miniature replicas of itself through a repetitive pattern. Meanwhile, Conjecture B suggests that the deepest laws of physics describe the geometric properties of a fractal invariant set within the cosmological state space.

Palmer's abstract and subtle perspective challenges the prevailing view in physics, which embraces Bohr's interpretation of inherent uncertainty in quantum mechanics. Instead, Palmer aligns himself with Einstein and Schrödinger, rejecting the idea of God playing dice and the concept of a cat being both alive and dead. According to Palmer, the laws of physics are deterministic, devoid of randomness. He suggests conceptualizing our world as a specific solution set within a space of permissible solutions, influenced by a

fractal attractor. This space includes neighboring solutions that represent counterfactual worlds similar to our own, some permissible and some not. This perspective resembles the multiverse hypothesis, suggesting the existence of separate realities that impact our own. Analogously, imagine a Mandelbrot fractal set with the gaps indicating prohibited solution sets. Palmer openly acknowledges that he has not fully developed the specifics of his hypothesis.

Palmer argues that reductionism, as an approach, falls short in addressing the profound questions of quantum mechanics. He advocates for unconventional thinking and the exploration of radically different solutions, as our understanding of quantum mechanics and its implications for the universe remains incomplete. In Palmer's view, the deterministic nature of the fractal universe offers an explanation for phenomena such as spooky action at a distance. He proposes a worldview in which elementary entities and the notion of reality possess certainty and definiteness, providing insights into quantum mechanics, gravity, dark matter and energy, and the expanding universe. Palmer expands his hypothesis to free will, consciousness, and the role of God. Ultimately, he applies the Lorenz model of chaos to understand the profound questions surrounding life and reality.

Palmer's speculative arguments from Part III follow from his philosophical naturalism, and seek to explain the grand inquiries within a worldview rooted in staunch physicalism. Consequently, his cosmogony is materialist, drawing from options in a cosmological state space, and he asserts that free will and consciousness are somewhat illusory. According to Palmer, our behavior, emotions, and thoughts can be traced back, through various scales, to the movements of subatomic particles.

Palmer's arguments ultimately rely on a false analogy. By conflating an observation from weather prediction to consciousness, free will, and God, he overlooks the crucial dissimilarities between these scenarios. He incorrectly assumes that what applies to one domain will inevitably apply to the others. A valid analogy requires relevant similarities between the elements being compared, justifying the comparison. Yet it is difficult to see how inanimate subatomic particles involved in weather patterns can be equated with traditional descriptions of God. Without these pertinent similarities, the analogy is flawed and may lead to erroneous conclusions.

Palmer's speculative and logically flawed exploration of options within state space is fundamentally a metaphysical response, substituting a "cosmological invariant set" for god. Nevertheless, I must acknowledge the enjoyment and intellectual stimulation derived from reading his book, and commend Palmer for his innovative naturalistic endeavor to explain reality, even though it ultimately falls short of being the best and most plausible account of reality.

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Psychology

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THEOPSYCH: A Psychological Science Primer for Theologians by Justin L. Barrett. Blueprint 1543, 2022. 176 pages. Paperback; $19.15. ISBN: 9798985852004. Also, free download at https://blueprint1543.org/wp-content/uploads/2022/03/TheoPsych-PDF.pdf.

It is not often that one finds a book about construction written by a psychologist. However, Justin Barrett's *TheoPsych* is just that. The author imagines the theologian as a master palace builder in need of a collection of specialized materials and knowledgeable artisans to do specific modular work for the larger project. *TheoPsych* serves as a "specs sheet" for the potential contributions psychological science can bring to the project. The manuscript is designed not only to serve the interested contemporary theologian who already desires this input, but even more so, it seeks to convince the suspicious or disinterested theologian of the usefulness of the discipline. As such, "bridge builder" seems an equally fitting metaphor. In any event, intellectual efforts which suggest a unity of truth come freighted with hope for this reader because of the potential they hold to generate cross-disciplinary clarity.

Descriptively, the book features five chapters, the first of which argues for the theologian's need of psychological science, distinguishes it from the more general and potentially misleading term "psychology," and seeks to help the inquisitive theologian identify the types of questions in which the psychological sciences will be useful. Here, as in other parts of the text, Barrett gives form to the points being made by posing insightful example questions. For instance, "Why does it often seem so hard for people to grasp and hold onto the idea of Grace?" (p. 13).[1]

Chapter 2 further defines the psychological sciences by way of a quick trip through the history of experimental psychology, notes the mindset of the scientific psychologist (i.e., curious and skeptical), describes the demographically relevant features of this community of scholars, and briefly catalogs the various types of materials produced by its professionals. Additional care is taken to delineate the organizational structure

of empirical papers and to clarify important discipline-specific terms such as evidence, hypotheses, effects, and effect sizes.

The third and largest chapter of the book maps out the many areas and subdisciplines the field has to offer. These include the biological basis for behavior, social psychology, personality psychology, cognitive psychology and cognitive science (it's more interdisciplinary cousin), developmental psychology, and a few others. The relative bulk of this chapter reflects space allotted within each area to draw out particular lines of research relevant for use in interdisciplinary collaboration. As in other sections, Barrett never strays too far from the book's stated aim, to serve the integrative needs of the interested theologian.

Interestingly, it is not until the penultimate chapter that implications related to emerging new paradigms and overarching themes are brought to the foreground. It opens with a description of the recent emergence of positive psychology and the current emphasis placed on cognitive anthropology and cultural evolution. These areas are followed by a section on evolutionary and comparative psychology. The chapter concludes with religion itself as a topic of study as viewed from four different vantage points: psychology, cognitive science, evolutionary studies, and neuroscience.

The last and briefest chapter addresses the thorny issue of methodological naturalism, noting its necessity to avoid supernatural explanations but also lamenting its inability to settle contentions regarding the relationship between human behavior and overarching metaphysical questions. This chapter also speaks to the problem of reductionism, arguing that psychological scientists oftentimes attack their topics of interest reductively. While acknowledging that many then blithely imply ontological reductionism in their interpretations, nonetheless Barrett suggests that "… most good psychologists do not forget the whole" (p. 140). The book concludes with one more call for theologians to incorporate the findings of psychological science into their work.

Evaluatively, the book has much to offer, including a very expeditious yet effective pathway forged through this broad and corrugated discipline. Additionally, the chosen areas of elaboration seem appropriate and properly suggestive of potential cross-disciplinary alignment. Complementing the helpful exemplar questions peppered throughout the summary sections are several text boxes highlighting examples of existing cross-disciplinary activity. For instance, one side-bar discussion features the work of theologian Christopher Woznicki, who argues that concepts in cognitive psychology can be used to better give an account of the theological notion of *perichoresis* (pp. 81–82). Most importantly, the author's genuine desire to stimulate interdisciplinary collaboration readily seeps through the pages. Barrett has built a strong and winsome case suggesting theologians willing to interact with the psychological sciences will be well served in doing so.

The most substantial drawback has to do with what has been left out, namely, the soft underbelly of the discipline. For instance, there was no mention of the replication crisis now plaguing the psychological sciences.[2] Readers should be aware that there are challenging measurement difficulties that sit at the foundation of all scientific pursuits, especially those that aspire to contend with concepts such as anxiety, emotion, personality, and attachment.

Furthermore, although the book offers many helpful definitions, two critical ones were found missing. One is the construct of *religion*. The default post-enlightenment understanding is far from clear and directive when made the focus of study.[3] The other is *science* itself. In addition to enduring definitional challenges regarding both the term as a method and as a body of knowledge, there are also important sociological aspects of the concept that merit mentioning. That is, science as a community; a community that can succumb to the same "groupish" tendencies found in all social networks.

A more complete historical account would serve to support the "science as community" omission noted above. Perhaps outsiders should be made aware that the history of psychology is more than a clean handoff from Wundt to Watson to the modern psychological scientist. Freud, for instance, was dogmatic in claiming his system of psychoanalysis was anchored in the natural sciences.[4] But there were also the Functionalists and the Gestaltists—the "physics-minded" Gestaltists offering a nonreductionistic paradigm, by the way. Readers should know that psychological science has been governed by many paradigms over the past 150 years, each of them being considered properly scientific by their advocates.

There is also no mention of some rather dubious attempts by psychological scientists in the past to directly address (i.e., correct) theological concepts,[5] including offerings of updated understanding of Jesus in light of modern psychology.[6] In one sense there may be good reason for their omission. These bygone works reside firmly in history's dustbin, and unlike these previous efforts, *TheoPsych* is not trying to "do" theology, rather it is merely offering its services passively. Nonetheless, an acknowledgment of and distinction between this history and the current project might serve

to allay any misgivings a historically informed reader might have, especially when sections of *TheoPsych* could be interpreted as being somewhat assertive (e.g., Various Sciences of "Religion," pp. 126–35). Greater lengths should be taken to avoid any impression that this is the work of a missionary from the land of facts sent to enlighten the backward residents of faith.

Finally, there is the influence of the current paradigm. The most popular option is evolutionary psychology. This approach is noted in the book; the promise of interesting connections being forged with biology, cultural studies, and anthropology is properly identified as clearly worthy of continued exploration. However, this is the third attempt to tie the science of human behavior to biological evolution, the first two (eugenics and sociobiology) having left a rather embarrassing legacy.[7] Evolutionary psychology has several major problems, and they are not particularly helped when partnered with the evolution of culture.[8]

In summary, this book would better serve collaborative efforts if the picture presented within were not so nice and tidy. In the long run, brutally transparent portrayals will be needed from all collaborators if there is to be hope for building cross-disciplinary theoretical structures that bring us closer to truth. Despite these criticisms, *TheoPsych* is unquestionably an impressive and important offering, one that is well positioned to advance the essential work of cultivating interdisciplinary syntheses. Now, if only more folk in the social sciences would care to understand what theology has to offer them.

Notes

[1]For example, Adam S. Hodge et al., "Experiencing Grace: A Review of the Empirical Literature," *The Journal of Positive Psychology* 17, no. 3 (2022): 375–88, https:/doi.org/10.1080/17439760.2020.1858943. Also, see K. I. Pargament and J. J. Exline, *Working with Spiritual Struggles in Psychotherapy: From Research to Practice* (New York: Guilford Press, 2021), https://www.guilford.com/books/Working-with-Spiritual-Struggles-in-Psychotherapy/Pargament-Exline/9781462524310/contents.

[2]J. P. Ioannidis, "Why most published research findings are false," *PLoS Medicine* 2, no. 8 (2005): e124, https://doi.org/10.1371/journal.pmed.0020124. Erratum in *PLoS Medicine* 19, no. 8 (2022): e1004085.

[3]Peter Harrison, *The Territories of Science and Religion* (Chicago, IL: University of Chicago Press, 2015).

[4]Sigmund Freud, "Some Elementary Lessons in Psychoanalysis," in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, ed. James Strachey (London: Hogarth Press, 1940).

[5]Raymond B. Cattell, *Beyondism: Religion from Science* (New York: Praeger Publishers, 1987).

[6]Granville Stanley Hall, *Jesus, the Christ in the Light of Psychology* (New York: Doubleday, 1917).

[7]Paul A. Lombardo, *Three Generations, No Imbeciles: Eugenics, the Supreme Court, and* Buck v. Bell (Baltimore, MD: Johns Hopkins University Press, 2022).

[8]Edwin E. Gantt and Richard N. Williams, "The Triumph of the Will: Evolutionary Psychology and the Conceptual Incoherence of Enhancement," *Journal of Humanistic Psychology* 62, no. 5 (2020), https://doi.org/10.1177/0022167819899009.

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POSITIVE PSYCHOLOGY IN CHRISTIAN PERSPECTIVE: Foundations, Concepts, and Applications by Charles Hackney. Downers Grove, IL: IVP Academic, 2021. 344 pages, index. Paperback; $45.00. ISBN: 9780830828708.

There have been quite a few volumes over the last several years that have attempted to make sense of the relationship between the burgeoning field of positive psychology and the theology and practice of Christianity. Charles Hackney begins this volume by drawing upon the popular definition of positive psychology provided by Shelly Gable and Jonathan Haidt, "The study of the conditions and processes that contribute to the flourishing and optimal functioning of people, groups and institutions." In so doing, Hackney sets the scene for a comprehensive and lively examination of how this booming field of psychology interacts with Christian faith.

Christians have been quite rightly interested in the field of positive psychology for numerous reasons. There is arguably a sense of common purpose between Christian aspirations and those of positive psychology. Both to some extent claim, or at least aim, to produce a flourishing and abundant experience of living, and thereby share an interest in outlining the kind of life that is likely to produce this sort of fruit. Over the last two decades, positive psychology has made its presence felt in almost every sphere of practice: education, business, health, politics, and spirituality, to name a few. Any field of scholarship that claims such a wide and all-encompassing remit will no doubt be of interest to people of faith, partly as a significant cultural phenomenon worthy of attention, but also perhaps as a potentially controversial competitor and usurper of faith.

Hence, while most treatments in the recent upsurge in Christian writing about positive psychology are largely (dare I say) positive, there is also a critical engagement with the field. There is both enthusiasm and disquiet in the secondary literature. It is a cause for celebration that many of the leading scientific contributors in areas such as humility, forgiveness, gratitude, hope, wisdom, and so on, identify themselves as Christians. Nonetheless,

there is some nervousness that this naturalistic and pragmatic approach to well-being and virtue could steer some away from genuine faith in the divine. Christian scholars are interested, but hesitant—as if they give two cheers for positive psychology.

Needless to say, Hackney covers all of the above clearly and accurately in the first section of this book. While there may have been several excellent books covering this area previously, in my view, this volume has some unique selling points. Firstly, it is a comprehensive introduction to the critical dialogue between positive psychology and Christian thought; Hackney does a very good job of covering many of the major concepts in contemporary positive psychology. Secondly, the reference list alone is worth the ticket price. It takes up over sixty pages and nearly a fifth of the entire volume. For those who want to explore the rich interaction between positive psychology and Christianity further and in more depth, the reference list will be a treasure trove.

Furthermore, the book is well organized, starting with the big picture in theology, philosophy, and psychology, then turning toward more-precise treatments of positive experience, cognition, personality, and relationships. It concludes with two vital areas of interest for positive psychology: its applications in sports education, the workplace, and religion; and an absolutely vital final set of chapters on the second wave of positive psychology (which has given more attention to the important dialectic between the positive and negative in life, a dialectic which prevents positive psychology simply being viewed as the study of positive thinking or a fatuous happy-ology). I particularly liked the title that Hackney offers to this final section: "the positive in the negative and the negative in the positive." It captures the spirit of the maturing field of positive psychology and makes for some more-nuanced treatments of the questions of sin and eschatology, the absence of which often bother Christians who consider the contribution that positive psychology can make to the life of faith.

It is also worth mentioning the style in which the book is written. It is easy to read, written in simple language, without dumbing down the technical theological and psychological nomenclature necessary for a scholarly treatment of the area. Hackney is not afraid to insert anecdotes and vignettes to enliven and illustrate the treatment of certain areas, and at various points demonstrates a reflexive stance by addressing the reader in the first person. Nor is he averse to a dose of witty humor; his subheading "Repent for the End (of this chapter) is Near" made me laugh out loud.

Overall this makes *Positive Psychology in Christian Perspective* an ideal entry-level text for the first-time reader. Previous volumes that have aimed to offer a relatively comprehensive analysis of the positive psychology-Christianity dialogue have been mainly multi-author editions or technical volumes written by and for theologians, philosophers, or psychologists. Hackney, however, seems to have pulled off a text that is both comprehensive and accessible. It is unlikely that advanced scholars interested in the field of positive psychology will read the book from cover to cover, but they will still no doubt benefit from dipping into the many pertinent insights that Hackney offers.

I assume that Hackney's principal audience comprises Christian students, undergraduates and postgraduates, all studying positive psychology for the first time, or wanting a Christian perspective on positive psychology. The increasing number of MAPP (Masters in Applied Positive Psychology) programs internationally often attract Christian practitioners, and Hackney has composed a very good accompanying text for helping them make sense of the alignment of their faith with their studies. For me personally, as a psychology professor working in a secular institution, it is unlikely to be the kind of volume that would appear on a reading list, but I already have in mind several students to whom I will be recommending it when I teach positive psychology in the spring semester. The book would be a perfect recommendation for pastors who are interested or concerned about positive psychology and would like to know more. Perhaps there is no better endorsement than that.

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TECHNOLOGY

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TECHNĒ: Christian Visions of Technology by Gerald Hiestand and Todd A. Wilson, eds. Eugene, OR: Cascade Books, 2022. 236 pages. Hardcover; $49.00. ISBN: 9781666704228.

The product of their 2019 conference of the Center for Pastor Theologians, *Technē* consists of fourteen contributed essays that seek to articulate important elements of the relationship between Christianity and contemporary technology.

The book is organized into two sections: Theological Reflections on Technology, and Technological Reflections on Theology. However, while one might expect a section of articles by theologians reflecting on technology, and then a section of articles by engineers and scientists reflecting on the implications of theology

for their work, this is not what the reader will find. Instead, the sections are best understood as "theoretical," focusing primarily on questions about the nature of technology and its relationship to the church, and "applied," focusing on specific technologies, fields of study, or theological methodologies.

The "theoretical" section of the book illustrates the divide between thinkers who are optimistic about the potential for technology to advance the faith (chap. 4) and those who are concerned about the impact that technology might have on the church or the Christian life (chaps. 1, 2, 3, 5, and 6). The book is relatively one-sided. Douglas Estes (chap. 4) and Jennifer Powell McNutt (chap. 14) both defend the adoption of digital technologies by the church, and while she does not make the argument in these terms, McNutt's article suggests that pastors should begin developing relationships with engineers working in information technology. However, Joel D. Lawrence (chap. 1), Nathan A. Brendsel (chap. 2), Andy Crouch (chap. 3), Christopher J. Ganski (chap. 5), Jonathan Huggins (chap. 6), Karen Swallow Prior (chap. 12), and Felicia Wu Song (chap. 13) are all much more cautious about the adoption of technology.

Estes claims that "the rot at the root [of Christian scholarship on technology] is the uncritical acceptance and appropriation of Martin Heidegger's ideas about technology" (p. 66). Certainly, Estes is correct that the discussion is heavily influenced by Heidegger's thought. However, this still allows for an array of views ranging from Lawrence's claim that we need to learn from the Amish (p. 13) to Crouch's distinction between *technē* as "the artful, cultural engagement in God's world" (p. 58) and *technology* (though perhaps "technologism" would be better) as a dream for a life of total ease and complete control brought about by near-magical technological artifacts. Certainly, we do need to *critically* interact with the Heideggerian roots of much contemporary writing on technology, and Estes's critique of Heidegger's thought is helpful, but perhaps we do not need to simply "exorcise Heidegger from our thoughts" (p. 74).

There is also a significant divide between two approaches that authors take to thinking and writing about technology. First, some want to speak of technologies or artifacts such as CRISPR, Digital Readers, or Virtual Reality Technologies. Second, others want to speak in terms of a technological worldview, social imaginary, culture, or society that shapes our motivations in interacting *with* technology. The concern of authors like Lawrence or Crouch is not primarily that eReaders are bad for our brains or that dishwashers are making us lazy. It is primarily that we have developed a milieu that prioritizes comfort, convenience, and ease as the highest good. The development of modern technologies has enabled a socio-culture perspective that enables and reinforces our idolatry of comfort, convenience, and ease.

The "applied" section addresses three specific contemporary technologies: AI (chap. 8 and 9), biotechnology (chap. 10 and 11), and social media (chap. 13). Neal D. Presa (chap. 8) defines AI as "a robot that functions autonomously" (p. 131) and focuses on the applications of AI in robotics. Missy Byrd DeRegibus (chap. 9) distinguishes between weak, strong, and super AI and focuses on the theological implications of strong and super AI. Nathan A. Barczi (chap. 10) and Jeff Hardin (chap. 11) both focus on applying theological insights to biotechnology. However, Barczi, a theologian, focuses on explaining the functional view of the image of God while Hardin, a scientist, focuses on explaining the process of embryonic development. However, their articles could both go much further in relating those subjects to the development of biotechnology. Song (chap. 13) provides a clear explanation of the ways in which social media is personally and morally deformative.

The three remaining articles are somewhat harder to categorize. Bruce Baker (chap. 7) provides a set of catechetical questions raised by new technologies and then attempts to answer them. Prior (chap. 12) argues for the importance of print reading over and against electronic mediums for reading. Finally, McNutt provides a detailed description of the important role that printers and the printing press played in the Reformation and claims that the same kind of relationship could be developed with the wide variety of digital technologies.

Some of the articles are excellent. For instance, Crouch and Wong both provide very persuasive and detailed arguments for their positions, and Estes gives an impassioned argument in defense of the adoption and use of technologies of many kinds by the church. However, some of the articles in the book miss the mark. As one example, Baker's catechism could be much more clearly organized. At the end of each question, he includes several scripture verses, but it is not always clear how they relate to his topic. This is perhaps most evident in question 8, which asks whether AI can be spiritual, but it is unclear how the passages he cites (Isa. 40:13, Job 5:9, and John 1:18, which appeal to the greatness of God) are related to the question. Further, the questions that he poses are good, but the answers he provides could be more clearly explained and supported. For instance, Baker argues against hard and soft materialism and dualism about the human person. He then endorses an "irreducible, intrinsic interdependence" of the human person, but if this is neither a version of soft materialism nor dualism, it is unclear what his position entails.

I was also surprised by what was not included in this book. The articles interact with two major streams of thought: (1) the Heideggerian analysis of a technological society read through a theological lens, and (2) what Evgeny Morozov labeled "technological solutionism," coming primarily through futurist writers and science fiction.[1] It is important to note that neither Estes nor McNutt are technological solutionists insofar as they do not claim that all human problems can be solved through advanced technologies. However, significant movements in the philosophy of information and technology are entirely ignored.

Two directly relevant examples are worth mentioning here. First, in the study of information and computer ethics, there is an important push to consider this field within the model of environmental ethics. The Italian philosopher Luciano Floridi has been a primary proponent of this view and has, at times, explicitly connected it with the idea of stewardship prominent in Christian environmental ethics.[2] Second, there is a turn toward the methodology of virtue ethics that is expressed both in scholarly and in professional work. Shannon Vallor has connected the ethics of technology with the Aristotelian virtue tradition, which has had many classical and contemporary Christian contributors.[3]

Further, the code of ethics of the Association for Computer Machinery places an emphasis on the moral character of computer engineers and opposes this to the common emphasis on strict rules to be followed.[4] There is, in turn, a strong Christian tradition of virtue thought, both Aristotelian and non-Aristotelian, that could be put into meaningful conversation with this turn to an ethic of virtue and character.

Finally, it is also worth noting that the book is preoccupied with digital and biotechnical technologies. While understandable, this preoccupation risks ignoring the significance of other areas of technological development such as transportation, energy, or construction technologies. This suggests to me that Christian theologians are, to some degree at least, overly focused on what we already know. We interact with important, but familiar, sources such as Jacques Ellul, Marshall McLuhan, and Neil Postman, but many of us are ignorant of the significant developments in both the philosophy and ethics of technology, and the actual potential of developing technologies. This book provides a helpful cross-section of current trends in Christian theological thought on technology, but it also suggests the need for Christian theologians to branch out.

Notes

[1]Evgeny Morozov, *To Save Everything, Click Here: The Folly of Technological Solutionism* (New York: PublicAffairs, 2013).

[2]Luciano Floridi, "Information Ethics," in *The Cambridge Handbook of Information and Computer Ethics*, ed. Luciano Floridi (Cambridge, UK: Cambridge University Press, 2010), 95.

[3]Shannon Vallor, *Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting* (Oxford, UK: Oxford University Press, 2016).

[4]Don Gotterbarn, Michael S. Kirkpatrick, and Marty J. Wolf, *ACM Code of Ethics and Professional Conduct: Affirming Our Obligation to Use Our Skills to Benefit Society* (New York: Association for Computing Machinery, ACM Committee on Professional Ethics, 2018).

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Letters

A Response to Gary Emberger's Article

I appreciate Gary Emberger taking the spirit world seriously in his helpful article on God, evolution, and Satan ("The Nonviolent Character of God, Evolution, and the Fall of Satan," *Perspectives on Science and Christian Faith* 74, 4 [2022]: 224–39). I am among those few who do consider the concept of the angelic fall to be helpful in our understanding of "natural" evil. However, I have a few comments/questions that may further our understanding.[1]

First, as with much biblical language, references to evil spirits are fluid and often ambiguous, with multiple metaphors being used to describe them (interestingly, some refer to animals: wild beasts, locusts, serpents, scorpions). Hints of an angelic fall are scattered (the serpent of Genesis 3, the sons of God in Genesis 6, the fall of an exalted one in Isaiah and Ezekiel, and the apocalyptic expulsion of the dragon/devil from heaven) throughout scripture, and describe differing reasons, chronology, and locations of this fall. A primordial fall also requires acceptance of the gap or restoration theory of creation, which has limited biblical support. It remains a logical concept but can only tentatively be accepted.

Second, although I agree that God does not desire suffering and evil works in opposition to his will, I wonder if you (following Boyd) ascribe too much power to evil spirits. The Bible depicts them as disorganized, having limited freedom and abilities, and following Jesus's commands (not Satan's). There is only one reference to animals being demonized (pigs in the Gerasene demoniac) and it is Jesus who inflicts the evil spirits on the pigs. Boyd compares demons with "viruses that cannot

survive long on their own; they need to infect someone or something."[2] Viruses have some ontological status, but not autonomous personhood (although more could be said).

Third, in the Gospel stories, and in much anecdotal and theological literature, evil spirits are noted to be associated with, perhaps parasitic on, sin (e.g., Eph. 4:26, 27; 1 Tim. 3:6). Indeed, their ontology may increase when fueled by human sin. However, it is difficult to understand how creatures not made in God's image, without moral responsibility, can sin and thus allow an entry point for demons. Furthermore, should Christians, who are authorized to expel demons, be expelling demons from animals?

Fourth, all the deliverance stories in the Gospels and Acts have theological purposes—primarily to reveal Jesus's identity and purpose. As his kingdom advances (Jesus moves to unclean places), we see more demonic activity, since evil spirits work to thwart God's purposes, and hinder salvation. It is difficult to see how violent behavior in animals may interfere with the kingdom of God, other than in a very general sort of manner, such as suffering and human disillusionment.

Despite these points, I cautiously support the concept of evil spirits possibly being a causative factor in "natural" evil. We cannot dismiss everything that lacks scientific or clear biblical support. I suggest that a both/and or multifactorial approach is more fruitful.[3] Some events that are incompatible with God's character and will may be random (by-products of normal processes, similar to Polkinghorne's free process defense) whereas others may result from the interference of demons. Or, perhaps more likely, evil occurs due to some interaction between them, as well as human sin or abdication of responsibility. Perhaps demons are parasitic on negative natural occurrences making them worse. It may be interesting to note any association between human sin and "natural" evil—this may strengthen arguments for the role of evil spirits. (David Bentley Hart suggests this with respect to the 2004 tsunami.[4])

The issue is interesting but complex!

Notes

[1]See E. Janet Warren, "Chaos and Chaos-Complexity: Understanding Evil Forces with Insight from Contemporary Science and Linguistics," *Perspectives on Science and Christian Faith* 63, no. 4 (2011): 255–66; E. Janet Warren, *Cleansing the Cosmos: A Biblical Model for Conceptualizing and Counteracting Evil* (Eugene, OR: Pickwick Publications, 2012). In support of Emberger's nonviolent approach, I argue against the use of "spiritual warfare" language.

[2]Gregory A. Boyd, *God at War: The Bible and Spiritual Conflict* (Downers Grove, IL: InterVarsity Press, 1997), 195.

[3]See Warren, *All Things Wise and Wonderful: A Christian Understanding of How and Why Things Happen, in Light of COVID-19* (Eugene, OR: Wipf and Stock, 2021).

[4]David Bentley Hart, *The Doors of the Sea* (Grand Rapids, MI: Eerdmans, 2005).

E. Janet Warren
ASA Fellow

Author's Reply

I welcome Janet Warren's identification with the "few" of us who consider an angelic fall helpful in understanding "natural" evil. Warren points out that the concept of evil spirits as causative factors in "natural" evils does not enjoy abundant, clear biblical support, but she is also wary of too quickly dismissing the concept on that basis alone. Indeed, as I attempted to demonstrate in my article, the plausibility of the concept resides in its resonance with the Bible's revelation of an unseen supernatural reality behind observed events, a reality where good and evil spiritual beings are in conflict. A reasonable and defensible corollary is that this spiritual conflict extends to deep time processes such as evolution.

Warren's comments about the complex causality underlying "natural" evil are well founded. Her suggestions about the parasitic nature of evil spirits and the usefulness of a multifactorial approach to "natural" evil are welcome and helpful. To be clear, the intent of my article was not to simplistically claim that all undesirable natural occurrences are the result of demonic activity; rather, my goal was to question the attribution of evolutionary evil to God's willful plan. Doing so, as explained in my article, is contrary to the character of God as revealed in the life and teaching of Jesus.

In an effort to better understand the complexity of this issue, Warren offers four comments/questions. I will comment on those aspects of her comments/questions most pertinent to my article.

First, I do not believe a postulated primordial fall of Satan requires acceptance of the gap/restoration theory of creation as popularized in the Scofield Reference Bible of the early twentieth century. This theory postulates a long gap of time between verses 1 and 2 of Genesis 1 in which an original creation (v. 1) was destroyed as a result of the fall of Satan, followed by recreation (v. 2). My article makes no mention of *when* Satan fell other than to indicate that a fallen Satan likely influenced or distorted the evolutionary process from early on.

Second, Warren suggests I "ascribe too much power to evil spirits." But why downplay their power? After all,

Jesus came to destroy the works of the devil, a being described as the *ruler* of this world and as holding the power of *death*. Certainly, the incarnation, life, death, resurrection, and ascension of Jesus to heaven has limited Satan's power in the present. But prior to Jesus's ascension, Satan and the other fallen angels apparently enjoyed considerable power and are portrayed as formidable foes (Dan. 10:13, Rev. 12:9). Pertaining to my article, the question to be considered has to do with their capabilities throughout evolutionary time—a matter of speculation, certainly, but the Bible offers little reason to underestimate Satan's power in primordial time.

Third, I agree with Warren's reluctance to think of animals sinning, thereby allowing entry points for demons. Nor do I think that Christians should be in the business of expelling demons from animals. The premise of my article is that evil spirit beings, working in opposition to God's will, distorted the evolutionary process resulting in the violence and suffering associated with evolution. The mechanisms underlying such distortions lie in the realm of speculation. My article does not suggest that, for this distortion to occur, it is necessary for demons to possess animals in the same manner as recorded for humans.

Lastly, Warren wonders how the "violent behavior in animals may interfere with the kingdom of God." Extending her tentative answers, I suggest that the attribution of the violence and suffering associated with the evolutionary process to God's willful intent presents not simply "human disillusionment" but, rather, a thoroughly contradictory portrait of God's character as revealed by Jesus. To suggest that predation, harmful mutations, cancer, deadly pathogens, etc. are all *God's ideas* and/or the only way God could have created, is to erect a substantial barrier, at least for some, to coming to faith and inclusion in the kingdom of God.

Warren rightly concludes that the causation of "natural" evils is complex. Mystery is interwoven with complexity. With no desire to downplay the complexity of the issue, a major goal of my article was to support the claim that the nature of the character of God is not part of that mystery or complexity. By ascribing the violence and suffering of the evolutionary process to evil spiritual beings working in opposition to God's will, God's good, loving, and nonviolent character is consistent throughout all time.

Gary Emberger
ASA Member

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