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Statement of Perspective. The word *zygon* means the yoking of two entities or processes that must work together. It is related to *zygote*—meaning the union of genetic heritage from sperm and egg, a union that is vital in higher species for the continuation of advancement of life. The journal *Zygon* provides a forum for exploring ways to unite what in modern times has been disconnected—values from knowledge, goodness from truth, religion from science. Traditional religions, which have transmitted wisdom about what is of essential value and ultimate meaning as a guide for human living, were expressed in terms of the best understandings of their times about human nature, society, and the world. Religious expression in our time, however, has not drawn similarly on modern science, which has superseded the ancient forms of understanding. As a result religions have lost credibility in the modern mind. Nevertheless some recent scientific studies of human evolution and development have indicated how long-standing religions have evolved well-winnowed wisdom, still essential for the best life. *Zygon*'s hypothesis is that when long-evolved religious wisdom is yoked with significant recent scientific discoveries about the world and human nature, there results credible expression of basic meaning, values, and moral convictions that provides valid and effective guidance for enhancing human life. *Zygon* also publishes manuscripts that are critical of this perspective, as long as such papers contribute to a constructive reflection on scientific knowledge, human values, and existential meaning.

Organization and Governance. *Zygon: Journal of Religion and Science* is owned and managed by Zygon: Journal of Religion and Science NFP, a not-for-profit scholarly corporation established in Chicago in 2019, which succeeds a joint venture established in 1965 and has as its members: IRAS, the Institute on Religion in an Age of Science (1954), CASIRAS, the Center for Advanced Study in Religion and Science (1972), and ISSR, the International Society for Science and Religion (2002). Over the history of the journal, funding has come from a variety of sources: an endowment has been built up from contributions from individuals, while operating costs of the corporation had been met from a share in publication revenue. With the disappearance of publication revenue after shifting to diamond open access in 2024, the main sources of income are now contributions (if any) from member organizations and individuals, as well as investment income and unrealized gains on investments. The corporation is dedicated entirely to publishing the journal. The corporation's Board of Directors ('Joint Publication Board') has nine members; each member organization appoints three directors. The selection and appointment of the Editor-in-Chief, or the joint Editors-in-Chief, is done by the Joint Publication Board. The appointment term is five years (renewable). The Editor-in-Chief can appoint Editors, Assistant Editors and Editorial Assistants. The Joint Publication Board appoints members to the Editorial Advisory Board; the appointment term is five years (renewable) and appointments are made (or renewed) with a view to diversity in the composition. The journal was formerly published by The University of Chicago Press (1966–1978), Wilfrid Laurier University Press (1979–1989) and Blackwell/Wiley (1990–2023), and from 2024 the journal is published by the Open Library of Humanities (OLH).

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VOL. 59, NO. 2, June 2024

Editorial

Replication in the Humanities

This issue opens with an Editorial by John Slattery, who challenges all who are engaged with the field of science and religion to reconsider the role of eugenics in this field; he invites essay contributions for a thematic section in *Zygon: Journal of Religion and Science*.

Below, you will find brief introductions to the articles included in this issue, both in the general section and in the thematic section on replication in the humanities, as well as an overview of books reviewed in the latest edition of *Reviews in Science, Religion and Theology*.

Articles

This issue contains six general articles. Tim Lomas et al. showcase diverse ways through which love of creation has been expressed and can be appreciated, using a selection of ten religious and philosophical traditions; they try to find some common ground among these traditions by constructing a provisional set of items for a love of creation measure that would be applicable across them. Michael Winkelman offers a framework for understanding recurrent forms of mystical experiences as natural brain states; he discusses how different mystical experiences involve changes in specific neurologically mediated forms of self that provide the basis for universal forms of mystical experience. Gregory Lobo analyses René Girard's "science of religion," especially his "scapegoat" mechanism its role in the process of hominization; he sheds more light on this process by drawing on the neuroscientific concept of prefrontal synthesis and the related philosophical concept of collective intentionality. Carl-Johan Palmqvist provides some critical reflections on philosopher John Schellenberg's project of "evolutionary religion" (a process that results in progress towards learning the truth about transcendent reality); he concludes, however, that humanity is currently too ignorant to begin this project. Patrick Becker tackles evolutionary approaches to religion (that is, biological explanations of religion) and the problem of transcendent meaning; he critiques a reductionist view that understands religion primarily in terms and argues that limiting religion to its evolutionarily ascertainable benefits overlooks the fact that these benefits only materialize when there is belief in the transcendent purpose that religion

provides. And Stefano Bigliardi scrutinizes the conceptualization of science advanced by the Muslim public speaker and author Hamza Andreas Tzortzis in his book *The Divine Reality*; he argues that Tzortzis's discussion suffers from problems related to the consistency and accuracy of the epistemological framework within which he defends (Islamic) theism.

Replicating John Hedley Brooke's Work on the History of Science and Religion

In this thematic section on "Replicating John Hedley Brooke's Work on the History of Science and Religion," a central work on the history of science and religion is critically scrutinized as a demonstration of how replication can be approached in the humanities. The team, consisting of Rik Peels, Gijsbert van den Brink, Hans Van Eyghen, and Rachel Pear, introduce and reflect on their direct replication and conceptual replication of particularly chapter 3 of Brooke's *Science and Religion: Some Historical Perspectives* (1991). Subsequently, John Hedley Brooke presents his reflections on the experience of his work being replicated and Jeremy Brown reflects on the project and explores which studies in historiography might lend themselves to replication.

Books reviewed in *Reviews in Science, Religion and Theology*

Reviews in Science, Religion and Theology is a quarterly joint publication of the European Society for the Study of Science and Theology (ESSSAT) and the International Society for Science and Religion (ISSR) and is distributed free to all members of ESSSAT and ISSR. In order to give readers of *Zygon: Journal of Religion and Science* an overview of recent publications, we include the list of books reviewed in the latest *Reviews* issue (in this case, June 2024):

- Joshua Farris and Joanna Leidenhag, eds., *The Origin of the Soul: A Conversation*, London: Routledge, 2024
- Benjamín Labatut, *The MANIAC*, London: Pushkin Press, 2024
- Philip Ball, *How Life Works: A User's Guide to the New Biology*, Chicago: University of Chicago Press, 2023
- Philip Goff, *Why? The Purpose of the Universe*, Oxford: Oxford University Press, 2023
- Christopher C. Knight, *Exploring Religious Pluralism: From Mystical Theology to the Science–Theology Dialogue*, Cambridge: Cambridge University Press, 2024

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Zygon®
Journal of
RELIGION AND SCIENCE
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Contents

REPLICATING JOHN HEDLEY BROOKE'S WORK ON THE HISTORY OF SCIENCE AND RELIGION

Zygon®: Journal of RELIGION & SCIENCE

Slattery, John P. 2024. "Editorial: Reconsidering Eugenics in Science and Religion Scholarship: A Reflection and Invitation." *Zygon: Journal of Religion and Science* 59 (2): 343–51. DOI: https://doi.org/10.16995/zygon.17110

Open Library of Humanities

Editorial

Reconsidering Eugenics in Science and Religion Scholarship: A Reflection and Invitation

The field of science and religion studies is in need of a historical reconsideration of the eugenic era. This reconsideration must include the close ties between the development of evolutionary sciences and eugenic philosophies in the early twentieth century, the related intersections of early evolutionary theologies with eugenics, and the legacy of the connections between anti-evolution and anti-eugenic views in the religious public. Since most would mark the beginning of contemporary science/religion conversations with the published works of Ian Barbour and Pierre Teilhard de Chardin, it is also important to reconsider their works as well as those who published and critiqued such works. What role did eugenic philosophies have in the development of the modern field of theological considerations of science, and in what ways have eugenic philosophies been ignored, erased, or supported during the development of this field? It is past time for the science/religion community to seriously consider these questions. I am grateful for the space here to consider this question, and grateful further for a thematic section of *Zygon: Journal of Religion and Science* on this topic in the future.

A Recent History of Reconsidering the Past

After the mass protests over the murder of George Floyd in 2020, many corporations, scholarly organizations, journals, and governments reconsidered their past to interrogate whether racism and other biases may have played a role in the construction and sustenance of their organizations. This seems an unequivocal moral good: moral clarity of the past allows for moral clarity of the

present and the future, an ethical judgment equally true for societies, individuals, organizations, and disciplines but perhaps most true for those who aim to move forward religious and theological understandings of God and the world.

In this wave of historical reconsiderations, the majority of published statements concerned reaffirming stances against any and all things racist. These statements were usually followed with some sort of pledge for action, such as donating community service hours, starting a scholarship fund, or pledging to employ more workers of color (Friedman 2020). For scholarly and professional organizations, such statements were usually the limit of their solidarity, but on a few occasions, an organization produced a comprehensive report considering the nature of complicity in its history. Such reports are a rarity in the scholarly world and nonexistent in the corporate world. Three are worth considering.

First, the American Psychological Association (APA) published a sweeping study that attempted to detail the historical failings of the association and apologize, quite directly, to people it harmed. The APA (2021) "failed in its role leading the discipline of psychology," the study begins, "was complicit in contributing to systemic inequities, and hurt many through racism, racial discrimination, and denigration of people of color, thereby falling short on its mission to benefit society and improve lives." It continues boldly, "The APA is profoundly sorry, accepts responsibility for, and owns the actions and inactions of APA itself, the discipline of psychology, and individual psychologists who stood as leaders for the organization and field" (APA 2021). The organization then laid out a plan for action based on this reconsideration and followed up a year later with another report, a US$1.1 million call for grant applications, and an expanded online presence. The organization has since transitioned this work into more regular work on equity, diversity, and inclusion and seems to be holding true to its original goals.[1]

Second, the American Society of Human Genetics (ASHG) published a landmark report in January 2023 (ASHG 2023a). The report includes the history of the ASHG in relationship to the American eugenics movement and commits the ASHG to multiple equity-focused actions over the next several years, including pledging to "prioritize DEI [diversity, equity, and inclusion] objectives" in its 2023 strategic plan (ASHG 2023b). Similar to the APA's report, the ASHG report evaluates both the complicated history of the ASHG as well as the legacy of genetics in general. Given the recency of this report, it is unclear whether its stated goals will be continued in the life of ASHG as a whole beyond the initial wake of publication.

Third, University College London (UCL) began a self-study in 2018 and published their own groundbreaking report in 2020, tracing in detail the ways in which UCL "played a fundamental role in the development, propagation, and legitimisation of eugenics" (UCL 2021; cf. UCL 2024). While this report was not in response to the 2020 protests, the systematic nature of the report

and the continued commitment to follow-up actions mark it as one of the most impressive systematic efforts to emerge from this period of racial and eugenic reconsideration among scholarly organizations.

Other scholarly organizations published reflections, but not to the extent of APA, ASHG, or UCL. The eminent scientific journals *Nature* and *Science*, for example, each reflected briefly on their past and the need for further action. *Nature* (2022) published an editorial in September 2022 that pointed to the failings in the history of the journal. The editors referenced the journal's complicity in the rise of eugenics, highlighting the aforementioned UCL report. *Nature* has since published multiple editorials and essays on its "racist legacy" (Nobles et al. 2022), even updating the reporting checklist for potential authors to include whether and how authors have described people "according to race, ethnicity, or other socially constructed categories" (*Nature* 2023). These steps attempt to "keep research from inadvertently perpetuating harm, and to avoid creating more negative experience for people for whom racism is a daily lived reality" (*Nature* 2023).

Science and its related member organization, the American Association for the Advancement of Science (AAAS), have published several reflections on the history of the organization, beginning with a 2021 editorial that I was fortunate to author alongside the CEO of AAAS and the editor-in-chief of *Science* (Slattery, Parikh, and Thorp 2021). *Science* has followed this work with several issues devoted to scientific racism, and AAAS has begun several institutional projects related to issues of racism in science, including an annual DEI report (AAAS 2023).

Since the initial swell of support for such statements, public support has waned, especially in the last two years, with anything tagged "DEI," "anti-racism," or "critical race theory" becoming objects of political and public debate (Kalita 2023; Wallace-Wells 2021). Books, campus initiatives, and even school names have been relitigated, with some rolling back or challenging measures put in place in 2020. Exemplifying this trend, a school board in Virginia voted in May 2024 to restore the names of two schools to honor Confederate generals, years after those names were successfully stripped from the schools (*The Northern Virginia Daily* 2024). Furthermore, several states have passed laws banning diversity initiatives at state colleges, with Florida, for example, restricting even "how educators could discuss discrimination in mandatory courses" (Betts 2024).

Despite this pushback, the task of historical reconsideration remains a moral imperative to expel the demons of the past and face more clearly the present and the future. For academic fields, such as those broadly governed by journals like *Zygon*, I find three steps necessary for a successful reconsideration: acknowledging the past, uncovering the depths of the historical challenges, and allowing that which is uncovered to alter the future. The work done by *Nature* and *Science*, for example, remains only in the first step. The work of the APA,

ASHG, and UCL signify a valiant attempt at the second step, and the future will determine if they complete the third.

Reconsidering the History of Science and Religion

In the interdisciplinary field of science and religion studies, little has been done at an institutional level in any of the three steps of historical reconsideration.[2] Many individuals, colleges, journals, and related organizations have done excellent work in the contemporary intersections of racism, bias, science, and religion,[3] but only a few have begun to encounter seriously the lineage of eugenics and racism in the historical development of the field.[4] Fewer still have dealt directly with the elision of eugenics in the science–religion conversations in the latter half of the twentieth century.[5]

In the historiography of intersections of scientific and theological philosophies, the body of literature seems to skip eugenics when considering the twentieth century. Courses and books on the intersections of Christianity and science, for example, traditionally begin with ancient Greece, then move to Galileo, Darwin, and the Draper-White hypotheses of the late nineteenth century. Such discussions then follow the evolution dialogues, coming into the slow acceptance (or lack thereof) of evolutionary theory by various Christian communities in the mid-twentieth century.[6] Finally, in the 1950s, the modern field of "science and religion" emerges with Ian Barbour and Pierre Teilhard de Chardin, SJ, whose masterful works laid the groundwork for at least the first half-century of science–religion scholarship.

My own contribution to this discussion has been to investigate the role of racism and eugenics in the works of Teilhard de Chardin. I argued in 2017 and 2024 that Teilhard de Chardin's corpus is suffused with a paternalist racism, best seen in his anthropological treatises and his discussion of human evolution (Slattery 2024; cf. Slattery 2017). This racism treats all humans beyond those of Western European descent as inherently inferior: those of Asian and African heritage slightly inferior, while indigenous peoples he names very inferior, "fixed pinnacles of their own weaker and imperfect evolutionary lines" (Slattery 2024, 12). These arguments contributed to his adoption of explicit eugenic philosophies beginning the late 1930s and continuing until his death. His eugenic and racist commitments did not affect every aspect of every essay, but they are significant in their impact and, most importantly, previously went largely unnoticed or ignored in scholarship (Slattery 2024, 33–38).

One of the more compelling facts about Teilhard de Chardin's case is his passion for eugenics through the early 1950s, when he became frustrated by the duplicitous renaming of institutions and the hesitancy of people to conduct eugenic experiments after the war (Slattery 2024, 32). Teilhard de Chardin was a very consistent thinker. Since he decided to follow eugenic ideas in the late 1930s, he named this public disapprobation for everyday eugenics in the 1950s

as hypocrisy, decrying the political motives that dominated the conversation. While there were plenty of critical discussions of eugenics in the 1950s, the criticisms were limited to those affiliated with the horrors perpetrated by Hitler and the Nazi party. All other eugenics discussions—like the ones connected to Teilhard de Chardin —were quietly elided and considered closed.

Thus, there was no justice demanded regarding the Americans whose worked influenced Hitler, like Madison Grant, nor of the American eugenic laws that laid the groundwork for the Nazi eugenic laws, like those in Virginia (see, for example, Lombardo 2022; Offit 2017). The postwar righteous anger was employed to catch Nazis, hold trials, and erase all mentions of eugenics in public policy and private conversations. Unless eugenicists were directly tied to the Nazi regime, they saw little consequences. Because of this, much of American eugenics was simply renamed, and many eugenicists continued to work under different pretenses. Over the next half century, these eugenicists thrived in their research, exemplified by protests against UNESCO's famous racial equality statements, fears of global overpopulation, and the misogyny and racism found in many scientific circles.[7]

The reality of the science–religion historiography of this era is that so much ink has been spilled over evolution and theology, attempting to correct or understand creationists, that perhaps we have developed a blind spot when it comes to uncovering and correcting our own errors of the past. While I disagree with the scientific denialism of creationists, perhaps such views were entrenched by the merging of evolution and eugenics and faith, and perhaps such views were further entrenched by the denial that eugenics was supported by the same people who supported evolution. It is time to set the record straight and recover the darker history of the intersections between science and religion, and it is time that this work be done by those who research intersections of science and religion more broadly.

A Collective Response as a Beginning

While I began by referencing the work of the APA, ASHG, and UCL, I believe that such collective, sustained actions are now highly unlikely given the shift in political climate and the expense required. Yet significant steps can still be taken without such succinctly organized actions, including the tasks of uncovering the past and researching the contemporary legacy of past harms. For the broad field of science and religion studies, it is precisely this type of collective work I am proposing, highlighted by an in-person workshop in the fall of 2025 and a thematic section of *Zygon: Journal of Religion and Science* in 2026 that will focus on essays addressing reconsiderations of the history of the science–religion discussion, especially the role of eugenics in the past and present of the conversation. This thematic section will be co-edited by myself, Myrna Perez, and Charles McCrary.

I propose this workshop and thematic section both as a gathering of important work from seasoned authors and as a way for the international community of scholars who read *Zygon: Journal of Religion and Science* to begin to work together towards a collective reconsideration of the origins of the modern discussions of the intersections of science, philosophy, religion, and theology. It is my hope that this work will be the next step in the process of reconsidering the past and, with clarity of thought, reconsidering the future.

For the thematic section of *Zygon: Journal of Religion and Science*, all essays will be considered, but I am especially interested in essays that discuss one of the following:

- eugenics in theological works in the early twentieth century
- eugenics in the evolution/creation debate in the early twentieth century
- eugenics in the emergence of theological consideration of genetics
- the impact of eugenics on fundamentalism and creationism in the twentieth century
- renewed historical considerations of figures, events, and discussions during the eugenic period
- the impact of race and racism in the development of the modern field of science and religion
- the changing definitions of religion in the early twentieth century as related to science
- eugenics as a form of governance in relation to secularism and religion
- eugenics as a science/religion framework that influenced colonial policies in the Americas, Africa, and Asia in the early twentieth century

In order to be considered for the workshop and thematic section, please send a 1,000-word abstract to slatteryj@duq.edu by January 31, 2025. Please direct all questions to the same email address.

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Notes

[1] The last update to this seems to be December 2022, at which time they shifted their recent work to a section focused on further equity, diversity, and inclusion actions, conferences, and grants. See APA (2023).

[2] In this case, by "institutions" I mean university centers, professional organizations, nonprofits, or journals specifically devoted to the broadly construed field of science, religion, and technology studies.

[3] In *Zygon: Journal of Religion and Science,* for example, see Jack Mulder (2021) as well as the March 2019 edition (*Zygon: Journal of Religion and Science* 54 (1)), which included both a study of racism in artificial intelligence and an extended book symposium on Terence Keel's 2018 *Divine Variations: How Christian Thought Became Racial.* Outside this journal, excellent examples abound, such as Daniel Bolger et al. (2024) and *Science as Mastery: A Story about Race and Power*, directed by Nathan Clarke (wwwAAASorg 2023).

[4] These books include Keel (2018), Sharon Mara Leon (2013), Alexander Pavuk (2021), Christine Rosen 2004), Perez Sheldon, Ragab, and Keel (2023).

[5] Again, the works listed in the previous note have somewhat ameliorated this elision, most recently essays in *Critical Approaches* (Perez Sheldon, Ragab, and Keel 2023) by Myrna Sheldon, Joseph Graves, and Cassie Adcock.

[6] My own books are as guilty of this elision as any other, discussing evolution in the 1890s and early 1900s without mentioning the rise of eugenic discussions and the impact of early eugenic considerations on evolutionary theories. See Slattery (2019, 2021) and Perez Sheldon, Ragab, and Keel (2023).

[7] For histories of the legacies of eugenicists and related persons in the mid-to-late twentieth century, see Alison Bashford (2022), Joseph L. Graves (2003), Adam Rutherford (2023), Angela Saini (2019), and William H. Tucker (2002).

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Love of Creation: Exploring Diversity and Commonality among Religious and Philosophical Traditions

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Love is widely recognized as one of the most important, desired, and consequential aspects of the human condition, and thus has rightly been the focus of much academic attention. However, this interest has tended to concentrate on specific forms of love—especially romantic and familial forms—to the exclusion of others.

One such overlooked form is love of “creation”—of the world and the wider cosmos in which human beings find themselves. Throughout history and across cultures, this kind of love has been developed and articulated by religious and philosophical traditions in diverse ways. This article showcases a selection of ten such traditions, generally through the prism of one particularly important figure within each tradition, including Hinduism, Judaism, Zen Buddhism, Manichaeism, Christianity, Islam, Maasai thought, Cherokee thought, Romanticism, and secular reverence. Through these lenses, the diverse ways love of creation has been expressed can be appreciated. In the conclusion, we also try to find some common ground among these traditions by constructing a provisional set of items for a love of creation measure that would be applicable across traditions.

Introduction

Few experiences are as cherished or sought after as love. Throughout history, it has animated and captured attention across myriad fields of endeavor, from philosophy to the arts. Scientific research on love—often focused on emotional experiences but also including acts of care—has gained traction in recent decades. Recent investigations have explored the dynamics of love across disciplines, from biochemistry (de Boer, van Buel, and Ter Horst 2012) to developmental psychology (Nosko, Lawford, and Pratt 2011). Despite this wealth of interest, the bulk of scholarship on love tends to be focused on a limited range of experiences and expressions. By far the most attention is either on romantic love (e.g., the kind of desire and passion one finds between people who have built a relationship around a sexual or sensual and emotional bond) (Asselmann and Specht 2020) or familial love (e.g., the kind of care and nurturing one finds within family settings, particularly the intimate bonds between parents and children) (Li and Meier 2017).

However, while these forms of love may be archetypal or prototypical, they are far from its only forms, at least insofar as the word is used in common language (Lomas 2018; VanderWeele 2023). After all, people can and do profess love for all manner of phenomena, from other beings like friends or pets to nonhuman entities such as places and objects to abstract phenomena ranging from ideas to principles. These loves are not usually or normatively romantic or sexual (except in rare cases, which tend to be regarded as "deviant"). But the term love is still appropriate, or at least is still widely used in common parlance (which may be the same thing). Indeed, the word encompasses a truly vast range of phenomena, spanning diverse spectra of intensity, valence, and temporal duration, and is used in relation to a panoply of relationships, objects, and experiences. To that end, Bernard Murstein (1988, 33) describes love as "an Austro-Hungarian Empire uniting all sorts of feelings, behaviors, and attitudes, sometimes having little in common."

Yet, as noted, most academic attention has focused only on romantic or familial love, with attention seldom paid to its other forms, particularly those not centered on other humans. This oversight applies especially to a form of love that historically has been widely celebrated across religious traditions but is all but absent from modern scholarship: love of creation. By "creation," we (the current authors) mean the entirety of existence, all that is. The only possible exception to this category is a "creator" in religions that posit one that stands outside and apart from creation, entirely transcendent to it. Not all creators meet this criterion: some traditions conceive of creators who are not only transcendent but also immanent; they are part of—or indeed wholly *are* —creation too. Thus, evidently, the notion of "creation" can be complex and nuanced. Nevertheless, some conceptual clarity is provided in a taxonomy presented by Alan Watts (1957), who suggests that across cultures, there have

been three main ontological perspectives regarding the nature of creation: constructed artefact, organic process, and divine play.

Each of these perspectives draws on different forms of creation humans see in their daily lives, the nature of which is then extended metaphorically to the cosmic arena. Thus, the first draws inspiration from the archetype of a potter fashioning works out of clay, and in that fashion suggests creation is similarly "made" by an all-powerful being (sometimes known by labels such as "demiurge"), as seen especially with the great monotheistic traditions like Judaism, Christianity, and Islam. The second perspective does not involve a separate creator per se but regards "creation" as an emergent unfolding process that is somehow self-originating, self-directing, and self-sustaining. The metaphorical archetype here is a flower, which unfurls in all its complex perfection without being "built" by an outside creator pe se. This view is particularly prevalent in Eastern traditions that are generally regarded as nontheistic, such as Taoism and Buddhism. The third perspective depicts creation as a cosmic drama or play in which the creator themselves acts out the creation that is unfolding, therefore being immanent as well as transcendent. This stance is found, for example, in the beliefs and practices now referred to under the label Hinduism, which includes Vedic ideas such as *lila* (Sanskrit for "play"), capturing the idea of the cosmos as a divine play.

This article aims to reflect and encompass this diversity of ideas, offering a mosaic of different perspectives on love of creation—hailing from a wealth of religious and philosophical traditions—that together present a good picture of the phenomenon. We have selected—based on the interests and expertise of the authors assembled to work on this article—ten different traditions from a range of cultures and eras to explore the way love of creation has been broached within each. These are: Hinduism, Judaism, Zen Buddhism, Manichaeism, Christianity, Islam, Maasai thought, Cherokee thought, romanticism, and secular reverence. These traditions are presented in very rough chronological order according to their historical emergence, though each tradition has roots stretching much farther back than their ostensible "beginning." Indeed, some traditions are difficult to localize at a particular point in time—particularly Maasai and Cherokee cultures—and so do not sit easily within any given chronology; as such, these have been situated as later sections due to the modernity of the figures discussed as emblematic. To that point, each tradition of course hosts diverse ideas on this topic; indeed, one could easily devote an entire paper, or even a whole book, to any one of them. It is beyond the scope of this article to delve into this internal complexity; as such, we have limited our discussions to one seminal figure from each tradition, allowing their particular take on the topic to provide something of the spirit of their tradition more generally. This approach is neither comprehensive nor exhaustive with respect to specific traditions or human thought more generally, with many traditions not featured

here at all. This is not a flaw per se; we regard such a comprehensive and exhaustive account as far beyond the feasibility of one academic article, or even an entire monograph. Nevertheless, we suggest this kind of review—selective and partial as it may be—can still convey the diversity of views on this topic that have emerged across cultures, and together they can give a relatively complete and nuanced picture of love of creation.

Finally, we conclude by constructing a provisional set of items for a measure that endeavors to capture the spirit of all the perspectives on love of creation discussed here, such that whichever view of creation a person endorsed, they would be able to convey their love for it through this measure. This proposed measure is not complete or final in any sense, since that would require data collection, psychometric evaluation, and potentially factor analytic procedures, which are beyond our scope here. Indeed, the plan is for this article to serve as a foundation for precisely this kind of future work. Nevertheless, we hold that constructing a proposal for an initial scale is a useful way of summarizing the various perspectives in this article and drawing the disparate threads together.

Hinduism: Loving All Is Loving God

Hindu religion and classical Indian philosophies are closely intertwined. The earliest Hindu scriptures—the Vedas—were not logically organized texts. Rather, they are claimed to be direct realizations of the seers and unmediated by human thought. Being oral traditions depicting deep spiritual experiential contents, these were expressed in symbolic language, where signs, objects, animals, and activities conceal profound meaning (Werner 1977). Hence, the Vedas have been multiply interpreted; each orthodox Indian philosophy rooted in the Vedas expounds its specific perspective about the relation between humans, the universe, and god. Such perspectives are offered as *darshanas*, the popular translation of the term "philosophy." But *darshana* means seeing or perceiving: thus, its etymological meaning is different from philosophy (i.e., love of wisdom). In that sense, *darshanas* can afford to be more tentative and mutually inconclusive than philosophy. Therefore, the coexistence of contradictory perspectives in the *darshanas* evolving on the Indian subcontinent is less threatening to the Hindu psyche than it would be in other traditions.

In ancient Indian thought, the creator and the created are simultaneously separate and identical, transcendent and immanent. The coexistence of such apparently contradictory premises may be integrated as stages of *sadhana* (or journey) toward wisdom at different levels, and the final integration may be made in terms of universal consciousness (*cit*) (Gupta 2003), known variously as *Brahman* or *Atman* (as in the Vedanta tradition) or *Purusha* (as in the Samkhya school) (Dasgupta [1957] 2009; Swami Ranganathananda 1968). There are four broad ways (*yoga*) to attain the experience of universal consciousness: *jnanayoga* (the path of knowledge), *rajayoga* (the royal path of control of inner winds

and mind), *bhaktiyoga* (the path of devotion), and *karmayoga* (the path of action without attachment). The four paths may be considered as tributaries of a river, all leading to the same goal of *moksha*, or salvation, though the experiential aspects of each are multiply shaded depending upon the path as chosen via one's disposition, and also upon the particular way one may have integrated it.

The essence of each path is to dilute or demolish the everyday conventional self or "I." This I (*ahamkara*), developed as a component of the inner structure (*antahkarana*), becomes the center of one's psychological universe. In most variants of the Indian religio-philosophical approaches, the everyday world is considered a delusion or illusion, the very primordial delusion being the I. Yet, a reality and an identity apart from the deluded reality attached to the mundane I exists as a potential in all beings. Every being possesses the potential of unification with the supreme spiritual existence, the absolute consciousness, and that state is the ultimate goal. Despite the implication of the integration of diverse paths made in numerous teachings and traditions, in practice, most spiritual leaders within Hinduism have pursued one specific path vigorously to attain this unification, only indirectly acknowledging, or sometimes criticising, other paths.

In the late nineteenth century, Sri Ramakrishna Paramahamsa highlighted the significance and validity of all possible paths and their variants by pursuing multiple systems of practice and realizing that they all reach the same goal. His experienced religious systems included but might not have been limited to personal devotion to Goddess Kali, the Ramalala, Tantra, Vaishnava sectarian practice, Advaita Vedanta, Islam, and Christianity. His realization-based declaration that "there are as many valid ways [to salvation] as there are views" was a fresh way of looking at spirituality, especially in the context of the India then torn by political and religious feuds (Swami Chetanananda 2020).

After Sri Ramakrishna's passing, his disciple Narendranath Datta took the monastic vow and adopted the name Swami Vivekananda. He traveled to the United States to participate in the World's Parliament of Religions held in Chicago in 1893. His speech was an immediate triumph. Subsequently, Swami Vivekananda delivered hundreds of lectures in the United States and England. Thus, he established Hinduism as a major and meaningful approach to personal, social, and spiritual life in the West (Burke 1985). In his lectures abroad, Swami Vivekananda often focused on the Vedantic and Yogic views, mainly to cater to the scholarly needs of the West. But he also established the Ramakrishna Mission in India, where apart from scholarly studies, he focused on devotional worship as well as service to all living beings seen as God. "Be grateful to the man you help, think of him as God," he said (Vivekananda [1947] 1979, 76). Service to others has always been a part of all religions. But Swami Vivekananda emphasized the Vedantic view that Brahman, or the ultimate consciousness, is

immanent in all beings and underscored this attitude as the basis for service to all humankind endowed with latent Godhood.

For him, service is not a love toward separate others but toward an extended self; Godliness is there in ourselves and others alike. Swami Vivekananda received this nondiscriminatory attitude in the form of a dictum from Sri Ramakrishna. The master once told that kindness to others is not the greatest virtue, as there is a hierarchy in kindness. Service should be given with love and the understanding that one is serving God and that the needy person is actually providing an opportunity to serve God directly in living form. Thus, through practical application of the Vedantic unification principles (Badrinath 2006), the creator and the creation become identical in the *darshana* of Swami Vivekananda, and the recommended way of dealing with this "reality" becomes the service of love.

Judaism

Love permeates the Jewish canon, from the Torah (Hebrew Bible) to the thought of the twentieth-century rabbi and philosopher Abraham Joshua Heschel. Contemplations and celebrations of love include the Psalms and the prayerbook, as well as rabbinic commentaries and philosophical examinations. Indeed, the Torah has historically been described as teachings that include laws; one might even describe love as a duty or responsibility, a moral imperative that is central to the realization of wisdom and order. The most common Hebrew word for love is *ahavah*, rooted in the Aramaic word *hav*, which means "to give." *Ahavah* represents a broad spectrum of love relationships, including familial, erotic, and divine love. Other Hebrew words denoting love are *chesheq* (passionate love) and *chesed* (loving kindness).

Love of creation in Jewish thought encompasses the Genesis story, which includes not only the creative process but also the creator's appreciation of His creations as "good." When considering the notion of "love of creation," the term "love" can also be translated as a deep pleasure of approval and satisfaction, as demonstrated by God's own evaluation of the goodness of creation. The story of creation in the Hebrew Bible exceeds six days. In Genesis 2:1–3, creation is crowned by the Sabbath rest and God's blessing of the day, making it holy. The concept of the creative pause, sanctified by God, contributes to the spiritual and social wellbeing of humanity and to nature. As it states in the commandment to keep the Sabbath (Exodus 20:8–11): "Remember the Sabbath day, to keep it holy. Six days you shall labor and do all your work, but the seventh day is the Sabbath of the LORD your God. In it you shall do no work: you, nor your son, nor your daughter, nor your male servant, nor your female servant, nor your cattle, nor your stranger who is within your gates." The notion and practice of the Sabbath rest is an essential expression of love extending toward family, friends, guests, workers, land, and God—indeed, the creator and all His creation.

It is posited that the Sabbath—our pause from work, from manipulating and extracting the natural world's resources for our benefit—provides a weekly time for manifesting our deep appreciation for the beauty of the creation.

Love in the Torah is prominent not only in narratives and poetry but also as part of the 613 commandments. Deuteronomy 6:5 states: "You shall love the Lord your God with all your heart and with all your soul and with all your might." A common interpretation of the commandment to love God is through teaching, learning, and contemplating the Torah. Moses Maimonides, one of the most influential medieval Jewish thinkers, linked the love of God to love of creation and the natural world. The orderliness of nature manifests God's governance of the world. According to Maimonides (1990, Yesodei Ha-Torah 2, 2), "reflecting upon his great and wondrous works and creatures," one comes to see God's infinite wisdom and immediately comes to love God. The more humans observe the natural world, the more we revere the creator because the natural world manifests the presence of order and wisdom. Maimonides's emphasis on science as an independent enterprise of knowing nature provides an intellectual and rational perspective of knowledge as integral to love of creation.

A poetic and mystical approach to love of creation based on the importance of the Sabbath as enabling the expressiveness of the love of creation is provided by Abraham Joshua Heschel. He writes about the Sabbath as "a palace in time" (Heschel 2005). It is only when humans cease our work that we can enjoy the manifold gifts of creation. Explaining the notion of "awe," he says, "awe is more than an emotion; it is a way of understanding, insight into a meaning greater than ourselves. Awe enables us to perceive in the world intimations of the divine, to sense in small things the beginning of infinite significance" (Heschel 1976, chapter 5).

Through the lens of the Torah and its hermeneutics, love of creation is embedded in the very story of creation in Genesis 1–2, which narrates the creative process and concludes with the designation of the weekly Sabbath as a holy day. Maimonides represents the medieval intellectualist approach to the love of God and His creation based on the wisdom and order of the natural world. In the twentieth century, Heschel offered in his theopoetics a portrayal of the Sabbath day as enabling the experience of awe and wonder of creation and love of God. These and numerous other teachings epitomize the expansive varieties of love from the divine to the human that have been contemplated and celebrated within Judaism.

Zen: Playful Direct Seeing into the "Suchness" of Reality

Love of creation is suffused throughout Buddhism. One must tread carefully here though, as the truth of this statement will vary according to how one understands love. After all, a core tenet of Buddhism is nonattachment,

which some people may feel is antithetical to love. Yet, nonattachment in Buddhism does not mean cold, detached, disinterest from the world around. It is more about not clinging to particular people or phenomena, given that all life is ultimately ephemeral, and instead being more accepting of change and transition. Within that recognition, however, people are not only allowed but encouraged to cultivate feelings like *metta*—translated as loving kindness—for family and friends, humanity as a whole, and indeed all life.

In that spirit, love of creation animates many Buddhist traditions. Perhaps the exemplar is Zen (Lomas et al. 2017), usually thought of as originating around 520 CE, when Bodhidharma, an Indian monk, reportedly traveled to China to disseminate Buddhism. One influential interpretation of this origin is that Bodhidharma's teachings were shaped by, and interpreted through the lens of, ideas and practices dominant in China, especially Taoism (Suzuki 1961). Buddhism hitherto had been formed by the Brahmanic context in which it emerged, which included tendencies towards abstract metaphysical analyses (King 1999). By contrast, Taoist thought is regarded as more focused on the dynamics of the world, with liberation found by living in accordance with the *Tao*—which, although sometimes described in esoteric, mystical terms, is described by Lee, Yang, and Wang (2009) simply as "harmony with the natural world or the external universe"—that is, being as "spontaneous and free-flowing as the natural world" (Chuang Tzu, third century BCE).

Zen fully blossomed when these teachings were introduced in Japan in 1191 by the Japanese monk Eisai (1141–1215). Subsequent centuries saw an astonishing flourishing of thought and practice centered on these ideals. While this blossoming had myriad elements and bore many fruits, key among these are deep attentiveness and devotion to what is referred to in this article as "creation"—above all, the natural world. There are various reasons for this stance, but perhaps ultimately because it offers a direct pathway to the self-transcendence that is at the heart of Buddhism. Put simply, the greater one's focus on the world around, the less self-preoccupied and the more liberated one is liable to be. Thus, Zen places great premium on "direct seeing" into the true "suchness" of reality, relatively unmediated—insofar as this ideal is attainable—by one's biases and interpretations.

Many Zen masters are thought to have attained this psychospiritual zenith, known in English by terms like "enlightenment" or the Sanskrit loanword *nirvana*. One of the most famous such masters is Matsuo Bashō (1644–94), a poet who perhaps above all others in Zen has come to epitomize the love of creation articulated in this article, and who is arguably the foremost proponent of the art of haiku. Before delving into his work, it is worth noting the significance of art in Zen, in which myriad forms—from flower arrangement to swordsmanship, poetry to painting—are harnessed as supreme vehicles for attaining and expressing spiritual insights. Such art is regarded as uniquely able

to capture and convey the "suchness" of reality, far more so than conventional prose.

It is through art that the genius of Bashō can be appreciated. In his haiku, one can find the particular spiritual and aesthetic qualities and "moods" that are so highly prized in Zen. Consider his celebrated "frog" haiku, which is thought to have marked the attainment of his own enlightenment (Lunberry 2019):

An old pond
A frog jumps in
The sound of water

As Bai (2002) elucidates, this poem strips perception to its essence. There are no wasted words, just the bare facts of the event. Indeed, the semiologist Roland Barthes (1982, 78) argues that while humans usually perceive and understand reality through the medium of discursive descriptions, haiku aim for the "end of language," enabling direct "apprehension of the thing" in itself, an "awakening to the fact" of reality as it is. Moreover, the essential simplicity of the poem reveals not only a quality of the art itself but a comprehensive *way of being* attained by Bashō, hence it being an expression of his enlightenment.

Or consider another perceptual quality valorized within Zen, the concept of *yūgen*. Though famously hard to translate, Parkes (2023) defines it as profound grace and describes it as the most "ineffable" of aesthetic concepts. In philosophical texts, *yūgen* can mean "dark" or "mysterious," alluding to the unfathomable depths of existence and the fundamental inability of the mind to comprehend these. As Suzuki ([1959] 1973, 220–21) elucidates, "It is hidden behind the clouds, but not entirely out of sight, for we feel its presence, its secret message being transmitted through the darkness however impenetrable to the intellect." In that regard, the following haiku by Basho is often regarded as the ultimate expression of *yūgen* (Watts 1957), exemplifying a profound attentiveness to, and reverence for, creation that is unique in its direct simplicity (Record and Abdulla 2016).

On a withered bough
A crow alone has settled
Autumn evening now

Christianity: Creation as Intrinsically Good and Originating from, Reflecting, and Pointing to God's Goodness

Traditional Christian understandings of love of creation are arguably most clearly grounded in the creation narrative in Genesis. In this account, the various days and aspects of creation typically conclude with the refrain, "And God saw

that [what was made] was good," and on the final day, "God saw everything that he had made, and indeed, it was very good."

In Saint Thomas Aquinas's (c. 1225–74) understanding, the object of God's love is the good (Aquinas [1274] 1948, ST I.II.27.1), and so it is natural that human persons should love creation, which is good (ST I.5.3). All that exists, having been created by God, has a certain goodness (Aquinas [1274] 1948, ST I.5.3), and goodness and being are essentially the same, but goodness is being under the aspect of being desirable (Aquinas [1274] 1948, ST I.5.1). God causes all things to exist, and God creates in order to communicate his goodness (Aquinas [1274] 1948, ST 1.44.4). Something that exists is said to be evil only insofar as there is something lacking in it—some imperfection—but not on account of existence, which is good (Aquinas [1274] 1948, ST I.5.3). God loves all existing things as they are good by their existence, and their goodness thus calls forth our love, though God's love differs from ours insofar as God's love infuses and creates goodness (Aquinas [1274] 1948, ST I.20.2). Our love and God's love of creation extend to all of creation, but love for the nonrational world and creatures is different in kind from our love of rational beings (Aquinas [1274] 1948, ST II.II.25.3). Creation is thus not loved with the same love one has for God, which is charity, a friendship with God. One can have charity or "agape," a love of friendship, with God and with other persons. However, one can only have friendship with nonrational creatures in a metaphorical sense, though one can still love them out of charity and wish and work for their preservation (Aquinas [1274] 1948, ST II.II.25.3). Humans are thus to value, love, and care for creation, and see it as reflective of God's goodness and glory.

The reflection of God's beauty, splendor, and radiance in His works of creation is the central theme of Saint Francis of Assisi's (c. 1240–1302) "Canticle of the Sun." In it, Saint Francis praises the qualities of sun, moon, stars, wind, air, water, fire, earth, and human persons; he especially likens the sun's beauty, radiance, and splendor to that of God's and entreats that God be praised by all that has been created. Creation is beautiful and reflects God's beauty and glory, and God is thereby praised by it. Saint Francis lived connected to and in harmony with nature and animals, and he is considered by the Catholic Church the patron saint of animals and ecology.

The present pope took the papal name "Francis" for the inspiration and guidance of Saint Francis. In his encyclical *Laudato Si'* (Francis 2015), he comments that "Saint Francis is the example par excellence of care for the vulnerable and of an integral ecology lived out joyfully and authentically" and that:

> just as happens when we fall in love with someone, whenever he would gaze at the sun, the moon or the smallest of animals, he burst into song, drawing all other creatures into his praise . . . That is why he felt called to care for all that

> exists . . . If we approach nature and the environment without this openness to awe and wonder, if we no longer speak the language of fraternity and beauty in our relationship with the world, our attitude will be that of masters, consumers, ruthless exploiters, unable to set limits on their immediate needs. By contrast, if we feel intimately united with all that exists, then sobriety and care will well up spontaneously . . . What is more, Saint Francis, faithful to Scripture, invites us to see nature as a magnificent book in which God speaks to us and grants us a glimpse of his infinite beauty and goodness.

In summary, much of the Christian tradition testifies to the intrinsic goodness of creation and to all creation having its origins in God, reflecting God's goodness, and pointing to God. The goodness of creation is a gift of love from God to human persons. That intrinsic goodness in turn prompts our love for creation, and for God, as we see its goodness, and as we see it reflecting God's goodness. Our love and God's love for creation, our connection with all creation, and our love for God prompt us to care for creation, cultivate or co-create within it, and give thanks and praise to God for the goodness of creation and God's goodness.

Escapist Vegetarians: The Love of Nature in Manichaeism

Of all of the worldviews considered in this article, none comes so close to an absolute rejection of love of creation as Manichaeism, named for its eponymous founder, the Persian prophet Mani (216–76 CE). As such, it serves as a kind of limit-case in this study, for, notwithstanding their generally world-denying outlook, even the Manichees found much to steward and rescue in the world of matter.

Manichaeism reflects a creative blend of Zoroastrian dualism, Christian narratives and motifs, Second Temple Jewish myths, and perhaps even Buddhist ascetical practices (Baker-Brian 2011; Sundermann 1997; Hansen 2012). Though it now commands few if any adherents, Manichaeism flourished from the third through the thirteenth centuries, extending at its peak from North Africa to China (Brown 1969; Lieu 1998) and enjoying a century of patronage as the state religion of the Uyghur Khaganate in Central Asia (Beckwith, 2009). Unfortunately, most of what is known about Manichaeism is filtered through the voices of its opponents, notably Christian and Muslim heresiologists, though a growing number of fragmentary Manichean texts have been discovered in the last century from Egypt to China (cf. Gardner and Lieu 2004; Gardner, Alcock, and Funk 1999; Klimheit 1993).

Manichean cosmology is dizzyingly complex both in its intricate stages and its vast *dramatis personae*. (For primary sources regarding Manichean cosmology, cf. esp. the fragments of Mani's *Šābuhragān* (in Mackenzie 1979) and Theodore

Bar Khoni's eighth-century *Book of Scholia* (in Williams Jackson 1932, 222–54), which is likely dependent on Mani's original Syriac corpus; for a recent survey, cf. Baker-Brian 2011, 96–133.) In brief, however, Mani taught that the cosmos was fundamentally divided between the co-eternal principles of good and evil, presiding over kingdoms of light and darkness, respectively.

Their separation was unstable, however, because the darkness envied and longed for the light, and eventually waged war on it (Williams Jackson 1932, 222–27). Although "the Father of Greatness" remained untouched by this assault, one of his dependents, the "Primal Man," was imprisoned by the forces of darkness. The result is the material world we know, in which light is held captive by the gross entanglements of "matter," bound within interminable cycles of death and decay and subjected to demonic forces (Williams Jackson 1932, 228–49). The elect few who know the truth of their condition strive to free the light—both within themselves and in the world—from its bondage to decay and look forward to a day when "Jesus the Luminous"—the Father's emissary from the kingdom of light—will come in judgment to impose an everlasting *cordon sanitaire* between light and darkness (MacKenzie 1979, 505–9).

Manichean belief and practice were ordered primarily to withdrawing individuals from the cycle of life and death—notably through commitments to vegetarianism and lifelong celibacy—and enlisting them in the work of freeing light from its material prison, particularly through ritualized daily meals (BeDuhn 2002). In one sense, then, the Manichee seems to be motivated by a profound dislike and pity for the world of medium-sized dry goods that envelops us here and now. Nonetheless, even the world-denying Manichees could not bring themselves to reject all of creation: rather, they saw all of life as a kind rescue operation to free what is good in it—the fragments of the Father's "kingdom of light"—from its bodily shackles.

It is also interesting to consider that some of the Manichees's most self-consciously world-denying practices, such as their antinatalism and vegetarianism, are ones that people today often associate with love for the natural world. So, Mani "said: 'He who would enter the cult must examine his soul. If he finds that he can subdue lust and covetousness, refrain from eating meats, drinking wine, as well as from marriage, and if he can also avoid [causing] injury to water, fire, trees, and living things, then let him enter the cult" (quoted in Baker-Brian 2011, 122). Perhaps ironically, it was precisely the desire to bring an end to the physical world as we know it—the world of predation, sex, and birth—that motivated the Manichees's rejection of meat-eating and sex and birth, both of which find echoes in parts of the contemporary environmentalist movement (as explored in the final section of this article). Perhaps the moral here is that, in our relationships to creation as much as in our relationships to one another, only a fine line separates love and hatred.

Islam: Submit to God, Submit to Love

Bismillah Hir Rahman Nir Rahim is the most frequently repeated Quranic verse by Muslims. It translates as, "In the name of Allah, the Most Gracious (Rahim) and Most Merciful (Raheem)." The root word of *Rahim* is *rahm*, which in the Arabic language has connotations of nurturance and development and is associated with the womb. Thus, in Islam, the cosmological originator is more compassionate to human beings than their mothers (Haque 2014). Allah is described in the Qur'ān through ninety-nine names or attributes, each representing a human attribute. Despite being an omnipresent and all-encompassing entity, Allah shares some attributes with humans (Abdin 2004). In particular, consider two associated with love: *Al-Wadud* means the most loving, the most affectionate, someone who shows the purest form of love, the singular source of all love and kindness; *Al-Muhib* means being responsive and readily available to hear and answer supplications, invitations, needs, and prayers, especially when one is in trouble.

These two attributes signify that Allah is most loving and responsive when we are suffering. Love of Allah, however, is not unconditional. Through His Prophet, Allah commends clearly, "O Messenger, tell people, if you indeed love Allah, follow me, and Allah will love you and will forgive your sins. Allah is all-forgiving, all-compassionate" (Qur'ān 3:31). In Islamic doctrine, loving Allah literally (and metaphorically) means submitting to God by following the path of his Prophet.

The love of the creator in Islamic tradition is arguably best represented by Persian scholar, theologian, poet, and Sufi mystic Jalāl al-Dīn Muḥammad Rūmī (1207–73 CE). The focus and goal of Rumi's poetry is love, which is essentially the love of God. Rumi's poems—such as "Love Is the Water of Life," "Lovers," "This Is Love," and "The Springtime of Lovers Has Come"—are his prolific articulation of the transformative power of love and its numerous benefits (Acim 2022). Rumi's poetic discourse has shaped an interpretive frame for Western minds as to how the lived practices of Islam can be seen as a longing for and love of God (Abraham 2018).

Rumi believes that all creation is a representation of God and that God-seeking and God-loving are fundamental to our human existence. Rumi invites us to reach within our hearts. Tucked in our hearts is our bond of love with the creator. This bond gets fractured when human beings pursue material goods. However, if we focus on love, we can connect or reconnect with God. For Rumi, connecting with God is the highest form of transcendence (Abraham 2018). At the same time, Rumi does not limit the notion of love to God (Golkhosravi 2001). Rather, love includes all elements of creation. He sees love as the superglue that holds all pieces together, a source of unity between the different elements of nature. Love, Rumi notes, enables us to see the beauty around us, and through love we are

able to ignore the flaws of others and perceive others beyond the superficial differences that divide us. When our love connections are broken, we suffer (Saddam and Abbas 2020).

This theme of universal love may partially explain recent American fascination with Rumi (Acim 2022). Universal love often includes the notion of one culture that unifies people, irrespective of their religion, race, color, or creed. This universal love is firmly rooted in the theory of identity and sameness, which posits that all humans are viewed as God's creatures and there is no distinction between them; they are made of same bones and blood, and all of them are respected and loved. This feeling of love enhances the sense of belonging and promotes peace and harmony. Love is the ultimate human attribute, which Rumi sees as uniting the physical and spiritual dimensions. This vision is encapsulated in the following poem, whereby the physical dimension is symbolized by the Earth, and the spiritual dimension is symbolized by love. As Rumi observes (Khalili and Rumi 1994):

> Friends,
> Look at Love
> How it tangles with the one fallen in Love
> Look at spirit
> How it fuses with earth giving it a new Life

Maasai People

Love of creation permeates the culture of the Maasai, a traditionally seminomadic and pastoralist indigenous ethnic group of people who inhabit parts of southern Kenya and northern Tanzania in East Africa (McCabe, Leslie, and DeLuca 2010). For the Maasai, there are delicate, complex, and inseparable economic, physical, social, emotional, and spiritual connections between humans, nonhuman organisms (e.g., animals, plants), and the broader environment that shape their everyday ways of being (Davis and Sharp 2020). As one example of how the multilayered interdependency between human, nonhuman, and environmental objects informs the Maasai's love of creation, consider the central role livestock play in their culture. Cattle have historically been the primary source of subsistence for the Maasai (McCabe, Leslie, and DeLuca 2010), and they have relied on cattle as "the basis of the economic modes of production, social connections within and outside of Maasai communities, spiritual connections to God and the landscape, and physical nourishment" (Davis and Sharp 2020, 5). The Maasai believe that cattle were created, endowed, and entrusted to people by God; therefore, cattle are sacred to the Maasai, and the Maasai see themselves as custodians of these animals (Asiema and Situma 1994; Davis and Sharp 2020).

This explains why the Maasai's knowledge of and multifaceted connection to their livestock are intimately integrated into their daily life, and why afflictions that befall their livestock are perceived as having negative impacts not only on the livelihoods of themselves and their families but also on their relationship to the divine (Davis and Sharp 2020; Olupona 1993). Because the health of their livestock is so closely intertwined with their own health and wellbeing, the Maasai are also highly attuned to and invested in the health of the environment in which they and their livestock are embedded. Thus, as this brief illustration shows, the traditional lifestyle of the Maasai can be characterized by a deep understanding of how human life is precariously nested within the health of the broader environment. Moreover, it involves a recognition that, in the words of one member of the Maasai community, "nature takes care of us when we take care of it" (Jones 2022, para. 2), suggesting that love of creation ought to guide the way humanity approaches and interacts with the natural environment.

Amid growing concerns over climate change and environmental degradation, the love of creation espoused by the Maasai community is shaping efforts to promote environmental sustainability and preservation of indigenous ways of living. One important figure in this movement is Salaton Ole Ntutu, an internationally acclaimed Maasai community leader and elder who lives in Kenya. Recognizing the "need to create harmony between people and their natural surroundings, and between people and the animals that share the same land" (Abdelrahim 2015, para. 6), Salaton is involved in various initiatives focused on preserving the indigenous Maasai cultural knowledge—including ways of relating to the natural world—and environmental conservation, which are guided by an underlying love for creation.

For example, a key issue for Salaton is the increasing privatization of land that has taken place in Kenya over the last few decades, resulting in changes to the landscape (e.g., partitioning of land, property development) that affect the availability and quality of land for wildlife (Abdelrahim 2015). In many ways, Salaton has become an ambassador for the voiceless nonhuman species and environmental objects whose interests tend to be neglected because environmental decision making is too often skewed in favor of human self-interests. Shaped by the wisdom of Maasai culture, Salaton's perspective and endeavors signal a need for humanity to reflect deeply on its position within the environmental hierarchy and focus more attention on prioritizing the wellbeing of nonhuman creation: "The land is one of our first elders. Then, after the land, we came into the world. . . . So we are the children of the world, we need to show respect" (Abdelrahim 2015, para. 19).

Cherokee: Love Is an Action Word

"None of what I say about indigenous things is ever universal, any more than any other human population is prone to universal truths. We are a varied group,

and, unlike Europe, our unifying event wasn't religion, it was colonization . . . Unless you are referencing a specific group, it's [Native American cultures] always plural. Sometimes in a specific group, it's also plural. If you get three Indigenous people in a room and talk about any topic, there are generally at least five opinions" (Kim Shuck, interview with author, July 1, 2023). Thus explains contemporary Cherokee and Polish poet and artist, Kim Shuck (e.g., 2022, 2023), about the vast diversity among Native American belief systems.

Renowned in Native communities as a fiercely loving elder, Shuck comes from an esteemed lineage of Cherokee traditional knowledge and has written extensively on love. She generously agreed to talk with me (one of the authors of this article) about love of creation in our worldview to give a glimpse into a Native pedagogical practice in which knowledge of cultural importance is primarily passed down through oral tradition and observation rather than the written record. While the Cherokee oral tradition predates colonialism by thousands of years, like many Indigenous cultures experiencing genocide, it continues to be essential for preserving knowledge and is also used, in conjunction with published works, to share knowledge outside Native communities.

When I ask Shuck about the Cherokee words for love of nature, she says, "A lot of it is kind of understood, so it needn't be talked about. No one ever told me to be respectful, to watch the birds, but I saw the grown-ups around me do it, so I did it. It's more than just respect, though. It's watching to know how to be in good community with living things." A tenet of Native epistemology is that our understanding is shaped by how ready we are to understand, whether we are deemed worthy to know a thing, and our powers of observation. Elegant Native vernacular summarizes this as "the way I was taught" to recognize that our understanding is, at best, local—to our family, our community, our biome—and not universal. Knowledge about the living world is the basis for Cherokee love of creation.

"Many of the culture groups indigenous to what is now referred to as the United States called themselves the people of the place they lived in. This later was often shortened to 'the people,' but I want you to sit for a moment with what it would mean to identify self as being the place you live in". Shuck elaborates, "Today, people think of themselves as the unit of life, but we might just be mitochondrial. We are not alone in this. We are cradled in the bosom of these hillsides. We provide what we provide, and they provide what they provide, and why wouldn't you need to know about that?" To be in good community with all of creation, we try to understand how we can be beneficial by observing what the living things around us—water, earth, plants, animals, people—need to thrive. Shuck explains, "See how things are on your block. Does that tree have lichen on it? Does it like that? The tree is acting in conjunction with everything in its environment, including you. The tree and animals are interacting with the environment with greater sensitivity than us, so it behooves us to listen." She

continues emphatically, "And they notice when we listen. That is important to understand. Nature is watching us and reacting accordingly." Creation is not merely an inert collection of beings and elements that are experienced by people. In these traditions, people are taught that all things, including water, minerals, and works of art, as well as plants and animals, have their own unique sentience. Each can communicate, consent, generate love, and react to love. While people work to understand creation, it is understanding us back.

Native thought does not consider mere knowledge accumulation about creation to be love. As Shuck said, "Love is a verb. Love is an action word. Our relationship to the world around us is work, like any relationship." Love is the accountability we show in all our actions to our inherent interconnectedness with all living things. We experience love of creation first as the beloved. We are continually given everything we need to make up our bodies by our mothers and the Earth. Then, we gain the power to reciprocate that love, albeit feebly, as our understanding expands. "When I'm disconnected, I get depressed and feel lonely. We are designed to be a part of this stuff. When I'm not disconnected from nature, no matter how bad things get, I don't get depressed. Joy is making sure you're not alone. Love is the joy of learning a thing. Part of the dance is that we have to empower ourselves to empower others."

Romanticism: Finding Peace in Natural Sublimity

The eighteenth century saw the flowering of an artistic and intellectual movement, Romanticism, that placed appreciation of the natural world at the center of human life to a degree unprecedented in Western culture. Comprising a century's worth of debate among significant thinkers and artists from Germany, England, and beyond, Romanticism famously defies easy summary (Lovejoy 1924). The Romantics were, however, centrally united by a commitment to "the primacy of the aesthetic," the idea that "aesthetics should permeate and shape human life" (Gorodeisky 2016). As Friedrich Schlegel (1772–1829) put it, "The Romantic imperative demands [that] . . . all nature and science shall become art" and "art shall become nature and science" (Beiser 2003, xv).

Romanticism was in part a reaction against Enlightenment conceptions of nature. For René Descartes (1596–1650), for instance, the cosmos was a great clockwork mechanism within which the human body fit as a mere cog, while the spiritual intellect was essentially alien—and so only adventitiously related—to the natural world (Descartes [1644] 2017). By the late eighteenth century, this mechanical philosophy had borne substantial fruit in the accelerating pace of scientific, technological, and industrial development, turning cities such as London into—at least for William Wordsworth (1850, 199)—"a monstrous anthill on the plain," mere "anarchy and din, / Barbarian and infernal."

Romanticism was in part an effort to overcome humanity's growing alienation from nature, both in theory and in practice, by exalting a particular mode of

engagement with the natural world—neither coldly analytical nor graspingly practical, but rather contemplative and rapturous—as the pinnacle of human experience (Beiser 2003, 2). Their ambition was, as William Blake (1757–1827) put it, "To see a World in a Grain of Sand / And a Heaven in a Wild Flower / Hold Infinity in the palm of your hand / And Eternity in an hour" (1988, 490).

Romantic aesthetics had many exponents in the nineteenth century, but the focus here is on the account given by Arthur Schopenhauer (1788–1860) in his magnum opus *The World as Will and Representation*. Schopenhauer identifies three fundamentally distinct human attitudes toward the world. In some cases, we seek to draw the world into ourselves through the understanding, the paradigm for which is the natural scientist's efforts to analyze the world into its constituent parts and fundamental laws. In other cases, we seek to spread ourselves upon the world through our practical mastery over it, as when we hew forests and scar the Earth with mines to serve our interests (Schopenhauer [1844] 1909, vol. 1 *passim*).

These two perspectives are not the only possibilities, though. However necessary and even noble each of these attitudes is, Schopenhauer, with earlier Romantics, thought either was ultimately an insufficient basis for a fully human life. On the one hand, the quest for pure understanding is alienating: "Philosophy will clip an Angel's wings," lamented John Keats (1795–1821), and "unweave a rainbow" (1820, 41). On the other hand, the quest for practical mastery is Sisyphean, since "all *willing* arises from want, therefore from deficiency, and therefore from suffering. The satisfaction of a wish ends it; yet for one wish that is satisfied there remain at least ten which are denied" (Schopenhauer [1844] 1909, 253).

For genuine peace and satisfaction, Schopenhauer thought, we must seek a different relation to the world, in "the state of pure perception, of losing oneself in perception" and "thus of entirely renouncing one's own personality for a time, so as to remain pure knowing subject, a transparent World-Eye (*klares Weltauge*)" ([1844] 1909, 235; [1844] 1977, 240). Schopenhauer illustrates this attitude with a quotation from Lord Byron (1788–1824): "Are not the mountains, waves and skies, a part / Of me and of my soul, as I of them?" ([1844] 1909, 235). When something thus "lifts us suddenly out of the endless stream of willing, delivers knowledge from the slavery of the will," we are able to observe the world "without personal interest, without subjectivity . . . Then all at once the peace which we were always seeking, but which always fled from us on the former path of the desires, comes to us of its own accord, and it is well with us" (Byron 1909, 254).

While Schopenhauer ([1844] 1909, 255) recognized that any object could become the occasion for "pure perception"—citing Dutch still-life painting as an instance of its application to daily life—he nonetheless took it that "that purely objective disposition is facilitated and assisted from without by suitable

objects, by the abundance of natural beauty which invites contemplation, and even presses itself upon us." But not all nature, he insisted, was created equal for such purposes.

Romantic aesthetics was centrally concerned with a distinction first made by Edmund Burke (1729–97) between the "beautiful" and the "sublime" ([1756] 1863). The beautiful—an attractive nude, a landscape of gently rolling hills dotted with fields and pastures—is fitted to our use or congenial to our way of being. As such, even as it absorbs our contemplative interest, the beautiful always threatens to revive the restless appetites that we look to it to still. The sublime, on the other hand, is essentially alien and even threatening to our interests: a craggy, snow-capped mountain; the tempestuous sea; or the vast expanse of interstellar space provokes not delight but breath-taking awe. Such vistas cannot be enjoyed as good *for me*, but only as good *in themselves*, and so to immerse oneself in them is to feel that freedom from striving which, for Schopenhauer ([1844] 1909, 258–67), is in fact our deepest desire.

This Romantic love of wild places and their sense that communion with them is the highest human good profoundly shape the modern world. This is evident not least in the movement launched by the belated Romantic John Muir (Simonson, 1978; Stoll 1993), who sought to found national parks as sanctuaries for the unspoiled wild amid urban encroachments. It equally lives on in the ongoing conservationist efforts of the modern environmental movement, to which this article turns next.

Love Is Duty: Secular Reverence and the Protection of Nature by Any Means Necessary

> O world, as God has made it!
> All is beauty. And knowing this, is love,
> and love is duty.
> –from Robert Browning's poem, "The Guardian Angel"

In 1962, the marine biologist and conservationist Rachel Carson published *Silent Spring*, a secular book that did more than any other single work published up to that point to raise public consciousness in the United States about the adverse effects of the overuse of chemical pesticides. Its influence has been pervasive, helping to "inspire the modern environmental movement" (Kirsch 2023, 60). Carson hoped to thwart what she came to see as "biocide"—poisoning the Earth to the point that it was "unfit for all life" (Popova 2019, 478). Her efforts entailed two decades of committed work despite the ravages of health problems, including eye inflammation and the often-debilitating cancer that ultimately claimed her life less than two years after the book's publication (Popova 2019).

Her strenuous defense of the natural world was grounded in what might be understood as a secular reverence for all life, or what her critics have condemned as "environmental religion" or "secular religion," which they see as encouraging a dogmatic, unscientific "environmentalist cult" and "disastrous" regulatory policies, even as they continue to accept some of her "eventual conclusions" (Walker 2013). Carson did not attend church as an adult but was raised by devout Presbyterians and continued to read theology throughout her life (Rachel Carson Council n.d.).

Many of the secular environmentalists who have followed Carson's lead would likely affirm Browning's poem, even if they might be inclined to substitute the word "God" with "nature" (Kirsch 2023, 62). Following Browning, if love is understood as a duty—commitment to the good of the "other," in this case the natural world and all living creatures, including humans—then, for Carson, *Silent Spring* was indeed a labor of love in the service of a most noble end, undertaken despite great physical suffering. It is now common for scholars to include within their definitions of spirituality and transcendence a range of meaning-making activities that "may or may not include religion," such as a "natural spirituality" that is "a direct sense of listening to the heartbeat of the living universe" (Miller 2015, 25). Indeed, even some irreligious activists use terms like "sacred" to describe the "wilderness" because nonreligious terms are not powerful enough to express the depth of their feelings (Lee and Kychen 2010, 235). Love of nature becomes worship of nature in the antihumanist perspective, which celebrates a future without the natural ravages that derive from what is viewed as the "metaphysical egoism" of the Anthropocene: "Things will some day be the way they should be—there will be no people" (Benatar, quoted in Kirsch 2023, 62). The growing antihumanist (as well as transhumanist) social movement is, in the words of one observer, "a spiritual development of the first order" (Kirsch 2023, 60).

From some orthodox perspectives, displacing God with the worship of nature is an obvious form of idolatry, or disordered love. From some secular perspectives, the greater danger is to be "so heavenly minded" that one is "no earthly good," as Johnny Cash used to sing, drawing on a famous phrase attributed to Oliver Wendell Holmes, Sr. There is no inherent reason why science and religion must necessarily be adversaries in the expression of love of creation. Indeed, there are many examples of convergence. But observers have also pointed to the incongruent "absolute moral imperatives" (Kirsch 2023, 65) and "philosophical and conceptual bases" (Scarce 1990, 32) at the heart of conflicting ideologies. The argument seems to turn on the empirical question of whether the current state of environmental degradation has reached a crisis point. Rachel Carson did not advocate for

violence against people or the destruction of property. But her experience demonstrated that complacent institutions and groups will not be moved without a shock.

Multitudes today believe that legal regulations, social and political pressure campaigns, and religious wisdom and inspiration are all insufficient to break the "spell of numbness and cruelty"—as articulated in *The Love of Nature and the End of the World* by Shierry Weber Nicholsen (in Burton-Christie 2011, 45)—that has prevented meaningful action to protect the sacred "heartbeat" of Miller's (2015, 25) "living universe." Many affirm the call from a leading environmental spokesperson—Greta Thunberg—to use "extra-legal" methods to defend against an "existential threat" (Hays 2023). For those in the so-called "radical environmental movement," including Earth First! organizer Darryl Cherney: "This is a matter of war" (quoted in Scarce 1990, 13). From this perspective, crimes such as sabotaging bulldozers on construction sites are understood as forms of "property enhancement" because "the highest and best use of a place [is] to leave it in its natural state" (Scarce 1990, 12; see also Black (1983) on crime as the enforcement of norms rather than norm violations). Until national and global institutions respond with the hoped-for effectiveness, secular reverence for an imperilled planet will likely contribute to the escalation of a particularly dramatic expression of love: the duty to protect the beloved by any means necessary.

Conclusion

This article has offered a mosaic of perspectives on love of creation as developed by diverse traditions across the world. Together, they illuminate the rich tapestry of thought on this topic, showing real and meaningful differences in the ways people have sought to enter into relationship with the world in which they find themselves. This concluding section aims to find common ground among these perspectives. It highlights what the authors believe to be some core ideas and beliefs that interweave the various traditions, guided by a spirit of what Ken Wilber (1995) called, without contradiction, "universal pluralism": while we can recognize and celebrate the nuances of cross-cultural diversity and difference (i.e., pluralism), we can still do so through a lens that also aims to see and cherish people's common humanity (i.e., universalism). From this perspective, the authors argue that reverence for "creation" is a quality that humans across the world have discovered and cultivated, even while the ways this vision has manifested are beautifully distinct.

Before articulating this common ground though, let us once again emphasise the pluralistic nature of love of creation articulated here. Across the traditions discussed, there is a considerable variety of ideas and beliefs, as briefly summarised in Table 1.

Tradition	Key Figure	Key Points
Hinduism	Swami Vivekananda	The essence of all paths is to dilute or demolish the everyday conventional self or "I." Service is not a love toward separate others but toward an extended self; goodness is there in ourselves and others alike.
Judaism	Moses Maimonides; Abraham Joshua Heschel	To contemplate and view creation with a loving appreciation is an end in itself as well as an expression of love for God. This is aided by regularly taking a creative pause (observing the Sabbath).
Zen	Matsuo Bashō	Nonattachment but not cold, detached, disinterest from the world around. Direct apprehension of reality beyond language.
Christianity	Aquinas; St. Francis of Assisi	God created in order to communicate love, and all of creation originates from, reflects, and points to God's love and goodness.
Manichaeism	Mani	Cosmos is fundamentally divided between good and evil, light and darkness.
Islam	Rumi	God the Most Gracious (Rahim) and Most Merciful; God-seeking and God-loving are fundamental to our human existence.
Maasai	Salaton Ole Ntutu	Multilayered interdependence between humans and non-humans, and environment.
Cherokee	Kim Shuck	Love is the reciprocal relationship between creation and ourselves based in mutual understanding, benefit, and respect.
Romanticism	Arthur Schopenhauer	The highest human good consists of the disinterested enjoyment of unspoiled wilderness.
Secular reverence	Rachel Carson; Greta Thunberg	Love is understood as duty—a commitment to the good of others, including the natural world, sometimes expressed in the contemporary era through acts of destruction (e.g., of bulldozers, an expendable aspect of "creation") when conventional social processes fail to protect against biocide.

Table 1: A summary of love of creation reflected in ten traditions.

From one perspective, some of these visions are radically different, and at a certain level could perhaps even be seen as incommensurate. This is especially the case in terms of the underlying metaphysics, particularly in whether the tradition invokes theistic conceptions of a creator being or alternatively presents other ideas of genesis and creation. Similarly, an antihumanist perspective would privilege some aspects of creation (e.g., a flourishing natural environment) over others (e.g., the existence of humans or the manifestation of the will of God as revealed in scriptures). However, we argue that most of the broader traditions reviewed nevertheless share much common ground, featuring ideas

and experiences that resonate across them despite their differences. We have sought to identify and articulate these commonalities in the form of a love of creation assessment that taps into this common ground. Such a scale would of course not be exhaustive and could not cover certain specific beliefs that might be found within a given tradition. For example, within theistic traditions, love of creation would often include love for the creator responsible. This kind of idea is not featured in our scale, since it would then exclude or be irrelevant to traditions that do not feature such a being. Nevertheless, we have sought to construct our scale in a way that a person with a strong love for creation would, regardless of their particular tradition, likely score highly on it.

Our process of scale construction had two main elements: adaptation from an existing template (John Templeton Foundation 2022; VanderWeele 2023), and item refinement through discussion, with each author guided by their expertise in the ten traditions represented in this paper. In terms of adapting an existing template, this article is situated within a broader psychometric project on love that involves creating scales for different specific forms (e.g., romantic love, parental love, love of neighbor, etc.). Each of these scales uses a common template involving twelve items grouped into two categories. The two categories have been derived from the work of Aquinas ([1274] 1948), Stump (2006) and others (VanderWeele 2023) and involve the idea that all forms of love feature two main aspects: unitive (i.e., whereby one desires to be experientially connected with the focus of one's love in some way); and contributory (i.e., whereby one desires to have benefit come to the object of one's love in some way). Each of these categories is then conceptualised as having six different manifestations or components of love, drawing on the work of Lomas (2018), who identified these components through a process of crosscultural linguistic analysis centered on interpersonal love. These are: passionate love (which we define here as a disposition towards desiring to be united to a person or desiring good for that person that is especially intense); connected love (a disposition towards desiring to be united to a person or desiring good for that person that is particularly concerned with union with that person); caring love (a disposition towards desiring to be united to a person or desiring good for that person that is particularly concerned with that person's wellbeing); intimate love (a disposition towards desiring to be united to a person or desiring good for that person that is particularly concerned with the deepest knowing or experience of or with that person); appreciative love (a disposition towards desiring to be united to a person or desiring good for that person that is grounded in an appreciation of that person's worth, dignity, or qualities); and committed love (a disposition towards desiring to be united to a person or desiring good for that person that arises from or results in commitment). As such, we sought to create a scale pertaining to love of creation following the same template. This template also features a five-point response scale centered on the frequency of experiencing

the various forms of love: "never true of me," "rarely true of me," "sometimes true of me," "often true of me," and "always true of me."

The second component of scale construction was item refinement through discussion. Throughout the project, our team conducted numerous conversations about the article in general (e.g., on our common aims and vision). Based on these discussions, the senior author created an initial iteration of the items. Subsequently, the team met twice to discuss and refine the items. The main points of deliberation were usually (i.e., for most items) around the main verb construction and the object of the sentence. Regarding verb construction, for instance, the third item for unitive love—U3, which centers on caring love—was initially phrased as "I try to take joy in every living thing." However, it was felt that overall the items were too focused on the feelings of the individual person and not enough on the relational dynamic. Moreover, there was a keenness to include the term "restoration" within one of the items, implying that people may be made more whole and complete through meaningful engagement with the natural world, as exemplified in the Cherokee tradition, for example. Furthermore, team members reached out to others for input and comment on the project, and in that respect, elders from the Cherokee community emphasized that love of creation inherently involves a reciprocal relationship between humans and the world around. As a result of these considerations, after much deliberation, U3 was changed to "I seek restoration through my relationship with nature."

Secondly, some refinements were also made in terms of the objects of the sentences, which revolved around options such as "creation," "all life," "all living beings," "nature," "the natural world," and "the environment." Overall, we sought to have a balanced distribution of these options throughout the items collectively. As a result, the final item selection is as follows. First, as with the other scales created within the broader love project, there is a single direct item, which could perhaps be incorporated into an overarching love scale (featuring all these single items). Then, there are six items for unitive love and six for contributory love.

Single direct item

I love all of creation.

Unitive love

U1 (passionate): I deeply desire to fully experience the natural world.

U2 (connected): I give up various things to more fully appreciate my environment.

U3 (connected): I seek restoration through my relationship with nature.

U4 (intimate): I seek to understand all aspects of nature.

U5 (appreciative): I seek to appreciate the whole of the universe because of its extraordinary beauty.

U6 (committed): I am fully committed to cherishing all of creation.

Contributory love
C1 (passionate): I deeply desire the wellbeing of all of creation.
C2 (caring): I make necessary sacrifices in order to care for my environment.
C3 (caring): My own wellbeing depends on meaningfully contributing to the natural world.
C4 (intimate): I seek to nurture other living beings.
C5 (appreciative): I seek the wellbeing of all of nature because it is so precious.
C6 (committed): I am fully committed to preserving the goodness of all things.

As noted in the introduction, we view this scale as preliminary and in need of empirical work to determine its utility. Indeed, we aim for this article to be a foundation for future cognitive testing, psychometric work, and evaluation that can be used to refine and strengthen the initial formulation proposed. Such future work can consider the relation of our construct and assessment to other, at least tangentially related, scales and measures. More broadly, we hope this article can help stimulate a wider and deeper conversation within academia around the idea of love of creation, one that ideally finds points of intersection and communality across traditions—even while we recognize and celebrate their nuanced differences—around this vital topic. To that point, we argue that while acknowledging and, moreover, cultivating this kind of love is perennially important, it is especially so today. The natural environment is almost universally acknowledged as being in peril, with concerns about a climate crisis already wreaking havoc upon the world. While this situation has many dimensions and factors, a crucial component is the often-destructive ways in which humans have interacted with the natural world. Over recent centuries, many cultures—particularly more industrialised and/or Western ones—have developed predatory and disconnected modes of interaction in which nature tends to be constructed as a resource to be exploited (rather than, say, a commonwealth to be protected). However, many peoples and cultures have historically cultivated less destructive and more appreciative modes of relationship, with not only the natural environment but also the broader cosmos, and of which some of the traditions featured in this article are the custodians (Lomas 2019). Addressing the climate crisis may require many different elements and remedies, from the political to the technological. However, we suggest that, at the heart of these endeavors must be movement towards a different relationship with creation (Lomas 2023), without which even the best efforts are likely to fail, or at least be limited in their effectiveness. To that end, we hope that the love of creation expressed in these traditions offers a way for humanity to engage with the Earth in a more mutually beneficial, uplifting, and sustainable way.

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Neurophenomenology and Neuroepistemology Approaches to Integrating Constructivist, Perennialist, and Universalist Perspectives on Mystical Experiences

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Differences among constructivist, perennialist, and universalist perspectives on mystical experiences are bridged with neurophenomenology and neuroepistemology perspectives that illustrate constructivist and deconditioning processes and universal innate experiences. These approaches show that phenomenal similarities and differences in the features of meditative experiences are related to specific brain functions and processes. This illustrates that recurrent forms of mystical consciousness involve the activation or suspension of specific brain functions and their forms of knowing. Meditators' deliberate modifications of brain processes engage constructivist and deconditioning processes that provide access to intrinsic states understood as mystical experiences. Deconditioning of habitual cognitive processes through meditation changes habitual attention and cognition, permitting access to preconceptual awareness and normally unconscious intrinsic mental processes. Different mystical experiences involve changes in specific neurologically mediated forms of self that provide the basis for universal forms of mystical experience. Neuroepistemological perspectives on qualia of meditative states and their relations to mental processes and brain features provide a framework for understanding recurrent forms of mystical experiences as natural brain states.

Are Mystical Experiences Universal or Constructed? Competing Paradigms

A central debate in understanding the nature and bases of mystical and meditative experiences involves whether they are universal or culturally specific (Ferrer 2000; Forman 1990, 1999; Jones 2020, 2021; Katz 1978a; Laughlin and Rock 2020; Rose 2016; Sparby 2019; Taylor 2016, 2017). The perennialist and universalist versus constructivist perspectives on mystical experiences offer what appear as irreconcilable views, with conflicting theoretical, epistemological, and methodological perspectives. This article proposes that these competing claims regarding mystical experiences can be assessed and integrated through interdisciplinary methodologies. Neurophenomenology (Khachouf, Poletti, and Pagnoni 2013; Thompson 2007; Olivares 2015) and neuroepistemology (Laughlin and Rock 2020; Laughlin, McManus, and d'Aquili 1990) help understanding of mystical universals as involving constructive and deconditioning processes that provide access to the innate aspects of the mind. Neurophenomenology is a research approach that endeavors to integrate third-person neurophysiological data with first-person phenomenological qualitative data, allowing "first-person accounts and neurophysiological data [to] mutually inform one another" (Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 1). These kinds of relationships allow for the establishment of the physiological mechanisms involved in producing mystical experiences.

As Charles Laughlin and Adam Rock note, cross-cultural similarities in meditation experiences indicate that the human brain is "wired" for specific features of mystical experiences. The recurrent homologous features of mystical experiences across traditions require the examination of how their phenomenology is related to neurognosis—our innate neurological cognitive functions. Comparative approaches and neurological evidence can help integrate these differing positions, as brain studies of meditators illustrate both tradition-specific constructivist processes and common effects across meditation practices. Meditative construction of consciousness is attested to in the widespread differences in techniques used (i.e., focused attention, mindfulness, mantras, loving compassion), while universals are illustrated in common efforts to develop control over habitual attention and mental processes. Changes in habitual attention involve narrowing the perceptual field to specific thought processes and altering or suspending habitual mind operations, permitting the emergence of new awareness. Enhanced awareness freed from habitual construction processes provides access to normally unconscious mental processes and experiences that are reported as universals because they reflect intrinsic operations of the brain-mind. This combination of constructivism and the deconditioning of habits as sequential and complementary processes provides a basis for explaining both the differences in various mystical experiences and their cross-cultural similarities.

Perennialist, Universalist, and Essentialist Perspectives

Perennialist approaches (i.e., Smith 1976, Schuon 1975) propose a primordial, transcultural, esoteric, mystical wisdom, a privileged perception revealing an unchanging, culturally invariant universal truth that nonetheless may be obscured by specifics of the traditions. The perennial approach supported by the influential work of Walter Stace (1960, 1961) points to similarities in mystical experiences such as unity with the universe; a sense of timelessness and spacelessness; feelings of joy and bliss; a connection with the sacred; and an awareness of an ultimate reality.

Perennialist approaches do not necessarily propose a universality to any specific mystical experience or allege that cross-cultural features are characteristic of all mystical experiences. The perennialist position is about an ultimate truth, a knowledge that is not accessible to the senses or rational mind or even manifested in the reported experiences of mystics. Rather, this perennial knowledge is only accessible through a "metaphysics" or "divine science," which requires an alteration of consciousness, producing the mystical experience necessary to perceive such truths (Jones 2021). The perennialist perspective is that an ultimate truth is perceived in such experiences, even if mystics make different claims about such experiences due to the beliefs of their traditions.

Richard Jones (2020, 2021) distinguishes this perennial philosophy position about universal truth from an essentialism that proposes the universality of certain types of mystical experiences that share common phenomenological features. This essentialism is reflected in "perennial psychology," in contrast to the "perennial philosophy," which focuses on true beliefs. While Kenneth Rose (2016), Steve Taylor (2016, 2017), and Robert Forman (1998, 1999) are often considered to present perennialist perspectives, Jones identifies them as "essentialists" in that they propose a cross-cultural distribution of various forms of mystical experiences. These essentialist perspectives propose that while most mystical experiences are structured by cultural concepts, some exist outside of cultural conceptualization, unmediated aspects of experience that occur when the mind operates free of all conceptual input.

Universalist perspectives also propose a diversity among mystical experiences, i.e., the distinction between transcendental and immanent experiences. Transcendent mystical experiences involve an awareness of a personal and benevolent divine power transcending the material world, the source of all the universe. Immanent mysticism involves a loss of sense of personal self, which disappears in an experience of merging with all existence. Nonetheless, both transcendent and immanent mystical experiences (extrovertive and introvertive, respectively) share features of bliss, spiritual love, and access to infinite knowledge. Universalist perspectives are supported by commonalities across mystical traditions, as illustrated in Rose's (2016) and Donald Rothberg's (1990) comparative analyses. Contemplative universals identified by Rose

are convergence of the mind on a meditative object; simplification of the mind processes; stilling of the mind's processes; and, finally, transcendence of the processes of the mind. Steve Taylor (2016, 2017) proposed that shared phenomenological features of mystical experiences include enhanced awareness, increased empathy, and experiences of union. Other similarities across traditions include specific stages of progressively unfolding mystical experiences and the perceptions of an increasingly differentiated, stratified, multifaceted metaphysical reality (Laughlin and Rock 2020; Wilber 1977, 1986).

Constructivism

The opposing position to perennialism is constructivism, which asserts that all mystical experiences are determined at their core by the beliefs of their tradition. The primary historical opposition to the perennialist perspective was Steven Katz's (1978a) statement in the chapter "Language, Epistemology, and Mysticism" of his edited book *Mysticism and Philosophical Analysis* (Katz 1978b). The central thesis is not merely that mystical experiences are constructed by the beliefs of their respective disciplines. Rather, it is the extreme position that there are no pure or unmediated experiences, mystical or otherwise. Katz's position is based on the "epistemological fact [that] as a result of his process of intellectual acculturation in its broadest sense, the mystic brings to his experience a world of concepts, images, symbols, and values which shape as well as colour the experience he eventually and actually has" (Katz, 1978a, 46, cited in Jones 2020, 6). The central assumption of constructivism is that the experiential reality of mystical experiences is necessarily and inevitably merely a product of the conceptual structuring provided by the cultural and linguistic systems, making mystical experiences totally determined by prior patterning of thought and belief. This goes beyond the Kantian position that direct and unmediated knowledge of noumena is impossible to further assert that the cognitive content perceived in mystical experiences is nothing more than a projection of the mystic's cultural formation.

The core justification of the constructivist approach is the impossibility of unmediated experience, an absolute dismissal of the central claims of many mystical traditions that their practices decondition the habitual reactions of the mind and enable the meditator to empty the mind of all content. The constructivist approach emphasizes contextualism, which argues that understanding mystical experiences and doctrines requires that they be placed in their respective cultural settings. But contextualism does not require the strong constructivist position that cultural structuring creates all mystical experiences.

Constructivist Shortcomings

Jones points out that although the constructivists assert that mystical experiences are constructions, how they are allegedly constructed has not been explained by Katz or other constructivists. Katz's central and blanket rejection of the

principal mystical claims regarding unmediated experiences also negates the principal foundations of many mystical traditions. Katz fails to justify rejecting *a priori* what mystics claim to be their experiences in favor of a philosophical dogma that all human experience is necessarily based on prior experiences (Jones 2020). A fundamental weakness of Katz's approach is that it denies the evidence of the mystics' experiences and the perception of some direct and unmediated experiences of reality claimed by many mystical traditions (see Rothberg's (1990) analysis of Upanishadic, Buddhist, Sufi, and Christian traditions). In direct contradiction to Katz's rejection of the possibility of unmediated experience are the reports of many mystical traditions that it is through the annihilation of the ego and discursive intellect that they achieve a direct and unmediated experience of reality. As Jones notes, there is no legitimacy to the constructivist claim that philosophers can know better than the meditator the phenomenology of the meditator's experience.

A scientific approach to mystical experiences must start with the mystics' reports of their experiences, even though such reports will necessarily reflect influences from the beliefs of their traditions. It is the phenomenological cross-cultural patterns of these reports illustrating common forms of mystical experience that must be explained. A basic tenet of science is that experience, especially interpersonally validated, intersubjectively shared experiences, provides the primary data from which valid information is obtained. While science is typically characterized as focused on external sensory experience, it is personal experience that provides data. Harald Walach (2014) elaborates this point in discussing Francis Bacon, a founder of modern science, who emphasized that personal experience comes in two forms: external and internal. Reports of what is experienced are basic data regarding the nature of reality, physical as well as spiritual. The common forms of mystical experience reported cross-culturally are intersubjective facts independent of the interpretations imposed.

Mystics cross-culturally report perceiving a reality without concepts, an intersubjectively confirmed experience reported across cultures and mystical traditions that attests to innate human perceptions. A scientific approach must attempt to explain the patterns in reported experiences, not deny that the experiences exist. The presence of the same experiential phenomenology across diverse traditions indicates its production by a common underlying neurology is what explains the widespread distribution of similar experiences and the phenomenal qualities they manifest. Jones notes that while contextual approaches are needed to understand mystical experiences, this does not mean acceptance that all aspects of mystical experiences must be understood as culturally constructed. As John Hick's (1993) analysis of mystical experience shows, the mystical experience is both of a metaphysical entity (and necessarily mediated by neurological processes of the brain) as well as something that is interpreted through the mystic's religious beliefs (and therefore known and

shared through its construction). This implies that the mystical experience is of something that exists independent of and different from the metaphysical framework used to interpret it. Repeated reports of such experiences by mystics from diverse traditions mean that the possibility must be accepted of a unmediated perception of a transcendent reality distinct from the postexperiential interpretations that necessarily involve a constructed system of knowledge (Jones 2021).

Perennialist, Universalist, and Essentialist Shortcomings

Jones (2020, 2021) also shows that the perennial philosophy claims of a single underlying set of esoteric beliefs across mystical traditions are not substantiated in that mystical traditions generally do not espouse perennialism beliefs. Mystical traditions have different beliefs, practices, and goals, and often substantial disagreements regarding human nature, consciousness, and transcendent reality, rejecting others' claims (Jones 2021, paraphrase 1). Extreme differences among mystical explanations mean that the meditators from different traditions have different experiences and are making genuinely different mystical claims.

Jones (2020) characterizes the perennialist perspective as a "religious theory" and metaphysic that imposes its interpretative framework onto accounts of mystical traditions. Jones notes that such perennialist and universalist arguments need rigorous evidence, but that what would be the most direct evidence—clear agreements across mystical traditions—is not the case. How can one argue that the perennial philosophy is correct if the variety of mystical traditions do not attest to the common perception of a single common truth, and traditions vehemently disagree with one another regarding experiences and their explanations?

But could there be a perennial philosophy, truths about transcendental realms, even if it is not a metaphysical position subscribed to by the traditions themselves? The findings of phenomenologically similar mystical experiences and the beliefs about them found across cultures and traditions suggest a common foundation among traditions, evidence of an implicit set of universals. "Our common neurology may enable an experience that is independent of cultural conditioning and thus is the same in all cultures and eras even if different forms of mysticism are unique to each religion or each subtradition within each religion. That is, all human beings may have the same neurology when it comes to the depth-mystical experience" (Jones 2020, 35).

Edward Dale (2009, 2011, 2013, 2014) proposes an alternative to extreme constructivist and universalist perspectives in recognizing the effects of discipline-specific practices in constructing particular forms of meditative experiences within a universalist perspective that recognizes significant similarities in experiences across traditions. Variations and similarities across mystical traditions illustrate that both constructed and neurognostic aspects are foundational to mystical experiences.

If there are universal mystical experiences, these should have clear epistemological characteristics, especially neuroepistemological features that reflect their intrinsic relations to the brain and its informational and self-referencing functions. Homologous relationships of brain dynamics to meditation experiences—for instance, a slowing of brain activity associated with a sense of calmness—illustrate the source of the phenomenal qualities of mystical experiences and provide neurophenomenological explanations for these qualities. Support for universalist perspectives comes from features of mystical experiences that are directly related to specific innate brain dynamics. These brain dynamics involve the operation or deafferentation (disabling) of specific brain mechanisms, for instance, those related to managing information from the environment and about the self.

Neurophenomenological Methods for Assessing Mystical Experiences[1]

Neurophenomenological perspectives that connect brain dynamics to the experiential phenomena of mysticism can help sort through competing truth claims by basing considerations in the functional capacities and processes of the brain. Neuroepistemological approaches explain experiences with reference to brain systems that engage or suspend intrinsic forms of knowing. Studies reviewed here show that meditators' selective engagement and disengagement of specific brain systems are directly related to the phenomenology of their experiences.

Neuroepistemological approaches establish that anti-essentialist, constructivist perspectives cannot be defended considering neuroscientific knowledge regarding homologous brain functions across people and cultures (Laughlin and Rock 2020). Common patterns of information processing and responses manifested in newborns and meditators indicate innate neural models of perception (Laughlin, McManus, and d'Aquili 1992). This supports neuroepistemological explanation of recurrent mystical features as reflecting neurognosis, i.e., inherent biological structures of knowing.

The brain's information processing capacities and their phenomenological manifestations in experience provide models to substantiate transcendent aspects of consciousness as reflecting innate cognitive processes. These innate processes can provide evidence for perennialist and universalist claims and assertions of unmediated experiences in evidence of the brain's ability to deafferentiate (block or suspend) sensory, cognitive, self-processing, and interpretative frameworks to permit the operation of functional brain systems and their innate information management capabilities as unmediated forms of knowledge.

Laughlin and Rock (2020; cf. Laughlin 2020) propose that neuroepistemological approaches can account for specific qualities of mystical experience such as flow, bliss, and numinosity in terms of features of human biology. Laughlin (2020; Laughlin, McManus, and d'Aquili 1992; also see Fischer 1992) attributes

differences in the phenomenology of meditative experiences to variation between low to high states of arousal in the autonomic nervous system (ANS) and internal versus external focus of attention. Charles Laughlin, John McManus, and Eugene d'Aquili propose that these factors reflect opposing dynamics of the ANS: the ergotrophic and trophotropic divisions, which include the activating sympathetic system and relaxing parasympathetic system, respectively. An extreme activation or deactivation of either ANS division can produce mystical experiences. An extreme ergotropic activation can produce an ecstatic state with experiences of endless energy and a "flow experience" as manifested in long-distance running. An extreme trophotropic activation results in extreme relaxation and produces calm, peacefulness, and "oceanic tranquility" (i.e., Buddhist concepts of *zazen* and *samadhi*).[2] Laughlin, McManus, and d'Aquili's neurophenomenological model illustrates direct relationships between ANS activation and the phenomenology of mystical experience.

Neurophenomenological Dynamics of Meditative Experiences

Neuroscience studies illustrate the neurophenomenological dynamics of meditation by showing that meditative practices engage brain areas controlling attentional, emotional, and cognitive processes (Lancaster 2013; Fox et al. 2016. Intentional meditation effects on brain regions controlling the different attention systems of the body include higher-order executive control of attention; the alerting system for vigilance for external stimuli; and the orienting system that selectively attends to specific stimuli (Gay and Kreiselmaier 2017). Meditation traditions emphasize specific procedures that modify mental habits of attention, a training to increase awareness and control of mental processes. Techniques may involve fixed attention on an object, an open receptivity to the emergence of material into consciousness, or a focus on loving compassion. Increased attention produces mindfulness, a present-centered awareness that eventually provides access to innate primary forms of consciousness as a result of freeing attention from habitual patterns (deconditioning).

Although different attentional dynamics are produced by specific meditation techniques (i.e., focused attention, mindfulness, recitation of mantras, walking, or feelings of compassion and loving kindness; see Fox et al. 2016), there nonetheless are physiological similarities across meditation practices resulting from an internal focus of attention and quiescence. Meditation traditions that still the body and mind—restricted movement, stable posture, eyes closed, an internal focus of attention, and prolonged concentration—induce the relaxation response and activation of the parasympathetic nervous system. Evidence of this physical relaxation is manifested in reduced breathing, oxygen consumption, heart rate, muscle activity, cortical arousal, muscle tension and skin conductance, and occasional respiratory suspension (Wahbeh et al. 2017).

Decades of studies of meditators' EEG patterns (see MacDonald, Walsh, and Shapiro 2013) for review) report similarities involving increases in alpha

and theta brain wave power and coherence and improved functional brain connectivity. A systematic review of EEG meditation studies (Wahbeh et al. 2017, 19) found meditation-induced increases in alpha power and coherence, alpha-theta power/amplitude and coherence, and functional neural connectivity. Meditation decreases brain wave frequency to alpha and theta ranges with amplitude increases in frontal and central brain regions (Takahashi et al. 2005; Cahn and Polich 2006). Alpha waves have relatively slower frequencies (7.5 to 12.5 cycles per second) than the beta waves characteristic of waking states and are associated with calm and relaxation. The even slower theta waves (4 to 7 cycles per second) reflect activity associated with sensory-motor processing, memory formation, motionless alertness, and REM sleep; theta is also a typical EEG pattern of diverse alterations of consciousness (Winkelman 2011, 2017). Russel Hebert et al. (2005) characterize alpha waves as reflecting the integration of information; E. A. Solomon et al. (2017) similarly propose that theta is a sign of interregional integration in the brain. These slow, calmer brain wave dynamics are reflected in the phenomenology of meditative experiences.

One source of mystical experiences derives from the ability to place awareness on internal processes of the body that are normally habituated and ignored. The freed attention can provide novel experiences and new knowledge about the nature of existence, being, and self through access to innate and unconscious cognitive processes normally obscured by the habitualized attention of ordinary waking consciousness. Mystical experiences can emerge from enhanced awareness of normally subconscious and unconscious processes and structures; awareness of increasingly subtle levels of the mind and consciousness; altered awareness of ordinary processes, such as awareness during dreams; experiences of normally inaccessible structures and levels of consciousness and the universe; and awareness of higher levels of the mind.

Mystical Experiences as Deconditioning and Deconstructions of the Self

Central to meditative perspectives on consciousness is the role of various forms and levels of the self, the experiencer and interpreter (see Cornelissen 2004, 2011). Self-faculties are based in the integration of various lower-level processes, from sensory to emotional and cognitive, including the mind and intellect. Different forms of self and their roles in experience are key elements in the production of consciousness, including the ego, which experiences and acts; *chitta*, which functions as a storehouse of memories and aspects of the unconscious; and a deep self engaging pure consciousness. As these different forms of the knower engage or disengage, the experience of consciousness, self, and identity change.

Deconditioning leading to the suspension of habitual self-processes is fundamental to mystical experiences—a deconstruction of habitual perceptions

exemplified in Buddhist traditions that deny altogether the ultimate reality of the perceived self. Meditation practices also engage new senses of self through changes in the meditator's habitual attention and awareness, enabling engagement with subtle aspects of normally unconscious processes. Greater awareness of normally unrecognized aspects of one's totality allows for a disidentification with the ego, which can be superseded with the development of an identity with transcendent consciousness.

The deconditioning that occurs in meditation involves detachment of habitual unconscious programming that causes mental reactions. This detachment enables one to observe events without an emotional engagement with them, resulting in liberation because of only witnessing events, rather than emotionally or judgmentally engaging with them (Larson 2004). In only witnessing events, one is freed from the suffering that comes from identifications made by the personal self. This leads to a detachment of the ego or physical self (*jiva*), permitting development of another aspect of self that is referred to as true self (*purusha*) (Taimni 1968; Castillo 1991). This involves observations detached from the habitual labeling, judgment, and classification, functioning as an uninvolved witness to the activities of the physical self and the world.

Neurological Bases of Suspension of the Self

These different aspects of selfhood are not merely intellectual abstractions or cultural constructions but reflect the differing operations of neurological structures. Meditation-induced changes in experience of the self involve modifications in activity of the default mode network (DMN). The DMN mediates cognitive processes that provide self-consciousness and self-representation and engagement with memories of one's personal past or imagining possible future events in reference to oneself (Buckner et al. 2008; Raichle 2015). The DMN provides the structural and functional connections for self-related meta-cognitive processes involving introspection, daydreaming, and self-reflection. Several studies (Brewer et al. 2011; Panda et al. 2016; Scheibner et al. 2017) show that both internal and external meditative focus reduces DMN activity. Judson Brewer et al. (2011) found that experienced meditators from three mindfulness meditation practices (concentration, loving kindness, and choiceless awareness) all manifested relative deactivation in the main nodes of the DMN (medial prefrontal cortex and posterior cingulate cortex). This deactivation was complemented by enhanced functional connectivity and stronger coupling among other DMN areas (the posterior cingulate, dorsal anterior cingulate, and dorsolateral prefrontal cortices), regions that have roles in self-monitoring. Rajanikant Panda et al.'s (2016) EEG and fMRI study of expert Raja yoga meditators using mental concentration found they exhibited significant reductions in activity and connectivity of the DMN's posterior cingulate hub. Hannah Scheibner et al. (2017) similarly found that the meditative

practice of mindful attention produced significantly less neural activation in the primary DMN hubs, medial prefrontal cortex, and posterior cingulate cortex.

In a meta-analysis of many studies of meditation and brain functions, Kieran Fox et al. (2016) found that focused-attention meditation deactivates two major DMN hubs (posterior cingulate cortex and posterior inferior parietal lobule) that process self-related information. The suspension of these brain areas that support metacognition involving self-consciousness, reflective self-awareness, recall of the autobiographical past, self-representation, and future plans explains how meditative states such as witnessing reduce the role of self-reference in thought.

Altered States of Self

Evidence for the direct relationships between self-referential information and DMN networks in the alteration of consciousness is presented by Andrew Fingelkurts, Alexander Fingelkurts, and Tarja Kallio-Tamminen (2021), who used neurophenomenological methodologies to examine mystical experiences they called altered states of selfhood (ASoS) that spontaneously emerged in meditators. Using first-person reports and simultaneous EEG data to identify brain areas involved, Fingelkurts, Fingelkurts, and Kallio-Tamminen discovered that different forms of spontaneous ASoS were related to the activation and deactivation of specific neurophysiological subnetworks of the self-referential networks as measured by EEG operational synchrony. These subnetworks constitute functional or operational modules that form the brain's principal self-referential network, the DMN. EEG operational synchrony analyses differentiate three major modules that correspond to three phenomenal aspects of selfhood, which Fingelkurts, Fingelkurts, and Kallio-Tamminen characterize as first-person agency, embodiment, and reflection/narration. These correspond to self experiences called witnessing observer, representational-emotional agency, and reflective agency, respectively, which Fingelkurts, Fingelkurts, and Kallio-Tamminen (2021) also call "self," "me," and "I," respectively.

They propose that the spontaneous ASoS that emerge during meditation reflect the phenomena of self-consciousness's alteration in a "pure form" (i.e., not induced chemically or through volitional effort or external stimulation), and consequently reveal how the background neural mechanisms producing the features of the subjective experiences of selfhood are transiently altered. Alterations in the "self" and "me" self-referential networks were the prevalent features of ASoS, with "me" the most frequently altered state of self reported (75%), reflecting the role of the embodiment domain as a primordial form of self-consciousness.

The analysis of Fingelkurts, Fingelkurts, and Kallio-Tamminen (2021) demonstrates the presence of unique phenomenological profiles for different types of ASoS, with three major components of selfhood expressed consistently both phenomenologically and neurophysiologically in the activated and

deactivated self-referential networks. This illustrates that specific combinations of the "self"-"me"-"I" aspects of selfhood with different expressions of correspondent neurophysiological modules of the self-referential networks are associated with distinctive forms of experiential selfhood during mystical experiences.

The self-referential network "I" module is responsible for a language-based "reflective agency," an implicit first-person undergoing the experience that functions during thinking about oneself, self-reflection, and memories involved in self—that is, autobiographical storytelling. The self-referential network associated with the sense of "I" is localized in the left posterior module of the DMN, consisting of the left temporal, parietal, and occipital lobes. These networks are notably absent in these ASoS experiences, instead being activated during self-reflection, recall of self-related episodic and semantic memory, and autobiographical storytelling (paraphrase Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 5).

The self-referential network that Fingelkurts, Fingelkurts, and Kallio-Tamminen (2021, 4) label the "self" (also the "witnessing observer") is an experience of the phenomenal first-person perspective and sense of agency. This "self" module is localized in the anterior part of the right DMN (left and right frontal lobes and the frontal midline area) that provides the "phenomenal non-conceptual core in the act of knowing itself"' (Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 4). This experience of being a witnessing agent involves the enhancement of the functional integrity of the "self" module, accompanied by pronounced decreases in the functional integrity of the "me" and "I" modules.

The self-referential network module that Fingelkurts, Fingelkurts, and Kallio-Tamminen label as "me' involves experiences of an egocentric, spatiotemporal representation of the bodily self, emotional states, and autobiographical memories. This "me" module involves the right posterior part of the DMN (right temporal, parietal, and occipital lobes), which provides mechanisms for experiences localized through interoceptive and exteroceptive sensory processing and emotional states and memories (paraphrase Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 4). The defining feature of the "me" module is its origin in body representation, a self-model referred to by others as a "minimal self," "proto-self," and "bodily self," reflecting functions "as a 'vehicle' that enables being a self in the world" (Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 5). This aspect of selfhood is suspended in meditation to produce a loss of bodily perceptions, resulting in experiences of "self-boundaryless-ness" or "bodylessness," with body boundaries absent or distorted (Fingelkurts, Fingelkurts, and Kallio-Tamminen 2021, 10). This experience is associated with strong down-regulation of both the "me" and "I" modules and a loss of both embodiment and the thoughts of self-narration, consequently

producing the subjective feelings of disembodiment and loss of self-reflection (paraphrase Fingelkurts Fingelkurts, and Kallio-Tamminen 2021, 10).

These correspondences of different phenomenological ASoS with specific self-referential networks show that concepts of self are not arbitrary cultural conceptions. Instead, they represent functional operation modules of the brain. This grounds features of mystical experience in specific brain operations, with their functional and operational qualities providing the mechanisms that produce the phenomenal qualities of distinctive mystical experiences and the universality of specific forms of mystical experience.

Neurophenomenological Explanations of Contemplative Universals

Similar experiences across mystical traditions have been long noted, but their basis has not been fully explained. Such phenomenal experiences conceptualized as internal light, extinction of the self, identity with deity, unity with the universe, void, bliss, love, and others attested to across traditions should be the primary focus for scientific study of mystical states because the similarities across cultures indicate underlying biological dynamics are responsible. Neurophenomenological perspectives may explain the mechanisms producing these experiences in their association with stimulation or suspension of specific brain processes that have functions directly related to the effects reported in mystical experiences.

Mystical Experience as Suspension of Ordinary Biological Processes

The notion of mediating neurological structures in experience is reflected in Immanuel Kant's ([1781] 1933) proposal that the human mind imposes *a priori* forms such as time and space. These are not the imposition of cultural structures of interpretation as proposed by the constructivist perspectives but rather the functioning of biological adaptations humans use to make experience intelligible. Thus, mystical experiences of timelessness and spacelessness are not constructions but rather experiences resulting from the suspension of ordinary biologically based cognitive processes. This notion of the suspension of innate modular structures of thought underlies the epistemological perspective on mystical experiences proposed here. These suspensions are implicitly addressed in Forman's (1990) model of pure consciousness events (PCE), which he characterizes as a "mystical forgetting" wherein the adept gradually or suddenly enter a state in which the mind temporarily "comes to forget all of its cognitive processes (e.g., attention, awareness, cognitive maps, memory systems) culminating in the PCE" (Laughlin and Rock 2020, 44).

The suspension of normal human biological operations appears as a widespread characteristic of mystical experiences. The suspension of normal processes of evaluation and attachment is well recognized in Buddhist

traditions, where nonattachment to ordinary pleasures of life is viewed as key to attaining mystical states. Giving up ordinary desires—sex, pleasure, cravings, even happiness—is seen as necessary to achieve bliss and enlightenment. The suspension of desire for pleasurable emotions and experiences of the body enables deeper states of meditation, producing equanimity and a basis for further development into more advanced states of formless absorption that require the suspension of bodily sensations.

Procedures designed to deconstruct consciousness are illustrated by meditative practices that encourage the suspension of habitual tendencies to evaluate and judge experience through filters embodied in memory, language, and cultural conceptualizations. These suspensions and the curtailing of normal habitual mental activities free up awareness to engage mental levels that precede thought and language, the unconditioned aspects of perception before constructions imposed by the processes of the mind. Within Buddhist traditions, continued meditation can lead from this blissful state into a greater degree of absorption in which all thoughts and perceptions are eliminated, a state known as the fourth *jhana* and *samadhi*, characterized as being beyond pleasure and pain and manifesting a pure mind.

Meditative practices that seek unmediated and direct awareness use an internal attentional focus that reduces the transmission of information from sensory centers of the brain, a disconnection (deafferentation) of their input that interrupts the normal processes of consciousness construction. Enhanced internal consciousness requires eliminating sensory input so that the mind can focus on its operations, a deafferentation of ordinary input to focus on internal information and processes. Since concentration limits sensory data, it facilitates the emergence of the unconscious mind and experiences that result from the suspension of ordinary mental functions.

This deconstruction through meditation-induced alterations of consciousness results in increased awareness of normally unconscious mental processes (called *Ālaya* awareness or '*ālaya-vijñāna* in Buddhist traditions (Waldron 2011)) that are the foundation for ordinary perception, cognition, emotions, and identity. These unconscious mental processes involve a habitual conditioned background for consciousness, persisting dispositions from one's past experiences that constitute barriers to focused awareness. When the mind is freed from these constructed habits of consciousness, it has a greater capacity to access intrinsic forms of consciousness, which are interpreted as mystical experiences.

Light and Visionary Experiences as Innate Responses

A widely reported meditative experience of internal light occurs naturally when one closes off the senses, turning attention inward and experiencing one's consciousness. Experiences of light may appear as flickering points, veils of smoke, globes, stars, and jewels, or even full figures and scenes (Lindahl

et al. 2014). Sensory deprivation and perceptual isolation result in internal visual experiences, especially entoptic phenomena reflecting innate properties of the visual system. Jared Lindahl et al. (2014) report that such internal experiences described in Buddhist traditions reflect natural consequences of sensory deprivation and decreased stimulation. Concentrative practices that reduce sensory input result in spontaneous firing of neuronal circuits and visual hallucinations, a consequence of homeostatic mechanisms that increase neuronal excitability to compensate for the absence of sensory stimulation. Social deprivation and perceptual isolation, including kinesthetic deprivation caused by immobility during meditation, attenuate sensory input. Attention to details of internally generated images increases the capacity for visuospatial processing and working memory (Kozhevnikov et al. 2009).

Bliss and Joy

A widely reported mystical experience is characterized as ecstasy, bliss, and joy, often linked to love. Bliss is considered an essence of consciousness and a fundamental aspect of reality in the Vedāntic system (Cornelissen 2004, 5; cf. Laughlin and Takahashi 2020). Such experiences emerge naturally when control of attention allows meditators to escape patterns of thought that bring suffering. Increasing levels of tranquility leads to experiences of pleasure and equanimity. Experiences of pure bliss, calmness, and peace involve qualities intrinsic to pure consciousness (Cornelissen 2011).

Patricia Sharp (2014) proposes an explanation of meditation-induced bliss experiences as involving effects on dopamine and endogenous opiates, which have an interactive role in the reward and pleasure processes mediated by the nucleus accumbens. Sharp proposes that the accumbens, which is central to many different sources of pleasure, responds with a down-regulation of these pleasure-causing neurotransmitters because of habitual mental processes. Meditative practices that change habitual mental processes produce or liberate states of bliss and positive affect by terminating the down-regulation of the dopamine/opiate system. Meditation can disrupt the repetitive compulsive thought patterns that cause a decrease in responses of dopaminergic neurons, leading to disinhibition of dopaminergic networks and increases in pleasure.

Experiences of bliss produced by meditative practices are different from the pleasures evoked by "worldly" rewards in that meditative experiences do not appear to produce a down-regulation of the positive affective states. Sharp proposes that instead, the repeated practice of meditation leads to substantial increases in the nucleus accumbens dopamine levels by counter-conditioning the habitual synaptic patterns and producing a condition of positive affect.

The positive affect associated with meditative states involves increased levels of activity in the limbic system, the emotional center of the brain, which can produce ecstatic, rapturous emotional states. d'Aquili (1982, 374; d'Aquili and

Newberg 1993) links these experiences of positive affect to right-hemisphere and limbic processes and enhanced connections of the sensory association areas with the inferior parietal lobe.

Non-Dual Awareness

Epistemic suspensions are illustrated in the advanced level of meditative development referred to as non-dual awareness, a state experienced as lacking the opposing dualities of self and objects of perception. The dualistic fragmentation of experience is a normal condition of human life that obscures the underlying unified reality (Josipovic 2013). Non-dual awareness is considered a form of background awareness that exists prior to conceptualization, an experience that links perception and affect with cognition without fragmenting them into separate experiences.

People do not ordinarily experience non-dual awareness because their experiences are mediated by concepts and symbolic representations. Non-dual awareness is a reflexive awareness that is regarded as innate and unconstructed. In some meditative traditions, the non-dual experience is the final goal in the developments that unfold with the dedicated practice of meditation (Josipovic 2013).

Non-dualism involves a distortion or collapse of one's consciousness of time and space that results in a state of profound absorption characterized as a "now" state. Laughlin and Rock (2020, 40) review Edmund Husserl's ([1928] 1964) description of the cognitive processes underlying this "now" state in terms of the suspension of what he referred to as "retention" and "protention." The former involves influence on perception from "what has gone on before" while the latter is concerned with influences from "anticipation of what is about to occur" (Laughlin and Rock 2020, 40). The suspension of these two normal aspects of apprehension of the present produces a state sought in the absorption practices of Buddhist traditions called "formless" (*arūpajhāna).*

Thilo Hinterberger et al. (2014) sought to identify the brain activity that results from meditation practices that seek to reduce mental processes, specifically "thoughtless emptiness" or "thoughtless void." They characterized thoughtless states as involving a mindful presence reflecting an enhanced ability to down-regulate specific forms of mental processing. In comparison with "focused attention" and "open monitoring," thoughtless emptiness is characterized by reductions of both high-frequency and low-frequency brain waves—suggesting an overall reduction of brain processing—as well as decreased DMN activity. This experience of thoughtless emptiness involves a reduction in the conscious representations of mental contents, reduced self-referential activity, and a reduction in the activity of the attentional network. They characterize this as "non-duality" because of the cessation of perceptions, memories, emotions, thoughts, and associations (Hinterberger et al. 2014, 2); such cessation epitomizes the epistemological suspensions posited as the core of mystical experiences.

Absolute Unitary Being

d'Aquili and Newberg (1993, 1999) illustrate the role of selective suspension or deafferentation of input from brain systems in producing a mystical experience they call absolute unitary being, which involves the loss of "all boundaries of discrete being," an awareness unlimited by senses of self, time, or the environment (d'Aquili and Newberg 1999, 95). Experiences of absolute unitary being have either a positive affect, which is experienced as a benevolent god, or a neutral affect, experienced as void. Similar mystical experiences are routinely reported among contemporary ultrarunners, who after many hours of incessant running may spontaneously enter a state they report as a feeling of flow and boundless energy that produces an experience of "unitary connection" (see Winkelman 2010, 259–60 for discussion). One form of this mystical consciousness is referred to as void: the dissolution of any distinction between self and object. This experience of dissolution of boundaries between the ego and the universe is interpreted in distinct ways in different traditions and even plays different roles in the ultimate goals of practices (i.e., absorption constituting a hindrance to awakening versus the ultimate goal of meditation—a state of nirvana involving an intuitive knowing of the essence of mind). While the different traditions construe the experience differently, similar phenomenology is present.

d'Aquili (1982, 375) proposes that the neurophysiological mechanisms underlying the experience of absolute unity involve activity of the parietal lobe of the nondominant frontal hemisphere. d'Aquili and Newberg (1999) review studies that indicate such experiences result from interference with the brain's processing loops and the normal functions of tertiary association areas. Among the cortical regions affected are the posterior superior parietal lobe, which functions to analyze and integrate information, particularly somaesthetic (body), visual, and auditory information that defines the spatial location of the body and self-other differentiations; and the inferior parietal lobe and prefrontal cortex, association areas that integrate information from the other brain regions. This loss of information for self-awareness must be seen as a causal factor in producing these epistemological states.

Mystical Experiences in Neuroepistemological Perspective

Epistemological perspectives are central to contemplative traditions (e.g., Buddhist) that characterize consciousness as a construction created by the mental models used to produce experiences. Consciousness is explicitly equated with knowledge in many meditative traditions. Knowledge is a part of consciousness that emerges when one knows through entering contact with external objects through the faculties of the mind and the systems of the brain. As the faculties, brain systems, and interpretative frameworks change, so too do the experiences of consciousness and knowledge. There are many different types of knowledge that humans can have access to, each imparting an

inherent aspect of consciousness. Knowledge and experience require epistemic structures, assumptions about the nature of the knower and what is known. Assumptions construct information and simultaneously constrain knowledge since epistemic structures assimilate information into their own structures and principles (see Michael Winkelman (1997) for a review of this aspect of Jean Piaget's (1972) thought). This perspective allows for the characterization of mystical experiences as concerned with epistemology, the study of the origins of knowing and its nature. Examining forms of mystical knowing in relationship to the functions of the brain allows for an assessment of their epistemic nature.

The notion of mystical experiences as involving different capacities for knowledge is explicit in Sri Aurobindo's (1972) characterizations of forms or modes of knowledge as (see Cornelissen 2012, 2015):

- "separative and indirect knowledge" that underlies ordinary knowledge of the physical world in which one knows indirectly through the senses and with a sense of separation from what one observes;
- "knowledge by identity," which is inherent in all beings;
- "knowledge by intimate direct contact," a direct, pre-reflexive experiential awareness of one's thinking or feeling; and
- "separative direct knowledge," a surface awareness that provides indirect knowledge of the world that is not mediated by the senses and distant from what is observed, such as in introspection.

Beyond these naïve surface forms of knowledge exist expert modes of knowing that can be achieved through meditation and experiences of the higher layers of the mental plane that produce what are recognized as mystical experiences. Knowledge by identity in the expert mode provides true intuition, a plane of intrinsic truth, such as exemplified in psychic development. Knowledge by direct, intimate contact developed through meditation provides access to pure consciousness through connecting with one's consciousness and the consciousness of others. Separative direct knowledge in the expert mode of meditators emerges when consciousness is separated from mental processes and provides a basis for pure witness consciousness (*sakshi*) and pure consciousness (self-consciousness, *purusha*).

Stages of Mystical Experiences as Epistemic States

Similar experiences are reported across mystical traditions, but not all agree on the sequence of stages or a common final endpoint. Differences across traditions may reflect different practices, intentions, and epistemic assumptions. Some transpersonal psychology approaches characterize mystical development as a form of post-formal thought, a continuation of earlier cognitive development

stages of Piaget (1972). Dale (paraphrase 2013, 27) characterized meditation's post-formal features as autonomous moral convictions; an awareness of multiple realities; transcendence of space and time; and understanding inherent paradoxes and contradictions. Meditation stimulates the development of post-formal cognition by enhancing convergence with a fuller model of reality through knowing reality in different mediums or modalities simultaneously. Meditation engages the processes of "reality testing" that Piaget attributes to the child's process of construction of reality.

But Dale (2009) questions versions of universalism that propose invariant sequences of experiential stages in meditative development (e.g., Wilber 1977, 1980, 1986). Dale (2013) reviews evidence (Ferrer 2000, 2002; Rawinson 1997; Schlamm 2001) showing that meditative experiences do not unfold in a single universal series of stages. Dale (2009) notes, for instance, the general absence of visions or union with a personal god (*unio mystica*) in Buddhist meditators. Some traditions focus on achieving non-dual states directly without the intermediary stages considered essential in other traditions. Mystical traditions also vary in whether form or emptiness-related experiences develop first, or whether illuminative development occurs before or after non-dual experiences. Mystical experiences can even emerge spontaneously, without practice, as exemplified in children's accounts of mystical or transcendent experiences occurring during crises and trauma.

Dale (2011) proposes an alternative to hierarchical models of meditative development by considering the differences in the stages of meditative development found across traditions as resulting from different lines of development that emphasize the various innate cognitive modules or intelligences (i.e., visual, spatial, imitation) identified by Howard Gardner (1983, 2000). Different modular cognitive capacities develop at distinct rates, a heterochrony resulting from different environmental and social circumstances that evoke specific developmental responses. Extreme meditative practices produce stressful influences, with prolonged meditative postures and other ascetic practices altering the normal developmental trajectory and enhancing the development of specific innate cognitive capacities.

Dale (2011) proposes that meditative experiences engage the development of presentational cognitive capacities that emerge parallel to representational cognitive development. The concept of presentational cognition involves "felt meanings" and visual and corporeal modes of knowing expressed in imagery, music, dance, and performance and manifested in dreams (Dale 2013, 27; also see Winkelman 2010). Harry Hunt (1995) characterizes transpersonal development as involving the influences of Gardner's (1983, 2000) intrapersonal intelligence acting within introverted absorptive meditation practices that reveal experiences not ordinarily available to the rational mind.

Meditative Consciousness as Epistemological Suspensions

Winkelman (2010, chapter 4) proposes that stages of meditative development and universal forms of mystical experience involve different epistemological systems based on the selective engagement and disengagement of specific brain functions. Meditation experiences derive from deliberate suspensions of epistemological assumptions adopted during earlier stages of cognitive development, such as the separation of self and objects. The suspension of epistemic structures involving perception, social evaluation, affect, and self that are adopted at early stages of cognitive development releases pre-language modes of cognition in symbolic structures manifested in images and innate conceptual processes. This suspension of epistemic structures also enhances knowledge by removing limitations imposed by previous assumptions. Some models of mystical levels of consciousness (i.e., Wilber 1980) present features that involve suspension of epistemological assumptions made during early levels of development, suspending the conceptual structures assumed in Piaget's stages of sensorimotor through formal operations and leading to the recognition that ordinary consciousness is a construction. An initial meditative development involves the suspension of ethnocentric cultural assumptions, leading to realizations of cultural relativism and perceptions of universals through recognition of the culturally relative expressions of knowledge. At the psychic level, there is suspension of habituated perceptual habits through recognition of the constructed nature of ordinary perception. This involves suspension of the habitual personal and cultural programming embodied in the routine processing of sensory information that produces personal consciousness in the conditioned structures of attention and perception. The perennial psychology emerges after the de-automatization or suspension of the learned information processing habits, permitting the perception of innate psychology. At the subtle level, there is the suspension of emotional attachment and self-identity. The suspension of the participating self as the point of reference leads to the emergence of the "observing self," or witness. Vedic psychology attributes the resulting profound positive affect to derive from unification of self and the world, an unbounded or nonattached self that experiences bliss, love, and joy.

Recognition that known objects are the consequence of the separations, divisions, and distinctions produced by the imposition of assumptions upon the world can lead to a non-dual mode of knowing based on perception of the mutually interdependent interactions of the perceiver and the perceived. This epistemological realization results from suspension of the separation of the self from known objects, early developmental distinctions imposed on the world. Suspending learned assumptions leads to a non-dual mode of knowing and an experience of unity with all reality where subject and object are not experienced as separate.

The pure consciousness is considered the deepest level, where consciousness can directly perceive its nature. As meditation progresses from mindfulness to awareness, one becomes aware of one's awareness, an unfolding of inner awareness that manifests in experiences of humanity's archetypal dimensions, including access to a primordial dimension of timeless awareness referred to as "pure ground awareness," the realm of everything and all potentiality. This experience is the complete absence of sensations, of all senses and mental processes. "Ineffable," incapable of being expressed in words, is one concept often used to express this consciousness. This reflects the direct, intuitive unmediated nature of these experiences produced by the suspension of the functions of language and the intellect.

The suspension of conceptual thought and language descriptions, as well as innate knowledge structures, leads to experiences of contentless awareness and void. Void consciousness, an experience without any objects or thoughts, is achieved by concentrating awareness until it is completely cut off from the sensory world and mental structures so that nothing arises in consciousness. This void consciousness is generally considered to be beyond description and concepts, a perception of reality without personal, cultural, or linguistic conceptualizations, a perception free of conditioning and all conceptual distinction. Suspension of the imposition of concepts results in experiences of the undifferentiated nature of ultimate reality—a seamless universe of wholeness and connectedness without boundaries.

Conclusions: Mystical Experiences as Intrinsic Forms of Knowing

Neurognostic and biosocialization perspectives integrate universalist, constructivist, and perennialist approaches to mystical experience. Neurological functions and processes provide bases for universalist perspectives in neurophenomenological dynamics where experiences reflect innate neurognostic functions. Constructivist processes reflect recognition of the enculturation of these neurognostic functions into specific cultural models that contribute to the elicitation of innate dynamics, formation of their phenomenology, and interpretation of these innate potentials. Deconditioning processes reveal mystical similarities via the deconstruction of the enculturated mind, removing acquired habits of perception to allow for perception of the innate structures and processes of the brain-mind. Perennialist perspectives reflect these biological commonalities of consciousness and the unfolding of specific forms of mystical consciousness through different forms of self-structures and their operations on the contents of knowing. These self-structures have specific neurological foundations and functions that produce a natural neuroepistemology reflected in cross-cultural similarities in the forms of consciousness seen across mystical traditions.

When mystical states and forms of knowledge have homologies with basic brain states and functions, there is evidence of the bases of mystical forms of knowing. When activity in specific brain systems covaries with the intentions and experiences of meditators, this identifies the brain system or dynamics that play a role in constructing, producing, and mediating such experiences. This may not be the mechanism directly producing the subjective qualia, but it is a mechanism in the overall process generating the experience. These relations between neurological functions and phenomenal experience constitute a neurophenomenology of mystical experiences and support for the general idea of perennial psychology and universalist claims of cross-cultural similarities in the nature and characteristics of mystical experiences. Similarities in the features of mystical experiences across individuals, cultures, and time—such as those conceptualized as light, identity with deity or the universe, the extinction of the self, and void—are highly significant for the scientific study of meditation because these similarities across traditions and cultures indicate that innate biological dynamics are responsible.

Neurophenomenological perspectives on these experiences indicate that their bases should be sought in their association with the operation or suspension of specific brain processes. The validity of the neurophenomenological perspective is indicated by the relationships between the phenomenological contents of meditative consciousness and homologous brain operations, for instance, a slowing of brain activity associated with a sense of calmness. Neurophenomenological studies are essential for elucidating the source of the phenomenal qualities of mystical experiences and providing the basis for explanations of similarities across diverse meditation-induced alterations of consciousness (Newberg and Yaden 2018).

The substantial similarities in meditation experiences across cultures have explanation in terms of humans' innate psychology and how meditative practices alter the habitual constructions of perception and brain processes. There are nonetheless differences in how these experiences emerge that reflect the specific intentions of the practitioners and their activities that lead to the construction and deconditioning of their experiences. Neurological evidence for the role of the brain in producing specific types of mystical experiences counters the widely held constructivist view of these experiences as being strictly the result of expectations. The correspondence of specific meditative experiences with the activation or suspension of specific neurological circuits supports neurophenomenological accounts of mystical experiences, and consequently their universality. These findings also provide direct evidence for the top-down effects of consciousness on the brain, where the intention of meditators provokes specific kinds of biological and structural activations.

This dynamic places the longstanding position of constructivism in a different light. Meditative experiences support a constructivist view of ordinary

consciousness as a construction produced in the interaction of a person's habitual mental models and routines for the interpretation of experience. This understanding of the constructed nature of ordinary perception is derived from a deconditioning, a suspension of these habitual processes that permits the disinhibition and emergence of neurological-based forms of knowledge. Although the idea of unmediated experiences free of any personal or cultural programming is contrary to most contemporary psychological and anthropological theories, such experiences are central claims of many meditative traditions. One example is the notion of a condition of pure consciousness characterized by contentless consciousness. This and other meditative alterations of consciousness found in traditions around the world reflect innate aspects of the operation of the brain. These experiences emerge naturally when practices engaged by meditators lead to the suspension of habitual learned patterns of interpretation, and even suspension of input from sensory and perceptual systems of the brain. Such claims are amenable to verification by studies of the modifications that occur in the brain during meditative alterations of consciousness. Such studies can enhance understanding of the relationship of consciousness to the brain's innate functions and the roles of mystical experiences as special forms of knowing. When phenomenologically similar forms of mystical gnosis are reported across traditions, and their features involve concomitant brain functions and/or their deafferentations, this provides evidence for the universalist postulate of mystical experiences as based in our innate psychology. Aurobindo (1972) proposed that universal aspects of mystical experience result from engagement with seven major planes of consciousness, beginning with the levels of the physical, vital, and mind and continuing with the supermind (truth consciousness), *ananda* (bliss), *chit* (pure consciousness and will), and *sat* (absolute existence). These levels of the mind engaged by meditators of these traditions should be amenable to neuroscientific verification in specific patterns and loci of neural activity corresponding to engagement with these different cognitive planes.

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Notes

[1] The overall perspectives on the phenomenology of meditative and mystical experiences presented here derives from the perspectives of the Samkhyayoga and Vendanta traditions and Matthijs Cornelissen's (2005, 2011) synthesis of Sri Aurobindo's views, considered the most sophisticated and well-developed of India's meditation practices and the basis of Hindu, Jaina and Buddhist traditions (Mukhopadhyay 2003).

[2] The etymology of *zazen* is "seated meditation," referring to the posture adopted in Japanese Zen Buddhism (Leighton and Okumura 1996), although the practitioner may engage in different mental practices (e.g., attention to breathing or open awareness). Contemporary use of the term refers to a present-moment focus in meditation (Fischer-Schreiber, Ehrhard, and Diener 1991). The term *samādhi* is derived from ancient Sanskrit (Pali), and its etymological meanings include "to bring together" and "convergence," referring to the rising into consciousness of the latent structures of the mind (Lusthaus 2006). *Samādhi* is widely used to refer to specific form consciousness in meditative and yogic traditions that engages practices for the attainment of spiritual liberation, referring to the near final stages of practices.

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René Girard's Science of Religion: The Scapegoat Mechanism, Prefrontal Synthesis, and Collective Intentionality in the Process of Hominization

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This article discusses René Girard's "science of religion," examining its central idea—variously called the scapegoat, victimage, or founding mechanism—and its role in the process of hominization in light of the neuroscientific concept of prefrontal synthesis and the related philosophical concept of collective intentionality. The latter concepts, it is argued here, while unavailable to Girard himself, offer a way to make more scientific sense than is present in his account of the scapegoat mechanism in relation to hominization and his related and radical notion that "human culture and humanity itself are religion's children."

In a recent article on the priest and paleontologist Pierre Teilhard de Chardin's work and its relevance for the scientific study of religion, David Sloan Wilson (2023, 9) wonders, logically enough, what "happened in human evolution to make [human] communities much more cooperative" than, for example, chimpanzee populations. The somewhat imprecise answer given by Wilson (2023, 9) is "social control." The work of a compatriot of Chardin, René Girard,[1] would have have offered Wilson a more clear-cut answer. The work of Girard suggests that religion itself, rather than a rough notion of social control, is what happened to human aggregations (it would be precipitous, as discussed later, to call them communities before its emergence), allowing them to cooperate in ways that animals—even chimpanzees—simply do not. Religion enabled this by managing without overcoming the endemic, endogenous, and centripetal violence to which, Girard argues, prehuman hominin populations always tended due to natural mimesis (and which still haunts us today). Such violence is decidedly noninstrumental, and the much-vaunted fact that human history is, as David Sloane Wilson notes, marked by cooperation ought not blind us to our less vaunted, but notorious nonetheless, disposition to engage in this lethal intra-conspecific violence to a degree and intensity that, again, animals, not even chimpanzees, match. Absent the production of religion, this latter disposition would have consigned prehuman hominin populations to endless cycles of a level of cooperation (which I would prefer to conceptualize as *coordination*) perhaps only as remarkable as chimpanzee teamwork, interpolated by bouts of violent dissolution and a precarious regeneration to population levels not much different from those of our primate cousins.

In an attempt to emphatically convey the radical implications of his theory, Girard (2008, 117) puts it thusly in one of his later works: "Human culture and humanity itself are religion's children." Girard's thinking on the emergence of religion is scientific in that it is rooted in evolutionary theory, which is to say, in hypotheses about humanity's evolved animal nature. In other words, it is rooted in thinking about the biology, brains, and consequent behavior of *Homo sapiens*. In this article, I want to examine Girard's "science of religion" (1987, 3), which explains that religion both derives from our animal nature, which is fundamentally mimetic (enabling coordination and violence), and constitutes our hominization, our becoming human, through the mechanism of the scapegoat. However, Girard's understanding of human cooperation and how it differs from animal coordination was constrained by the limits of scientific knowledge of the human brain as it relates to the development of culture. As a consequence, and because I am able to benefit from later developments in neuroscience, in this article I argue that his emphasis on the scapegoat mechanism as it stands may well be untenable. I thus suggest an emendation of Girard's account in light of developments in science and

philosophy that he did not have chance to consider. The developments have to do with phenomena called *prefrontal synthesis* and *collective intentionality*. I argue, finally, that an understanding of these phenomena gives grounds for positing not sacrifice—killing, murder—or the scapegoat mechanism but what I will call transcendence as the essence of the religiosity that still, nonetheless, emerged from our biology and drove the process of hominization.

Girard's Science of Religion: Mimesis, Violence and the Scapegoat Mechanism

Girard's theory of religion has not changed significantly since it was initially articulated and subsequently elaborated at length in first *Violence and the Sacred* (1977) then more definitively in *Things Hidden since the Foundation of the World* (1987). Here, I draw additionally from later works, *Reading the Bible with René Girard* (2015) and *Evolution and Conversion* (2008), in which Girard defends and expounds his theory without notable modification.

For Girard, everything begins with mimetic desire: all human desire is mimetic or "imitative." We imitate the desire of a conspecific, the "model" for our desire (Girard 2008, 56–7). Since this article is concerned with hominization, I present Girard's account of that process or passage from precultural hominins to cultural human beings. For early populations of the primates who would become *Homo sapiens*—who have to be understood as our precultural ancestors, still ethological or zoological organisms without culture; referred to henceforth as *hominins*—despite rudimentary manifestations of coordination similar to those seen today among chimpanzees, "rivalry . . . eventually erupted" between two conspecifics, as each became the model for the other, for the model was as much subject to mimetic desire and behavior as was his imitator (Girard 2008, 57). They thus became rivals or opponents with respect to each other, which lead to neither being able to satisfy their mutually reinforcing, imitative desire. In short order, the "two rivals [became] more and more concerned with defeating the opponent for the sake of it, rather than attaining the object" they both previously desired (Girard 2008, 57). But though the object itself may have been forgotten, the violence need not abate. To the contrary, Girard continues, often enough this mimetic confrontation developed into full-blown violence. It is to be noted that this violence is not instrumental, nor is it subject to any level or degree of means-ends analysis. Such violence might well be the most common type, even today.

Swept up mimetically in this senseless violent reciprocity, the rivals became "doubles"; their actions relentlessly twinned as each thoughtlessly puts back into the confrontation that which the double, in turn, puts in "first." Due to the fact that the hominin organism is essentially mimetic, the crisis was not contained by the form of the dyad but "[became] contagious with

bystanders" (Girard 2008, 57): other conspecifics within the population, and indeed eventually all of them, were drawn in as participants. This constitutes the mimetic crisis suffered by small aggregates of precultural hominins, each member of the population senselessly engaged in violence characterizable as *all against all*.

I have been drawing on Girard's exposition in *Evolution and Conversion*. I now turn to *Reading the Bible* for a condensed account of how the mimetic crisis, having engulfed the population, was resolved and how religion—and humanity as such—emerged from this resolution. "We can assume," he says, "that as the mimetic fighting increases, it involves the entire community" (Girard 2015, 39).[2] Next, still under the influence of mimesis, "more and more antagonists [begin] choosing the same antagonist" (2015, 39). Then,

> there comes a moment when everybody is against the same antagonist, a single antagonist. So when a single antagonist has everybody against him, he's going to die, to be killed. Then, at least for a brief moment, no one in the group will have an antagonist. The *death* of the last antagonist will *automatically* reconcile the group, because it will be the antagonist of everybody; therefore, peace, will *suddenly* return *because of this victim*. (Girard 2015, 39; emphases added)

I want to stress here that in this account peace returns automatically, uniformly, and suddenly to the population as a result of the killing. I stress this to draw a distinction, mentioned earlier, between what can be thought of as mere coordination—which at this point still resolves the crisis without complex goal setting, planning, and role taking—and something more complex, more human: cooperation per se, which would involve such predicates.

Girard continues as follows, treating what is in fact a plurality of distinct organisms (whose minds it would be precipitous to theorize, as Andrey Vyshedskiy (2019a) points out, since to do so would be to already anthropomorphize them) as a collective agent whose mind he understands:

> In the *eyes of the group*, this victim seems to be responsible for the whole trouble; but he is also responsible, through his death, for the reconciliation. Therefore this victim seems all-powerful, for good and evil; *that victim is at first seen as "God."* The victim seems to be the master of the crisis; she resolves it through her death. Just as this victim was deemed responsible for violence, so also the victim is responsible for the return of peace when everybody joins together against her. So we have a situation that is *suddenly* one of peace, and *the community rejoices*. The community is freed from the crisis, but this freedom is not going to last. Very quickly, mimetic rivalry will come back over other objects. Then the *people will remember* that a victim saved them, and *they'll try* to do the same thing again. *They will deliberately choose other victims and kill them*

> *collectively* in the hope that this will reconcile *them* again. It does, mimetically; this is the *invention* of ritual sacrifice. (Girard 2015, 39–40; emphases added)

This is a condensed account, but it contains *in nuce* Girard's theory of religion, especially as it pertains to hominization. For in as much as the "community" remembers the solution and re-enacts it—that is, kills in ritualized fashion a now-sacred victim—in order to minimize the violence that threatened it, it already has religion and its members have already become human. This is Girard's attempt at a scientific (nontheological) "integration of culture and biology through the scapegoat mechanism" (Girard 2008, 125), with the latter being the key to understanding how "religion itself is produced" (Girard 2008, 108) and hominization occurs.

In summary: the biology (including the neurobiology) of our hominin ancestors, left to its own devices, quite naturally episodically generated a particularly violent form of interaction that could engross the whole population. If the population did not destroy itself it is because the chaotically distributed violence coalesced—without planning or forethought or, strictly speaking, cooperation—on a single conspecific. The death of that one would have resulted in peace.

Now, as Girard (1987, 28) says in *Things Hidden*, the "community that was once so terribly stricken suddenly finds itself free of antagonism, completely delivered." In consequence, he continues:

> the *community* attempts to consolidate its fragile hold on things under the still strong impressions of the crisis and its resolution, *believing itself* to be under the guidance of the victim itself. Clearly, two principal imperatives must come into play. (1) Not to repeat any action associated with the crisis, to abstain from all mimicry . . . This is the imperative of the prohibition. (2) To reproduce . . . the miraculous event that put an end to the crisis, to immolate new victims substituted for the original victim in circumstances as close to possible as the original experience. This is the imperative of ritual. (Girard 1987, 28; emphases added)

While both imperatives are constitutive of religion, it is the second that receives most attention from scholars. The scapegoat or victimage mechanism refers to the idea that after an untold number of iterations, the solution of killing a conspecific is collectively remembered and deliberately reproduced by the population in order to prevent or at least minimize the deleterious consequences of the violence afflicting said population. Such reproduction—the sacred essence of religion—is enacted by what can now properly be referred to as a cultural community; it is the moment something like modern *Homos sapiens* is born. It is called the scapegoat mechanism because the sacrifice implicates

the victim as guilty even though they clearly (to scientific eyes) are not. It is called a mechanism because it is argued to causally trigger or generate the non-natural—cultural—behavior of religious ritual in and across the entirety of the specific hominin population in question, leading to the appearance of nothing less than a behaviorally new species (Vyshedskiy 2019a).

The Metaphysics of the Scapegoat Mechanism

The scapegoat mechanism is the centerpiece of Girard's science of religion as it relates to hominization. Regarding its pivotal role in what he refers to as the "process of hominization," he affirms that "there is absolutely no question of attributing everything to the scapegoat effect" (Girard 1987, 32); this "collective murder" marks a "true rupture" between "animal nature . . . and developing humanity": it "is the origin of hominization" (Girard 1987, 97).

Yet, I am not sure it can bear the demands placed on it by Girard. Indeed, despite his scientific aspirations, the scapegoat mechanism as it stands seems to me more metaphysical than scientific, for how it works is not clearly explained, but it is nonetheless employed throughout Girardian discourse as a master but reductive *explanans* for religion and hominization. Metaphysics often refers to the study of ultimate reality, but additionally, to characterize something as metaphysical as I am doing here is to claim that its explanatory power is far too abstract and that it operates far above the level of detailed scientific explanation at something like a quasi-theological level.[3] While I do not contest the idea that human beings often create community at the expense of scapegoats, I find no explanation in Girard's discourse, beyond forceful insistence, as to how the scapegoat mechanism causes religion and hominization. Thus, I would argue that it is not scientific, which is to say, it does not explain things at a sufficiently granular level. More specifically, though it associates the scapegoat mechanism with the appearance of ritual, it does not show causality in any precise way and thus can be characterized as relying on a logic of *post hoc ergo propter hoc*.

For example, in light of what is known about biology, issue might be taken with the temporality Girard describes: after the killing "peace, will *suddenly* return" and "we have a situation that is *suddenly* one of peace" for all those concerned (Girard 2015, 39; emphases added). This description ignores the fact that the mimetic crisis will necessarily lead to hormone secretions in the bodies involved. The effects of hormones in such situations are characterized as having a "slow onset and offset" by neuroscientist Joseph LeDoux (2019, 364), meaning that in the aftermath of the crisis the disruptive effects of the hormonal onset it provoked would "continue even after the threat itself [had] dissipated—one may feel 'shaken' or 'jittery' for some time after encountering a snake or being mugged" or being, I think it is safe to say, overwhelmed by the violence of a mimetic contagion even though it seems to have come to an end. Given that part of the purportedly scientific character of mimetic theory

is its naturalism, considerations of hormonal effects cannot be jettisoned in thinking through this primordial scene. Such a scientific detail is elided in Girard's account; readers are simply referred back to the scapegoat mechanism. Then, in addition to claiming that each organism apperceives the events and the consequence in exactly the same way (paraphrasing: "The victim saved us, the victim is a god!"), with each of his phrases Girard paints a just-so picture of all the pertinent individual consciousnesses being overcome immediately, at the same time and in the same way, by the effects of the killing, which were, in addition to being both homogeneous and unanimous, instantaneously pacifying. Again, the explanation of this is the scapegoat mechanism. I do not think it is too scandalous to suggest that this theory proposes an explanation that leaves open too many questions. The mechanism seems to have assumed something of a quasi-theological status and the power to produce, essentially, something out of nothing—which is why I refer to it as a metaphysics—driving the spontaneous emergence of a collective mind from cumulative experiences, which neither social nor natural science can abide.

On the other hand, my issue, to be clear, is not with Girard's description of the mimetic process, which science as it stands seems to support. Current research by data scientists, organizational theorists, cognitive scientists, and psychologists suggests that this scenario is far from fantastic (Farkas, Helbing, and Vicsek 2002, 2003). Reduced to its bare essentials, Girard's idea is that a population of hominins (our ancestors), small in number, was at peace and coordinated in a very limited way; this state of affairs was disrupted by conflictual mimesis; a local conflict developed into a violence of all against all; the violence converged on one particular conspecific who was killed; a general calm returned. This narrative is certainly not implausible. Given the type of animals we (still) are—mimetic: predisposed to automatic, non-representational, non-teleological emergent coordination with others (Knoblich, Butterfill, and Sebanz 2011; Makowski 2020; Passos, Davids, and Chow 2016) and automatic imitation (Heyes 2011) of others; unencumbered by the need to know what we are doing or why we are doing it (Cole et al. 2018)—it is rather plausible that our ancestors fell into mimetic contagions of violence that quite possibly culminated in a spontaneous, automatically coordinated assault of one member of the aggregate by the rest.

The larger issue is why this series of events should ever generate the outcomes Girard postulates. Why should this series of events ever be conducive to the emergence of a minded organism capable of complex symbolic operations like interpretation, logic, planning, and role-taking?[4] Logically, such a mind would be necessary *a priori* to generate the interpretation—that the victim/god had caused the trouble, bestowed the solution, and should be henceforth appeased or conscripted to save "us" through future re-enactments by "us" of the immolation of a surrogate victim—in the first place. Why, in

other words, does the mimetic process need or lend itself to interpretation at all? If the collective killing was indeed a natural solution to a natural problem, no interpretation by the organisms involved would have been required. Such hominin populations could have muddled along at population levels not much different from those of the other primates without ever creating religion or becoming human.

Girard (1987, 89) poses the problem—a scientific understanding of "the origin of symbolic systems [culture, religion] on the basis of animal nature"—correctly; somewhat more dubiously, however, he locates that origin in the scapegoat mechanism: "The only thing an animal needs to become human is the surrogate victim" (Girard 1987, 102). It is as if the mechanism simply triggers both symbolic thought and the capacity for it. If that capacity was already latent in what he has called our "animal nature," waiting to be triggered, then we are no nearer understanding what drove hominization. In other words, Girard's earlier explications of the scapegoat mechanism do not really help us "think through the process of hominization" (Girard 1987, 89) nor, really, the production of religion—not in the terms of mutations and fitness advantages in individuals required by the scientific discourse of evolutionary theory, at least.

However, in a chapter of *Evolution and Conversion* titled "The Symbolic Species," Girard's interlocutors give him the chance to revisit the "emergence of the symbolic sphere . . . and the origin of culture within a naturalistic [scientific, evolutionary] framework" (Girard 2008, 96–97). In taking up the invitation, Girard begins by stressing that "the process of the emergence of cultural elements" has "no absolute beginning" and is "extremely complex and progressive" (Girard 2008, 97). Nonetheless, he repeats his fundamental point: "The creation of culture is engendered by religion through the victimary mechanism" (Girard 2008, 98). He still does not provide the details of how this could happen but explicitly rejects alternative possibilities. He dismisses, quite rightly, notions of individual human agency and any sort of "methodological individualism" (Girard 2008, 98–99) in the matter. "The group itself mediates everything," he insists, and consequently, the correct level of analysis must be the "level of the *social group*" (Girard 2008, 99), for the "scapegoat mechanism provided a fundamental contribution to the *fitness* of the group" (Girard 2008, 99).

Girard (2008, 104), some forty years after first articulating his view, continued to view the scapegoat mechanism as a "collective mechanism" but also as the "origin" of "symbolic power." Though his fundamental view was unchanged, he added the caveat that one "cannot point out the exact, isolated moment when it [the mechanism] happens and, finally, culture emerges" (Girard 2008, 105): "It has to be seen in a time-frame of dozens or even hundreds of thousands of years" (Girard 2008, 105). However, even just having opened the

door to a properly evolutionary, and indeed scientifically plausible, timeframe that might have allowed for a better understanding of the emergence of symbolism/culture/religion, Girard (2008, 110) returns to the central idea that it is a collective mechanism "which saves the proto-communities from [the] crisis of mimetic violence, [and] is disciplined into a ritual system" by the community as one.

My claim that this account is not sufficiently scientific is based on Girard's reluctance or inability to problematize and thus theorize human *cooperation*, which is quite unlike animal *coordination*. His insistence on a group-level analysis is what renders Girard's theory vulnerable to the criticism that, despite his aspirations, it is not quite scientific, since group selection, though seemingly plausible, has no scientific support (Dunbar 2022). Ironically, then, we seem to be dealing with something like an article of faith, a metaphysics, rather than a scientific explanation when it comes to understanding the emergence of cooperation in the development of hominization. I believe we can do better. But if I am right about this, it is only because I have had the fortune to become acquainted with prefrontal synthesis and collective intentionality, which will help understanding of how cooperation itself (rather than coordination) ever emerged in the first place.

Beyond Metaphysics: Prefrontal Synthesis and Collective Intentionality

Paraphrasing somewhat, Girard's basic claim is that the scapegoat mechanism—participation in a collective murder—caused our ancestor hominins, over time, to move beyond mere coordination to cooperation (ritual). In so doing, it hominized our immediate predecessors. Cooperation, as I am distinguishing it from coordination here, is a skill or ability limited to humans. Conceived of as a distinctly human capacity, it is what philosophers (Margaret Gilbert, Angelica Kaufmann, Hans Schmid, John Searle) and developmental psychologists (Hannes Rakoczy and Michael Tomasello) call collective intentionality. It depends on symbolic thought. On what, then, does symbolic thought depend?

It depends on our brains. At one point in his attempt to shore up his argument that the scapegoat mechanism triggers symbolic processes, Girard, all the way back in 1978 when *Things Hidden* was published in French, quoted Jaques Monod's *Chance and Necessity* from 1970: "It is the powerful development and intensive use of the *simulative* function that, in my view, characterizes the unique properties of man's brain" (quoted in Girard 1987, 94; emphasis added). Oddly enough, Girard (1987, 94–95; emphasis added) uses this quote to support his claim that it "must have been the increasing power of *imitation* [mimesis] that initiated the process of hominization," ignoring the fact that Monod is talking about simulation, or what might be thought of as voluntary imagination, which is not inherently related to mimesis at all. I mention it because here

Girard is nonetheless indirectly acknowledging the less spectacular claim that neurological mutations—rather than collective murders in and of themselves—subtend the process of hominization; this is the claim I want to pursue in developing an alternative to the more spectacular claim that the process is wholly indebted to the scapegoat mechanism. Again, Girard (2008, 99) privileges this because he believes it "provided a fundamental contribution to the *fitness* of the group." What is needed, however, is something that contributes to the fitness of the individual organism.

Prefrontal Synthesis

Prefrontal synthesis (PFS) is defined by Vyshedskiy (2022a, 1) as "the ability to juxtapose mental visuospatial objects at will." It can be thought of as the ability to imagine voluntarily, willfully, on purpose (not mere dreaming). For example, "PFS ability is essential to imagine a hybrid object with the head of a lion and body of a human; to predict the outcome of an imaginary event . . . ; to imagine yesterday's football game per friend's description; and to follow a fairy tale" (Vyshedskiy 2022a, 2). Furthermore, PFS "enabled articulate speech to communicate an infinite number of novel object combinations with the use of a finite number of words, the system of communication that we call recursive language" (Vyshedskiy 2022a, 21).

I introduce PFS here because such an ability would be essential to formulate and act upon the interpretation Girard gives the sequence of events of the mimetic process that lead to the elaboration of religion. Indeed, most pertinent for my considerations, "[r]eligious beliefs . . . are the ultimate products of PFS" (Vyshedskiy 2019b, 97). Now, both Vyshedskiy and Girard are working within an evolutionary framework, and only modern *Homo sapiens* have PFS ability, but Vyshedskiy is trying to understand the emergence of the ability to engage consciously in imaginative thinking (religious thinking) in terms of neurological development in response to general survival pressures.[5] Girard argues that at some point such development occurred evenly and spontaneously[6] across all members of a population, triggered (somehow) by the scapegoat mechanism, causing the invention of ritual (religion, culture) at the level of the group.

This group-wide phenomenon, however, would have been impossible, according to Vyshedskiy's work,[7] because humans only develop the potential ability to engage in PFS due to a genetic mutation that slowed the development of their lateral prefrontal cortex during the first five years of life. This is called the PFC delay mutation (Vyshedskiy 2019a, 22). However, the actual development of PFS requires exposure to recursive language use. The problem here is that recursive language itself depends upon PFS. The conundrum, then, is how could a population of hominins have acquired PFS all at once, without exposure to recursive language, and how could they have developed recursive

language without having already acquired full PFS ability? The scapegoat mechanism is not a scientific answer to this scientific question, which is why I previously referred to it being used in such a way as metaphysics.

To solve this conundrum within an evolutionary framework, Vyshedskiy (2019a, 26) proposes what he calls the "Romulus and Remus hypothesis," which "calls for (1) two or more children with extended critical period due to 'PFC delay' mutation; (2) these children spending a lot of time talking to each other; (3) inventing the recursive elements of language, such as spatial prepositions; (4) acquiring recursive-dialog-dependent PFS; and (5) surviving to adulthood and spreading their genes and recursive language to their offsprings."

This is what I would characterize as a properly scientific explanation, grounded in evolutionary theory, of how the very capacity for ritual might have emerged among our ancestors via mutations that would have supported symbolic operations in at least two individual organisms only and not at a stroke "at the level of the group," as Girard supposes with his "collective mechanism," as criticized earlier. Vyshedskiy (2019a, 26) continues: "As adults [presumably by age 13 or 14], Romulus and Remus could immediately entertain the benefits of the newly acquired mental powers. They could have engineered better weapons and plan[ned] a sophisticated attack strategy using animal traps and stratagem. They would have become more successful builders and hunters and quickly reach[ed] the position of power enabling them to spread their genes more efficiently."

Vyshedskiy (2019a, 26) then invokes the notion of the "founder effect," referring to "a few individuals who acquired PFS and nearly completely replaced the rest of hominins." *Nearly* because even today "as many as 18% of modern individuals exhibit PFS disability" (Vyshedskiy 2019a, 4). There is no reason to assume that entire populations of our distant ancestors acquired PFS en masse, or that it eventually spread through the entirety of those early populations after initial acquisition by some conspecifics. But what can be supposed is that the "marriage of articulate speech and voluntary imagination [PFS] at approximately 70,000 [years ago] resulted in the birth of a practically new species—the modern *Homo sapiens*, the species with the same creativity and imagination as modern humans" (Vyshedskiy 2022a, 21), as the founders were able to translate their new ability to "see" things, both old and unprecedented, into reproductive advantage (fitness). More specifically for this discussion, while Vyshedskiy imagines that the founders of such a species would have turned immediately to weaponry and hunting strategy, I want to suggest that they might well have turned to interrupting the mimetic process, which they had witnessed and survived more than once.

The fact that PFS (and the ability to use recursive language) was not uniform nor universal suggests how, without relying on a quasi-theological causality provided by the scapegoat mechanism, the rituals of religion could possibly have

emerged over an evolutionary timeframe, turning natural hominin populations into religious human communities. I outline the process later in this article. But, for now, to properly conceptualize the difference between an animal population on the one hand and a human community on the other, the concept of collective intentionality is still needed.

Collective Intentionality

According to Vyshedskiy (2019a, 32), the "acquisition of PFS resulted in what was now in essence a behaviorally new species: the first *behaviorally modern Homo sapiens*."[8] Nonetheless, Vyshedskiy (2019a) seems to assume the givenness of the "tribe" rather than simply a population, even before the development of PFS and recursive language.[9] As discussed, Girard refers similarly to the pre-religious hominin population as a "community" endowed already with some developed degree of cultural cohesion. I take issue with these understandings, which suggest the existence of behaviorally modern, culturally cohesive *Homo sapiens* prior to the appearance of PFS ability. I argue that for something like a tribe or community to exist in the first place requires something like PFS ability and, dependent on this, the ability to engage in collective intentionality. Otherwise, simply populations should be spoken of, which is what I do here.

Collective intentionality names the ability of human aggregations to conceptualize and engage in non-instinctual cooperative behavior (Searle 1990, 2010; Gilbert 1990) in joint projects. According to Tomasello (2008), Rakoczy and Tomasello (2007), Schmid (2011), and Kaufmann (2012), collective intentionality is strictly limited to humans. I argue that this is the case due to the fact that collective intentionality must depend on PFS ability. Crucially, Vyshedskiy et al. (2022) argue PFS disability (or its non-existence) impedes pronoun conceptualization, while Vyshedskiy (2019a) argues that PFS disability impedes the mental "combination of objects" into novel images (Vyshedskiy 2019a, 3), which is to say it impedes, again, conceptualization. Difficulties with pronouns like *I*, *we*, and *us* amount to difficulties in the practical apprehension of *my* goal-oriented actions being a part of *our* goal-oriented action, a complex intellectual operation that essentially defines collective intentionality (Searle 1990, 2010; Gilbert 1990; Turner 2003). Without PFS, becoming human in the sense meant here is difficult if not impossible, for PFS itself allows for recursive, nested ideation—my doing as a part of our doing—which is the logical structure of human cooperation or collective intentionality, though not at all necessary for genetically driven animal coordination of, say, chimps, wolves, or colonies of bacteria.

Girard never considered the phenomenon of collective intentionality nor its conditions of possibility. And Vyshedskiy seems not to be concerned with the phenomenon as such. But collective intentionality is the condition of possibility of any ritual, i.e., any non-instinctual collective behavior that is scripted or

representational, entails a telos, and requires conspecifics taking on roles. As Stephen Turner (2003, 147) puts it, "[g]etting to the point of agreement is a task; intersubjectivity of intention . . . or real co-intending, is not a given, but an achievement." Ritual, in other words, depends on something like an implicit social contract. Girard (2008, 124), however, privileging the causality of the scapegoat mechanism, insists that "at the moment of supreme rage, supreme excitement, when you are out of your mind, ecstatic in the way of violence—there is no scope, no possibility, for social contracts." Much more strongly, the "idea of social contract is an *absurdity*: it means that humans are rational enough to have an agreement that they will all subsequently respect," which, he says flatly, "is not true" (Girard 2015, 37; emphasis added). Girard's hypothesis is put beyond discussion: "The creation of a [human] society is the resolution of a violent conflict" (Girard 2015, 38), where the scapegoat mechanism produces—quite miraculously, as I have intimated—that resolution.

Nevertheless, he also observes that in that very moment of rageful, mindless, ecstatic violence, "the people will remember that a victim saved them, and they'll try to do the same thing again. They will deliberately choose other victims and kill them collectively in the hope that this will reconcile them again" (Girard 2015, 40). Such an account aligns with the idea that "in ritual centred around the sacrificial act *a spirit of collaboration and agreement* pervades the re-enactment of all aspects of the crisis" (Girard 1987, 103–4; emphasis added), an idea upon which he also insists.

A commitment to the scapegoat mechanism predisposes Girard to reject notions of agreement, social contract, or collective intentionality in his attempt to theorize religion and hominization, but his discourse on these matters, being so extensive, cannot entirely suppress recognition of what an empirical understanding of human, as distinct from animal, being demands: the phenomenon of, but also the capacity for, collective intentionality, which I am arguing is subtended by PFS. In one sense this is trivial: of course everything is subtended by the brain. My point, however, is that the introduction of PFS specifically into Girard's account must change that account at its core, decentering the scapegoat mechanism and putting in its place the plural first person.

Rupture: The Plural First-Person and a Science of Religion

I now propose an account of religion that is more naturalistic and, I dare say, more scientific than Girard's because it is based on how *Homo sapiens* actually cooperate and uses an evolutionary framework. Girard, believing himself to be employing a naturalistic and indeed scientific method, argues that the "scapegoat mechanism can only emerge from social grouping, like the herd or the pack" (Girard 2008, 102), because with "the pack one gets closer to society" (Girard 2008, 102). The problem with this supposition is

that while herds and packs imply numbers of conspecifics, they are not otherwise particularly similar to human society. Their coordination is natural and spontaneous, preordained, so to speak, by their genes: they cannot *not* coordinate. While hominin populations would have coordinated as packs and herds do, human society as we know it emerged on the basis of a rupture with that ability to coordinate naturally and unconsciously. Complex human sociality depends on cooperation: organized, conscious, and purposeful coordination. Such sociality does not happen spontaneously but emerges out of negotiation and agreement, which are only possible because of collective intentionality and PFS: these allow for a self-sense nested within the sense of another, the sense of others, in interrelated activity. Individual chimpanzees, for example, participate in the hunt automatically, instinctually, but not on the basis of collective intentionality (Tomasello 2008);[10] their individualistic participation tends to ensure, nonetheless, the survival of the group through time without their ever having to think about how to safeguard that survival. Their sociality is genetic, not symbolic. However, the participation of individual hominins in non-instinctual rituals would be impossible absent instruction and guidance by PFS-enabled conspecifics attempting to operationalize collective intentionality. The efforts of the PFS-enabled "leaders" would have no doubt been aided by mimesis, though the leaders could not have known this.

In one of his attempts to explicate how the scapegoat mechanism works, Girard (2008, 119) indeed gives it a theological spin, explaining that the group must have thought "a god came down to teach them that killing the right victim reconciles the community," clarifying that, "[w]hen I say 'god,' I mean a sacred force that is believed to be outside the community." *A sacred force believed to be outside the community*, with the community itself already self-conscious and one-minded, strikes me as overly fanciful given that there is no reason to believe the whole group would have been able to have such a conceptualization. Much more plausible, I think, is an apprehension of the group as an amorphous but all-powerful agent transubstantiating the chaos into calm. This apprehension, based on limited PFS ability, would only have been had by as few as two of the population. We, as observers, can conceptualize the two relating to this agent as something that might be described as a sacred force insofar as its appearance was unprecedented and therefore resistant to their understanding or conceptualization (these abilities were very much "in development"). The agent would have elicited something like veneration and even awe, for it would have been in fact quite difficult to convoke and constitute—but undeniably powerful and satisfying when the attempt was successful.

What happened can be imagined: the two children with late prefrontal cortex development—Remus and Romulus in Vyshedskiy's hypothesis—interacted during their early years, simultaneously inventing the recursive elements of language and acquiring recursive-dialog-dependent PFS. In so doing, each child

would have been able to, as none of their contemporaries could, conceptualize a self-sense and "a sense of the other as a candidate for cooperative agency . . . as actual or potential members of a cooperative activity" (Searle 1990, 414), which the very operations of recursive language and collective intentionality require and which PFS made possible. This means that each one would have developed a sense of themself as part of an unprecedented and almost limitlessly powerful entity: a "we," an "us," a first-person plural that is both the subject and object of remembered past events ("we did things," "things happened to us.") Each individual could now be a part of a first-person plural entity that could foresee and plan for new processes and events. Such an entity, able to think things that simply did not exist prior to being thought, and which as an agent only really exists through the recursive language and voluntary imagination made possible by PFS, would most momentously have made its appearance when it stopped the mimetic violence of all against all by getting ahead of the natural process, by acting *out of time* in some sense, arranging and thus accelerating the cooperation of all against one.[11] The novelty of the first-person plural must be appreciated; it was a fey thing, somewhat unworldly, somehow supernatural—not banal or pedestrian by any means.

To put it another way, the two mutant child protagonists, having fortuitously survived a number of mimetic cycles, were to able remember (see again) the solution to the crisis, to see perhaps with what Tomasello (2008, 179) calls a "bird's eye view" the different individuals playing different roles; then, during one momentous iteration of the process, they must have been able see themselves and others as something like at least potential cooperators constituting an unprecedented agency capable of solving the problem and urged proximate conspecifics to collaborate in enacting that solution *now* rather than wait for nature to take its course.[12] Vyshedskiy speculates about how early hominins, not yet equipped with PFS, might interact with the world. He does this by describing modern people just like us who have, unfortunately, suffered neurological damage that incapacitated their ability to engage in PFS. They are so much like us that "their disability shows only when [they] have to imagine several objects or persons in a novel combination (revealing the problem of PFS)" (Vyshedskiy 2022a, 20), because they cannot do it. It can be imagined then that some and even most members of the hominin population in question, those without PFS, would not have been able to apprehend either the first-person plural as such, nor their belonging to it. But what was important, and decisive, was that some could.

Those whom I will call mutants could have *imagined* cooperation—or rather, what should now be construed as the agent of collective intentionality—and on that basis could have attempted to activate the plural first-person in response to events in an effort to manipulate those events, to achieve ends that heretofore had been arrived at by automatic, merely mimetic, coordination.

The course of evolution and the invention of culture, it turns out, depended not on autonomous individuals in the sense of individual subjects but on individuals nonetheless: individual *organisms* endowed with mutations that gave them survival and reproductive advantage (fitness) within what still must be conceived of as something like natural populations. Quoting and paraphrasing Vyshedskiy (2019a, 16) from a slightly different context, though with an obvious relevance for this one: the "process must have been pre-planned by [one or two] and then explained to all" the rest, one way or the other. In this way, despite most or even the rest of the group being as yet underdeveloped with regard to PFS, "both the [individual mutant] and the tribe [the population] would have gained an advantage" (Vyshedskiy 2022, 11)—but the population's advantage is unthinkable without the mutants'. The physiological mutation subtending PFS, recursive language, and collective intentionality would have given the two mutants reproductive advantage within the population, resulting in the spread of PFS, recursive language, and collective intentionality within the population. This would then have given this population reproductive advantage vis-a-vis other populations, insofar as it could operationalize collective intentionality and act for itself, while other similar populations were stuck in genetically structured natural cycles of coordinated but not cooperative behavior that imposed something like a natural limit on their flourishing.

A Cult of the Victim, or Transcendence?

Here I arrive at what I think is the most substantial break with Girard's scapegoat-centric vision, in which the victim is divinized. My account is speculative but nonetheless plausible, based on the explanation of ritualization offered thus far. In the vision I am sketching out here, based on PFS and collective intentionality, I argue that the plural first-person is divinized. If each body can cooperate in just the right way with every other body in the population, the result is an agential entity, unprecedented in the experience of each body and constitutive of a new experience for each one: being subjectively part of something that is subjectively experienced as greater than each individual self. It is a collective force that *is* us (because it is based *on* us), but it is also *beyond* us; it is not us, because though it can be visualized in the mind of each (assuming PFS), it is in fact beyond any single organism's control. Nonetheless, if all goes well, it is capable of delivering each one of us from perdition. Is this not, in fact, how "we" relate to the gods of which we conceive?[13] They are all powerful but always beyond control, always mysterious in their workings and ways, capricious even; ours, us, but not ours, beyond us. Such entities, these deities, are manifest in the cooperation itself, which in the very process of cohering banishes, defeats, the chaotic terror of the mimetic crisis and its relations. This being the case, I argue that this cooperativity itself is the key for understanding the religious nature

of hominization; it is what makes human *being*, heretofore at least, essentially religious, because it is the very object of human *being*—subjective togetherness, oneness through conscious collective intentionality. In a word, I am talking about transcendence.

The rupture I am suggesting shifts focus here to what Girard (1987, 101) calls the "hallucinatory paroxysm of the mimetic crisis" as constituting itself the resolution of the mimetic crisis. The crisis is resolved *in actu* in the reconciliatory coordination and not post facto in the aftermath of the killing that results from it. In other words, it is the ecstatic cooperation (transcendence) as such, rather than its alleged telos (a killing, a victim), that generates the bonds and bliss that Girard specifies as the immediate, uniform, and homogenous upshot of the killing. Indeed, I am not convinced that killings as such ever gave way to the celebrations and joy Girard ascribes to them. I cannot see why they would.

If the mutants successfully engage conspecifics in a joint enterprise, the discord mysteriously troubling the population is immediately replaced by active harmony, which amounts to an evolutionarily preferred non-threat situation for the individual organisms involved.[14] Reconciliation (a non-threat situation by definition) is already achieved.[15] The agent of such reconciliation is the population, is us, now indeed a community, but only the mutants can "see" this agent due to their novel symbolic capacities. Out of nowhere, something that had not existed before appears: the first-person plural, a collective agent/entity bringing peace. But its appearance has now been explained in evolutionary terms. This unprecedented being is all-encompassing: *it* is the all-powerful entity, the deity I argue, that henceforth commands obedience not from the group *qua* group but from each individual in the group insofar as that individual is understood, and understands themself, to be part of the "us."[16] This process of hominization will take place over generations as PFS spreads through the population/community.

Is it not the case that, essentially, coordination (the result now of cooperation, or each person playing their appropriate, pre-scripted role)—harmony, oneness itself—is the point of every ritual, though it has been toned down in the religious rituals of, say, the monotheistic religions? It is certainly still very much the point of things like rock concerts and festivals like Burning Man, of fandom and spectatorship, and it is even part of the recrudescence of Christianity in some of its current forms, wherein the weekly gathering resembles nothing so much as, indeed, a rave. Indeed, for some African cultures, dance is not an instance of mere emotionality or anything similar; it is nothing less than a positive response to the "ontological and epistemological imperative to be in tune" (Ramose 2005, 43). What are all these forms aiming at? They are purposeful rituals whose goal is an experience of transcendence itself. What Emile Durkheim (1915, 424) wrote some time ago is relevant here:

> [C]ollective life awakens religious thought when it rises to a certain intensity . . . because it brings about a state of effervescence that alters the conditions of psychic activity. The vital energies become hyper-excited, the passions more intense, the sensations more powerful; there are indeed some that are produced only at this moment. Man does not recognize himself; he feels somehow transformed and in consequence transforms his surroundings. To account for the very particular impressions he receives, he imputes to the things with which he is most directly in contact properties that they do not have, exceptional powers and virtues that the objects of ordinary experience do not possess. In short, upon the real world where profane life is lived, he superimposes another that, in a sense, exists only in his thought, but one to which he ascribes a higher kind of dignity than he ascribes to the real world of profane life. In two respects, then, this other world is an ideal one.

The agent of collective intentionality resides, it might be said, in that other world. The image of a transcendent plural first-person becomes reified and even fetishized. This ideal image will be invoked to shape the behavior of others. Just as today one member of a couple might, amid strife, invoke an early image of effortless coupledom to convince themselves as much as their counterpart to "cooperate" by reminding them of "the way we were," so might PFS-enabled conspecifics use an image of "the community" in its transcendent splendor to cajole other conspecifics into cooperation based on a memory or understanding of the "the way we were." Just as all too often the two constituents of the purported couple might have different memories or images of the way they were, and that there might even be disagreement as to whether or to what extent they were, in fact, a couple, so can be imagined that success in some conspecifics convincing other conspecifics to act cooperatively on the basis of an image of their unity, as a collective first-person, took time and was always inconclusive and subject to decay. Nevertheless, is this not what Pericles is doing in his Funeral Oration (Thucydides and Kakridis 1998), wielding an image of "us," Athens, a plural first-person, to bring together the Athenians (those who would consider themselves interpellated as such) in cooperation, in transcendence, going forward? Indeed, it remains something that we humans are still striving to accomplish on a consistent basis today.[17] (Is this not the implicit logic behind the injunction to make American great again?)

Conclusion: A Scientific Framework for Divinization

The question still to be posed and answered scientifically is the following: What environmental pressure would drive this neurological mutation (the basis of PFS)? Vyshedskiy (2022, 11) posits that "predation from camouflaged motionless felines was driving" it. But our primate cousins seem to have done well enough without PFS in such an environment. Girard's contextual emphasis

here seems to me spot on: rather than big cats, the real pressure was from conspecifics, most especially at the time of mimetic crises.

The mimetic crisis constitutes a threat to the survival of all the individuals who find themselves caught up in it. As such, it should be remembered that all living organisms have old evolutionarily "defensive survival circuits" (LeDoux 2019, 345) that are constantly alert to threats. When stimulated, these circuits help the individual organism prepare for defense by inducing in the individual organism what LeDoux (2019, 345) calls "an organism-wide physiological state, a global defensive survival state." Most importantly for the purposes of this article, such a state can "facilitate goal-directed instrumental actions" in mammals with nervous systems that can generate "feelings" based on this state (LeDoux 2019, 345). Humans are exquisitely attuned to such feelings (Damasio 2019), and this is important when the most natural, clear, and present threat for one of us is others of us.

That survival state must have taken hold when the proximal conspecifics (and oneself) descended into mimetic crisis. The pre-cultural mimetic solution to this is known: as discussed previously, through emergent coordination and automated imitation, and without reference to a specific goal, chaotic insecurity coalesced into coordinated security. Survival was assured insofar as every individual organism was doing the same thing and thus no single organism constituted a threat to any other. That one organism from among the population would die from this "solution" was of no concern to any other (unless it were to be made the hinge of one's theory).

Now, the defensive survival circuits are properties of individual organisms, not of the group as such, and the global survival state refers to the single organism, not to the collective. As LeDoux (2019, 345–46) says, "in organisms that are capable of conscious awareness of their own brain's activities, the . . . global survival states can . . . influence conscious emotions, which, in turn, can result in deliberative control of . . . behavior." But he is describing what can happen in individual, not collective, organisms.[18] The individual organism will try to survive, but without PFS is not be able to concern itself with "our" survival or "see" how its survival is in fact tied up with the survival of the others. LeDoux (2019, 352) distinguishes between the "noetic awareness that danger is present" and "autonoetic awareness in which you know that *you* are the one in danger." To answer the question of what is adaptive about PFS: it confers advantage on the individual by giving the individual a way to see and thus organize safety by organizing cooperation when it *knows* it is in danger; however, it thereby also confers advantage on the population because it minimizes loss of lives by organizing and accelerating the cooperation that ends the mimetic crisis. PFS—voluntary imagination (but unequally distributed)—subtends what LeDoux (2019, 353) describes, allowing for the articulation of imagistic "predictive models (expectations) and scripts (possible courses of

action)" in the minds of these mutants. They can then encourage the other proximal bodies to join in a beating, and if successful, they have *already* resolved the mimetic crisis and experienced that resolution as something like a feeling of transcendence, what would be called the arch religious feeling.[19]

Girard believes that the victim, inescapably seen as both the cause of the trouble and something like the bestower of peace, is divinized or sacralized. Alternatively, I argue that something like collective intentionality is what is sacralized, for through it humans are capable of impossible things: returning ourselves to peace, among others. Unconvinced that a primordial aggrupation of hominin could have all together interpreted the "meaning" of the cadaver in what strike me as quite extraordinary ways, I suggest that among such a population, some mutants could apperceive the coordination among conspecifics and assimilate it to the elation felt in or produced or induced by that same coordination. The ability to envision and then organize the re-enactment of that coordination is cooperation (collective intentionality), which depends, as I argue, on PFS. Cooperation inherently and instantly—miraculously, one might say, from the point of view of those involved—resolved the danger, whose source, to be sure, was hardly understood.[20] This experience stands in radical contrast to the subjective stress caused by activation of the global survival state. It is an experience of deep affective connection to others outside oneself with whom one somehow forms a unity: it is an experience of transcendence.[21]

A part of the population—not the whole in some miraculous, unanimous fashion—was thus able to conceptualize, roughly, to be sure, something like the first-person plural, the "we" that could, as "we," end the terrifying violence. "We"—a real but evanescent collective entity, a decidedly new element in and of experience, an inconsistent but undeniably powerful force—could remember and foresee and plan and act (cooperate) and make things safe again. The mutants could have the new and powerful experience of being part of, of being in some real sense one *with*, all those present, which was, again *in actu*, the experience of transubstantiating the terrifying violence through nothing other than transcendence itself.

My hypothesis, finally, is this: the reconciliation is not post facto (after the killing) but *in actu*. It results from the coordination/cooperation whose result is, yes, a killing. But from what, specifically, did reconciliation and safety result? The killing or the acting together? I am insisting that it resulted from the cooperating, from the alignment of the various bodies in one, first spontaneous, now consciously organized, activity. This organized activity resulted from cajoling, inveigling, and somehow involving others on the basis of an image of the entire population conceptualized, again by some, in terms of what should be thought of as an unprecedented first-person plural subject or agent capable of unprecedented things. Ultimately, it is ourselves and not, as Girard claims, the sacrificial victim, that we worship, whether at the dawn of hominization and

primitive religion or amid the bellicose enthusiasms of resurgent nationalisms and populisms today.[22]

If cooperation is achieved, *the mimetic crisis is already over*, for now, and that cooperation is experienced as something like transcendence. In *Reading*, Girard (2015, 41) asserts that "human societies are all built around religion." "Sacrifice," he then specifies, "is the center of human culture" (Girard 2015, 41). But is religion—the primordial form of human culture—really a question of sacrifice? Is it not, rather, a question of transcendence? I think the latter. I think that the notion of a community, a first-person plural, is at the center of human culture: the image of the group in cooperation, the experience of transcendence in that cooperation.

That our worship of ourselves has tended, empirically, all too often to end in murder (lynchings, international, civil, and class wars, inter-ethnic and -religious violence; even much interpersonal homicide is driven, one could argue, by an image/idol of oneself that demands one kill the victim who insults that image/idol) does not mean that it must always be so. Perhaps one option to reduce this tendency is to see it as but one way, perhaps the predominant way, or an all too easy way, of organizing transcendence. But it is not the only way; our task is to find and promote better ways, if we can. They need not be new ways. Perhaps, as Girard himself advocated, religious belief and practice elaborated in terms of steadfast non-violence would be among them.

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Notes

[1] René Girad (1923–2015) spent the greater part of his career defending a scientific theory of religion based on natural human mimesis that he developed in the 1970s. Recognition of the importance of his work led to his being invited to become an *immortel* of the famed Académie Française and has inspired the International Association of Scholars of Mimetic Theory; the Colloquium on Violence and Religion, which has its own journal publishing content from Girard's followers, *Contagion. A Journal of Violence, Mimesis and Culture*; the Raven Foundation, which seeks to "to impact communities and individuals with God's healing love and nonviolent theology" (ravenfoundation.org); and Imitatio, financed by the Thiel Foundation, which seeks to underwrite applications of mimetic theory to the study of culture.

[2] Girard uses here the notion of "community," which I find places the cart before the horse. That is, when speaking of precultural humanlike primates, "community" already suggests some degree of cultural reality. But the attempt to explain the emergence of human communities *qua* religious communities cannot itself draw on the notion of community. Thus, though I will reproduce quotations as they were written, my own language will distinguish between populations or aggregates of precultural humanlike primates and what I am trying to explain: the (necessarily religious) communities that emerge from them.

[3] Here I must thank an anonymous reviewer for pushing me, and helping me, to achieve the appropriate language to characterize the scapegoat mechanism.

[4] Marcia Pally (2020b) discusses the requisite minds, thanks to which *Homo sapiens* can engage in "recursive thinking" and create and participate in a "we-centric [. . .] space" and "shared, collaborative, intentional activities." Such minds thus explain "why play, theater and *ritual* are humanly possible" (Pally 2020b, 1098; emphasis added). Indeed, I concur wholly with Pally's conclusion that "the playful ability" afforded by our minds "is not a recent add-on to the human repertoire . . . It is foundational to our cognitive, emotional, and social capacities—in short, to what it means to be human" (Pally 2020b, 1104). Such minds and their abilities are indeed what make us human in the first place. The main point of this article is to explain those minds and their abilities, that is, what hominizes us, in evolutionary terms, but also in the terms of mimetic theory insofar as, I argue, it gives us a theory of religion that necessarily marks our very humanity as inescapably religious.

[5] To avoid any confusion, Vyshedskiy's work has no relation to Girard's and at no point touches on the mimetic process. I am bringing them together.

[6] Recall his words: "In the *eyes of the group*, this victim seems to be responsible for the whole trouble; but he is also responsible, through his death, for the reconciliation. Therefore . . . *that victim is at first seen as 'God'* . . . . So we have a situation that is *suddenly* one of peace, and *the community rejoices* . . . . Very quickly, mimetic rivalry will come back over other objects. Then the *people will remember* that a victim saved them, and *they'll try* to do the same thing again. *They will deliberately choose other victims and kill them collectively* in the hope that this will reconcile *them* again. It does, mimetically; this is the *invention* of ritual sacrifice (Girard 2015, 39–40; emphases added).

[7] Impossible too, according to evolutionary theory in general, since the traits subtending it would be specific, at first, to individual organisms and not spread among the group, awaiting activation by a scapegoat mechanism.

[8] As an aside that cannot be developed or defended here, I might remark that a more appropriate latinate name for our species might emphasize less our intelligence and more our imagination: *homo imaginans*, for example.

[9] If intra-conspecific violence is not something to be overcome in order for hominization to occur, then Vyshedskiy's full account aligns nicely with Pally's (2020a, 2020b), according to which, if I understand it correctly, early humans were hypercooperative and not particularly violent. It was

only with the age of agriculture, with its sedentary, hierarchical, surplus-producing societies, that human violence became an instrumentally valuable option (for some) and thus a notorious feature of human history.

[10] Perhaps this is the appropriate moment to acknowledge that Tomasello has a whole book on hominization, *Becoming Human* (2019), which nonetheless, as far as I can see, fails to engage with PFS and the lateral prefrontal cortex delay as decisive for understanding of this phenomenon. In fact, it only offers "culture" as explanans, without ever explaining *it*. Thus, the book remains engagingly descriptive of the different and tremendously important ways humans are unique with regard to other animals but avoids shedding light on what underwrites this difference.

[11] Vyshedskiy (2019a), for his part, imagines the appearance of this unprecedented collective agent in an act of hunting that eschewed persistence hunting in favor of setting up a heretofore unthinkable elaborate traps that reduced effort and increased yield.

[12] Based on Tomasello and Rakoczy (2003), this can be thought of as something like an *epistemic seeing*, made possible, again, by PFS.

[13] The story of Achan in Joshua 7, in the Old Testament, is revealing here. As the story is told in the Bible, Achan disobeyed God, stealing items of value in the attack on Jericho when God had explicitly told the Israelites to destroy everything they found there. Achan's failure to cooperate properly brings potential ruin on the community: "Now Israel itself must be destroyed," God says, for its failure to carry out his plan to the letter. Unless, that is, Israel learns to cooperate better, which also means rooting out, and killing, the one who did not cooperate: Achan. Before "the people of Israel" stone Achan to death, Joshua tells him: "You caused us a lot of trouble. Now the LORD is paying you back with the same kind of trouble" (Joshua 7:25 CEV). The conflation of the Lord and the people of Israel, the community as God, as sacred force, as animated by the sacred force, is exactly what I am trying to explain in the text. The Israelites kill Achan because God demands it—because they themselves demand it. Once he is dead, the Israelites burn Achan's body. "Then the LORD stopped being angry with Israel" (Joshua 7:26 CEV). And Israel, having dialed in its ability to cooperate, goes on to raze a series of enemies with little to no resistance (because God once more favors it).

[14] Here I must reference Pally's (2020b, 1095–96) particular attention to ritual sacrifice in human development and cooperation as it relates to harmony. She understands Girard to be arguing that "ritual sacrifice" is "one way to dispel . . . social tensions," and indeed that it is the "foundation of civilization" (Pally 2020b, 1095). But, crucially, she also draws attention to the fact that "ritual sacrifice requires complex cognitive and organizational skills" (Pally 2020b, 1095). This then prompts the following question: "Why did early *H. sapiens* bother to dispel accumulating tensions? Why not have Hobbesian war?" (Pally 2020b, 1095). According to Pally, one cannot invoke as an answer a "certain preference for basic societal harmony" because, for example, "our closest cousins the chimpanzees don't share it" (Pally 2020b, 1095). The account I am trying to elaborate here does not, however, rely on a preference for societal harmony. Rather, it relies on every organism's evolved preference for non-threat situations, which can be presupposed according to the theory of evolution as elaborated by theorists of defence mechanisms (Eilam, Izhar, and Mort 2011; Mobbs et al. 2009; Woody and Szechtman 2011). Such a "preference" is not restricted to humans. What is restricted to humans is the ability to imagine and realize complex strategies for safeguarding a non-threat situation or extending it. The ability to do this is, as Pally concludes, what makes us human. My purpose here is to situate that hominization, that becoming human, in the religious framework provided by Girard's theory while correcting Girard's still metaphysical dependence on the scapegoat mechanism. I am not trying to test Girard's theory in terms of a transition from hunter gatherer group to sedentary, agricultural groups but make it accord with the evolutionary process in which pre-cultural hominins driven by mimesis to episodic but almost apocalyptic bouts of intra-group violence become cultural human beings who have found a way to manage but not neutralize the tendency to such violence through sacrifice and prohibition (though I do not talk about the latter here). The evolutionary process in question is only possible due to neurological mutations in two conspecifics that made such management imaginable in the first place. I say more about this in the conclusion.

[15] In fact, in at least a couple of places, Girard (1987, 26) gives ballast to my argument. For example, "[c]onflictual mimesis . . . creates a *de facto* allegiance against a common enemy, such that the conclusion of the crisis is nothing other than the reconciliation of the community." Here, is he not saying that coordination results automatically from the mimetic process and thus concludes the crisis? This cannot be dismissed as a slip, something similar is also found later: "In the founding mechanism reconciliation is achieved against and around a victim" (Girard 1987, 102), but not specifically after the victim is dead. The conspecific is not yet dead, and yet the reconciliation has been achieved, Girard says, though he does not follow through. These examples suggest that Girard's discourse is not immune (and why should it be?) to the aporias that, according to Jacques Derrida (1976), plague all discourses.

[16] During the French Revolution, the Abbé de Sieyès (2003, 137) theorized the nation in much these terms: the nation is "a legitimate association, one that is voluntary and free," but such a nation "cannot alienate or prohibit its right to will and, whatever its will might be, it cannot lose its right to change it as soon as its interests require it." The nation, in other words, is us, but beyond and above us, somehow autonomous with regard to us; though it only exists through us, it is not us, and we must do its will.

[17] Constructing a community for itself takes time. See, for instance, Shlomo Sand (2009) and Edward Thompson (1963).

[18] Again, mob or crowd behavior is based on mimesis. After the fact, those involved are often unable to rationally account for what they did. This is why we are so indebted to Girard on this point. The transition to deliberate, essentially rational behavior—"let's do X to prevent Y"—requires something other than mimesis, which of course does not replace it but surely can eventually account for it and diminish its power.

[19] It is of note in this regard that recent experiments with terminal cancer patients who were given doses of psilocybin showed that they had experiences of transcendence that diminished their subsequent stress or dysphoria about their imminent passing. See Griffiths et al. (2016).

[20] That we humans ourselves are the source is of course one way to understand the elaboration of the idea of original sin, which Girard's theory of mimesis gives an anthropological twist.

[21] It is temporary, of course. Under the effects of mimesis (which I have not had cause to question), we are soon at each other's throats again.

[22] To be clear, I do not think it the case that we worship society à la Emile Durkheim here (although society might well be an object of worship), nor that we worship Ludwig Feuerbach's God who consists of our own displaced/alienated goodness. It is, to put it another way, our collective intentionality as such, our sense of our own sublimation in something that is bigger than ourselves, to which we are in thrall. I thank an anonymous reviewer for pointing out the need for clarification on this.

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Discerning Progress in Schellenberg's Evolutionary Religion

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John L. Schellenberg has suggested that the evolution of religion should be guided towards the goal of discovering the truth about transcendent reality. I argue that some way of discerning progress is needed if this project is to be practically feasible. In this article, I explore what discernible progress would require in some possible future scenarios. Focus lies on scenarios involving improved cognitive contact with the transcendent, but I also consider scenarios involving only cultural change and those where no transcendent reality exists. I conclude that whether progress can be discerned varies heavily between different versions of these scenarios and therefore suggest that humanity is currently too ignorant to begin this project.

Introduction

The future evolution of religion has long been an important topic in John L. Schellenberg's philosophy. He has often invited us to practice "evolutionary religion",[1] a present-day religious stance aimed at accommodating what the religion of tomorrow might bring (Schellenberg 2019a). In recent writings, Schellenberg not only encourages us to anticipate future religious change, he also suggests that we could actively guide the evolution of religion (Schellenberg 2013, 75; 2019d, 20–21). This radical proposal raises several questions. Setting aside issues regarding our human capability to guide our own evolution as well as the question of whether this is an endeavor we should actually attempt, I concentrate on the matter of discerning religious progress.

The need to discern religious progress becomes crucial when moving from promoting progress in general and trying to guide the evolution of religion in a certain direction. Progress can always be promoted simply by investing resources and hoping for the best. Guiding or controlling a process, however, requires a way of detecting whether progress is being made. Without the ability to discern progress, anyone attempting to guide religious evolution will have no idea whether their attempts are successful.

Schellenberg understands religious progress as a process towards learning the truth about transcendent reality (more on this in the next section), which makes discerning progress anything but easy. Any transcendent reality lies outside the scope of ordinary experience, and there is currently no straightforward, independent way of checking whether changes in understanding of the transcendent represent progress.[2] We cannot even be sure whether fundamental historical changes, as the move from animism and polytheism to monotheism, represent progress or regression (more on this later too). But perhaps changes might occur in the future that will make it possible to discern progress in a non-question-begging manner?

As will become apparent in subsequent sections, whether and how religious progress can be discerned depends on several distinct factors: how religion evolves, how intelligent life evolves, and the existence and nature of the transcendent reality itself. The number of possible scenarios in the deep future is seemingly endless, many lying far beyond the current human ability to imagine. It is beyond the scope of any treatment to explore all relevant scenarios, let alone all possible scenarios. I therefore concentrate on a few significant possibilities where the changes taking place are not too alien. These possibilities are mostly what I call best-case scenarios, where beneficial circumstances intuitively should make discerning progress easier than it currently is. If discerning religious progress is ever practically feasible, it should be under such favorable conditions.

In the next section, I give a brief introduction to the relevant aspects of Schellenberg's philosophy, namely, evolutionary religion and the religion project. In the third section, I assess different ways of discerning progress

if a religious cognitive faculty evolves. In the fourth section, I consider the possibility of measuring progress in terms of human flourishing if no relevant biological evolution occurs, and in the fifth section, I discuss how progress could be discerned if naturalism is true. The article ends with some concluding remarks.

Evolutionary Religion and the Religion Project

Since the interest of this article lies in discerning religious progress within the framework of Schellenberg's evolutionary religion, it must begin by taking a closer look at the details of his position. In particular, clarity on his view of religious progress must be established.

Archaeological evidence suggests that roughly 50,000 years have passed since the dawn of religion. In comparison, humans might have as much as 750,000 years ahead of us as a species, and there might be as much as one billion years left for intelligent life to continue evolving on Earth (Schellenberg 2013, 15–16; 2019d, 16). Pointing to our potentially early position in the history of intelligent life, Schellenberg suggests that religion as we know it might only represent a primitive stage. It is a possibility that most important religious evolution still lies ahead of us, in the deep future (Schellenberg 2013, 2019c). In his view, an awareness of the deep future as a realm of religious possibilities should guide our religious life in the present (Schellenberg 2009, 2013, 2019a, 2019c). As mentioned, "evolutionary religion" denotes a present-day religious stance aimed at accommodating any changes the future might bring (Schellenberg 2019a).

According to Schellenberg, a religious stance needs to meet some basic conditions to qualify as a proper instance of evolutionary religion:

> Evolutionary religion, so I suggest, will be
>
> (1) **temporally qualified**, identifying what is appropriate religiously with what is appropriate to our immature stage of development (Religious Stage Relativism);
> (2) **diachronic instead of synchronic**, situating our present stage in the context of processes and changes unfolding over vast periods of time taking us from the deep past into the far future (Religious Diachronism);
> (3) **cognitively modest**, finding, for the expression of religious intellectual commitment, attitudes and propositional contents reflecting due appreciation for the audacity of a young species engaging the most profound and controversial matters (Religious Intellectual Humility); and
> (4) **attentive to the evolutionary benefits of redesigned religion**, thinking about how religion itself might help us evolve toward ever greater maturity in all areas of human life, functioning as part of the solution to our many immaturities instead of as part of the problem (Religious Pragmatism). (Schellenberg 2019d, 21)[3]

Condition one and two are straightforward, but condition three, which speaks of cognitive modesty, requires clarification. Schellenberg (2007, 2013, 2019c) argues at length that the proper epistemic attitude towards religious propositions at religion's early evolutionary stage is agnosticism and that neither religious nor naturalistic belief should be considered justified. However, that does not exclude the possibility of a religious life. Schellenberg advocates non-doxasticism a religious stance compatible with agnosticism. In non-doxasticism, belief is substituted with some weaker cognitive attitude, like hope (Muyskens 1979), acceptance (Alston 1996), or voluntary assent (Schellenberg 2005).

Condition four is central to present purposes. The idea of guided evolution becomes explicit in Schellenberg's explanation: "Evolutionary religion can be a vehicle, both for religious and for a more widely human evolution—a positive evolution that we, more and more, are able *intentionally to guide*." (Schellenberg 2019d, 21, emphasis added) The idea is that humans should control the evolution of religion to achieve the positive developments we desire, both in terms of religion and human evolution at large. Even though it surely an intriguing idea to guide human evolution through religious means, I focus exclusively on guiding the evolution of religion.

Evolution itself is not a teleological process with preset goals. Attempting to take control of the evolutionary process means attempting to change that fact by imposing a direction of development towards some chosen goals. It is only from this perspective that it makes sense to talk about evolution as progress. Robert McKim (2019) distinguishes between two kinds of religious progress: practical progress, which concerns religion as a means for human flourishing, and progress of understanding, which concerns progress towards finding religious truths. There is a strong focus on progress of understanding in Schellenberg's writings. Agnosticism might be the proper epistemic response to religious claims in the present, but that will change as humans learn more about the transcendent.

Schellenberg has written extensively on religious investigation and progress of understanding. I concentrate here on the sense specified in *Religion after Science* (2019), his latest and most extensive treatment of the subject.[4] Schellenberg invites readers to consider "the religion project," a great human project comparable with the scientific project.[5] It encompasses all of humanity's religious thought and activity, and its ultimate goal is to uncover the truth about transcendent reality[6] by answering the question "*Is there any such thing* as a triply [i.e., metaphysically, axiologically, and soteriologically] transcendent reality, and, if so, how should we understand its nature? Are we even able to learn anything about such profound matters?" (Schellenberg 2019c, 10). The goal of the religion project can be met in three ways: humanity can learn that there is a transcendent reality and what properties it has; humanity can learn that there is

no transcendent reality; or humanity can learn that the truth about transcendent reality will forever be beyond our cognitive grasp (Schellenberg 2019c, 61).

However, as I pointed out in a previous publication (2022, 117), the idea that humans might discover that knowledge about transcendent reality lies forever beyond our cognitive limits seems questionable. How could a species ever learn that no further cognitive evolution is possible? Is it even possible for a species to master the science of evolution so fully that it can be determined beforehand which future evolutionary paths are possible and which are not? Progress towards the third possible endpoint of the religion project seems highly improbable. Since Schellenberg has yet to address this issue, I set aside this alleged possible outcome. This leaves two ways of reaching the goal: to learn that a transcendent reality exists and what properties it has or to learn that no transcendent reality exists.

While religious evolution itself is a kind of cultural evolution, it can be based on both the biological evolution of human cognitive capacities (Schellenberg 2013,67; 2019a, 580; 2019c, 31; 2019d, 17) and the evolution of cultural factors (Schellenberg 2013, 26; 2019c, 133; 2019d, 21). In many instances, it is not clear which type of evolution Schellenberg has in mind, which is unsurprising since cultural and biological factors tend to be intertwined when it comes to human evolution (Ferretti and Adornetti 2014). In what follows, I discuss religious evolution of both types. The next section focuses on biological evolution and the development of human cognitive faculties. It is followed by a section considering cultural evolution only.

Best-Case Scenario: Beneficial Cognitive Evolution

The most straightforward way the human species could evolve in a direction beneficial for the religion project would be if our cognitive contact with the transcendent improved. Such a scenario does not seem far-fetched from an evolutionary point of view, since, if there is a transcendent reality, this kind of evolution would be pragmatically beneficial for the individual (Van Eyghen and Bennett 2022, 120–23). In this section, I explore the idea of how religious progress can be discerned if a religious cognitive faculty (RCF) develops. For present purposes, religious cognitive faculty (RCF) is defined as sensory functions that enable cognitive contact with the transcendent.

There are at least two main possibilities to consider regarding RCF. The first is that humans' ordinary senses might improve in a way that enables the formation of reliable beliefs about the transcendent. Since the transcendent is beyond the physical world of our senses, such evolution will not allow us to "perceive" the transcendent itself, only its impact on the world. Successful cognitive evolution along these lines would allow humans to experience the transcendent in the same fashion as we can now be said to experience the minds of other agents.

Both philosophers of religion and cognitive scientists of religion have argued that humans already possess a capacity of this kind. Alvin Plantinga (2000) famously claims that humans have a *sensus divinitatis*, a "sense of God," that works with and through the ordinary senses to produce warranted true religious beliefs about God. Hypersensitive agency detection device (HADD) theory (Barrett 2004) from cognitive science of religion claims that humans possess a "hypersensitive agency detection device" that enables us to detect agency not only in persons but also (supernatural) in nature. However, while Plantinga takes the *sensus* to be reliable, most proponents of HADD theory regard the device as overly active and unreliable, detecting agency where there is none in the supernatural case (Barrett 2004; Braddock 2016; Szocik 2017).[7] I want to stress that I am interested not in the current reliability of a HADD but in the possibility that a reliable RCF (which might or might not be a development of a HADD) could evolve in the future.

The second possibility is that humans might develop a new kind of sense that allows for direct cognitive contact and lets us "perceive" transcendent reality in much the same way our ordinary senses let us experience the world. Successful cognitive evolution along these lines would empower us with a new sense faculty that could be analogous to an existing sense, like a "second sight," but could also be something else entirely.

Of course, we cannot be certain that such direct contact with the divine is metaphysically possible. In a worst-case scenario, the border between what humans can experience and transcendent reality is absolute, in which case, no experience of the transcendent will ever be possible, even if the transcendent exists. The evolution of an RCF of the second, direct type requires a best-case scenario wherein experience of the transcendent is metaphysically possible and the reason humans currently cannot experience it boils down to evolutionary bad luck (like we presently happen to lack the ability to see ultraviolet, which most birds can).

I conceive of RCF broadly enough to include both direct and indirect experiential contact with the transcendent. RCF is not meant to include nonexperiential capacities (like improved reasoning powers), since such capacities would contribute to other forms of religious progress (like better philosophy of religion).

In what follows, I consider the question of how it could be discerned whether RCF evolves towards greater reliability. An indirect RCF might well evolve without there being any transcendent reality, like several proponents of HADD-theory suggest (Braddock 2016), but it seems unlikely that a direct-style RCF would develop in such circumstances. Just as fins do not evolve in the desert, it seems extremely unlikely that a new sense would evolve to let humans "perceive" that there is "nothing there." However, this matters little for present purposes, since the problems connected with discerning whether RCF evolves towards greater reliability will be the same for both indirect and direct RCF.

Quite naturally, a scenario where RCF evolves towards greater reliability is also a scenario where the transcendent exists.[8] The possibility that an indirect RCF might evolve if there is no transcendent reality can be safely set aside.

Discerning Progress in Terms of Consistency

How could it be discerned whether RCF evolves towards greater reliability? The reliability of an information-gathering process is sometimes measured in terms of sensitivity, i.e., its ability to reject false negatives, and specificity, i.e., its ability to reject false positives (Joyce 2003). However, such criteria are inapplicable in this case, since there is currently no way of independently identifying false negatives or positives and no way of estimating these numbers. Other criteria are needed to measure the reliability of RCF.

Religious diversity is a primary obstacle to regarding RCF as reliable. Even if RCF were to provide clear perception of the divine, there would still be a strong reason to regard it as unreliable if it remained the case that different subjects had different and incompatible experiences. Reliable cognitive mechanisms should not be expected to produce several incompatible systems of belief (Palmqvist 2022, 108–9).[9] It therefore seems intuitive to suggest that increased consistency between different religious outlooks would indicate that RCF has evolved in a more reliable direction. This is based on the assumption that an increase in agreement would be due to better cognitive contact with transcendent reality. Since increased convergence between religious views is a clearly discernible phenomenon, consistency seems a natural candidate for measuring religious progress. Put a bit more formally:

> **Premise one:** If RCF evolves to become more reliable, religious subjects will be in a better position to make true claims about transcendent reality.
> **Premise two:** If religious subjects were in a better position to make true claims about transcendent reality, there would be a discernible increase in consistency between religious outlooks.
> **Conclusion:** A discernible increase in consistency between religious outlooks is evidence that RCF evolves to become more reliable.

The argument, however, is faulty since it rests on the false, hidden premise that all possible increases in consistency are due to improvements of RCF. Religious consistency can increase for other reasons, including deterioration of RCF, and it can even be the case that improvements in RCF lead to decreased consistency. Establishing a connection between consistency and reliability is surprisingly hard.

Here, I demonstrate the difficulties of connecting consistency with progress of understanding using Tiddy Smith's (2020) argument for animism. A recent study on the religious beliefs of thirty-three isolated hunter-gatherer societies discovered that all thirty-three hold worldviews that include animism

as a vital aspect (Peoples, Duda, and Marlowe 2016). Since the thirty-three societies are isolated, they can be treated as thirty-three cases of independent evidence. Monotheistic religion, by contrast, goes back to the same original sources: Zoroaster and a few other prophets in the ancient Middle East.[10] Smith argues that this is indeed compelling evidence for preferring animism over monotheism.

Smith's description of humanity's current religious situation represents an excellent point of departure for discussing the relation between consensus and truth on an evolutionary picture (if, like Hendricks (2022), you disagree with Smith, consider it a thought-experiment). An obvious way of reading Smith is that RCF has already evolved to a degree where religious consensus is possible in animism. However, the spread of the axial world religions (monotheism in particular) through cultural diffusion has distorted the natural consensus.

Let us assume that monotheism too is a product of RCF, and that Zoroaster and the other prophets had a special kind of monotheistic RCF that functioned differently from everyone else's. Instead of experiencing a plurality of agents in nature, the prophets became aware of one singular agent behind everything. What does this say about the evolutionary status of the prophets' RCF? There are two main possibilities to consider:

> **Improved RCF:** Monotheistic RCF constitutes an evolutionary improvement over animistic RCF, allowing for better cognitive contact with transcendent reality.
> **Deteriorated RCF:** Monotheistic RCF functions poorly. It represents a retardation as compared to animistic RCF.

The problem is that one cannot tell which of these two alternatives is correct (at least not without already knowing the truth about transcendent reality). There is no way of telling whether the monotheistic disturbance of animistic consensus represents progress or a degeneration of understanding.

It might be objected that if thirty-three out of thirty-four independent witnesses agree, it is obvious that the thirty-three animists should be trusted rather than the lone monotheist. However, when beliefs are judged only by their coherence with other beliefs, it becomes hard to explain how radically novel ideas can ever be justified. This problem is especially significant in an evolutionary context, where advancement depends on new cognitive capacities that very few people will have initially. It is therefore far less obvious than in ordinary witness situations whether to trust the majority.

Given Schellenberg's deep future perspective, would it not be premature to draw any conclusions regarding the prophets' RCF? Should we not wait a hundred thousand years and see whether monotheistic RCF becomes dominant in the population? However, that a feature becomes dominant through evolution in no way implies that it represents a qualitative improvement. There are many

examples of how physical features can deteriorate in an evolutionary process. Think of the tiny, useless arms of a T-Rex, or think of flightless birds, or think of seals' poor ability to walk on land. Even if monotheistic RCF becomes dominant in a hundred thousand years, it could still represent a functional degeneration.

Religious progress of understanding cannot be discerned by measuring consistency, since we have no way of knowing whether an inconsistent exception represents progress or deterioration, and since it is possible for a deterioration to spread to the entire population, in which case consistency would represent universal regress. But if convergence between religious views is not enough to conclude that RCF is becoming more reliable, what is?

Discerning Progress in Terms of Self-Support

One philosopher who has explored the question of when religious extra-sensory "perception" can be regarded as reliable is William Alston (Alston is preoccupied with contemporary Christian mystical perception, but his ideas are equally applicable to the evolution of RCF). Alston's account is extensive, and I will only take up one of his core ideas for consideration, namely, the requirement of significant self-support. To count as reliable, a belief-forming practice must offer significant self-support. For example, ordinary sense-perception produces a coherent picture of the world that allows for interaction (Alston 1991, 173–75). Alston (1991, 276) claims that Christian mystical perception offers self-support in terms of spiritual growth: "This significant self-support amounts to ways in which the promises God is represented by the practice as making are fulfilled when the stipulated conditions are met, fulfilled in growth of sanctity, in serenity, peace, joy, fortitude, love and other 'fruits of the spirit.'" Hans Van Eyghen (2022, 120) has re-applied Alston's argument in an evolutionary context, suggesting that "mystical experience provide guidance to interact successfully with God" and spiritual growth is a sign that this interaction is indeed successful.

This kind of self-support is not very persuasive. As pointed out by McKim (2019, 33), there is no straightforward connection between practical religious progress and religious progress of understanding. All major religions contribute to human flourishing in some way or another, but they cannot all be literally true, since they propose incompatible views about the transcendent. It seems obvious that religion contributes to human flourishing regardless of its truth. It is therefore hard to see how factors such as spiritual growth could be used as primary indicators of reliability in a non-question-begging way. This remains true even if what is "learned" through RCF explicitly forecasts that spiritual growth will take place (as in Alston's example), because it is easy to see how followers of a false religion might still correctly predict a development that takes place for purely natural reasons.

However, there seems to be something intuitively right about Alston's general idea that reliable sensory experience should produce significant

self-support. If the connection between spiritual growth and reliability is too contentious, perhaps significant self-support can come in other forms? Might a more highly evolved RCF produce self-support of the same kind as sense perception? It is surely a live possibility that an evolved RCF might enable humans to interact with, control, manipulate and perhaps also make predictions about the transcendent in ways presently undreamed of.[11]

As pointed out by Alston (1991, 209–25), control of or stable predictions about transcendent reality should not be expected if transcendent reality turns out to be the God of perfect being theism. Attempts to manipulate a personal transcendent reality always get ambiguous results. For example, if one prays for the health of one's spouse and they get a chronic disease, does this mean that God heard the prayer and intervened to prevent her death, that God ignored the prayer, that God does not exist, or that God decided to punish the person praying?

On the other hand, if the transcendent is impersonal or has impersonal aspects, manipulability is not ruled out as on the theistic picture. Whether the transcendent can be manipulated ultimately depends on its nature. If the transcendent is manipulable and humans eventually learn to manipulate it based on RCF experiences, it seems reasonable to regard such manipulation as a way of discerning that RCF is becoming reliable and that progress of understanding is being made.[12]

A worry is that manipulability will enter the picture too late to be of any use as a means of discernment in the near evolutionary future. Humans surely do not seem able to manipulate the transcendent in the present, and perhaps manipulability should be taken as proof that RCF has reached a stage where it is fairly reliable rather than as an indication that it is becoming reliable. Consider an analogy. Imagine that you are blind but partaking in a treatment that gradually restores your sight. In the first weeks, you see poorly, and you cannot be said to have reliable sight. During this time, attempts at interaction based on what you think you see fail. After the first week, however, your sight is reliable enough to make interaction with your surroundings possible. The point is that when manipulation becomes possible, your sight is already fairly reliable. It seems reasonable to suppose that the same holds for manipulation of the transcendent based on RCF. This suggests that even if humans have a developing RCF, we are presumably too early in religious evolution to expect manipulability, and therefore it is hard to see it function as a means of discerning progress in the near future.

Cultural Evolution and Human Flourishing

I now leave all RCF-scenarios behind in order to consider the possibility, perhaps much more likely than not, that no further religiously relevant biological evolution will take place and that humans will never get in better cognitive contact with

the divine. Religion would of course continue to develop, and developments resulting in substantial progress of humans' religious understanding might still take place. How could we hope to discern progress if all religious evolution is based on cultural factors only?

Schellenberg has written extensively on how to promote religious evolution by cultural means. In Schellenberg's view, humans have thus far underperformed on the religion project, with widespread intellectual and religious shortcomings hindering progress. Schellenberg mentions examples such as self-importance, intellectual greed, dogmatism, premature belief, and misguided loyalty. He suggests that humans can promote change by freeing ourselves from these "immaturities" (Schellenberg 2019c, 38–50).

Would it be possible to discern progress by measuring how successful humans are in eradicating these immaturities? The straight answer is no. Getting rid of the immaturities would be a way of promoting religious progress, but it would not in itself constitute progress. Trying to discern progress this way would be like trying to measure the growth of flowers by measuring how much weed is removed from the flowerbed. A more direct approach is needed.

Psychological and sociological studies confirm that there is a strong connection between religious participation and human flourishing (VanderWeele 2017). Perhaps progress could be discerned by relying on this connection? The assumption at work is that if religion A is closer to the truth than religion B, religion A should lead to more human flourishing than B. This especially will be true if the transcendent has what Schellenberg (2019, 8) calls "transcendent benefit," in which case a greater good will be available to those properly aligned.

In the previous section, I rejected the idea of viewing human flourishing as self-support for RCF. My main objection holds in this context as well: if false religions can contribute to human flourishing[13] as much as true religions, human flourishing cannot be taken as an indication on religious progress. However, other possibilities remain. In this section, I first assess whether lack of flourishing could be understood as indicating a lack of progress, after which I discuss a best-case future scenario in which a new religion leads to unparallelled increases in human flourishing.

If it is assumed that religious truth always leads to human flourishing, and that false religions might or might not lead to human flourishing, it might seem reasonable to think that progress of understanding always must be accompanied by human flourishing. If so, human flourishing could function as a necessary requirement, and views that do not lead to increased human flourishing could be set aside as not viable candidates for progress.

Unfortunately, even on the assumption that true views lead to human flourishing, progress towards that truth does not necessarily lead to an increase in human flourishing. There can even be progress alongside a decrease. Consider a scenario where Christian theism is true and animism false. Christian theism,

the true view in this thought experiment, instantiates the idea of a personal triple transcendency. Imagine an animistic cult experiencing considerable human flourishing. Their religious view is far from true. Not only do they worship nature spirits that do not exist, they also lack any concept of soteriology, and the spirits they worship are not tied to morality in any significant way. This means that their view, while metaphysically transcendent, lacks both axiological and soteriological transcendency. Clearly, if the cult where to change their religious view to one entailing the existence of a personal triple transcendency, this would constitute a substantial leap in progress, and it would do so even if the cult's new view were to get the specific details wrong.

Imagine if, due to some strange turn of events, the cult's leaders decide to introduce the worship of Xelarr, god of extreme renunciation. Like Christian theism, the idea that Xelarr exists entails the existence of a personal triple transcendence. Unlike Christian religion, Xelarr worship is built on extreme self-negligence with a focus on self-mutilation, and self-loathing is considered the highest virtue and spiritual goal. Xelarr offers salvation in the form of complete obliteration, but only to his most devout followers. After this religious development, the level of human flourishing in the cult drops significantly. While Xelarr does not literally exist, the cult now rightly recognises that a personal triple transcendency exists, and so they have made substantial progress of understanding. Therefore, a view cannot be dismissed as moving in the wrong direction just because it leads to a decrease in human flourishing.

Up until this point, I have assumed that false religion and true religion contribute equally to human flourishing. What if that assumption is wrong? Perhaps all current major religions, none of which can uncontroversially be said to lead to much more flourishing than the others, are all false, and the true religion, once it has arrived, will contribute to human flourishing on a scale previously undreamed of. Consider the possibility that, in the deep future, a "super-religion" emerges that leads to human flourishing on a completely new level. Would it not be reasonable to consider this an indication that the super-religion has finally brought humanity close enough to the truth for the soteriological greater good to be available?

Of course, this is on the *ceteris paribus* assumption that there are no other detectable differences between the super-religion and other religions. If all members of the super-religion also use a new super-drug or take part in a new gene therapy or mental training programme, such possible reasons for the rise in human flourishing would have to be eliminated first. Given that there are no such differences, it seems reasonable to suggest that an otherwise inexplicable rise in human flourishing would indicate religious progress, since human flourishing is what should be expected from alignment with a soteriological transcendence.

It might be objected that even if there are no other detectable differences between the super-religion and other religions, the belief system itself of the super-religion will be different. Perhaps humans could flourish simply by holding these beliefs, in which case it would be the beliefs themselves rather than their truth that lead to human flourishing.

I have two responses to this objection. First, while false beliefs regularly lead to human flourishing in all the false religions (whichever they are), it is a substantial assumption that some set of false beliefs no one has yet considered could do this exceptionally more efficiently. Second, and most importantly, if such beliefs are possible, we should expect them to increase human flourishing in roughly the same way as other false beliefs, only much better. Therefore, the rise in human flourishing would not be inexplicable. There would be natural detectable by psychologists specialised in the connection between belief and wellbeing.

The argument assumes that human flourishing would occur as a direct result of alignment with the divine. Many religions, especially in the Abrahamitic monotheistic tradition, contain the contrasting idea that the transcendent (in this case, God) brings about human flourishing indirectly, through natural means. However, my point is simply that if a super-religion emerges, it will be reasonable to explain the rise in human flourishing by assuming that it represents religious progress. If the connection between the divine and human flourishing is indirect, there will be no inexplicable rise in human flourishing.

Another assumption of the argument is that human flourishing can be detected independently of human connection with the transcendent. This would be denied by some religious traditions, especially those where ascetism and renunciation play a crucial role. While I think there is much to be said for a notion of a transcendent reality whose axiological and soteriological dimensions are consistent with an everyday notion of human flourishing, this assumption is nonessential to the argument. Human flourishing can be thought of as relative to what the religion in question says about a good human life. If the super-religion says that misery is the true form of human flourishing and its spread leads to a massive *and otherwise inexplicable* rise in misery, that should also be taken to indicate religious progress (though such progress might make humans reluctant to continue with the religion project).

There are many possible methods one could employ to discern progress if no relevant biological evolution takes place. Like for human flourishing, these methods would have to depend on measuring some empirical phenomenon on the assumption that it correlates with religious progress. These methods would therefore be similar to using human flourishing in two important regards. First, they would be ambiguous in the present, both with respect to competing religions doing equally well and with respect to competing naturalistic explanations.

Second, they would only be truly useful in a future best-case scenario where a new religion is accompanied by uniquely high levels of the relevant phenomenon for which no natural explanation is easily found.

What If There Is No Transcendent Reality?

Schellenberg envisages that the religion project could end with a negative outcome by establishing beyond reasonable doubt that no transcendent reality exists. How could humans make progress towards learning such a truth, and how could such progress be discerned?

As previously mentioned, no beneficial biological evolution should be expected if there is no transcendent reality. Since creatures evolve to be better adapted to their actual environment, it seems highly unlikely that humans would evolve an RCF just to see that "nothing is there." And there are no best-case scenarios analogous to the rise of a super-religion, which would make establishing the "negative" outcome relatively easy. If there is no transcendent reality, the only obvious path to religious progress is philosophical reasoning.

Some philosophers seem to think that defending the view that there is no transcendent reality is easy as long there are no strong arguments in favor of such a reality. In the debate over the existence of God, atheists sometimes suggest that the burden of proof lies on the theist, since they are the one making transcendent claims. I am skeptical of the idea that there can be default positions in philosophy in need of no defense. In my view, such claims are often fallacious, resting on either an implicit *argumentum ad populum* (the burden of proof falls on the theist because they have the minority view among philosophers) or an implicit *argumentum ad ignoratiam* (where the theist's inability to prove God's existence is taken to imply the truth of atheism). It should likewise be impossible to reach the "negative" outcome simply by complaining that proponents of transcendent views lack convincing arguments (even if this happened to be the case).

So how could the "negative" outcome be reached? The fastest and most straightforward way would be to find a knock-down argument for naturalism, establishing beyond doubt that the world, as described by science, is all there is. However, as pointed out by Schellenberg (2019c, 94–97), naturalism is not supported by knock-down arguments but by "economic" considerations in metaphysics, ideals of ontological simplicity, and, of course, the success of science. To reach the "negative" outcome, i.e., to settle the matter once and for all, something more definite is needed.

There is no easy route to the "negative" outcome. To reach it, all possible views of a triply transcendent reality need to be ruled out. As I see it, the only way to do so is by finding convincing arguments against one view, or group of views, at a time. Let us call this the Popperian method, after Karl Popper, who famously suggested that science progresses by falsifying incorrect theories

(Popper [1959] 2005).[14] On this picture, making and discerning progress would be uncomplicated. The more views about the transcendent that can be conclusively rejected, the more progress can be made. However, there are at least two major obstacles with this approach, the first having to do with the total evidence and the second with the range of theories about the transcendent that need to be falsified.

According to Schellenberg, humanity might currently not be in the evidential position required by a Popperian approach. The process of falsification will presumably be evidential, meaning that transcendental views will be rejected based on available evidence. But how can we know if we possess all relevant evidence? In *The Wisdom to Doubt*, Schellenberg (2007, 15–49) presses this point at length. At our early stage in history, humans should be aware of the possibility of evidence regarding the transcendent that is currently undiscovered, neglected, unavailable, or even undiscoverable, thereby distorting our total evidence. This is a fundamental reason for Schellenberg's view that evolutionary religion needs to be cognitively modest. If taken seriously, it seems that a Popperian falsification requires a best-case scenario in which there is both enough of the total evidence to make correct falsifications and knowledge that we are in such a favorable epistemic position.

The next worry concerns the range of alternatives. In Popper's original account, science progresses in terms of falsification, but since the number of possible theories to falsify is infinite, the process will never be completed. There will be no future state where all false theories are falsified and only truth remains (Popper [1959] 2005, 6). The same seems to hold for the religion project, since the number of logically possible theories about the transcendent is also infinite. Even if future species where to prioritize the religion project above everything else, working on it until the end of the universe with the help of supercomputers using all energy in the galaxy,[15] they would never be able to complete it. The deep future might be vast, but it is not infinite.

Schellenberg does not agree with this conclusion. His position is that humanity is currently ignorant concerning the range of relevant possibilities and whether the range is infinite: "The truth is that we are not in a position to fix the range of relevant religious options: our ignorance is such that any traditional claim must be seen as possibly belonging to an indefinitely large set of actual and possible competing religious claims, which is at present, and may for some time remain, *both nondefinable and nonadjudicable*." (Schellenberg 2009, 22). It seems another "best-case scenario" is required to reach the negative outcome: a scenario in which the range of relevant transcendent alternatives is discovered to be finite. Schellenberg seems to think that such a scenario is possible, but I am doubtful. If there is no transcendent reality, I cannot see how it could ever be discovered that the range of relevant possibilities is any less than the full range of logical possibilities, which is infinite. Historically,

discoveries of nonexistence have been limited to alleged empirical phenomena with fixed properties, like unicorns, or scientific entities with crucial functions embedded in theories, like phlogiston or ether.[16] The set of possibly existing things that might correspond to the concepts of "unicorn" or "phlogiston" is therefore very limited. But the set of possible views of a triply transcendent reality has no such restraints, and what other restraints could there possibly be?

It might be suggested that the investigation could be restricted to views that are at least minimally plausible, and that the project could be judged as effectively completed once all such views have been falsified. However, minimal plausibility depends on cultural context, and this will surely change by future cultural evolution.[17] It would therefore be premature to deem the project "effectively complete" just because all views presently found minimally plausible have been falsified.

A Popperian process of falsification seems like an appropriate way forward in a scenario where no transcendent reality exists. In a best-case scenario where it is known that the evidence available is adequate, there will be discernible progress. However, the (negative) goal of the religion project will remain out of reach.

Concluding Remarks

To be feasible, Schellenberg's grand idea of guiding religious evolution towards the goal of discovering the truth about transcendent reality requires a way of discerning religious progress of understanding. I have considered the possibility of discerning such progress in some best-case scenarios in the relative near future. Conclusions about the future are speculative by necessity, and given how hard it is to foresee the future, I am the first to acknowledge that my conclusions are tentative at best. With that being said, the prospects for discerning religious progress in the evolutionary near future do not seem particularly bright to me.

In the best-case scenario where an RCF evolves, the intuitive idea that progress could be measured by convergence turned out to be a dead end. If the transcendent is impersonal and manipulable, an ability to manipulate it would certainly be a discernible kind of progress, but presumably manipulability enters the picture too late to be of much use at our early stage.

In a scenario where no RCF develops and there is only cultural religious evolution, it will be hard to discern progress—unless we humans find ourselves in a best-case scenario where a new super-religion emerges that leads to otherwise unexplainable empirical effects, like an unprecedented rise in human flourishing (which would require that the transcendent affects the world directly rather than indirectly).

The best-case scenarios in which it is possible to discern progress do not only depend on the right evolutionary developments taking place, but also

on the nature of transcendent reality. For example, if the transcendent is an unmanipulable, personal God who works through natural means (i.e., the view of the transcendent that is by a large margin the most popular today), there will be no progress on any of the considered scenarios.

If no transcendent reality exists, the most straightforward way to proceed is a process of Popperian falsification. To get off the ground, this approach would require a best-case scenario where the relevant evidence is known and where we humans know that we are in these lucky circumstances. While this method would never reach the goal of the religion project, it would at least allow for discernible progress.

At present, we are ignorant about all relevant factors. We do not know if the transcendent exists or what properties is has, and we have no idea whether the future will bring any best-case scenario (or if we are already in one!). This means that we have no idea which, if any, method we should use to discern any religious progress. It therefore seems that we are currently too ignorant for Schellenberg's idea of guiding religious evolution towards the goal of the religion project to be practically feasible.

Of course, everything might change in the deep future. In X million years, intelligent life might find itself in a position where it is apparent that an RCF is evolving, or perhaps future intellectual discoveries will limit the set of possible transcendent realities. Or maybe something even more beneficial will happen that lies far beyond what we are presently able to imagine. In such case, guiding religious evolution towards the goal of learning the truth about transcendent reality might become a feasible project worth considering. But that future is far off, and it might never come.

Notes

[1] Schellenberg's evolutionary religion has only begun to receive proper philosophical attention. The discussion has mostly been limited to which religious views and attitudes best fulfill its requirements (Elliott 2017; Palmqvist 2019, 2022; Rottschaefer 2016; Schellenberg 2009, 2013, 2019a) and how religious progress can be promoted (McKim 2019; Palmqvist 2022; Schellenberg 2019c, 2019d). The idea of guided religious evolution on which I focus in this article has not been previously assessed.

[2] Of course, religious adherents usually regard their own view as progress compared to other views. Schellenberg is only interested in progress on the philosophical meta-level, which does not presuppose the truth of any specific religious view (remember that agnosticism is the proper religious stance today in his view).

[3] This recent version of the conditions comes from "The Future of Religion" (Schellenberg 2019d, 21). It represents a revision of the original conditions in *Evolutionary Religion* (Schellenberg 2013, 75).

[4] I do not consider here the idea of religious investigation within the framework of ultimism (Schellenberg 2009, 2013).

[5] It might seem strange to view religion as a project. However, within the broader context of evolutionary religion, the idea makes considerable sense. (Schellenberg himself explicitly combines the ideas of evolutionary religion and the religion project in "The Future of Religion" (Schellenberg 2019d, 13, 21)). If humans are to guide religious evolution to increase religious progress, religion undeniably turns into a project.

[6] Schellenberg is committed to the view that religious reality must be transcendent. If it turns out that religious naturalism is true, and that religiously significant structures or entities exist within the world described by science, discovering the truth about such religious reality falls outside the scope of the religion project (in such a scenario, the discovery of religious truths will instead fall within the scientific project).

[7] For the contrasting opinion that HADD is reliable, see Van Eyghen 2019.

[8] Of course, in a scenario where no transcendent reality exists, a development where humans lose our HADD and stop detecting agents in nature would in some sense constitute a cognitive improvement, but it would not be a scenario with improved cognitive contact with a transcendent reality (because there is none).

[9] An objector might claim that it is perhaps the interpretation of its output rather than the RCF itself that produces the incompatible systems. To sidestep such objections, I assume that RCF contains both an element of observation and one of interpretation. One way to spell out this position is to say that religious experiences are theory-laden.

[10] This is true at least regarding Abrahamitic monotheism. We also find monotheism in Hindu vedantism, sun worship and Akhenaton's religious revolution in ancient Egypt. The point is that compared to the number of societies with animism and/or polytheism, these outbreaks of monotheism are few and far between.

[11] It might be objected that a false picture of transcendent reality might still allow for manipulation. One need only think of Don Quixote and his fight against windmills to see that one can manipulate reality while being completely deluded. However, the objection can be met by an inference to the best explanation. Even though quixotical delusion is logically possible, it is a much better explanation of a subject's apparent success in manipulating reality that she is in fact right in her assumptions. Similar arguments are often given for realism in the philosophy of science (see, for example, Miller 2016).

[12] An objector might raise the concern that in attempting to manipulate the transcendent, humans have crossed the border from religion and magic. While not uncommon, this distinction between religion and magic presupposes a very theistic understanding of religion. If the transcendent is not personal, manipulation (in a broad sense) will be the default mode of interaction.

[13] Note that false religions do not necessarily have to contribute to human flourishing for natural reasons. According to philosophers like John Hick (1989), all religions are literally false but still

provide some kind of access to the divine (or "Real-an-Sich," as Hick prefers to call transcendent reality).

[14] To be fair, Popper also thought that one theory can be more "truthlike" or have a greater verisimilitude than its competitors. However, as I am interested in progress in a scenario where there is no positive truth about the transcendent to be found, the idea that different theories can be more or less close to the true picture of the world has little relevance for present purposes.

[15] According to the famous Kardashev-scale, a civilization able to harness all energy in its galaxy (a type III civilisation) is the most advanced form of civilization theoretically possible.

[16] This should not be conflated with when belief in certain entities has waned over time because they no longer seem relevant. It has not really been discovered that there are no demons or witches, and yet such beliefs have plummeted in the last centuries (at least in developed countries). Belief in demons or witches should therefore not be regarded as disproved in the strong sense relevant for Schellenberg's project.

[17] See, for example, Schellenberg 2019b, where the point is argued that traditional theism has become less likely as cultural developments have changed our conception of what it means to be good.

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Evolutionary Approaches to Religion and the Problem of Transcendent Meaning

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This article analyzes the concept of religion within the framework of evolutionary biology. It critiques a reductionist view that understands religion primarily in terms of function and the grounding of such an interpretation in principles of chance. Common understandings of the role of chance do not derive from biological evidence; a broader understanding of this element is needed. Likewise, limiting religion to its evolutionarily ascertainable benefits overlooks the fact that these benefits only materialize when there is belief in the transcendent purpose that religion provides. Consequently, the article advocates for the recognition of religion as an emergent cultural phenomenon whose essence can never be fully captured through a purely functional, scientific lens.

Religion is increasingly being empirically studied as the result of cultural evolution and analyzed using the methodology of evolutionary biology. Charles Darwin discussed this possibility as early as 1871 in *The Descent of Man*. However, the debate did not truly build momentum until the early twenty-first century, when several publications espousing a critical view of religion gained popularity. This article attempts to identify the critical stance towards religion that is intrinsic to the evolutionary biology approach in order to assess the strengths and insights that have already been gained from this approach. By differentiating the functional aspects of religion and the question of meaning addressed by religions, the article concludes that while evolutionary biology can critique and understand the functions of religion, it fails to address the more profound, existential aspects that transcend the functional level. Therefore, I argue that the philosophy of religion should not respond to evolutionary theory by pinpointing design elements within evolution or perceiving God as a compassionate part of an otherwise blind trajectory of evolutionary development. Instead, it should focus on highlighting how religion creates meaning that transcends mere worldly functionality. The central argument is that belief in the afterlife creates the observable, evolutionarily expressible functional strengths of religions by providing a sense of meaning that transcends them. I conclude that the academic study of religion requires a transdisciplinary approach that combines functional analysis with a hermeneutic perspective, thus recognizing religion as an emergent phenomenon that engages with transcendence.

Chance as an Argument for a World Void of Meaning

In the early nineteenth century, William Paley presented a compelling argument for the existence of God based on the order of nature, as elaborated in his *Natural Theology*, published in 1802: nature appears so complex and well coordinated that one cannot but conclude it has an intelligent designer. This traditional God argument had such a high degree of plausibility and intuitive persuasiveness that Charles Darwin can be viewed as the first thinker to have "made it possible to be an intellectually fulfilled atheist" (Dawkins [1986] 1991, 6). For only since Darwin has it been possible to understand nature solely on the basis of internal laws and processes and without recourse to an external architect. Similarly, Jerry Coyne concludes: "Evolution is the greatest killer of belief that has ever happened on this planet because it showed that some of the best evidence for God, which was the design of animals and plants that so wonderfully matched their environment could be the result of this naturalistic, blind materialistic process of natural selection" (Glasgow Skeptics 2012).

With Richard Dawkins, one can regard the theory of evolution as a refutation of classical arguments for belief in God. However, this alone does not yet explain its ideological impact. For this, further interpretative steps must be taken so that the theory of evolution can be used as evidence against a planned

creation. Those who explain the world in evolutionary terms, like molecular geneticist Jacques Monod (1970), may understand human existence as a stroke of luck in a cosmic lottery. Stephen Gould (1989, 318) affirms that "we owe our existence, as large and reasoning mammals, to our lucky stars."

Dawkins does not stop at using the theory of evolution to weaken the teleological argument for belief in God, either. Instead, he launches an all-out attack: "The universe we observe has precisely the properties we should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind, pitiless indifference" (Dawkins 1995, 133). Thus, he states his agenda clearly: empirical analysis can demonstrate that both the belief in God as creator and the fundamental notions of meaning and inherent morality within the universe are false.

This agenda is based on the reductionist conviction that human beings, their beliefs, and ultimately the entire universe can be explained in scientific terms. It goes hand in hand with the debate on reductionism, which is conducted around naturalistic interpretations of humans and their mental characteristics (Becker 2009, 21–26). The dismissal of any inherent meaning in the universe, as derived from evolutionary biology, aligns with an argument that denies humans any unique qualities. This perspective reduces cultural achievements to mere tools for gene propagation and, consequently, functionally deconstructs (religious) notions of meaning.

In this regard, the principle of chance inherent in evolution is so ideologically charged that it contradicts the assertion of the meaningfulness of evolutionary development. Even Monod argued that the combination of a biological natural law process (selection as survival of the fittest) with chance (variation or mutation) necessarily excludes intentional action in the sense of consciously intended control. Anyone who believed in the theory of evolution as a meta-framework for the development of nature would thus be compelled to dismiss God from the origin of species.

Significantly, there were considerations quite early on that offered a way out of this fatal conclusion for the monotheistic faith. A prominent thought leader was the French Jesuit Pierre Teilhard de Chardin, who also saw evolution as a spiritual path, namely, the development of the spirit, which has universal love (and thus ultimately God) as its goal. Teilhard de Chardin (1956, 293) wrote: "The universe fulfilling itself in a synthesis of centres in perfect conformity with the laws of union. God, the Centre of centres. In this final vision culminates Christian dogma. And so exactly, so perfectly does this coincide with the Omega Point that I would never have dared to consider or rationally formulate the hypothesis if, in my consciousness as a believer, I had not found not only its speculative model but also its living reality."

Teilhard de Chardin thus linked the horizontal way of thinking of the natural sciences, which characterized an inner-worldly development, with the vertical view

of the neo-scholasticism of the time, which focused on an otherworldly meaning in an immutable God. He thus propagated a cooperative model of theology and natural sciences in order to understand reality. His model was, as he himself acknowledges in the preceding quote, a speculative idea imbued with a profound spirituality deeply influenced by Christianity (Del Rossi 2021). Nevertheless, his synthesis met with resistance in the Catholic Church because it positively embraced the idea of development, which was frowned upon at the time.

Teilhard de Chardin's system only works if chance is viewed as not quite as blind as it is by Dawkins, Gould, and Monod. Accordingly, biologist and theologian Ulrich Lüke (2016, 112–16) points out that the empirically described chance is open to interpretation. Chance does indeed play a constructive role in the evolutionary process, allowing a mutation to appear as an element of innovation. From this perspective, mutation should not be considered evidence of a lack of planning or aimlessness. Instead, it can be viewed as a regulatory factor in the process of achieving goals through trial and error.

Lüke illustrates this using the example of the lottery, which is centrally based on chance when the numbers are drawn but nevertheless pursues a clear overarching goal, not least the ability of the lottery company to earn a profit. Therefore, the incorporation of chance does not justify excluding a plan and purpose from the overall process, and it certainly does not, Lüke continues, lead to the inevitable exclusion of a comprehensive planner and goal setter. In order to draw this conclusion, humans would have to overlook the process as a whole and position themselves outside of it, which is fundamentally impossible for them as a part of evolution.

Martin Rhonheimer (2016, 26–33) underlines Lüke's argument by pointing to the results of evolutionary research within evo devo (evolutionary developmental biology). This field of research focuses on the question of which regulatory processes are effective in the formation of tissues and organs: it is less chance that is decisive here than the ability to self-organize.

Rhonheimer therefore interprets chance as facilitating the ability of nature's inherent potential to unfold. This development shows a direction and thus a goal: biology presents a picture of nature full of organizational structures, meaningful connections, and creative potential. Hence, Rhonheimer's interpretation is strong and certainly worthy of further discussion. It is merely employed here to illustrate that the reductionist interpretation of the theory of evolution is by no means necessarily based on biological findings.

Indeed, it is possible to come to a religious interpretation: the dynamics described in biology obviously create a realm of possibilities for essential human traits that also prove to be non-naturalizable. These include freedom of will, morality, and creativity (Becker 2018). These characteristics empower individuals to shape the world within the confines of their scope of activity. As a result, the question of what it all means becomes particularly virulent for

them. In this understanding, the theory of evolution no longer appears to be the antithesis of a religious interpretation of the world but an integral part of it: the static world order of Hellenism, a hallmark of the Middle Ages, has now been abandoned in favor of a belief in the power of history and change.

In this line of reasoning, it is no longer necessary to identify an element of design or even a person behind the design when describing evolutionary processes in the natural sciences, as is repeatedly attempted. Such approaches usually fail because they run counter to both the empirical data and the internal logic of evolutionary theory. For instance, theologian Rope Kojonen's effort to ascribe greater explanatory power to the combination of evolutionary approaches with the design paradigm than to evolutionary theory alone (Kojonen 2021) has already been convincingly critiqued on these two grounds (Dilley et al. 2023). One has to state that the order of biology provides no grounds for believing in a purposeful creator.

That is precisely why the question remains: How can one determine that evolution is not a blind process but rather one progressing towards a higher value? After all, the theory of evolution does not imply any form of moral judgment. Consequently, biology does not recognize a linear progression towards a specific, qualitatively superior goal.

It may seem obvious to rank the biological "kingdoms" in a hierarchy where humans are placed above animals, animals are placed above fungi, plants, and bacteria, and all of these are placed above inanimate nature. However, if this suggests a higher qualitative value, it cannot be inferred from biology alone. Biology describes the way in which a particular species has occupied an ecological niche; it also analyzes the sometimes complex processes of niche construction by which some organisms modify their ecological niches to fit them better. The value that can be attributed within this biological view remains at a functional level, namely, how long a species is able to maintain or shape its niche. Similarly, it is challenging to establish qualitative differences in biology because biology is characterized by fluid transitions. This makes it difficult to prove the unique, precious qualities of humans in nature (Priest 2023, 386–89).

It should therefore come as little surprise that human dignity is currently a topic of discussion within the philosophical domain and is—in its classical form—in some cases presented as an outdated concept (Sorgner 2010). If evolutionism frames the concept of humans in strict biological terms alone, then no sense of dignity can be established or sustained. The biological approach, like any natural science, is focused on the functional analysis of processes. As a result, it is unable to fully grasp dignity defined in contrast to function.

Biology has had great success investigating the specific fitness benefits of cooperative behavior and how such behavior can be generated by natural selection. While this research provides insights into the evolution of morality, specific human concepts—especially that of love, which inherently involves a

non-functional aspect—also cannot be fully grasped within a purely biological viewpoint. There seems to remain a gap between a naturalistic interpretation of biology and an understanding of (human) morality, love, and dignity.

Nevertheless, even a strict naturalistic biological description of evolution presents a criterion that can be used for further considerations. The complexity of the nervous system, for example, varies between species; it is also apparent that complexity tends to increase in the evolutionary process (Laland 2017). This does not substantiate Teilhard de Chardin's idea of an overall line of development of the universe, because we have only minimal temporal insight into a tiny part of the history of the universe. Nevertheless, the increase in biological complexity presents a potential starting point for incorporating perspectives on meaning, ethics, and irreducible human dignity. Even if "complexity" does not imply any value from a naturalistic perspective, it can be argued from a philosophical and theological standpoint that dignity increases in line with complexity.

No decisive argument can be drawn from this, especially not one that could claim to better explain the biological data. However, this idea undermines the reductive-biological criticism of religion: if religious beliefs are dismissed on the grounds that the perspective of meaning cannot be derived biologically, then this constitutes a circular argument. This is why Dawkins and other proponents of a biologistic-functional interpretation of religion attempt to demonstrate that faith itself can be assimilated into the evolutionary paradigm, thus implying that it holds no intrinsic value of its own. The purpose of creating meaning can, therefore, be defined in purely functional terms; religions are regarded as nothing more than evolutionary tools that serve the success of human genetic propagation.

The Evolutionary Perspective on Religion

As a well-known proponent of this argument, Daniel Dennett aims to break down religion into its worldly utility in *Breaking the Spell*: *Religion as a Natural Phenomenon*. Dennett builds on the preliminary work of Pascal Boyer (2001, 33), who describes the reasoning behind this proposition as follows: "What it means is that, at all times and all the time, indefinitely many variants of religious notions were and are created inside individual minds. Not all these variants are equally successful in cultural transmission. What we call a cultural phenomenon is the result of a selection that is taking place all the time and everywhere."

Boyer thus makes it clear that religion (like all cultural phenomena) is subject to the same selection principles as biological characteristics. Accordingly, religion can be analyzed and resolved using the functional explanation of evolutionary biology. Boyer denies that religions offer an answer to the question of meaning. For him, the answer to the question of human religiosity is inherent to the way our cognitive systems work.

He makes this assertion plausible by attempting to trace the starting point of a religious interpretation of the world. Since there is no specific moment when religion first appeared in the world, he assumes a slow process of development. This idea can certainly be substantiated theologically, as the slow development of the monotheistic faith can be traced in the Jewish holy scriptures themselves (Schwienhorst-Schönberger 2023). Religious convictions did not emerge in individual, separable areas but changed the interpretation of the world as a whole. Boyer (2001, 17) is thus looking for a phenomenon that does not address a single "inference system" (by which Boyer means human senses and the processing of sensory data in the brain) but all (or at least most) inference systems.

Apparently, evolution has configured human cognitive systems in a manner that results in situationally appropriate behavior. One consequence of this, Boyer suggests, is that humans tend to assume there is a living agent behind unfathomable actions. This evolutionary trait leads us to instinctively assume the presence of an active agent as a driving force behind any situation or event whose cause is unclear to us. A rustling sound in the forest is initially ascribed to a living creature to ensure that the presence of a prey animal or an enemy is not overlooked. If it turns out that wind caused the sound, then no one is hurt, and no potential source of sustenance is lost. Religion comes about through nothing other than the fact that we transfer this principle of constantly seeking an agent behind any action to the concept of the universe as a whole. This transfer lies in the logic of the process because the universe on a large scale is just as unfathomable to us as the rustling in the forest on a small scale.

Sociobiology does not stop here, because Boyer's question remains as to why this religious explanatory model has prevailed in culture. What are the fitness-maximizing factors of religion? After all, religions have gone beyond the mere intuition of a transcendent agent to develop complex belief systems, explanatory models, and institutions. This is where Dennett's work starts, as he compiles existing studies and data to trace the evolution of religious ideas and systems over millennia.

Dennett sees developmental steps in animism, superstition, and ancestral beliefs. All these religious phenomena are characterized by the fact that a mental agent with a certain level of control is attributed to a physical process. Ultimately, humans began to see an agent behind the universe itself; by endowing this agent with omnipotence, they created the concept of a monotheistic God. Each individual step in this process can be linked to specific aspects of utility. For example, ancestral worship, like many early religious rites, would aid in decision-making; ritual hypnosis ceremonies supported the human psyche, thereby facilitating healing processes. Dennett refers to supporting studies for each step. For example, James McClenon (2002) studied the healing power of rituals across various cultures.

Hence, Dennett sees sufficient evidence to attribute evolutionary value to folk religion. The next major step towards organized religion is also understandable from a utilitarian standpoint; for instance, organized religion facilitates identification and trust among its members, which in turn enhances group fitness. Additionally, the concept of being chosen instills a sense of purpose and confidence. He summarizes: "Religion gradually became more 'artful' or sophisticated, more elaborate, more of a production. Not necessarily better in any absolute sense, but better able to respond to increasingly complicated demands from populations that were biologically pretty much the same as their distant ancestors but culturally enlarged, both equipped and encumbered" (Dennett 2006, 153).

Dennett's question concerning the usefulness of religion in contemporary society is now being addressed and pursued in many areas of research. Rüdiger Vaas and Michael Blume use statistics to show that religious people actually do have more children and are thus more effective at perpetuating their lineage than atheists (Vaas and Blume 2009, 65–106; cf. Fieder and Huber 2021, 314–316; Blume 2009). Like Dennett, Vaas and Blume contrast their position with Boyer's assertion that religious belief has no intrinsic functional value. According to their study, children are more likely to be perceived positively and cherished in religious groupings. This has a direct impact on the individuals involved and gives them access to a better, broader network of support services. Vaas and Blume therefore argue that religions offer a genuine selection advantage and are not merely a by-product of other inference systems, as Boyer claims. The approaches presented here are thus not identical, and sometimes even contradictory, despite a common ideological thrust.

Boyer substantiates his assertion that religions are "parasitic" vis-à-vis other human phenomena by viewing their merits as being independent of them: ideas of morality, for example, exist independently of religion; they can only be readily associated with religious beliefs. The human mind often attributes effects to an agent even when there is no connection to religion. Consequently, Boyer does not believe that the key to religious ideas is that they produce something new; rather, they connect existing human "inference systems." People would be just as moral, communicative, and socially interactive without religion; religion merely makes use of the associated inference systems. Boyer concludes: "We do not need to assume that there is a special way of functioning that occurs only when processing religious thoughts" (Boyer 2001, 311).

This is Boyer's attempt to explain why religions have appeared in all cultures, although no clear functional reason or time for their emergence can be given. He could argue against Dennett that some of the phenomena presented are not religious in the narrower sense at all or were developed independently of religious content. Humans still talk to plants today, though rarely in the context of our religious beliefs. We use rituals even without any type of religious reference, and yet they still have a stabilizing, supporting effect. Arguing against

the thesis that there is an express reason for the emergence of religious systems, Boyer (2001, 31–32) states that "most origin scenarios suffer from similar flaws. If religion is reassuring, why does it create much of the anxiety it cures? If it explains the world, why does it do it with such baroque complication? . . . Why is it so closely connected to morality, whereas it cannot really create morality?"

Ultimately, Boyer declares religion obsolete. Modern individuals, one must conclude, no longer require religious interpretation because they see through the underlying mechanisms, recognize the parasitic nature of religion, and can achieve the same effects and functions attributed to religion without having to invent a level of transcendence.

Boyer thus plays to contemporary ideas of secularization and secularism, according to which religion may be practiced as a private matter but has no social value or may even pose a threat if religious rationale is traded for general moral reasoning. Richard Dawkins's aggressive work *The God Delusion* also falls into this category. Dawkins ([2006] 2016, 346) likewise considers religion to be a by-product, but one that leads to arbitrariness and irrationality: "Christianity, just as much as Islam, teaches children that unquestioned faith is a virtue." Even if religions have positive individual functions, a negative overall balance must be drawn for the present day.

Vaas and Blume's approach runs counter to this assertion insofar as their aim is to demonstrate the tangible benefits of religion based on empirical data. They draw on a wide field and long tradition of psychological research focusing on religion as a coping mechanism and other effects of religiosity on individuals, providing deep insights into the value of specific beliefs and different religious traditions.

As meta-analyses show, religion does have a stabilizing and supporting function (Garssen, Visser, and Pool 2021). Vaas and Blume argue that because religion reinforces moral behavior and encourages religious people to live healthier lives overall, they are less likely to take drugs and, as a result, suffer less depression. Religion offers comfort, protection, meaning, and order, all factors that truly do make life easier. All these characteristics of religion are conducive to having a wealth of children and therefore offer a genuine benefit that leads to the spread of religion and thus to its evolutionary success.

The functions and roles mentioned here are all well suited to religions. They are not only empirically validated by Vaas and Blume but also align with the self-conception of religions. After all, what religion does not claim to offer structure, support morality, and stabilize society? A study by Martin Lang et al. (2019) analyzing the social impact of organized religion in fifteen different communities shows that the latter is indeed the case across cultures. For Margaret Boone Rappaport and Christopher J. Corbally (2020, XI), this finding is so clear that they flatly deny that institutions that prove to be socially harmful are religions. Instead, they primarily have a non-religious interest that is geared towards economic gain or political power, for instance.

While this discussion is beyond the scope of this article, it can be said that the problem lies not in uncovering the socio-biological functions of religions. On the contrary, these analyses are helpful for the understanding and self-reflection of religions and societies. Apart from the reductive approaches discussed so far, a wide field of non-reductive research has developed to date. Many studies offer valuable insights without taking a position on how they should be interpreted (Szocik and Van Eyghen 2021). The problem lies instead in reducing religion to its functions. "Much of the empirical data outlined in this book may argue that God exists inside, not outside, the brain, that God did not create brains, but they created him" (Vaas and Blume 2009, 206), Vaas and Blume conclude based on their findings. However, to deduce from the existence of practical advantages that the phenomenon was invented solely because of them does not follow from the data itself.

It is more likely to be the other way around. The reflective criticism of religion must find an explanation for why so many people are religious across generations and cultures, even if there is no such thing as God or nirvana. A simple shrug of the shoulders will not suffice here, particularly from an evolutionary biology perspective, which teaches that only that which proves itself will prevail. Typically, religions demand significant effort and are therefore costly in evolutionary terms. For this reason, anyone who dismisses them as nonsensical, thereby attesting to a world-distorting view, must provide substantial alternative reasons to justify their ability to prevail over the ages.

Interpreting them as "parasitic" would eliminate this problem but would be challenging from an empirical perspective. Here, too, it is not only the data cited by Vaas and Blume that needs to be explained but also the high level of effort this parasitic phenomenon generates and demands. Therefore, the strategy that remains is to ascribe to religion a functional value obtained by creating the illusion of transcendence.

This strategy can be persuasive as a critique of religion only if it simultaneously asserts that such value no longer exists today, meaning the functional benefits have become counterproductive. Indeed, this is precisely what Richard Dawkins argues. The reasons for this shift in the cost-benefit ratio would require a separate explanation. The allusion to the "modern" context is evident and should be either explicitly stated or at least implicitly understood: it revolves around the conviction that contemporary humanity no longer requires religion, having outgrown its need for the consolation it provides. The assertion that religion currently does more harm than good represents a typically modern viewpoint that is nevertheless likely incapable of garnering majority support globally.

Herein lies the circular reasoning that underpins the use of evolutionary biology in critiquing religion: only those who believe they can fully explain the world in functional terms (i.e., have a reductionist worldview) can judge the veracity of beliefs based solely on their functional value. This is precisely the

position of Dawkins when he asserts that only the natural sciences are qualified to assess issues of dogma. He claims the answer to religious questions should be "strictly scientific" (Dawkins [2006] 2016, 83).

Absent a reductionist interpretation, relying on the functional aspects of religion diminishes the cogency of the argument against religious belief per se. Corinna Klodt (2021, 226) is correct when she emphasizes that "the evolutionary genesis of a phenomenon and its truth . . . must be methodically distinguished." The approaches discussed thus far overlook the dimension of religious experience. This is remarkable for a stance that claims empirical evidence as its basis, and—unsurprisingly—it aligns with reductionist reasoning in the philosophy of mind. The self-experience of humans as free agents is also ignored in this context, and Thomas Metzinger (2009, 130) notably discredits any recourse to it as one of the two "silliest arguments."

This provides the decisive discrepancy: religions derive their self-conception not from tangible, practical benefits in life, but first from religious experience and second from a perspective of meaning that elevates humans above inner-worldly entanglements. When reductionism's critique of religion confines religion to its worldly utility, thereby absolutizing biological observations, it fails to fully appreciate religion in its self-conception, since religious narratives aim to transcend worldly considerations of utility.

From Functional Analysis to the Question of Meaning

The alternative to a reductionist interpretation of evolution is to identify qualitatively new phenomena in its course. In this sense, Volkhard Krech (2021, 32) characterizes evolution as a process that "generates and increases complexity through differentiation." From the perspective of biology, the outcomes of evolution seem "random," given that evolution lacks a predetermined goal (and attributing intentionality to it constitutes a categorical error). However, these outcomes are observably accompanied by the emergence of novel, qualitatively distinct characteristics. Krech describes this process as emergence. Because they are emergent, "none of the evolutionarily differentiated levels can be reduced to another" (Krech 2021, 16).

Krech (2021, 15) sees religion as an area of society that becomes a "distinct sub-area in the differentiation process of social evolution, which depends on certain aspects of its environment, but follows its own standards in the formation of structure and information." Contrary to the reductionist position, Krech can thus ascribe religion a genuine intrinsic value.

By starting from "different emerging levels of the structure of order," Krech (2021, 16) describes a more complex reality than previous reductionist systems. He compares religion with language, both of which can be appropriated, but not produced, by humans. "Not only did individuals not invent religion . . . , they—as individuals—cannot even significantly alter or transform it. This would

require social processes," explains Krech (2021, 17), "which are not simply the sum of many individuals but are based on emergent structures." Consequently, his approach dismisses the notion of comprehensively understanding and explaining religion solely through functional analysis.

The function Krech ascribes to religions also differs from the previously outlined approaches. He does not see it as primarily providing specific advantages to the individual or society but as the pursuit, determination, and delimitation of the transcendent. This gives rise to a way of handling contingency as a secondary effect, emerging from engagement with transcendence.

Krech thus addresses a flaw in reductionist arguments: the functions of religion only manifest if one believes in the existence of a transcendent sphere. Ergo, I can only benefit from the advantages of a religious worldview if I am convinced of its truth. That is to say, first there is faith, then there is function. It is not the functional benefits that inspire a religious worldview but rather the compelling nature of the religious response to the experience of contingency. Therefore, religion extends beyond mere worldly functionality, finding its essence in how it relates to transcendence.

Krech's emergent reconstruction of the origins of religion can give more consideration to social dynamics. "Religious semantics and processes of reflection on the one hand, and social and societal structural developments on the other, are mutually influential," explains Krech (2021, 82). In emergent logic, these processes, like culture as a whole, receive their own unique quality, which cannot be resolved at the level of the individual.

These reflections align with Pierre Teilhard de Chardin's approach, wherein the emergence of new qualities is understood as a cosmic narrative of salvation. The emergence of human mental attributes, such as creativity and freedom, is thus viewed as part of a cosmic evolution that transforms inanimate matter into an increasingly divine likeness. The concept of love as an endpoint of history, as proposed by Teilhard de Chardin, is currently a topic of discussion. David Poister (2022, 368) refers to this as a "Christian call to love," interpreting it as both a part and a realization of evolutionary progress.

In Teilhard de Chardin's model, cosmic history is perceived as a fusion of "horizontal" progression, documented through evolutionary theory, and the "vertical" emergence of new qualitative attributes. This development is fluid, and the emergence of religion lacks any specific moment of origin. "The evolution of religion has to be embedded in human, or perhaps hominin, cultural evolution," Hansjörg Hemminger (2020, 23) stresses. Lluis Oviedo (2020, 6) adds: "Religion . . . is not seen as something new, sui generis, but more as a continuity with previously existing forms."

It is therefore impossible to specify precisely when each characteristic is formed and to what degree. Some animals also have an understanding of aspects of freedom, creativity, and even love. "Emergence" therefore only denotes the

presence of new qualities and does not causally explain their origination. The criticism repeatedly voiced in the debate that acknowledging emergence also implies admitting a lack of knowledge is indeed valid (Mutschler 2014, chapter 4).

This should not be surprising, and the lack of precision may even be necessary. As long as concepts of causality are shaped by science, it will be a struggle to fully grasp the emerging characteristics of culture and the (human) mind. The only scientifically relevant finding is the one mentioned in the second point, which states that emergent properties require a certain degree of complexity in their basis. Based on this, complexity is the link between the horizontal and vertical axes.

The precise timing of the emergence of religion cannot be pinpointed for another reason: religion is actually in a reciprocal relationship of influence and condition with culture; it is simply not independent of the cultural context in which it exists. Thus, the emergence of religion was not a single event but is an ongoing, dynamic process. This results in novel, independent qualities that can only be understood in holistic terms (Hemminger 2021, 208).

Religion thus continually emerges and, in the process, acquires an independent status. By distinguishing between the immanent and the transcendent, it addresses a distinct field of its own. It is thus not self-sufficient but self-referential and autonomous (Krech 2021, 41). In this context, Liane Gabora (2018, 38) describes an autopoietic process, which she sees as present in the emergence of culture and life in general. Based on the empirical data, it can be argued that a reductionist interpretation of evolutionary mechanisms falls short not only in the realm of religion but also in the emergence of life itself.

If religion in this sense is described as autopoietic, i.e., as an emergent, self-sustaining system, focus must shift to its own logic. In its discourses and actions, religion refers primarily, though not exclusively, to itself. Attempting to comprehend religion solely through the analysis of other areas of society (such as a stabilizing factor of governance) or its impact on the individual results in an oversimplification and misses its essence. This oversimplification invalidates every explanation that relies solely on functional aspects of religion. It is not possible to interpret religion functionally because to do so would ignore its very essence.

Belief in Transcendence as a "Living Option"

Understanding religion, therefore, hinges on taking its self-conception seriously and analyzing it primarily through its own rationality. At the meta-level, which concerns not a specific religion but the fundamental phenomenon, it is crucial to inquire into the nature of religion as a whole. The sociological determination that Krech follows sees the separation of immanence and transcendence at the forefront of all religious beliefs and systems. Religion, therefore, serves the purpose of providing meaning by anchoring it in a transcendent reality (Bertocci and Rohlf 2021).

At the level of experience, the initial question arises as to the nature of experiences that can evoke and lend plausibility to a religious interpretation of meaning. To this end, Martin Dürnberger (2017, 60–66) presents considerations that shed light on the fundamental grammar of religious experiences. Dürnberger contrasts two types of experiences that interact to elicit a religious response. On the one hand, there is the "recurrence of a *malum* [evil] . . . , which is categorically not meant to be and which absolutely affects us in its not-being-meant-to-be" (Dürnberger 2017, 60). The *malum* may manifest in the form of guilt and suffering, both of which are characterized by an uncontrollability (*Unverfügbarkeit*) and inability to be entirely transformed for the better. On the other hand, Dürnberger sees the experience of a *bonum* (good) that cannot be diminished or rendered negative.

When both *malum* and *bonum* are experienced in this profound way, they defy operationalization and transcend existing modes of action and thought. Dürnberger (2017, 65) explains that the "mutually inextricable and simultaneous nature of both experiences that cannot be resolved by reason . . . sparks [the question] of what life and the world as a whole are and can be about, in which both are present and both are threateningly possible: irreparable evil and irrevocable good."

Dürnberger points out that the essence of experiences leading to meaningful responses resides in what humans categorize as "good" and "bad." These experiences of good and bad do not inherently make people religious, as they are a characteristic of every human life. But they force us to interpret them in a meaningful way.

The process of interpreting meaning is shaped by both the concrete individual experiences and the interpretative framework offered within the social context. An intense and intractable experience, such as a serious accident, can evoke religious beliefs even in someone with an atheistic background, just as a person raised in a religious environment might adopt religious responses without undergoing such an intense experience. However, no interpretation emerges entirely out of the blue, as at the very least, a certain capacity for language must be present. Thus, tradition(s), community, and institutions are essential for the formation of beliefs. They offer the plausibility structure within which the individual can embrace and cultivate personal beliefs. In a religious context, this justifies the significance of community, church (or other religious institutions), liturgy, sacraments, rites, and prayer practices.

If every person must necessarily interpret their current experiences in a meaningful way (Routledge 2018), it can be said that everyone has a relationship to transcendence. However, this does not necessarily entail the "ultimate" form of religious transcendence; it can manifest in "weaker" forms. The difference likely lies in the extent to which the two types of experiences identified by Dürnberger are recognized as uncontrollable.

The concept of transcendence can be examined from a sociological perspective, as illustrated by Thomas Luckmann's distinction between various forms of transcendence (Knoblauch 2009, 56–69). Luckmann contends that transcendence is not inherently associated with a deity or a future existence beyond the confines of space and time. Luckmann approaches transcendence from the perspective of human experience, thus differentiating between great transcendence, which refers to an overarching experience that goes beyond the ordinary; intermediate transcendence, which includes experiences with other people; and small transcendence, in which the individual encounters the boundaries of space and time. In light of Luckmann's distinction, even the body culture that pervades modern society, from tattoos to asceticism and wellness culture can be considered to relate to transcendence, albeit in the "small" sense. Here, "the individual himself becomes the central subject of religious expression" explains Robert Gugutzer (2012, 288).

Thus, the transformation of modern society has not brought about a decrease in religiosity but rather a shift from great transcendence to small transcendence. The search for meaning evoked by the experience of good and bad no longer necessarily results in a longing for God (or another ultimate being). Hubert Knoblauch therefore extends the concept of religiosity and integrates not only body culture but also football, Zen meditation, and horoscopes. He thus marks a transformation of religion that—according to the theory of secularization and individualization—is grounded in personal experience.

The sociological findings shed light on the interweaving of long-term cultural dynamics with specific individual experiences as well as the role of the social environment and (religious) institutions. This reinforces the approach of emergence, which views religion as a phenomenon intricately intertwined with cultural evolution. It suggests that religion did not emerge just once in history, only to then evolve and adapt based on purely functional criteria. Instead, it posits that religion is in a perpetual state of flux, influenced by both cultural shifts and individual experiences. Religious belief thus represents an individual's culturally influenced response to a specific kind of experience. According to the working definition of religion employed in this context, those who exhibit religious responses are aligning themselves with a transcendent horizon in a "great" sense. This alignment invariably alters their personal belief system, worldview, and concrete actions. Ultimately, the scale of the meaning's horizon—whether narrow or broad—significantly influences how one perceives their experiences and actions.

This begs the crucial question: What transformations occur in a person's life and outlook when they are religious, when they believe in an entity that exists beyond, above, within, and around the world, transcending both space and time? The individual is therefore faced with the fundamental question of an afterlife and a perspective of meaning that transcends current events and an individual's personal life plan.

If proponents of the reductive approaches discussed in the second step argue that belief in the afterlife is no longer beneficial, they are likely operating within a horizon of experience that is commonly found in contemporary societies. These religious skeptics may still experience the good and bad in life, but they will not experience these events with the same intense, unavailable quality that Martin Dürnberger described as being the foundation of religious answers. Now, both are controllable by them. They believe they can independently create positive outcomes and avoid negative ones. This belief underpins the globally prevalent optimism towards progress, which proposes that humanity's minor and major challenges can be resolved by developing innovative technology (Becker and Wormstädt 2023, 11–15). It is founded on the triumph of the natural sciences and the technologies they have produced over several centuries.

The outcome is a worldview that highly values and adopts the lens of scientific-functional analysis to interpret the world. Consequently, reductionism represents the peak of a modern, widespread belief that humanity can gain control over the world. The message of the afterlife stands in stark contrast to this view, as it does not align with such a functional orientation. Belief in the beyond challenges every form of inner-worldly one-sidedness, performance-driven mentality, and insatiable greed. It brings into perspective the relative significance of humanity and its worldly role, subordinating them to a higher value. The message of the afterlife in Christianity (like in all other religions) implies that a person's essence extends beyond their worldly accomplishments. Individuals do not have to be able to do and create everything, nor must they experience everything within their own lifetimes, as this world does not hold the ultimate authority. The afterlife expands humankind's vision, overcoming the inherent limitations of the functionally oriented, inner-worldly perspective.

Therefore, the religious-philosophical answer to reductive explanations of religion is the reference to its relationship with transcendence: all functions of religion that can be described through the lens of evolutionary analysis are based on the belief in a reality that transcends this-worldly entanglements and thus precisely this functionality. Any reductive interpretation of religion, which relies only on functionality, fails to capture its essence and therefore cannot be used as a compelling argument for or against faith. On the other hand, theological approaches, which ignore evolutionary insights, are similarly ignorant. Knowledge of the functionality of faith is important for understanding the development and value of culture and any religious concept. I thus propose the concept of emergence as a model for transdisciplinary research that is able to do justice to both the empirical data and those aspects of culture and religion that extend beyond.

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The Half-Baked Loaf: Examining Hamza Andreas Tzortzis's Discussion of Science in *The Divine Reality*

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This article scrutinizes the conceptualization of science advanced by the Muslim public speaker and author Hamza Andreas Tzortzis in his book *The Divine Reality*. The Islamic theistic outlook advanced by Tzortzis is based on extensive discussion of science, including a rebuttal of science-based atheism and the prescription for Muslims to practically accept the theory of evolution as a best-working model without in fact including it in their belief system. It is argued that Tzortzis's discussion suffers from six major and intertwined problems related to the consistency and accuracy of the epistemological framework within which he defends (Islamic) theism.

Introduction: Hamza Andreas Tzortzis and His Work

Hamza Andreas Tzortzis (b. 1980) is a prominent Islam apologist whose speeches enjoy great visibility. At the time of writing, the most popular video on his official YouTube channel (a debate with Dublin City University lecturer and political/religious speaker and writer Mark Humphrys on the current situation in Palestine) has nearly 127,000 views (Hamza Andreas Tzortzis 2024b). Additionally, his 2013 debate on Islam versus atheism with physicist Lawrence Krauss (b. 1954) at University College London has more than 5.3 million views (iERA 2013). Tzortzis, a British convert of Greek origin, exudes eloquence and self-confidence, projecting an aura of youthfulness, informality, dynamism, and modesty, apparently bestowing rationality and philosophical depth on the arguments he deploys while "sharing and defending the ways of God" (Hamza Andreas Tzortzis 2024a).

Religion and science scholar Shoaib Ahmed Malik (2018, 32) calls Tzortzis one of the "middlemen" in the Islam-atheism debate, which he describes as "a category of individuals in between the laity and fully established and recognised scholars; they have taken it upon themselves to fill a void that they think needs addressing." In his book *The Divine Reality: God, Islam and the Mirage of Atheism* (Tzortzis 2019), Tzortzis offers a collection of the arguments he uses in his debates on Islam and non-belief. So far, the book has undergone three editions, and readers have responded to it mostly enthusiastically.[1] It articulates a contemporary, philosophical understanding of Islam that draws on ancient as well as modern arguments in defense of God's existence in general and the Qur'an's divine origin in particular. While Tzortzis cannot be said to have advanced original arguments, their arrangement and the style in which they are presented, and the systematic confrontation of Western "new atheism" and Islam embodied by Tzortzis, can prove novel and intriguing, especially to young readers, and merit discussion based on Tzortzis's visibility and popularity.

This article offers an analysis of Tzortzis's book, focusing on his discussion of science. In fact, he advances a whole multifaceted, theism-informed understanding of Islam vis-à-vis atheism in which all elements are ultimately tightly intertwined; it is, however, only his conceptualization of science that I scrutinize here, leaving his defense of the Qur'an somewhat more marginal (at least as far as some arguments for it are concerned). I think a critical focus on Tzortzis's discussion of science is particularly important. On a first and general note, science is crucial in the discussion of, and in its concrete intersections with, contemporary Islam.[2] Second, and more specifically, I am convinced that any attentive reader can detect several tensions in Tzortzis's conceptualization of science that warrant attentive scrutiny in the interest of building consistent, well-informed, and logical debates on science and religion or theism versus atheism.

While approaching Tzortzis's work and ideas, one should keep in mind that he served as the CEO of, and was very active within, the missionary organization

iERA (Islamic Education and Research Academy) between 2017 and 2020. Ideally, Tzortzis's thought should be analyzed and understood in the context of said organization's objectives and strategies, as well as its development over time. In this regard, valuable scholarly work has been contributed by Mira A. Baz in the PhD dissertation "Online Islamic Daʿwah Narratives in the UK: The Case of iERA" (Baz 2016). Baz has the merit of advancing a comprehensive, thorough, and contextualized examination of Tzortzis's production; additionally, Baz often points out areas of opacity and imperfection in such work (e.g., Baz 2016, 80–82, 197–99, 206, 210, 212). The present study is prominently philosophical in nature, focusing solely on the ideas offered in *The Divine Reality* regarded as a system, specifically its conceptualization of science.[3] It is important to add, however, that Tzortzis no longer works with iERA. *The Divine Reality* is currently published by the Sapience Institute, an organization Tzortzis founded in 2020 and of which he serves as the CEO (cf. Hamza Andreas Tzortzis 2024a).

Tzortzis's book is divided into sixteen chapters (plus a preface and an afterword). Of those, one chapter (twelve) tackles the question of whether science has disproved God; it extensively discusses science and religion and ends with Tzortzis's prescription on how to deal with them. At least eight other chapters (1, 3, 4, 5, 6, 7, 8, 9) make extensive or important references to science. The structure of this article is as follows: first, I provide a summary of the references to science in chapters 1, 3, 4, 5, 6, 7, 8, and 9; second, I provide a detailed reconstruction of the twelfth chapter; third, I elaborate on six (entwined) problems that, in my opinion, are left open in Tzortzis's discussion of science and religion.

Before I delve into the discussion, I want to specify that the present pages are written from the perspective of a moderate and hopeful agnostic, who is genuinely convinced that, as far as some crucial debates at the interface of science and religion are concerned, the jury is still out. I also think, however, that Tzortzis, in some cases, has failed to see that very point, creating for his religious readers (or potential converts) the illusion that some issues have been rationally settled once and for all; yet, in other cases, he himself suggests that the jury is still out, while in fact the verdict has already been reached and released. Additionally, I want to emphasize my appreciation of several prescriptions directed by Tzortzis to his readers (or the concrete good example he sets), in particular when he humbly points out his own past mistakes (Tzortzis 2019, 15), when he emphasizes the value of compassion (Tzortzis 2019, 15), and when he teaches that one should "debate," not "hate" (Tzortzis 2019, 299–301).

Science in *The Divine Reality*

The first chapter of *The Divine Reality* discusses the history of atheism; here, Tzortzis raises a point that he returns to multiple times: atheism is often embraced along with (or as a consequence of) philosophical naturalism, or

"the view that all phenomena within the universe can be explained via physical processes" (Tzortzis 2019, 22). He points out that some "intriguing discoveries of the mid-20th century," including the Big Bang or the discovery and study of DNA, "progressively brought theism back onto the intellectual and academic discussion table" such that it currently is "a perfectly respectable position" (Tzortzis 2019, 28–29). In the third chapter, Tzortzis argues that atheism is irrational. One of his arguments is that "rationality cannot come from blind, non-rational physical processes" (Tzortzis 2019, 47; cf. also 51–52). More specifically, Tzortzis suggests that evolution cannot explain the emergence of reason. The fourth chapter makes a case for atheism being "unnatural." Here, Tzortzis reports that belief in divine creation, God, design, and mind-body dualism has been observed in children. In this regard, he cites distinct research and publications authored by experts, mostly in psychology and the neurosciences, such as Olivera Petrovich, Paul Bloom, Deborah Kelemen, Elisa Järnefelt, and Caitlin F. Canfield. Such observations, suggests Tzortzis, show that theism is natural. A complementary idea advanced by Tzortzis in this context is that atheism or non-belief is acquired and "intellectually exhausting" (Tzortzis 2019, 71–73). In the fifth chapter, Tzortzis tackles the origin of the universe, writing that he does not discuss scientific research in this regard "because the data is currently underdetermined" (Tzortzis 2019, 84). In this chapter, however, he advances some criticisms of science (Tzortzis 2019, 87) and starts a discussion of causality (Tzortzis 2019, 88–90) that he refers back to, and elaborates on, throughout the book. Additionally, he discusses several science-related arguments or topics (Tzortzis 2019, 90–91, 96, 98–100). In the sixth chapter, Tzortzis elaborates on the idea that the universe must depend on God, which he suggests is a conclusion one can rationally draw; here, he delves into the limitations of science, a topic he explores further later (Tzortzis 2019, 111–12). In the seventh chapter, Tzortzis discusses neuroscience, arguing that no matter how sophisticated it may become, it will not solve the "hard problem" of subjective consciousness. In the eighth chapter, Tzortzis discusses the idea that the universe is designed, referring to multiple scientific observations and topics.[4] In the ninth chapter, elaborating on the divine authorship of the Qur'an, Tzortzis discusses the epistemology (and science) of testimony, touching on the open questions in such a field (Tzortzis 2019, 217–19).

The twelfth chapter of *The Divine Reality* contains a rebuttal of the idea that science disproves God. Tzortzis starts off illustrating science's limitations with a comparison: if one visits a palace and sees that its first room is a classroom, they cannot legitimately conclude that all its rooms are similar or that further investigation is worthless (Tzortzis 2019, 193); similarly, the reader is to conclude, one should not stop at the scientific observation of the world. Tzortzis (2019, 193) writes that "God, by definition, is a Being who is outside

the physical universe," so science can never negate his existence. He then proceeds to summarize the "assumptions" via which (some) atheists claim that science denies God: (1) the idea that science is the yardstick for truth and has all answers; (2) the idea that since science "works" it must be true; (3) the idea that science leads to certainty; (4) the idea that since science cannot investigate the supernatural, the supernatural does not exist (Tzortzis 2019, 194–96). Tzortzis dedicates the subsequent pages to refuting such points one by one.

Tzortzis objects to the first point, that science has all the answers, by referring to six subpoints: (a) science is limited to observation (Tzortzis 2019, 198); (b) "science cannot be a basis for meaningfulness and objectivity of morals, since it cannot tell us what is right and what is wrong"— here, drawing on his previous discussion (Chapter 9), he points out "the innate and undeniable fact that some morals are objective" (Tzortzis 2019, 199); (c) science cannot test the "personal," e.g. individual emotions (Tzortzis 2019, 201–2); science cannot answer "why" questions (he emphasizes this point with an analogy: if someone bakes another a nice cake, science can analyze its composition but not the intentions of the person who baked it (Tzortzis 2019, 202–3); (d) science cannot answer multiple metaphysical questions, including the reason conclusions in deductive reasoning necessarily follow from the premises, if there is an afterlife, or what subjective consciousness feels like (Tzortzis 2019, 203); (e) necessary truths such as mathematics and logics cannot be proven; (f) "science cannot justify other sources of knowledge, such as testimony"—and reliance on testimony, Tzortzis points out, is pervasive, even in the case of truths such as that the Earth is round (Tzortzis 2019, 204–5).

To the idea that, since science works, it must be true, Tzortzis levels two objections. First, there are examples of scientific theories that were proven false but still useful in coming up with new scientific truths, like the discovery of nitrogen in 1772 by Dan Rutherford while relying on the theory of phlogiston (Tzortzis 2019, 206). Second, facts that are held to be undeniable can be overturned. "All scientific theories," points out Tzortzis, "are 'work in progress' and 'approximate models'" (Tzortzis 2019, 206–7).

Discussing the issue of science and certainty, Tzortzis (2019, 209) relies on a "Humean" criticism of induction, pointing out that the assumption that "the future will resemble the past" is circular. Additionally, Tzortzis remarks that the history of contemporary science testifies to science's "dynamic nature," with the replacement of the Newtonian model with the Einsteinian model (Tzortzis 2019, 209–10). The author also argues that since "there are no Moses tablets in science" (Tzortzis 2019, 210), science cannot be used to claim that the Qur'an is wrong. "If the Qur'an conflicts with limited human knowledge," he writes, "it should not create massive confusion" (Tzortzis 2019, 211). Here, he also provides the example of how, with the Big Bang model, "science came into line

with the Qur'an" (Tzortzis 2019, 211). He adds, however, that "the Qur'an does not give any details concerning natural phenomena" (Tzortzis 2019, 211). Then, in what are perhaps the most significant passages of the chapter, he writes that:

> both well-confirmed scientific theories and the revelational truths should be accepted, even if they contradict each other. Scientific conclusions can be accepted practically as working models that can change and are not absolute, and the revelational truths can be accepted as part of one's beliefs. If there is no hope of reconciling a scientific conclusion and a statement of the Qur'an, then you do not have to reject revelation and accept the science of the day. . . . [One should not] mak[e] massive epistemic leaps of faith and conclud[e] that the evidence we have acquired and the conclusions we have made are *gospel truth*. (Tzortzis 2019, 211–12)

At this point, Tzortzis spells out what he calls a "strategy" for dealing with science and revelation:

> We can accept scientific conclusions practically and as working models, but if anything contradicts revelation (after attempting to reconcile the two), you do not have to accept the scientific conclusion into your belief system. This is why Muslims should not need to deny Darwinian evolution; they can accept it practically as the current best-working model, but understand that some aspects of it cannot be reconciled with orthodoxy. Remember, just because something is the current best-working model, it is not the absolute truth. It is also important to note that scientific knowledge and Divine revelation have two different sources. One is from the human limited mind, the other is from God. (Tzortzis 2019, 211)

Finally, Tzortzis explains that those who preserved the Qur'an and the prophetic traditions were not making use of induction, so they cannot be criticized along the same lines as science (Tzortzis 2019, 212–13). The chapter ends with his refutation of the conflation of methodological naturalism with philosophical naturalism, which he defines as a "faith" (Tzortzis 2019, 213–14).

One can identify at least six main problems in Tzortzis's discussion of science and theism/Islam. In what follows, I try to elaborate on each one in sufficient detail.

"Scientific Miracles": Where Did the Alternative Approach Vanish?

One popular idea among Muslims is that the Qur'an contains accurate notions regarding the natural world that have only been ascertained by modern science. This idea is known as *iʿjāz ʿilmī*, or the "scientific miraculousness/precision" of the Qur'an (but "miraculous scientific content" of the Qur'an is a more accurate

expression for it). The discourse built on *iʿjāz ʿilmī* has nourished (and keeps nourishing) countless books, articles, videos, and conferences. Various Muslim authors, including some with a solid understanding of science and epistemology, have advanced arguments against the understanding of science (and scripture) underpinning such discourse (see, e.g., Sardar 1985; Guessoum 2018; cf. also Naguib 2019 for earlier critical positions). Such critique and criticism, however, have not made it to the masses, and *iʿjāz ʿilmī* is also commonly used to argue for the superiority of the Qur'an in comparison with other scriptures.

Tzortzis, too, takes a critical stance towards this trend, with an article titled "Does the Qur'an Contain Scientific Miracles? A New Approach on how to Reconcile and Discuss Science in the Qur'an" (Tzortzis 2013b). In the article, Tzortzis states that "[r]egrettably, the scientific miracles narrative has become an intellectual embarrassment for Muslim apologists" and reports that the criticism he received about his own research regarding (allegedly) accurate Qur'anic verses about the human embryo provided him a clear perception of the flaws in the discourse about scientific miraculousness, even resulting in him withdrawing a paper he had written on the topic. (Incidentally, this is a commendable example of integrity on behalf of Tzortzis.) He also points out that if people convert to Islam due to the supposed scientific accuracy of the Qur'an, they may well abandon it once they realize the flaws in such discourse. In the same article, Tzortzis states that he is offering "a new approach to the topic that is nuanced and bypasses the intellectual hurdles and problems faced by the scientific miracles narrative." After identifying and discussing six fallacies (or weaknesses) that afflict the discourse on the "scientific miracles" of the Qur'an, Tzortzis advances this "new approach":

> 1. The Qur'ān allows multiple and multi-level meanings. 2. Our understanding of natural phenomena and science changes and improves with time. 3. The Qur'ān is not inaccurate or wrong. 4. In the case of any irreconcilable difference between a Qur'ānic assertion and a scientific one, the following must be done: Find meanings within the verse to correlate with the scientific conclusion. If no words can match the scientific conclusion then science is to be improved. Find a non-scientific meaning. The verse itself may be pertaining to non-physical things, such as the unseen, spiritual or existential realities. (Tzortzis 2013b)[5]

In his 2019 book, Tzortzis does not really engage with "scientific miracles." Indeed, in the book, Tzortzis seems to have given up on the mission he identifies in the article: "It is hoped that the readers of this essay will adopt the new approach so a new narrative emerges in the public sphere. This new narrative will be able to withstand scientific criticism while bringing to light the timeless nature of the Qur'ānic discourse" (Tzortzis 2013b).

I contend that the 2019 book, which is otherwise concerned with scientism, does not sufficiently emphasize that the so-called "scientific miraculousness" of the Qur'an is irremediably flawed, as Tzortzis accurately described in 2013, nor that such discourse is an expression of very crude scientism placed at the heart of the contemporary understanding of Islam on behalf of countless Muslims.

Additionally, keeping in mind the difficulties of *iʿjāz ʿilmī*, Tzortzis does not seem to offer a perfectly consistent or pedagogically effective account when he mentions the Big Bang theory as an example of an instance in which the science "came into line with the Qur'an" (Tzortzis 2019, 211). Tzortzis gives this example while discussing the challenges of relating Qur'anic verses and science, addressing those critics who point out mismatches between the Qur'an and scientific information. However, to a Muslim reader used to appreciating the alleged "scientific miraculousness" of the Qur'an, the statement about the Big Bang may well sound like a promise of future "scientific miracles" in addition to the Big Bang one. I think it would have been helpful if Tzortzis had added a statement or two such as "but even a possible/future alignment with science should not be taken as a demonstration of the Qur'an's divine origin but rather an example of how science and the Qur'an sometimes seem to coincide and sometimes do not, a fact whose importance should not be overemphasized."[6] He did not.

Ultimately, if one embraces, fully and consistently, the idea that science is fluid, transient, and not representative of the truth (as opposed to the Qur'an, which represents permanent truth), then as difficult as such an idea may seem to an unsophisticated reader, science and the Qur'an become incommensurable. However, the notion of incommensurability defeats the whole idea of an "alignment" between science and scripture. Perhaps Tzortzis sensed a dreadful philosophico-exegetical challenge and chose to gingerly backtrack or suspend the discussion.[7]

Should One Use Science to Defend Theism?

The second problem is constituted by Tzortis's reliance on science to argue in defense of theism. In particular, Tzortzis contends that several scientists have concluded that a "theistic" understanding of the world is innate. This kind of argument opens a veritable Pandora's box. I will be leaving aside otherwise important questions such as those pertaining to the scientific solidity of the results appreciated by Tzortzis, the way in which they have been interpreted by their discoverers, and so on. This would require a separate and lengthy analysis; therefore, I am for taking Tzortzis's mention of such results at face value. Still, one cannot fail to notice a few major challenges here. To start with, considering the downplaying of science that permeates Tzortzis's book, one is automatically led to ask why he relies on science when it seemingly supports his views. If one genuinely and consistently subscribes to the idea that science does

not have solid answers, that it is essentially different from revealed knowledge, then it would perhaps be fairer to also abstain from any science-based defense of religious concepts.[8] Second, the "theistic" inclinations verified by the scientists Tzortzis discusses are far from lending support to a specific religious worldview or theology, let alone Islam. Those observations demonstrate at best that humans are born with an inclination to understand their environment in terms of agents and purposes; there is an immense gap between this and a specific theology. Third, as Tzortzis himself mentions while challenging the theory of evolution, there can be "natural" ways of understanding the world that are irrational or wrong (in terms of content) but functionally still useful for survival (Tzortzis 2019, 55). Finally, a fine-grained discussion of the concepts of "nature" and "nurture" definitely exceeds the scope of the present article, but I feel compelled to point out that, in addition to understanding the former as synonymous with "good," Tzortzis seems to perceive those very concepts in a strictly binary way, and such a perception is highly questionable. To summarize, Tzortzis has advanced his points about the naturality of theism quite hastily; it would be recommendable to elaborate on them in the context of a more detailed and nuanced discussion of the respective definitions and (possible) associations of concepts such as "natural," "cultural," "innate," "acquired," "rational," "irrational," and "useful/useless for survival."

What Is the "Science of the Day"?

A third problem concerns the way in which Tzortzis characterizes science in reference to time. I have discussed how he reassures his Muslim readers that they do not have to "reject revelation and accept the science of the day" (Tzortzis 2019, 211). To be sure, in other passages of the book, Tzortzis elaborates on some aspects of modern science and its methods and does so fairly accurately. However, the emphasis he places on time, as well as on the shift from one theory to another over time (Tzortzis 2019, 209–10), is potentially misleading, especially for an uneducated reader. Obviously, in everyday parlance, it is perfectly meaningful to critically point out that a theory or idea is "obsolete" or "outdated" (or similar); this is particularly valid when talking about statements about the natural world that were advanced before the emergence of the modern scientific method. In such cases, however, adjectives like "obsolete" (and the like) should not be taken as indicating that an idea or theory is invalid just because it is "old"; they are short form for "meanwhile, the theory in question has been *scientifically* disproven/superseded" (or similar). While it is true that scientific theories change over time, it is also important not to characterize such shifts as merely erratic or governed by matters of marketing, taste, and mutual imitation on behalf of consumers (as happens in the world of fashion). Scientific theories can succeed one another, but (as in the very example of the Einsteinian model and the Newtonian model provided by Tzortzis) older theories are rather

integrated by new ones, and, in any case, to be accepted, a new and alternative model should abide by criteria of consistency and experimental verification. In summary, in the interest of a fair and balanced conceptualization of science, the reference to a shift over time should be balanced by a description of the logic followed by such a shift, else one also loses sight of what distinguishes science from other kinds of activity and knowledge. To put it differently, the use of expressions like "science of the day" provide science with an unwarranted aura of capriciousness and evanescence.

Selective Skepticism

Tzortzis seems quite fond of referring to some ideas advanced by David Hume (1711–76), and in fact, some of the criticism of science he advances is apparently built on Humean concepts.[9] In one passage of his book, Tzortzis (2019, 26–27) acknowledges that the Scottish philosopher "wrote a corpus of material on the issue of God and religion. He argued that the idea of God was incomprehensible. He also contended the idea of God's necessary existence and attempted to expose the weakness and limitations of the argument from design."

To begin with, Tzortzis does not seem to fully take into account the challenge historically posed by Hume to theism. Such a challenge is a major one, especially considering the power of Hume's objections to all theistic arguments that rely on analogies between the universe and human-made constructions or situations; Tzortzis's book uses this kind of argument multiple times.[10] In this regard, it is perhaps significant that Tzortzis engages with Hume's *Enquiry Concerning Human Understanding* (1748; cf. 218–19, 320 n. 341, 350, and 321 n. 360) rather than his *Dialogues on Natural Religion* (1779), which offers a sharp criticism of theistic views.

It is of course fully within Tzortzis's right to selectively read the works of a great author of the past. I have misgivings, however, regarding the selective interpretation of Hume's ideas that Tzortzis's book represents. It is true that Hume advances a form of skepticism and that, in at least some passages, such skepticism is pushed to extreme, nearly nihilistic, consequences. It is likewise true, however, that Hume mitigates such skepticism with empiricism, suggesting a way to navigate uncertainty and rank possible inductive inferences. To put it in basic terms, if one follows Hume's empiricism, an inductive inference regarding the future is reasonable if it is based on extensive evidence and precedents, and alternative inductive inferences about possible future outcomes can also be compared and ranked in reference to that very evidence and precedents.

It is clear to me that Tzortzis did not set out to offer a comprehensive account of Hume's thought and its different interpretations in his book, nor is the present article written from the perspective of a historian of philosophy. But it is important to point out that one may well pick and choose an idea among those advanced by Hume, yet such an idea should be elaborated on

consistently. If one wants to propose and embrace a selective and (epistemically) "nihilistic" version of Hume's philosophy, that is perfectly legitimate, but they should not fail to see or discuss the fact that opting for such an idea also results in casting mistrust and doubt on any form, and object, of knowledge, including, for instance, the continuity of oneself (as Hume in fact ended up doing).[11]

In other words, a partial reading of Hume exclusively drawing on his criticism of (causal) inductive inference, and thus resulting in hyperbolic skepticism, creates a dilemma for any thinker, including a religious one like Tzortzis. Either such criticism translates into a major disruption of trust towards all human knowledge—including the knowledge that any person, believers and non-believers alike, relies on in their most elementary, day-to-day operations[12]—or one finds a way to rein in such skepticism, mitigating it through empiricism. However, in such a case, (modern) scientific knowledge turns out to be far more reliable and rational than Tzortzis suggests. Retrieving Humean skepticism towards inductive inferences in order to direct it exclusively at scientific knowledge seems, to put it frankly, quite an opportunistic move.

At this point, a religious commentator might argue that sacred scriptures and religious beliefs could and should be shielded from such skepticism—in other words, sacred scriptures and religious beliefs may be posited as untouched and untouchable by radical skepticism given their divine origin. But then where does one even start to draw a line between what is subject to radical skepticism and what is not? Ultimately, sacred scriptures, come through specific interpretations; their understanding is mediated by non-sacred writings (including Tzortzis's), and writings, sacred and non-sacred alike, are perceived through our senses, since we read them on material objects like books or screens. Additionally, such perception occurs in the context of a specific existential situation and through one's cognitive makeup and equipment, including memory (which, incidentally, plays a pivotal role in Islam).[13] Philosophically, the reliability of a believer's very consciousness, self-awareness, memory, common sense, and everyday inductive inferences about, and interactions with, the world are all invariably disrupted by extreme skepticism.[14] In other words, unconditional belief in the truth of religious scriptures can be safeguarded by a leap of faith. This is surely an option, and I do not take issue with it. However, it should be noted that it defeats Tzortzis's very claim of rationality for his theism. To conclude, the "Humean" arguments offered by Tzortzis are, at best, half baked.

Mixed Signals and Inaccuracies about Evolution

The fifth problem is Tzortzis's (unsystematic) discussion of evolution; it betrays multiple and different weaknesses. Tzortzis argues that advanced rationality—including the ability to distinguish between truth and falsity, or the ability to investigate and discover—is not necessarily useful for survival, or is sometimes even detrimental to it (Tzortzis 2019, 54). In sum, he suggests that models

that emphasize the survival value of evolved traits are useless or insufficient to explain rationality. On the issue of evolution and rationality, Tzortzis also points out that "even Charles Darwin himself had his doubts about this matter. He understood that our ability to acquire truth could not be accounted for if it had only evolved from lower life-forms" (Tzortzis 2019, 54). On this point, Tzortzis cites a letter by Darwin (1881) that seemingly suggests Darwin entertained serious doubts about his own theory. In at least one passage, Tzortzis seems to rely on an argument, or cluster of arguments, classically used to discredit evolution, pointing out that "according to mainstream secular academics, it is based on assumptions, considered relatively speculative, and there are disputes about its core ideas" (Tzortzis 2019, 206). Elsewhere, as discussed previously, Tzortzis writes that evolution is "the current best working model" (Tzortzis 2019, 212). Considering that other passages of the book are devoted to criticizing or discrediting evolution, Tzortzis's approach comes across as confused and confusing.

In order to tackle Darwin's "horrid doubt" (Darwin 1881), I am compelled to start on a preliminary, general note: picking parts of Darwin's books and private letters to emphasize his doubts and thus discredit evolution is bad practice (typical, for instance, of some forms of creationism.)[15] To be sure, I am not suggesting that Darwin's writings and ideas are uncriticizable or unobjectionable, but any citation from Darwin should be handled carefully, considering the context, the time (and, for private letters, the specific interlocutor), as well as the fact that modern evolutionary thought starts but does not end with Darwin and his work (on the contrary, it has been integrated into the study of genetics).[16] In the particular case mentioned by Tzortzis, Darwin responded to the Irish philosopher William Graham (1839–1911) regarding Graham's book *The Creed of Science* (1881): "You have expressed my inward *conviction*, though far more vividly and clearly than I could have done, that the Universe is not the result of chance." Such a conviction may sound supportive of a religious worldview (though not of a specific one). However, immediately after, Darwin adds, as cited by Tzortzis: "But then with me the horrid doubt always arises whether the *convictions* of man's mind, which has been developed from the mind of the lower animals, are of any value or at all trustworthy" (Darwin 1881; emphasis added). In other words, Darwin downplays that very religious-sounding conviction, pointing out that it ultimately stems from a fallible mind (like his own), which is fallible because of its very evolutionary origin. In sum, Tzortzis has Darwin's quote work in favor of a thesis that Darwin was not expressing in that very passage; Darwin was talking about one of the "big questions" for which his theory did not have a direct answer and doubted his own (nonscientific) intuition on the matter precisely on the basis of the evolutionary conceptualization of the human mind. To be sure, one may ask at this point why evolution itself

should be considered trustworthy if it is the fruit of the human mind that, by the admission of the very father of evolution, is fallible. But then again, as I have suggested while discussing Tzortzis's reading of Hume, it is not at all inconsistent to think that the human mind is fallible while still identifying and cultivating ways of guiding its use that ensure less-fallible reasoning; it is not inconsistent, in other words, to acknowledge the limitations of reasoning while elaborating on methods of reasoning that yield well-working models of reality (including the theory of evolution).[17]

Regarding the claim according to which mainstream scientists have challenged "core ideas" of evolution, in a note, Tzortzis (2019, 320, n. 338) directs his readers three volumes (Shapiro 2011; Pigliucci and Müller 2010; Godfrey-Smith 2014). Incidentally, the second is co-edited by Massimo Pigliucci, a well-known philosopher with a solid background in biology who combats pseudoscience and creationism. These volumes discuss how Darwin's ideas have been elaborated on and extended rather than radically challenged or replaced. Of course, it could be that Tzortzis has his own interpretation of (some of) the ideas contained in such volumes, but in order to conduct a fair and punctual discussion of his stance, one needs first to understand what he refers to by "core ideas" of evolution that, in his opinion, have been "disputed" by mainstream scientists.[18] In fact, in his book, there is at least one example of what he may be referring to: while discussing scientific change, Tzortzis (2019, 206) mentions the relatively recent discovery (based on DNA testing) that Neanderthals were another human species rather than our forerunners. But this is an example of a change within evolutionary thought that did not challenge, let alone replace, a "core idea" of evolution; not to mention that Tzortzis is here implicitly crediting evolutionary scientists. Since no further elaboration is offered by Tzortzis on such points, I shall avoid any speculation.[19]

Accepting without Believing—What Does It Actually Mean?

A sixth problem is related to the way in which a model like Tzortzis's may be received and implemented by his readers. I suspect that most Muslim readers of Tzortzis will already have their practical way of balancing science and religion according to their education, profession, and social role; therefore, such readers will mainly draw from Tzortzis's pages some kind of emotional reassurance, since the upshot of Tzortzis's discussion is, ultimately, "science does not harm your religion." And, quite simply, for someone who is not educationally or professionally concerned with science, this is more of a subject for casual conversation rather than a genuine concern.

That having been said, one could imagine an individual who sets out to follow Tzortzis's prescriptions verbatim, or a government in a Muslim country that sets out to design, promulgate, and implement educational policies in accordance with those very prescriptions. I suspect that if one, especially a curious and

educated person, tries to carefully think Tzortzis's prescription through, they will find it to be confusing, inconsistent, and unsustainable.[20]

The aforementioned hypothetical "Tzortzisian" (in things science and religion) may start wondering how to practically express and implement acceptance-without-belief in regard to (for example) evolution. Think of a Muslim science teacher. How would she or he express acceptance-without-belief of evolution in the classroom? Simply by stating that evolution, like all science, is subject to change? But, if properly understood (see earlier discussion), this is a platitude.

Should a "Tzortzisian instructor" insinuate religion-based criticism of evolution while teaching it, or teach evolution along with creationism? This technically represents an encroachment of religious beliefs on scientific ones rather than a coexistence, not to mention that not all theologians understand Adam, for instance, the same way. Then which theology will our teacher pick? In fact, should a science teacher be proficient in theology? Alternatively, should the "Tzortzisian teacher" refrain from teaching evolution or some aspects of it? This option may not be viable for university instructors interested in imparting complete and solid knowledge; and technically, this would not qualify as "acceptance." What about a professional "Tzortzisian biologist"? How would she or he be proficient in biology while ignoring evolution? Shall she or he simulate approval of evolution while dealing with colleagues who embrace it? This option opens a whole array of moral concerns. Additionally, from a practical viewpoint, what is the difference between effectively simulating belief in evolution in the context of scientific research and collaboration and actually believing in it?

If Tzortzis's suggestion is impossible to implement in a consistent way, it can only function as a catchphrase, including in education. In fact, in a society in which evolution is constantly denigrated and neglected (as is the case in Muslim countries), it is hard to see how "accepting without believing" could inspire any pedagogic advancement. In such a scenario, "accepting without believing" may just be used as doublespeak to conceal and embellish deep-seated resistance to, and ignorance of, evolution.

Please note that I have constructed the whole argument around evolution specifically because it is evolution that Tzortzis seems particularly concerned about. But this may apply to any other "scientific conclusion" that is said to contradict scripture (cf. Tzortzis 2019, 212). Let us imagine any future scientific theory X that, for some reason, theologians may argue to be irreconcilable with revelation. How will Muslim teachers, schoolers, students, and public receive X if instructed to "accept" it "without believing"?

Alternatively, in suggesting "accepting without believing," Tzortzis may have simply meant that evolution should not be made a theological doctrine; then again, since he starts off by describing evolution as a scientific model, by definition different from revelational knowledge, such a reading trivializes all of

Tzortzis's "strategy" from his very viewpoint. Is his whole suggestion nothing but a big tautology? (Again, this applies to evolution as well as to any other scientific notion).

Concluding Remarks

It is difficult to deny that Tzortzis's 2019 book has some virtues and positive qualities. I have already pointed out the author's humbleness and invitation to dialogue. Furthermore, his very rationalistic stance may be regarded as laudable (not to mention that, due to the variety of his sources, his very book may be seen as a testimonial to interreligious and intercultural dialogue). That having been said, Tzortzis considers inconsistency a threat to faith (cf. Tzortzis 2019, 17) and is quite critical of "intellectual double standards" (cf. Tzortzis 2019, 148). I have specified that I do not consider this article a contribution to atheism but rather to a general, rationalistic refinement of the discussion in which Tzortzis engages. If the reflections I have offered are accurate, Tzortzis's arguments, although they are presented as guided and permeated by rationality, still betray important inconsistencies, inaccuracies, and double standards. In other words, Tzortzis's outlook on religion and science—similar to his discussion of Hume, as I previously argued—the loaf he offers to his readers, is half-baked. It is my hope that Tzortzis will prove able to convincingly solve such inconsistencies so as to bake a more digestible loaf for his readers.

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I am grateful to two anonymous reviewers for extensive and constructive comments. I have written this article keeping in mind my students. This article is dedicated to them.

Notes

[1] Currently, Tzortzis's book (2019 edition) has 579 global ratings on Amazon.com, with an average of 4.9 out of 5 stars, and 72 reviews. On Goodreads.com, the book (all editions) has 802 ratings, averaging 4.48 out of 5, alongside 113 reviews. The vast majority of reviews on both websites are enthusiastic, usually referring to the book as a must read (for Muslims, but not exclusively), clear and well argued. Negative comments describe the book as repetitive, unoriginal, simplistic, and flawed. There are also mixed reviews, with some noting that while the book is interesting, it seems to focus more on refuting atheism than advocating for Islam.

[2] For an overview of the contemporary debates at the interface of Islam and science, see Guessoum and Bigliardi (2023).

[3] A detailed discussion of Tzortzis's originality compared to other Muslim and Christian authors presents an interesting topic. More generally, it has been explained that the Muslim rejection of atheism should often be understood through the lens of Judeo-Christian and Biblical literature (e.g., Daneshgar 2023c). However, all this exceeds the scope and ambition of the present article; readers seeking further insights on such matters may profit from reading Baz's dissertation.

[4] Due to the limitations imposed by my own expertise and background, I refrain from analyzing in detail the topics and arguments offered by Tzortzis in the seventh and eighth chapters. I suspect, however, that the shortcomings of Tzortzis's conceptualization of science highlighted in the present pages may have major implications for the discussions offered in such chapters as well.

[5] The last three are given in the article as bullet points.

[6] On close inspection, it turns out that the approach Tzortzis offers in the 2013 article conveys the idea that the Qur'an should guide (Muslim) scientists in their work (another principle typically held by the advocates of *iʿjāz ʿilmi*). Cf. the statements: "Find meanings within the verse *to correlate with the scientific conclusion*. If no words can match the scientific conclusion then *science is to be improved*" (Tzortzis 2013b, emphasis added).

[7] To integrate the present critique and reflections, readers are encouraged to read sections of Baz's dissertation that reconstruct and discuss Tzortzis's reference to "scientific miraculousness" in the context of iERA's activities (Baz 2016, 133–71). For a comprehensive historical discussion of this trend in the Muslim world, readers are strongly encouraged to explore Majid Daneshgar's studies (Daneshgar 2023a, 2023b, 2023c). Finally, for an analytical and brief overview of the "scientific miraculousness" of the Qur'an, readers may refer to Stefano Bigliardi (2014).

[8] To be sure, in at least one passage, (Tzortzis 2019, 71) does admit that the scientific results he mentions require more research; but, arguably, the rhetorical effect of inserting such references in his discussion is to support religion with science. And again, if science and religion should not mix, then seemingly positive associations should also be avoided.

[9] Famously, Hume deconstructed (and reconstructed) the concept of causality; however, Tzortzis (2019, 68) interestingly lists "the law of causality" among "self-evident truths." In another passage, he seems to be confusing the *a priori* existence of causality (as a concept human minds are equipped with) with the possibility of fruitfully applying causality itself to matters outside of one's experience. He also seems to forget that causality, in specific cases, can be misattributed (Tzortzis 2019, 88–90). Elsewhere, he states that "in philosophy there is no consensus on the definition and nature of causality" (Tzortzis 2019, 99).

[10] I feel compelled to add that such arguments are quite repetitive (admittedly, repetition may be pedagogically useful, but it may also be counterproductive in other ways). On at least one occasion Tzortzis offers an analogy that runs the risk having an opposite effect on his readers to what he

wishes, comparing the (re)discovery of faith in God to finding a toy he used to play with when he was five years old (Tzortzis 2019, 77).

[11] Namely, he elaborated on a "bundle theory" of the self, famously formulated in *A Treatise of Human Nature* (1739/40) I, IV, §VI.

[12] Notably, also Malik remarks that the criticism of evolution predicated on induction undermines basic human experience (Malik 2023b, 427–28).

[13] One of Hume's challenges concerns the reliability of testimony. This is particularly relevant to Islam, especially in regard to the claims traditionally made about the authenticity of the Qur'an and the prophetic traditions or *ḥadīth*, which are believed to have been transmitted intact. Tzortzis does take up such a challenge, at least to some extent. In a short passage, he argues that the criticism of inductive arguments does not impinge on "Islamic epistemology" since those who preserved the Qur'an and prophetic traditions made use of "inductive reasoning" as opposed to "inductive arguments"; the former "[state] the plain facts without making a conclusion for something that is yet to be observed" (Tzortzis 2019, 212–13). Tzortzis specifies that the criticism of inductive arguments does not apply to "inductive reasoning." I think he fails here to see the pervasiveness, in everyday life, of what he calls "inductive arguments" and the fact that humans also rely on previous experience to form a perception of past events they did not witness directly. Those who assessed the validity (or lack thereof) of verses or narratives surely relied on assumptions regarding human nature, human trustworthiness, information transmission, etc. that they must have inferred from their respective experiences and projected into the past that they had not experienced. Similar objections, I think, apply to Tzortzis's discussion of the epistemology of testimony (Tzortzis 2019, 218–19).

[14] Incidentally, hyperbolic skepticism also ends up disrupting one's reliance on indemonstrable principles (those used by Tzortzis in order to exemplify how science does not explain everything); their very "intuitive truth" is ultimately perceived by a subject on distinct occasions at different times, and they can only be appreciated by resorting to an inductive argument that projects their validity into the future. In other words, they cannot be defeated by empirical or scientific observations, but one may well imagine a scenario in which they simply disappear from one's mind. But again, we constantly rely on the assumption that they will not.

[15] *On The Origin of Species* contained, even in its first edition (1859), multiple chapters discussing possible difficulties for the theory of evolution. In the sixth edition (1872), Darwin added a new chapter written in response to criticism. In all such cases, Darwin did not limit himself to listing the difficulties, nor did he just mention them to suggest that they delivered a fatal blow to the theory—he responded to them.

[16] Also, evolution should be discussed on its own scientific merits rather than in reference to Darwin's statements (in particular, those contained in his correspondence as opposed to his essays and books).

[17] In his discussion of evolution, Tzortzis directs the reader to his 2019 essay "Can Evolution Adequately Explain Our Truth-Reliable Cognitive Faculties?" (Tzortzis 2019, 59 and 306, n. 78). Currently, the link provided in the book does not lead to any article. Another article on evolution, however, is still available (Tzortzis 2013a). In the words of Tzortzis, it "exposes the false assumption that the theory of evolution is a fact, or is certain." Here, he contrasts evolutionary conclusions with the conclusions of deductive arguments. The discussion he offers is reflected to a good extent in the book (where some passages seem to have been reused verbatim), but there are some points that Tzortzis seems to have softened, such as the suggestion that "[i]n situations where science and Divine revelation are irreconcilable, revelation supersedes science" (Tzortzis 2013a). In the 2013 essay, Tzortzis also writes: "For evolution to be certain, *all* phenomena related to the change in the inherited characteristics of biological populations over successive generations must have been observed. Including observing *all* evolutionary processes that give rise to diversity at every level including species and individual organisms." This of course raises the bar to an unattainable level. The consistent application of such a criterion would cause the collapse of any theory or argument about the world (including those outside of science).

[18] I have similar doubts regarding what exactly Tzortzis means when he mentions the "assumptions" of evolution and its "relatively" speculative character.

[19] For a Muslim approach to evolution that seems more well-informed about its historical development, refer to Malik (2023a). Malik writes, among other things, that "a fundamental problem with adamant critics of evolution, [is] that the slightest admission of debates in evolution seems to be understood as plus points for anti-evolutionary narratives when that is not necessarily the case" (Malik 2023a, 5). (While I appreciate this and similar points made by Malik, I must add, however, that I have strong misgivings as to his epistemology). A Muslim author who, before Malik, provided a positive survey of non-Darwinian positions on evolution, without misleadingly suggesting that such ideas constituted a full replacement or refutation of Darwin's views, is Nidhal Guessoum; he discusses them in the framework of a proposal for Islam and science that differs from Malik's perspective (see Guessoum 2011, 291–95).

[20] Here, I am inspired by Ian Barbour's (1923–2013) criticism of the suggestion to treat religion and science as separate (cf. Barbour 2000, 17–22, 36–37).

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Introduction: Replicating John Hedley Brooke's Work on the History of Science and Religion

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In this introduction, we first briefly describe the replication crisis as it occurred primarily in the biomedical and social sciences. We then argue for the possibility and desirability of replication in the humanities, particularly historiography. After that, we clarify why we opted for the replication of John Hedley Brooke's 1991 book *Science and Religion: Some Historical Perspectives*, specifically its third chapter. We elucidate why we chose to do both a direct and a conceptual replication. Finally, we lay out the procedures we used to conduct the two replication studies and look ahead to what is to come in this thematic section.

Introduction

This thematic section explores the desirability of replication in historiography (and the humanities at large). In other words, it explores the potential value of doing historical research again, and doing so systematically. We employ lessons learned from replication studies and the replication crisis in other fields. Elsewhere, some of us have reflected more theoretically on replication in the humanities and historiography (Peels 2019; Peels and Bouter 2018a, 2018b, 2021; Peels, Bouter, and van Woudenberg 2019). Here, we put our feet in the mud by actually carrying out two replication studies and reflecting on what we can learn from them. For this purpose, we have chosen John Hedley Brooke's seminal 1991 *Science and Religion: Some Historical Perspectives* as a case study.

This introduction is organized as follows: first, we briefly describe the replication crisis as it occurred—and is partially still ongoing—in the biomedical and social sciences. Second, we consider and argue for the possibility and desirability of replication in the humanities, particularly historiography. After that, we briefly clarify why we selected for replication John Hedley Brooke's 1991 book *Science and Religion,* specifically its third chapter. We elucidate why we chose to do both a direct and a conceptual replication. Finally, we describe what procedures we used to carry out the two replication studies and look ahead to what is to come in this thematic section.

The Replication Crisis

Since the early 2010s, there has been an ongoing replication crisis in a number of academic disciplines, such as the biomedical sciences (Begley and Ellis 2012), economics, and the social sciences (Open Science Collaboration 2015). The main concern that brought this crisis about was that attempts to carry out original research again often led to different results. The percentage of attempts at replication that led to different results varied from field to field and in fact from subfield to subfield or even topic to topic, but in many cases 60–85% of the studies failed to replicate. Of course, methodological worries had been around longer, but only in 2012 did this lead to a systematic attempt to analyze the problem and find solutions (Pashler and Wagenmakers 2012). The term "replication crisis" can now be found in numerous fields, as, fortunately, can attempts to solve the problems involved (Baker 2016; KNAW 2018).[1] Numerous people are still working on what exactly to take into account in replication studies and how replication studies differ from field to field (see, e.g., Pittelkow et al. 2023).

It is important to note that replication studies come in several varieties. In line with common practices in the field and with our earlier work on replication, let us make a threefold distinction between reproductions, direct replications, and conceptual replications.[2] Differences between all three pertain to how much a replication study differs from the original study with regards to

research protocol and use of new data or sources (Peels and Bouter 2021).[3] The differences can be summarized as follows. Reproductions reanalyze existing data sets. Direct replications use new data, but the approach (what in the sciences is called a research protocol) is the same as that of the original study. Conceptual replications use new data as well, but also modify the approach (protocol) of the original study. See Table 1.

Type of replication	Research protocol	Data/sources
Reproduction	Same as original study	Same as original study
Direct replication	Same as original study	Same as original study as well as new data/sources
Conceptual replication	Slightly different from original study	Same as original study as well as new data/sources

Table 1: Types of replication.

Of course, much of the terminology surrounding replication efforts may be foreign to humanities scholars. For example, historians would likely not speak of "datasets" but of "texts" and "sources," and would use terms like "method" or "approach" rather than "study protocol." We return to this issue in due course.

The main arguments in favor of carrying out replication studies are quality control and the corroboration of conclusions. Quality control refers to checking if the original study is of good academic quality. Errors in the original set-up or in the way the research was carried out come to mind. However, more often, quality control refers to a lack of reporting of null-results or selective reporting. Corroboration of conclusions refers to an additional assessment aimed at finding out if the conclusions of the original study are supported.

The unexpectedly high rate of studies that could not be successfully replicated has led to awareness that replication may be a highly important tool to improve what we could call the "self-cleaning capacity" of the involved disciplines. Accordingly, the reputation of replication studies in the sciences has increased sharply over the past couple of years.

Replication in the Humanities

Now, as more evidence has accumulated supporting the notion of a replication crisis in the biomedical, natural, and social sciences, scholars have begun to consider whether replication studies in the humanities are also possible and, if so, what their value and limitations may be (Aguinis and Solarino 2019; Kursell et al. 2020). Rik Peels (2019) and Lex Bouter (Peels and Bouter 2018a, 2018b) have argued that replication studies are both possible and desirable in a wide variety of humanistic disciplines, such as parts of anthropology, archaeology, classical literature, history, linguistics, literary studies, philosophy, the study of

the arts, and theology. They have qualified this claim in various ways, for instance by pointing out that it is restricted to empirical studies and does not concern purely theoretical studies (that is, it pertains to a posteriori rather than entirely a priori studies). After all, the latter, such as ethics, metaphysics, and epistemology, usually do not work with empirically collected data but with abstract principles and intuitions that then figure into, for instance, thought experiments.

Peels and Bouter have also pointed out that replication studies in the humanities can be valuable in two ways. First, by reanalyzing the original sources and including new sources, replication can increase the trustworthiness of the original findings. Second, attempts at replication can provide crucial insights into the method, background assumptions, and positionality of the researcher (for more, see Derksen et al. 2024). For these reasons, replication is one important way universities can meet their responsibility to take the humanities seriously and enhance progress in them (see also Peels et al. 2019; for an argument that progress can indeed be made even in some of the more theoretical humanities, see Peels 2020). However, now that the debate on replication in the humanities has begun, various objections to either its possibility or desirability have been raised in the literature. Rather than attempting to be exhaustive, let us sketch and discuss three common objections here.[4]

First, responding to the call for increased attention to replication in the humanities by Lex Bouter and Rik Peels (cf. Peels and Bouter 2021), Sarah de Rijcke and Bart Penders argue that replications are unhelpful in the humanities because the differences between the humanities and other scientific disciplines are too large. In their view, the humanities have different quality criteria that do not allow for replication. For example, where the social and biomedical sciences pursue truth, most studies in the humanities pursue meaning. Unlike other disciplines, the humanities allow for many, sometimes contradictory, interpretations alongside one another. Finally, the humanities relate differently to their objects of study. Where research is mostly one-directional in many other disciplines, humanities scholars engage in continued interaction with their objects of study (de Rijcke and Penders 2018; see also Holbrook, Penders, and de Rijcke 2019; Penders, Holbrook, and de Rijcke 2019).

While de Rijcke and Penders point to some relevant differences between the humanities and other disciplines, their objections to replication are not completely convincing. For example, assuming for the moment that meaning and truth are distinct things (rather than there being truths about meaning), some studies in the humanities are indeed aimed at meaning, but many others are aimed at truth. The study by John Hedley Brooke discussed in this thematic section, for example, aims to shed light on the Merton thesis—that is, the thesis that values associated with radical Protestantism fostered practical science. Clearly, the Merton thesis can be either true or false and is usually discussed in that way.[5] This holds for many other claims and studies in history as well.

The issue of multiple, coexisting interpretations makes replications in history different but does not undermine their value. If many valid interpretations of a historical source or text are possible, it is still valuable to check if a given interpretation is plausible or valid given the evidence available. Hardly any scholar would argue that all interpretations of historical sources are equally plausible, so it is important to weigh the various existing interpretations against each other. Widely accepted criteria for valid interpretations are available in the field. As a result, not all research in history is idiosyncratic.[6] Moreover, a replication could even come up with a new valid interpretation and thereby move the discussion forward.

Finally, in contemporary historiography, there is quite some discussion of how people's specific sociocultural location influences the way in which they interpret the past, so that we can never end up with "the one and only" correct rendering of some past event, series of events, or period. Each time will ask new questions (today, we see many new questions being asked, e.g., from postcolonial perspectives) and accordingly reconstruct the past in novel ways. In that sense, there is a kind of back-and-forth in our engagement with the past. Yet, in our view, de Rijcke and Penders's point about bidirectional engagement with objects of study does not really apply to history. Historians engage with sources mostly in a one-directional fashion, much like most other scholars in many of the humanities. The issue of continued interaction applies more to studies on living human subjects, such as in psychology and sociology.

Another worry is that replication might enforce standards from other disciplines on the humanities. One might thus regard the attempt to extend replication to the realm of historiography as scientistic, in the sense of suggesting that (natural and social) scientific research methods are the only legitimate ones in the academy. Replication and replicability are often associated with procedures like the preregistration of studies, the sharing of data, and the sharing of code. This can give rise to the idea that embracing replications in history would imply adopting similar research procedures that could change the discipline thoroughly.

We reply that increased replicability will indeed lead to some changes in the way studies are written down, such as more documentation on research protocols and methodology. Yet, it need not lead to embracing quantification of research or forcing historical research into unsuitable procedures. Replication in historiography may, and likely does, require its own standards and procedures, which largely are yet to be proposed and discussed. Such standards and procedures can be tailored to the specificities of the humanities or even to historiography in particular.

A change that is unavoidable for replication studies is more clarity on the research protocol. Studies in history do not usually include a separate methodology section or a lot of details on methodology. Some historians also

object that they do not have a set methodology and would have problems articulating a historiographic methodology. In reply, we note that recent historiography is more reflective on its methods and the many varieties in which such methods come. Some new developments, like history studies that make use of big data or studies in digital humanities, often do include methodology sections. Also, history studies that do not have an explicit methodology often have an implicit one. Some make use of quantitative methods. Clear examples are studies in economic history and those that estimate demographic developments. Others (perhaps most) are qualitative in nature and consist of interpreting various sources. Interpretive studies can come in many flavors. For example, some work with critical interpretation in line with critical theory, Marxist theory, or feminist theory; others aim at intentional interpretations of texts, attempting to reconstruct the author's mind (see Carroll 2000). By looking closely at how historians reached their conclusions from the sources, a research protocol can sometimes be reconstructed.

Reconstructing a research protocol or even urging historians to include details of their research protocols need not imply adopting standards foreign to the humanities. Historiographical research protocols need not be as stringent or clearly delimited as research protocols in the social and natural sciences. Interpretive studies can retain their unique nature or use of individual skills by the researcher while being more detailed about how the study was performed. Presenting more details on methodology may also make the discipline more open for interdisciplinarity and newcomers to the field.

A final hesitation approaches the subject in an almost diametrically opposed manner compared to the objections leveled and discussed so far. Some scholars claim that replication studies are not at all new for historiography. Historians have always been reassessing claims put forth by others. They have also regularly and carefully looked at specific sources time and again, in order to check whether conclusions by others held water. For example, they produce scholarly reviews of each other's work and occasionally return to the same past events and critically assess the relevant publications of previous historians.[7] In this sense, historians have always done replication studies, or at least something that resembles them fairly closely. So, what is new in the recent quest for replication, if anything at all? Have historians not done and valued this all along?

We agree. Yet, while historians have indeed been doing studies that resemble replication studies to some extent, strictly speaking, replication studies take on a different form. We suggest that by injecting more rigor and "controllability" into replication, unique advantages can be created. Preregistration, for instance, can be instrumental to tackling or mitigating certain biases.[8] Also, by sticking closely to the research protocol of the original study, replications keep a stricter focus. In other studies where sources or claims are assessed again, changes

are often (and mostly implicitly) made to the hypothesis tested, the research protocol, the sources used, or all of these. Keeping these largely the same allows for a more rigorous assessment of the reliability and validity of the original study. Still, we acknowledge that some conceptual replications can resemble traditional forms of comparative studies in history more closely because conceptual replications diverge further from the original study than direct ones and reproductions. We also acknowledge the continuing need for traditional ways of reviewing historical work—ways that go beyond strict replication—since these can discuss whether correct methods have been used to tackle some historical problem. This topic deserves further attention.

Replication in Historiography

Having discussed possible objections, let us now explore in a bit more detail what can be said in favor of replication studies in historiography. It seems historiography can benefit equally from additional quality checks on studies and from the corroboration of conclusions. With regards to quality control, Cumberledge, Smith Jr, and Riley (2023) note the frequent occurrence of quotation errors in leading history journals.[9] Quotation errors are references that do not support the propositions for which they are cited. As in most disciplines, references in historiographical studies imply that the study referenced supports the claims being made. Since scholarly references are usually trusted to be correct (especially when they are detailed), references are only checked to a limited degree. Cumberledge et al. suggest that the problem of mis-referring can be partly overcome by increased documentation in references, such as the inclusion of proposition-specific page numbers.

As to the importance of the corroboration of conclusions, Anton Howes notes a number of erroneous conclusions that are frequently repeated or assumed in subsequent research in historiography. An example is the often-repeated claim that the British government sent more troops to quell the Luddites in 1812 than to fight the Napoleonic forces in the Peninsular War in 1808. That claim was popularized by Eric Hobsbawm (1964), and its veracity is still frequently, but wrongly, assumed.[10] More falsehoods like this are repeated as well. For instance, the history of science and religion is already ridden with myths that stand in need of being exposed as such (cf. Numbers 2009; Numbers and Kampourakis 2015, which discuss no less than fifty-two such myths, most having some background in past scholarship). An increased number of replication studies could weed out erroneous conclusions or conclusions that do not stand up to closer scrutiny. We even suggest that the more well known and influential a historical study is, the more important it is to replicate it. That brings us to why we choose John Hedley Brooke's book for replication.

Choice of Primary Source and Methods

We chose John Hedley Brooke's seminal 1991 book *Science and Religion* for replication for the following four reasons:[11]

1. The study rightly can be called a cornerstone study, that is, a study that is frequently cited, influential, and deemed authoritative in its field.[12]
2. The book contains a limited set of clearly formulated hypotheses and theses.
3. Unlike most historical studies, Brooke's study includes an extensive bibliographical appendix that may render it more easily replicable.
4. The author of the book is still alive and turned out to be willing to help in our reflections on how to do the replication study.

We decided to replicate chapter three of the book, entitled "The Parallel between Scientific and Religious Reform." We did so for the following three reasons:

1. This chapter is of sufficiently limited scope to allow for replication.
2. This chapter stands out in that it cautiously engages an important and protracted debate of general interest. This debate focuses on the positive or negative roles religions—or rather, specific and often competing religious denominations—have played in the rise of modern science.
3. This chapter lends itself well to both a direct and a conceptual replication, as we show in the two ensuing articles in this thematic section.

The first replication study in this thematic section, led by Hans Van Eyghen, can be characterized as a direct replication. This study uses a research protocol highly similar to that of John Hedley Brooke and investigates Brooke's own original sources as well as some sources not used by Brooke at the time or unavailable to him, since they appeared later.

The second replication study, led by Rachel S. A. Pear, can be characterized as a conceptual replication. In this study, the original research protocol was slightly altered in that we looked at Jewish responses to Copernican thought rather than the Christian sources investigated by Brooke. In this way, it should be possible to test whether similar patterns in the interaction between scientific and religious reformations as found by Brooke in a Christian context can also be detected when focusing on Judaism.

Our idea was to experiment with both types of replications in order to understand the challenges that would be encountered in each and how they might be overcome. We evaluate these experiences in the reflection article that directly follows the presentation of the main findings of both replication studies in this thematic section. We also could have chosen to perform a reproduction of Brooke's chapter (i.e., a reiteration of the scholarly work

behind the chapter using the very same sources), thus also seeking the aid of the third member of the replication family. Since the direct replication includes all sources used by Brooke (as far as these could be tracked down) and retained the same research protocol, however, a reproduction did not seem to have much added value.

Procedure

We used the following procedure to carry out the replication studies. After an initial exploration of the original study, we contacted the author, John Hedley Brooke. It turned out that Brooke was more than happy to think along and comment on our work. We then decided to set up an advisory board that would give feedback at various crucial junctures of the replication studies. In the course of the project, we shared information for comment via email and met twice online and once in person (at a workshop for the project in June 2023). The board members were John Hedley Brooke; Ab Flipse (Vrije Universiteit Amsterdam), a historian who specializes in the interaction of science and religion; Jeremy Brown, a scholar of Jewish responses to Copernicus and the director of the Office of Emergency Care Research at the US National Institutes of Health; Jessica Roitman (Vrije Universiteit Amsterdam), who works in Jewish studies and is also a historian; and J. Britt Holbrooke (Department of Humanities, New Jersey Institute of Technology), a philosopher who focuses on interdisciplinarity and has been vocal in raising concerns regarding replication studies in the humanities.

Subsequently, we preregistered both studies.[13] This is still highly uncommon in the humanities. The basic idea of preregistration is that one lays out and publishes online what one considers to be the main research question of both the original study and the replication study as well as the main hypotheses, method, and any other details that matter to the replication study. All of this is done and published before the empirical research is actually carried out. This is primarily meant to avoid all sorts of biases, such as confirmation bias and hindsight bias, that might otherwise steer one in a particular direction in carrying out the research. It also makes one reflect more carefully on exactly what one is doing, how one is doing it, and why one is doing it that way. A final advantage is that others are aware that one is carrying out a replication study of this kind. They may reach out to join forces or exchange ideas, or even give up on their own intended replication study so as to prevent the waste of time and resources (if too many replication studies of the same original study are going on, which is clearly not yet a problem in the humanities).

After carrying out the two replication studies, we presented the initial results at an international and interdisciplinary symposium at the Vrije Universiteit Amsterdam. The original author John Hedley Brooke commented on the studies. Jeremy Brown, who also contributes to this thematic section, shared his

thoughts on replication in historiography. And other renowned and younger scholars from science and religion, art history, and other fields joined in the exploration of replication studies in historiography. We took their comments into account, revised the studies in light of them, and present the final results in this thematic section.

Set-Up of This Thematic Section

The set-up of this thematic section is as follows. After this introduction, we first present the direct replication, led by Hans Van Eyghen, and then the conceptual replication, led by Rachel S. A. Pear. The rationale for this will be clear by now: whereas the direct replication only draws in new sources (namely, sources from or on Puritanism), the conceptual replication both draws in new resources (namely, sources from Judaism) and uses a somewhat revised study protocol in that it considers a kind of source Brooke did not. After that, we carefully reflect on these findings and what they mean for the possibilities and limitations of replication studies in historiography. John Hedley Brooke then presents his reflections on the experience of his work being replicated. In doing so, he also provides background to the original study that cannot be learned from the study itself. Subsequently, Jeremy Brown reflects on his experience with the project and explores which studies in historiography, particularly in science and religion, might lend themselves to replication.[14]

Division of Labor

Rik Peels and Gijsbert van den Brink conceived the projects described in this article and were involved in all stages of the planning and execution of the research. Peels also drafted the first version of this introductory article. Hans Van Eyghen and Rachel S. A. Pear carried out most of the historical research.

Notes

[1] The crisis is also called the "replicability crisis," "reproducibility crisis," or even simply the "trust crisis."

[2] Sometimes replication studies have vague boundaries. For example, a study with a slightly altered research protocol can count as a direct replication, and a reproduction may or may not be seen as falling under the umbrella of replication studies.

[3] Rik Peels and Lex Bouter only use the term "data" (e.g., Peels and Bouter 2018a, 2018b). We added "sources" because it is not common to talk about data in history or in many of the humanities in general.

[4] Some of the objections discussed here are drawn from the literature on replication in the humanities. Others draw on personal conversations or discussions triggered by presentations of preliminary results of the direct and conceptual replications.

[5] The Merton thesis can also be partly true in the sense that some of its core claims or some (weaker) version may be true. Nonetheless, conclusions are usually in terms of "true" or "false."

[6] For examples, see the direct replication in this thematic section.

[7] See also John Hedley Brooke's contribution to this thematic section.

[8] In the scientific literature, this often relates to several well-documented problems, like "p-hacking" and the publication bias towards "positive" rather than negative results. Classically, if a scientific study is "positive," the null hypothesis—that there is no statistical difference between intervention x and intervention y—is rejected. If a study is "negative," the null hypothesis is not rejected. There tends to be far more excitement (and journal interest) with the former, and much less with the latter. For an introduction to preregistrations, see https://www.cos.io/initiatives/prereg; for a site that is a repository for preregistrations in the biomedical sciences, see clinicaltrials.gov; for an example of a project currently exploring replications broadly, see https://tier2-project.eu/. Our project is also interested in what preregistrations could mean in the humanities.

[9] The authors of the study do note some limitations. Only leading history journals were included; references beyond 100 pages, references that could not be retrieved, and non-English references were excluded; and the reviewers performing the check were not history professors.

[10] See Howes (2017) for examples of studies that assume its truth. Also see Jeremy Brown's contribution to this thematic section.

[11] We also did a replication study in art history. For more on that study, see Rulkens et al. (2022).

[12] At the time of writing, the book wherein the study was published had been cited 2,066 times according to Google Scholar.

[13] See, https://osf.io/xndwt and https://osf.io/j8n59.

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Brooke on the Merton Thesis: A Direct Replication of John Hedley Brooke's Chapter on Scientific and Religious Reform

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Awareness of the need for replication studies is growing in multiple disciplines. Replication in history and the humanities, however, is close to nonexistent. This article presents the results of a direct replication of John Hedley Brooke's study into the role of Puritanism in increasing the legitimacy of (practical or applied) science. The study serves as a pilot for the possibility and feasibility of replication in history. We give an overview of both what replication studies are and Brooke's original study. We subsequently revisit Brooke's study. For this purpose, we reconstruct Brooke's research protocol, revisit his sources, and include some new sources. We note minor points of divergence with the interpretation of sources on the dominance of Puritans in applied sciences. We conclude that the pilot study shows the importance of replication for history and that replication in history raises new challenges for replication studies.

Introduction

This article presents a replication study of John Hedley Brooke's discussion on the contribution of Puritan religious values to the development of modern science.[1] The study replicates Brooke's original study using the same research protocol and some new sources in addition to Brooke's original sources.[2] The study is also a case study for the possibility and feasibility of replication in history and what replication studies can contribute to the discipline.

Brooke's study features in a broader discussion on the importance of English Puritan ideas for science. Brooke argues that there is little convincing evidence that Puritan ideas or sentiments led to greater receptivity for new scientific ideas. Here, we assess whether Brooke's conclusions are confirmed by replicating his study. Chapter three of Brooke's *Science and Religion: Some Historical Perspectives* can be divided in two main parts. The first addresses the question whether the Protestant Reformation in general provided a more fertile soil for the acceptance of new scientific ideas (heliocentrism in particular). The second is similar but investigates whether theological changes in more radical, ascetic Protestant groups (especially Puritanism) led to greater receptivity to (practical) science. The direct replication in this thematic section zooms in on the second part, as it more easily lends itself to replication.

This article is structured as follows. We first discuss the methodology used in the original and replication studies. We then discuss the background to Brooke's discussion. After that, we present Brooke's original discussion and conclusions. Subsequently, we revisit Brooke's sources as a case study in replication, using the same research protocol (as far as possible) and looking at new sources. We end with some concluding remarks.

Methodology

Not all studies in history include robust details regarding how the study was performed. While Brooke did include a bibliographical essay in which he laid out which sources he used and why (Brooke [1991] 2014, 490–97), he did not include a clear explanation on his research protocol. Nonetheless, by looking carefully at how Brooke discusses his use of the sources and how he draws conclusions about them, a research protocol can be reconstructed. Earlier drafts of this reconstruction were shown to the original author and adapted to incorporate his comments.

The present replication study mainly relies on textual analysis of secondary sources and an in-depth analysis of the original study by Brooke. Most of these secondary sources analyze multiple original sources from England or New England Puritans or argue for recurring values or motivations in several Puritan writings. Some concern quantitative data on membership of scientific societies.

The methods used in the replication study are similar to those used in Brooke's original study. Yet, the original author mentioned in an advisory board

meeting that his original study leaned on a decade-long immersion in sources on the relation between religious and scientific reform. A similar immersion was, of course, not feasible in the relatively short time frame of this replication study. While full immersion was not possible, we did rely on overviews and monographs on the topic to some extent.[3] Apart from the obvious impossibility of copying someone's life-long immersion in certain historical sources, in line with the requirements of a direct replication, we stayed as close as possible to the research protocol used in the original study. This holds for the analyses of both the sources used in the original study and the new sources. The selection of new sources departed slightly from the original research protocol by including sources on Puritanism in New England, while the original study exclusively relies on sources on Great Britain. Given the close links between Great Britain and the North American colonies around the time (seventeenth century), this does not signal a stark departure from the original protocol. New sources are limited to the same historical period as in the original study.

The inclusion of new sources may give rise to the worry that we are pursuing an unfair evaluation of Brooke's original study. Brooke did not have access to sources published after his original study. Including them in an evaluation of his original claim might therefore lead to an unfair verdict on his original work. The use of new sources is, however, not intended to assess the reliability of Brooke's original study but rather to evaluate the validity of his conclusions. A replication study may conclude that the original study was of good (or even excellent) quality, yet add that new evidence or sources tilt the balance in favor of a rival hypothesis. Assessment of reliability (whether the original study is of good quality) and validity (whether the conclusions continue to hold water) can thus be distinguished, and including new sources is only relevant for the latter.

In order to stay close to the original research protocol, the replication study did not look into claims similar to but different from the Merton thesis. Since the publication of Brooke's study, a rich body of literature has emerged discussing the impact of various theological changes (associated with the Protestant and Catholic reformations) on the development of early modern science.[4] Ideas defended or criticized there were not on the radar of Brooke's original study. They were therefore left out of the replication study as well.

The Merton Thesis

A considerable part of John Hedley Brooke's third chapter of *Science and Religion: Some Historical Perspectives* addresses what is known as the Merton thesis,[5] which owes its name to Robert Merton, its foremost defender.[6] In this section, we give a brief overview of the thesis and its central claims. The Merton thesis can be stated as follows: theological changes associated with the rise of Puritanism in England (and to a lesser extent the New England colonies) led to a greater interest in and greater receptivity for new scientific ideas.

This thesis bears some similarities to Max Weber's well-known thesis connecting Calvinist religious ideas to the emergence of capitalist entrepreneurship (Weber 2013). Along similar lines, Merton (1938) argues that changes in theology or religious practice were not (only) instrumental for economic changes but for scientific changes as well.

As Steven Shapin (1988) notes, the thesis does not state that religious changes had a direct causal influence on the development of new methods in science or on the genesis of scientific ideas. It merely states that the dynamics and social standing of science as an enterprise received an impetus from religious changes. The explananda are therefore phenomena noticeable in England from the sixteenth century onwards such as increased attention to science, growth of interest in science and technology, increased tempo of scientific activity, enhanced cultivation of science, elevation of science to a place of high regard in the social system of values, and the fact that science became positively sanctioned (Shapin 1988). All these can be put under the header of increased legitimacy or valuing of science.

Merton argues that the increased legitimacy and valuing of science in sixteenth and seventeenth century England was partly due to the influence of Puritanism, a religious reform movement within the Church of England predominantly active at that time.[7] Adherents sought to purify the Church of England of remnants of Roman Catholicism, such as perceived Catholic elements in liturgy and worship. Puritans became known for a spirit of moral and religious earnestness. Through church reforms, they sought to make their religious lifestyle the pattern for the whole nation. Much of Puritan theology drew from Calvinist ideas like the doctrine of double predestination. More than contemporary Calvinists, Puritans stressed the need for a personal relation with God to redeem one's sinful condition. They also emphasized the inner working of the Holy Spirit in individuals (Encyclopaedia Britannica 2024).

Merton argues that Puritan religiosity gave rise to a religious sentiment that in turn fostered the legitimacy of science. The sentiment consists of two elements. First, according to Merton, increased stress on individual responsibility for salvation without a strong mediating role of the church motivated individuals to take action in the world. Acting and bringing about change in the world were increasingly regarded as ways to glorify God. Nature was seen as sinful and corrupt and bringing about control of that sinful world was a true sign of God's salvific work through individuals. Merton notes a link to scientific practice around the time. In the writings of members of the Royal Society, one can note a widely shared idea that science is to be fostered and nurtured as leading to the domination of nature. The study of nature was also seen by members as enabling a fuller appreciation of God's works as manifested in creation. The second key element in Puritan sentiment was an increased striving towards social welfare. Puritanism demanded constant, systematic labor and

constant diligence in each individual's calling. That calling included a strong concern for the welfare of others. Science could serve as a means to achieve this calling by developing new technologies (Merton 1936).

Some note that the Puritan ethos was given an extra impetus by a strong belief in the imminent return of Christ. Many people saw cataclysmic events at the time, like the Thirty Years' War and natural disasters, as signs that the world they knew was soon coming to an end. This created a sense of urgency in living a pious Christian life and bringing about changes in society that could prepare the way for the second coming of Christ (Webster 2002).

Merton is clear that Puritan sentiments and values were not the only factors driving the acceptance of science. He also does not claim that a (historically) particular sentiment like that of the Puritans is necessary for receptivity towards science. In a correspondence with Pitirim Sorokin, Merton writes: "I do not argue that these traits [sentiments] are peculiar only to Protestantism … they were found to a certain degree in medieval and later Catholicism" (Merton 2018, 295). According to Merton, medieval and later Roman Catholic movements like the Dominican, Franciscan, and Jesuit orders may display a similar religious sentiment that paved the way for receptivity towards science. These (Catholic) movements share with Puritanism an emphasis on personal religiosity and the application of faith to worldly, ethical issues.

Brooke's Study

One of Brooke's goals in the aforementioned chapter is evaluating the Merton thesis. Brooke's assessment is part of a broader chapter on the alleged impetus of Protestantism to modern science, which in turn features in a broader book on the history of the relations between science and religion. Brooke's chapter and overall book have been characterized as putting forward the complexity thesis.[8] The general idea of this thesis is that the relationship between science and religion is just too complex to be framed in terms of conflict or support. A close look at the history of the relation reveals too many intricacies and complicating factors to allow for strong conclusions about conflict or harmony.

Brooke's broader project has been criticized and qualified on numerous points (e.g., Numbers 2010). One of these criticisms, also raised during one of the advisory board meetings, is that merely pointing to increased complexity (over and against "simpler" narratives in terms of conflict, harmony, or separation) does not have much added explanatory value. Instead of merely pointing to complexity, Brooke could have highlighted broader patterns or advanced more nuanced claims.[9] An assessment of Brooke's broader project lies beyond the scope of this article. Instead, we zoom in on Brooke's specific claims regarding the Merton thesis, as previously laid out. As we discuss, these do not merely point to increased complexity but also aim at undermining claims in favor of the Merton thesis.

Most of Brooke's claims argue against the conflict thesis, which states that religion and science were in constant conflict, with religion being forced to yield. However, some of Brooke's claims go against theses that religion fostered science. His discussion of the Merton thesis is a clear example. His conclusion is overall negative, stating that the Merton thesis is rather difficult to test and some evidence rules against its viability. Below, we summarize Brooke's discussion and findings. In the next section, we revisit Brooke's sources and argumentation and reevaluate them. We also discuss some new sources not used by Brooke that bear on the Merton thesis.

Brooke's claims can be regarded as a slight restatement of Merton's original thesis. Brooke focuses on motivations to engage in (practical) science rather than on values at work in science.[10] While this may be regarded as a point of departure from Merton, it does not signal a stark difference. Values are generally conceived as motivating subjects towards achieving some goal or change (e.g., Parks and Guay 2009). If the same values that encouraged scientific inquiry can be found among Puritans, then Puritans can be said to be particularly motivated to engage in science. In this vein, Brooke's focus on motivations is not that different from the original focus on values but makes the influence of values more tangible.

Brooke's interest does not lie in evaluating Merton's portrayal of the Puritan sentiment that allegedly fostered scientific legitimacy. Instead, his focus is on whether that sentiment led to greater acceptance of science. Brooke does add that science may have been valued by Puritans because it affords a useful diversion from sensuality—from bags, bottles, and mistresses, as Robert Boyle would put it (Brooke [1991] 2014, 148). Brooke ([1991] 2014, 149) does slightly rephrase Merton's original thesis to state that "Puritan values helped to create an audience receptive to programs for the improvement of man's estate." Brooke therefore stresses the increased legitimacy of practical or applied science rather than all of science—an element also at work in Merton's original defense.

Whether Brooke's alterations or different points of focus constitute a stark alteration of Merton's original thesis is less important for our purposes. Brooke's interpretation has been influential in the debate regarding the influence of Puritanism on the emergence of science. By replicating his original study, we are replicating his particular reading. We are not replicating Merton's original studies. Whether the replication has implications for Merton's original thesis depends on how large the differences are. An assessment thereof again lies outside the scope of this article.

Brooke's Research Protocol

Like the vast majority of studies in history, Brooke's chapter does not include a clear statement of his methodology or research protocol.[11] Nonetheless, a

research protocol can be reconstructed. This section summarizes Brooke's research protocol and how he applies it to his sources.

Brooke's methodology mainly consists of analyzing secondary sources. Brooke evaluates the Merton thesis in a way similar to his broader assessment of an alleged link between theological reforms and willingness to accept science. First, he looks at sources that allow for "counting heads", i.e., investigating whether a larger proportion of scientists or people interested in science were Puritan compared to mainline Anglican.[12] For this purpose, he mainly looks at memberships of the Royal Society. Second, Brooke looks at writings that shed light on the motivations of (Puritan) scientists to accept new ideas. Noting that a considerable number of scientists drew inspiration from Puritan ideals or sentiments could provide support to the Merton thesis. Noting motivations in non-Puritan, mainline Anglican values or ideas would provide evidence against the thesis.

Brooke notes problems with both approaches. Pointing to a larger number of Puritans accepting new ideas reveals nothing about their motivations for doing so. Puritans may have been more accepting of new ideas or more engaged with science for a host of reasons other than their religious sentiments. Looking at writings does shed more light on the motivations or values for engaging in science. In this way, the writings of Puritans serve as a proxy to understand their values and motivations. This approach, however, runs the risk of cherry-picking and leaves scientists who did not write on their motivations out of the picture. We discuss both methods in greater detail.

Counting Heads

Brooke notes that Merton himself drew support from data akin to counting heads. Merton (1938) notes that of the foreign associates of the French Academy of Sciences, only eighteen had been Catholic, whereas eighty had been Protestant. Being Protestant is of course not identical to being Puritan or an ascetic Protestant. Given that the majority of Europe was Catholic around the time, the large number of Protestants is nonetheless noteworthy.

Brooke notes that a similar test can be done by identifying the religious allegiance of Europe's most prominent natural philosophers of the late sixteenth and seventeenth centuries and comparing the ratios of scholars accepting new ideas and scholars more reluctant (Brooke [1991] 2014, 151). Brooke notes that a similar comparison has been challenged by some who point to distinct Catholic motivations to accept new scientific ideas. For this purpose, Brooke refers to work by William Ashworth Jr., who argues that a number of Catholic scholars of the sixteenth and seventeenth centuries were motivated by religious sentiments as well. Therefore, counting heads does not readily support the Merton thesis. Some were motivated by the threat of occult or naturalistic

philosophies, others by providing support for divine design in nature, and still others by countering the threat of Cartesian philosophy. Members of the Society of Jesus were motivated to do scientific inquiry to recruit bright minds in the spread of Counter-Reformational ideas (Ashworth Jr. 1986). Brooke counters that other (non-Protestant) religious motivations are compatible with Merton's claim for distinctive ascetic Protestant motivations (Brooke [1991] 2014). To this we add that motivation from Catholic ascetism (e.g., from Dominican, Jesuit, or Franciscan orders) is compatible with Merton's original statement of his thesis (see the earlier section "The Merton Thesis").

Applying this method to Merton's thesis, Brooke notes that there was no strong Puritan presence among the early members of the Royal Society in England (founded in 1660).[13] Given that the Royal Society was the most notable institution for science around at the time, a large number of Puritans would signal a strong motivation for them to engage in science. From a sample of 162 eventual fellows of the Royal Society who had been old enough to be engaged in the English Civil Wars, thirty-eight fought for or supported parliament and were therefore likely Puritan. Of the sample, eighty-five were royalist and therefore likely not Puritan.[14] The high ratio of non-Puritans seems to rule against Merton's core idea. Brooke adds that as little as one in twenty of the sample can be properly described as scientists mostly engaged with applied science and of Puritan middle-class background. Quoting Lotte Mulligan (1973), Brooke ([1991] 2014, 154; emphasis added) writes: "The typical background of a science enthusiast in the 1660s was not middle class, mercantile, *Puritan*, politically radical, unacademic, or utilitarian. Rather, our typical Fellow was a royalist, *Anglican*, university-educated gentleman."

A problem for the counting heads test was that not all members of the early Royal Society were active members. Restricting the sample to active core members shows that of the ten most active members, five supported the Parliamentarian, Puritan regime. Mulligan (1973) also notes that applied scientists, like physicians, instrument makers, naval experts, agricultural reformers, and general applied scientists are more often found among supporters of parliament (and therefore among people with potential Puritan leanings) in the sample.

Counting heads therefore provides, at best, ambiguous evidence. Brooke reads the ratios of members of the Royal Society as supportive of an alternative thesis, i.e., that moderate Anglicanism was equally (or even more) conducive to the acceptance of science. Brooke does not outright deny that Puritan sentiments may have led some to be more accepting towards science. He does note that an excessive religious zeal or enthusiasm among many Puritans may have been an impediment to accepting science. He also argues that other religious sentiments, like Latitudinarian tolerance, also may have paved the way for accepting science, writing: "[I]t may imply that the kind of Protestant spirituality, for which the

term *Puritan* is commonly used, was not the only catalyst for the expansion of science. Perhaps a certain *detachment from* Puritan enthusiasm, an insistence on moderation and toleration on religious issues, defined the mentality that most often coincided with an interest in science in seventeenth-century England" (Brooke [1991] 2014, 155; second emphasis added).

Brooke's conclusions can be read in multiple ways. On the one hand, he does not deny Merton's core claim that Puritan (or broader ascetic Christian) sentiments led to greater acceptance towards (applied) science. On the other hand, most of his argument and sources cited in the chapter are aimed at providing arguments against a specific contribution of Puritan sentiments.

Probing Puritan Motivations

A second kind of source used by Brooke is information concerning the ideas and motivations of various Puritan thinkers, some of whom were scientists or science enthusiasts. By investigating whether they voiced ideas about science or related ideas like empiricism and how these were connected to their religious ideas, we can get a sense of how a Puritan sentiment might have fostered science. Brooke relies on secondary sources for this purpose. The number of sources in which Puritans discuss their motivations to engage in science turns out to be severely limited. However, given that some of the authors were highly influential within their communities, these sources do provide some evidence for sentiments or values shared more broadly.

Brooke acknowledges that some Protestant writers indeed saw experimental science as a way of mitigating the effects of original sin and making the world better in a way more befitting Christ's Earthly rule. John Beale wrote in a letter: "Here you must add the discovery of, or dominion over all the works of God; the conversion of stones into metals and back again; of poisons into powerful medicines, of bushes, thorns and thickets into wine and oil, and of all the elements to take such guise as man by divine wisdom commands" (Brooke [1991] 2014, 149). It is not clear whether Brooke ranks Beale among the Puritans, particularly because such identifications from that era are often difficult. He does seem to regard Beal as a prime example of the millenarian sentiment that may have fostered the acceptance of science.

Another example in support of Puritan zeal for scientific acceptance is Thomas Culpeper's remark that just like reformed theology rejected a pope in religion, a reformed science rejected a pope in philosophy (Brooke [1991] 2014, 150). Culpeper's reference to a "pope in philosophy" probably referred to the post-Copernican upheaval of the hierarchy of the sciences. A strong current of objections against Copernicus's heliocentrism was that his theory assigned primacy to mathematics over philosophy. Making claims about the position and movements of the Earth and sun was commonly regarded as the proper domain

of (natural) philosophy, which was of a higher status than most other sciences (all apart from theology). Copernicus instead drew conclusions about the Earth's place and movement on mathematical grounds. Most scholars in the sixteenth century regarded this as unacceptable. Culpeper suggests that reformation in theology (of which Puritanism was the successor and, in some sense, radicalizer) provided fertile ground for rejection of the traditional hierarchy of the sciences and, by implication, the acceptance of new scientific ideas.

Parliamentarian soldier Walter Blith writes in a letter that "the English nation might be made the paradise of the World, if we can but bring ingenuity into fashion" (Brooke [1991] 2014, 150). Blith expresses support for Merton's claim that Puritans sought to glorify God in creation by scientific innovation. An explosion of scientific publications between 1645–60 suggests that such ingenuity indeed took hold in England.

Brooke notes, however, that not all Puritan writings are in line with Merton's portrayal of the importance of the Puritan sentiment. To Puritan writers like William Perkins and William Pebble, it was not at all clear that the works of science were also good works. Scientific inquiry did not point toward the God who had entered into covenant with sinful humanity. Natural knowledge could not "set straight the wryed and distorted image of God in us," according to Pemble (Brooke [1991] 2014, 153). William Perkins (2014, 73) did stress the need to act in the world and "bring forth fruits worthy of life." It is, however, not at all clear that scientific endeavors were seen as included in such fruits. Perkins likely mainly referred to charitable works or spiritual fruits rather than empirical or scientific ones.

As a last example, Brooke notes the case of John Wilkins. Although Wilkins sided with the Puritan Parliamentarians during the English Civil Wars, he objected to much of their excessive enthusiasm (most notably, the beheading of King Charles I) and would not go along with more zealous reformers afterwards. He also stood up for universities when they were threatened by the Parliamentarian army chaplain John Webster. Brooke sees Wilkins as a clear example of the "Latitudinarian mentality,"[15] which involves shying away from obstructing religious controversies, a suspicion of (religious) dogma, and an advocacy of tolerance. Brooke suggests that the Latitudinarian mentality may have been as conducive towards the acceptance of new ideas than a Puritan sentiment ever was (Brooke [1991] 2014). Brooke thereby suggests that an enthusiastic zeal is typical of and perhaps defining for a Puritan religious sentiment. Such enthusiasm would often oppose science rather than foster it.

Replicating Brooke's Study

As noted, Brooke draws support for his arguments against the Merton thesis from analysis of texts by scientists and by looking at membership of scientific

societies. In this section, we move on to replicating Brooke's study. The replication is done in two ways. First, we revisit Brooke's sources and assess Brooke's conclusions drawn from them. Second, we look at some new sources not used by Brooke that bear on the investigated thesis.

Brooke's claim that analysis of the religious affiliation of members of the Royal Society shortly after the English Civil Wars does not support the Merton thesis mainly draws on a study conducted by Lotte Mulligan.[16] Mulligan's study set out to test the Merton thesis by investigating the proportions of Puritan and non-Puritan members of the Royal Society. It also compares whether Puritan members were more drawn towards applied science than non-Puritan members. As a proxy for religious affiliation, Mulligan counts how many members (or how many members associated with applied science) sided with the Parliamentarians or with the royalists during the English Civil Wars. She notes that religious affiliation followed political leaning rather closely during the war.

Mulligan notes different views regarding the Merton thesis, one being Brooke's favored alternative account: that Latitudinarian Anglicanism provided an equally or more fertile soil for the new sciences than the more radical Puritanism.[17] Mulligan's own favored account is different, i.e., that acceptance of new scientific ideas in the Royal Society was the result of waning interest in religious disputes and waning influence of religious ideas (Mulligan 1973). She supports her view mostly by pointing to the low level of differences between Puritans and non-Puritans. Her conclusion, however, can be read as providing some support for the Merton thesis.

As Brooke notes, Mulligan observes that out of the 162 members old enough to have sided in the civil war, thirty-eight were Parliamentarian and eighty-five were royalists in 1642. Others were not active members or were foreign associates. These numbers indeed do not fit well with the Merton thesis. However, as Brooke briefly notes, distinguishing between theoretical and pure scientists on the one hand and more practically orientated scientists on the other (e.g., physicians, nautical scientists, etc.) shows a higher proportion of Parliamentarians in the latter group. Mulligan adds that the small number of applied scientists and relatively small differences between both groups do not allow for strong conclusions in support of the Merton thesis. She also notes that hardline Puritans who objected to the restoration of Charles II were less well represented in the Royal Society (Mulligan 2012).[18] According to Mulligan, the last point suggests that a high level of adherence to Puritan ideas and sentiments was detrimental rather than conducive to the acceptance of new scientific ideas. Mulligan therefore suggests that differences in religious sentiment between Puritans and non-Puritans do not predict the acceptance of science. Instead, she claims that a diminished interest in religious questions overall was the key factor (Mulligan 2012).

Mulligan's own assessment of the number of Puritans and non-Puritans in the Royal Society is thus rather different from Brooke's. Brooke focuses on a number of claims made by Mulligan that highlight the greater contribution of non-Puritan, Latitudinarian members. This is most evident in how Brooke quotes Mulligan's claim that the typical science enthusiast did not display a Puritan sentiment but was rather a royalist, university-trained member of the upper class (see previous sections; Brooke [1991] 2014, 154). Mulligan, however, insists that this is unsurprising, since non-Puritan royalists outnumbered Puritans by two to one in the Royal Society (Mulligan 2012, 108). The results of counting heads in the Royal Society are therefore not as indicative against the Merton thesis as Brooke claims. Mulligan herself instead claims the evidence is unconvincing for a very different reason, i.e., a too limited sample. Her conclusions also allow for a different reading where three groups are to be distinguished: Latitudinarians, moderate Puritans, and radical Puritans. Of the three, moderate Puritans appear to have held applied science in highest esteem.

We noted earlier how Brooke raises worries about drawing conclusions from counting heads. Other scholars not discussed in Brooke's study note other reasons to be reluctant to see links between religious affiliation and a sentiment towards accepting science. Theodore Hoppen (1976) notes that a number of members were engaged in hermetic and alchemical practices. The alchemist practice of experimentation and empirical observation would have motivated at least some to be interested in science. Since members probably had reasons not to display their alchemical urges to a broad public, little can be said about the contribution of these or similar philosophical outlooks to the acceptance of science. Distinguishing members among Puritan and non-Puritan lines might conceal other such religious or philosophical motivations (Hoppen 1976).

Replication thus far highlights a new problem. We noted how the sources cited by Brooke allow for multiple interpretations. Some are in support of the Merton thesis while others run against it. All readings appear to have some degree of warrant. Brooke appears to put considerably more evidential weight on looking for traces of the Puritan sentiment, that allegedly provided a fertile soil for science, in writings of science enthusiasts. In the remainder of this section, we revisit the figures discussed in Brooke's original research and add some new ones. Some new sources concern New England Puritans and other English Puritans. Brooke mentions four Puritan figures in his original study. Of these, we omitted Thomas Culpeper due to a lack of sources.

The first figure is John Beale. His letter to Samuel Hartlib appears to display a drive to take active dominion over God's creation and lift it to a higher, more perfected level. Brooke does not dwell on what Beale's words imply or how they might reveal a pro-science Puritan sentiment. As Mayling Stubbs (1982) notes, Beale can be characterized as a Latitudinarian and monarchist and enjoyed a

Presbyterian upbringing. He nonetheless displayed some affinities with Puritan thought. After the restoration of Charles II, Beale fiercely opposed "popery." He also opposed the king's and other nobles' infatuation with wealth and luxury and made attempts to curb the influence of new Hobbesian, or atheist, ideas (Stubbs 1982). His stance towards science fits very well with Merton's thesis. Beale was an ardent Baconian, making considerable efforts to proliferate ideas concerning the new scientific methods in the Royal Society. Beale explicitly saw scientific endeavors as accompaniments to the Protestant Reformation, writing: "Our Savior hath built a fayrer Temple than yt of Solomon … Hee hath sent out the wise and learned, and his ship is landed in ye other world. And this is ye First, or most public attempt that hath beene of advancing the Light of nature into ye Light of grace, yt all usefull arts may be compleated in ye great prophesy" (Stubbs 1982, 327).

This quote clearly shows a sentiment to better the world and pave the way for God's glory. Furthermore, Beale saw the Royal Society and its advancement of science as an agent for the public good. According to Beale, the society should foremost advance utilitarian, applied science, for example by promoting agricultural reforms. Beale's efforts for reform stretched beyond science to advocating the need for economic reforms in response to poverty and unemployment (Stubbs 1982).

Beale seems to fit well into Merton's view. He was a science enthusiast and saw a clear connection to the Christian ideas mentioned by Merton. The problem is that Beale was not unambiguously Puritan. His ideas bear some resemblance to Puritan ideas, but he diverges in his Latitudinarianism and support for the monarchy. One may wonder if Beale can be regarded as a moderate Puritan. Given that Puritans were not a uniform group and Puritanism's initial focus was religious rather than political, a Puritan incorporation of Beale may be warranted.

The second figure in Brooke's overview is Thomas Sprat. Sprat indeed drew a clear parallel between the Protestant Reformation and the scientific revolution in their rejection of old authorities. The text wherein Sprat made the remarks, *The History of the Royal Society*, saw to defend the Royal Society that feared for its continued existence. John Morgan (2009) claims that the text was always read as a "forceful, though inaccurate propagandistic tract on behalf of the allegedly 'Baconian' methods, achievements, and values of the Royal Society." One way of defending the society was to show that it had public value. Sprat himself was an ardent royalist and insisted that the restored Church of England should not compromise towards political (Parliamentarian) or religious (Puritan) views (Morgan 2009). The context in which Sprat wrote on the links between religious reformation and scientific reformation renders it highly unlikely that Sprat's remarks can be regarded as support for the Merton thesis. Sprat appears to have had little affinities with Puritan sentiments, and his claim was foremost made for propagandistic uses.

The third figure is Parliamentarian soldier Walter Blyth. Little is known about Blyth's motivations or religious beliefs apart from his military allegiance to the Puritan Parliamentarians. David Noble sees Blyth's remark as exemplary of the millenarian spirit that gained momentum at the time. A considerable number of people saw the great turmoil and upheavals of the time (like the English Civil Wars) as evidence of the coming end of times. Ingenuity and constant labor would be required to be ready for the final days (Noble 1998). Noble notes that millenarism and associated zeal were not the exclusive domain of Puritans at the time.[19] This is, however, compatible with Merton's portrayal of his thesis.

Brooke suggests that these first three figures fit well with Merton's main claim. Our review casts some doubt on whether this is true for the first two. Brooke notes severe problems for Merton's thesis in other figures. He notes that prominent Puritan writers and preachers such as William Perkins and William Pemble claim that science can do little to set the distorted image of God in man right. Doing so is the sole prerogative of scripture. Perkins indeed accepts no equivalent of scripture in delivering truths about God. Scripture is also the sole means by which man can be informed of Christ's salvific works. However, some ideas in Perkins's writings chime better with Merton's thesis. Perkins stresses the need for continued repentance. He defines repentance as "a work of grace arising of a godly sorrow whereby a man turns from all his sins unto God and brings forth fruits worthy [of] amendment of life" (Perkins 2014, 73). Bearing fruits can therefore be seen as having some degree of evidence for being freed from sin by God. Merely professing faith is insufficient. Man also needs obeisance and to continuously search for the least of evidence of salvation (Perkins 2014). Echoing Max Weber, Merton sees the religious zeal stemming from the need to bear fruits as conducive for science. Although bearing fruits is often reduced to bearing moral fruits, there is reason to believe that it also includes material fruits. Brooke's emphasis on undoing sin or setting the image of God right by science is thus somewhat strange. Puritans and most Christian churches alike agree that doing so is impossible.[20] According to Merton, this is not really what would make Puritans accepting of science. The need to achieve practical success as a means of gaining evidence for salvation, however, might be.

In his discussion of the Merton thesis, John Morgan (1979) complains that defenders tend to cherry-pick Puritan examples with a pro-science attitude. Like Brooke, others skeptical of Merton's thesis point to prominent Puritan scholars who express ideas detrimental to science. As one example, Barbara Shapiro points to ideas voiced by Puritans William Dell and John Webster. Although their ideas seem to fit well with Merton's claim at first glance, a closer look reveals deep tensions. William Dell argues that neither learning nor reason have any role in achieving spiritual illumination. Therefore, universities should stop training ministers and philosophers and focus on applied, secular sciences

instead. The parts of mathematics, geography, and geometry that "carry no wickedness in them" (Shapiro 1971, 64) should be especially esteemed. John Webster advocates Baconian ideas and proposes educational reforms along those lines. Some doubts can be raised concerning Webster's pro-scientific sentiments, however, because he also advocates the study of magic and astrology. William Dell's claims are interesting because they triggered pamphlets in defense of universities' role in educating ministers. Shapiro (1968) notes that there is no discernable difference between Puritan and non-Puritan pamphlets. She thereby suggest that Dell's ideas were exceptional rather than indicative of a shared sentiment among Puritans at the time.

Another complaint against drawing attention to points of convergence in Puritan writings to a scientific, empirical outlook states that the similarities are merely shallow. Puritans may have been more inclined towards this-worldliness and betterment of the earthly situation. This could, however, delude the fact that Puritans imposed stark limits on the study of nature and saw betterment as a primarily spiritual, religious task. As a result, Puritan acceptance of science was severely limited and could work diametrically against receptivity towards science. Authors who voiced similar criticisms are Barbara Shapiro (1968) and Robert Middlekauff (1999). Maxine Van de Wetering notes how some remarks by Puritans can indeed be read in this way. Puritan Cotton Mather warns that notions of an "all-conquering science" could lead to a "theory of blind mechanism" without a role for an actively intervening God (Van de Wetering 1982). Middlekauf (1999) notes that Mather always insists on the central importance of the indwelling presence of God in order to "undermine the authority of scientific explanation of natural phenomena and to substitute the ancient sense of divine mystery."

Van de Wetering, however, adds some nuance to this picture. Mather, like other New England Puritans of his time, saw some limits to scientific inquiry but tended to incorporate scientific ideas in his sermons and allow for a significant explanatory scope for science. This is especially noticeable in his sermons on earthquakes. Earthquakes have always been closely connected to direct supernatural activity in the history of Christianity. The idea that earthquakes are interventions from God (to punish for sin) traces back to Biblical sources.[21] Puritan ministers, like Mather, accepted this view but clearly stated that earthquakes can be explained by natural laws that can be studied by science. Preachers tended to add moral causes on top of the material causes studied by scientists. Van de Wetering notes no urge in Puritan sermons to uphold the old idea of earthquakes as deeply mysterious and unexplainable by material causes, although doing so would have been acceptable at the time. Puritan minister Thomas Doolittle discussed the natural laws that gave rise to earthquakes in his sermons as well. He added that God can make use of natural, material forces as secondary causes to punish humans for moral transgressions. Therefore,

earthquakes are open to empirical investigation and have a supernatural element in them at the same time. Similar ideas can be noted in other New England Puritan sermons delivered around the same time (Van de Wetering 1982).

Mather was a man of some influence and urged young candidates for the ministry as follows: "As thorough an Insight as you can get into the Principle of our Perpetual Dictator, the Incomparable Sr. Isaac Newton, is what I mightily commend to you—Be sure, the Experimental Philosophy is that, in which alone your Mind can be at all established" (Lord 2000, 125). Middlekauf (1999) argues that some of the threats of a purely mechanical view of nature were stilled in Mather's mind because of Newton's insistence on God as divine lawmaker. Michael Winship argues that Mather had some worries about the implications of the science of his time but did not dare object to it for fear of ostracism by the intellectual class. Winship also notes how the study of prodigies may have led Mather to an empirical outlook. Prodigies needed to be subjected to exact observation and discrimination and were therefore a scientific issue. To give his view on prodigies a certain sense of intellectual respectability, Mather would have been motivated to wed them to material secondary causes (Winship 1994).

As noted, Brooke sees John Wilkins as a prime example of how a Latitudinarian (more than Puritan) sentiment fits well with the acceptance of science. Shapiro (1968) also notes how Wilkins was unsympathetic to religious quibbling among theologians. Wilkins advocated a moderate policy towards Puritans after the Restoration and claimed that (religious) controversies hinder the progress of science. Wilkins changed religious allegiance as regimes changed. His own religious stance was so moderate that his loyalties were questioned by Puritans and Anglicans alike. He made considerable efforts to advance a natural theology that would eliminate the issues that divided Puritans and Anglicans.

Shapiro also provides other examples of pro-science Latitudinarians. Walter Raleigh displayed no strong feelings towards religious dogma and opposed condemning people for (religious) opinions. Raleigh also displayed a broad tolerance towards religious views, including deism. Robert Boyle voiced sympathetic views towards many religious views, including those of the Cambridge Platonists, who rejected the Calvinist doctrine of predestination. He was a member of a group of scientists that he described as "persons that endeavor to put narrow-mindedness out of countenance, by the practice of so extensive a charity that it reaches unto everything called man" (Shapiro 1968).

The new investigation of Puritan writers discussed by Brooke and other writers attests to Brooke's overall conclusion. Some Puritans voiced ideas in line with scientific practice, while others did not. There is also ample evidence for pro-science sentiments among non-Puritans. The investigation therefore does not allow strong claims in support of an exclusive connection between a Puritan sentiment and a pro-science attitude. However, some sources can be

read as more in line with Merton's thesis than Brooke acknowledged. Puritans did stress that the emphasis should always be primarily on spiritual fruits and salvation from sin through God's work rather than by engaging in science. Some of the discussion here, however, strongly suggests that Puritans saw this as compatible with scientific practice and therefore did not see their theological conceptions as impeding scientific practice. This point is underappreciated by Brooke (and Shapiro).

Replicating Brooke's discussion on traces of Puritan motivations in writings of science enthusiasts also highlights how interpretations can diverge. Some of the sources can be read as supporting the Merton thesis, and others may count as evidence against it to some extent. How sources are interpreted seems to depend partly on background information and partly on how the sources are used in the overall argument.

Conclusion

We have presented the results of a direct replication of Brooke's discussion of the Merton thesis. Our conclusions depart somewhat from Brooke's original conclusions and therefore cast some minor doubt on the validity (but not the quality) of Brooke's study. We note that Brooke's version of the Merton thesis deviates slightly from Merton's original thesis. This may raise some worries about Brooke's original study, but we argue that these are fairly minor. In some interpretations of sources used by Brooke, we found reason to draw different conclusions. While this may cast some doubt on the reliability of Brooke's original study, it did not raise significant worries. Only in the study of the ratios of membership in the Royal Society did our interpretation of the sources used differ considerably from Brooke's. Differences in interpretation may also stem from focusing on different theses. While Brooke seems to mainly assess the claim that Puritans were more engaged in science simpliciter, conclusions differ with regard to whether Puritans were more engaged in applied science.

The differences in the general conclusion also follow from the analysis of new sources. Analysis of these mitigates Brooke's (and others') claims that Puritanism provided theological stumbling blocks for the acceptance of or engagement in (applied) science.

The present direct replication study highlights the need for replication in the humanities more generally. Replication can point to different possible ways of interpreting secondary sources. Incorporating new sources while employing a similar research protocol can also lead to different conclusions. The case study also lays bare some difficulties in replicating historical studies. Much of the key information required for any replication, like hypothesis, methods, and research protocol used, are not clearly stated and sometimes tacit in historiographical studies. Replication therefore requires a detailed attempt to reconstruct the steps

performed in the original study. A second issue concerns the interpretation of sources. Unlike data in other disciplines, historical sources are often not univocal (though certainly not always) and allow for multiple interpretations. While Puritan writings may be interpreted as supporting the Merton thesis, a different reading can provide support against it. Careful deliberation on what interpretations are warranted is therefore needed in replicating historiographical studies.

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Notes

[1] Brooke's discussion is found in the third chapter of *Science and Religion: Some Historical Perspectives* (Brooke [1991] 2014: 110–58).

[2] The current replication study was preregistered here: https://osf.io/xndwt. A related but conceptual replication (see the third article in this thematic section) was conducted in tandem by Rachel Pear, Gijsbert van den Brink, and Rik Peels, see: https://osf.io/j8n59 and the conceptual replication article in this thematic section.

[3] Such as, e.g., Charles Webster (2002).

[4] See, for example, Peter Harrison 2007.

[5] Brooke's discussion is found in the section "Protestantism and Practical Science" in chapter three (Brooke [1991] 2014, 147–57).

[6] Merton put his thesis forward in a number of publications. In this section, we focus on his later defense (Merton 1938) and a summary provided by Stevin Shapin (1988).

[7] While the movement was most dominant during that time, it has exerted an enduring influence on English and American religious life.

[8] It should be noted that Brooke was by no means the first scholar to argue that the relationship between science and religion was much more complex that often assumed (see, for example, Hooykaas 1987). See also the article on conceptual replication in this thematic section.

[9] The last criticism is also put forward by Ronald L. Numbers (2010).

[10] This point was suggested by an anonymous reviewer. The reviewer argues that the changed research question severely compromises Brooke's study and renders his arguments (largely) immaterial for the status of Merton's original thesis. We disagree, since values only have effects (on scientific activity) if they motivate actions.

[11] As mentioned, however, Brooke did add a bibliographical essay to the book where he lays out the sources he used (Brooke [1991] 2014: 475–42).

[12] Use of the phrase "mainline Anglican" is a bit anachronistic. The distinction between Puritans and Anglicans may be confusing, as people did not strongly identify as being part of a different group or denomination at the time. Nonetheless, both groups can be distinguished by the actions and points of view of their members.

[13] An obvious response could be that Puritans (especially hardline Puritans) frowned upon joining a royal society because it was supported by an institution they had spent years combating. Nonetheless, the presence of a considerable number of Puritans indicates the worth of checking the membership ratios.

[14] The remainder of the 165 were foreigners not in England during the English Civil Wars or individuals without sufficient documentation regarding their religious affiliation.

[15] The positive link between religious Latitudinarianism and science, rather than Puritanism and science, was first discussed by Barbara Shapiro (1968).
[16] Mulligan also presents an analysis of other, smaller scientific societies. She notes that these do not allow support for or against the Merton thesis because the proportion of religious affiliations was skewed due to the political context.
[17] Mulligan associates this view with Barbara Shapiro (1968).
[18] The reluctance of hardline Puritans to join a royally decreed institution after the Restoration may also have more obvious political explanations rather than them having ideas detrimental to science. However, barring themselves off from institutions like the Royal Society because of religious objections may also have formed a barrier against accepting science.
[19] A well-known example is the Anabaptist Munster rebellion of 1534–35.
[20] The motive of setting the image right was at work in some thinkers, like Robert Boyle (see Harrison 2007). It, however, remains the prerogative of God for most Christian churches.
[21] See, for example, 1 Samuel 14:15.

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Jewish Responses to Copernican Thought: A Conceptual Replication of John Hedley Brooke's Chapter on Scientific and Religious Reform

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This article explores how replication might work in the study of history through the presentation of a test case. Specifically, chapter 3 of historian John Hedley Brooke's seminal book *Science and Religion: Some Historical Perspectives* (1991) was chosen for this experiment by an interdisciplinary team, as it is a cornerstone study in the history of science and religion. This article details the "conceptual replication" undertaken, that is, a study in which the research protocol of the original study was modified while the main research question stayed the same. Brooke studied the responses of Protestants and Roman Catholics to Copernican thought to examine the widely held belief that those who had recently gone through the Protestant Reformation would be more open to the new astronomy than Catholics. Our conceptual replication investigates what historians have written about Jewish responses to Copernican thought and how these findings impact the question of the relationship between religious and scientific reform. The preliminary conclusion of this replication study is that historians of the Jewish responses to the new astronomy seem to support Brooke's view that such responses were determined by more than just theological or denominational considerations, since other factors (e.g., social ones) played a more constitutive role.

Introduction

This article describes the conceptual replication study we carried out of a chapter entitled "The Parallel between Scientific and Religious Reform" from John Hedley Brooke's seminal 1991 book *Science and Religion: Some Historical Perspectives*.[1] In his chapter, Brooke illustrates that historical sources do not necessarily support the assumption that Protestants were more open to the new sciences, such as Copernican thought, than Catholics. In our study, we draw from sources that have documented the Jewish engagement with Copernican thought. Because Brooke did not consider these sources in his original study, they lead to additional conclusions that may or may not corroborate his original findings.

The possibility and desirability of replication studies in the humanities is still being debated (e.g., Huijnen and Huistra 2022; Leonelli 2018; Peels 2019; Peels and Bouter 2018a, 2018b, 2018c; Peels, Bouter, and Van Woudenberg 2019; Penders, Bart, Holbrook, and de Rijcke 2019, Holbrook, Penders, and de Rijcke 2019). We recognize the challenges of applying replication studies to a thoroughly hermeneutical discipline like history (cf. especially Huijnen and Huistra 2022).[2] Yet, we argue that the proof of the pudding is in the eating: let us see what happens when we actually try to replicate an important contemporary historical study. We shall see whether those who are intuitively skeptical about the possibility of replicating historical studies will agree that doing so makes sense. We consider this effort a pilot study in the contentious field of replication in the humanities, with a focus on history. As part of our assessment of whether replication is relevant to the study of history—and, if so, how replication studies should be conceived and executed and how they might move the field forward—it is helpful to actually execute a replication study and see what issues emerge in the process. This article presents the replication study. Further reflection on what its results mean for replication in historiography and the humanities more generally is provided in the article entitled "Replication in the Humanities in Action: Reflections on a Direct and a Conceptual Replication in the History of Science and Religion" in this thematic section.

This article is structured as follows: first, we outline Brooke's original chapter and the approach we took in attempting its replication. As this entire process was experimental, we then review some of the issues we encountered. Lastly, we describe our findings and draw some conclusions.

The Original Study and the Set-up of this Replication Study

Brooke's 1991 book is known for catalyzing what has been called the "complexity thesis." This perspective on the interaction between science and religion contends that overarching, unidimensional paradigms of conflict, separation, or harmony are not borne out by detailed historical analyses (Numbers 1992). Brooke was by no means the only one to criticize such unidimensional paradigms, nor was

he the first to do so (for example, decades earlier the Dutch science historian Reijer Hooykaas complexified simple conflict stories, e.g., in Hooykaas (1959, 1972)). Yet, the new label "complexity thesis" caused debate in the field.[3] It was discussed whether this is indeed a thesis, a methodological principle, or just an observation serving as the starting point for further work (thus Cohen 2016, 396). It also has been argued that while it is misguided to see conflict or harmony at work everywhere and at all times, it is still helpful to point at mid-scale patterns such as privatization, secularization, globalization, and radicalization in science-religion relationships. This discussion is still ongoing and indeed forms a "lively debate" (Lightman 2019, 16).

Here, however, we relate John Brooke's explanation of the issue:

> Serious scholarship in the history of science has revealed so extraordinarily rich and complex a relationship between science and religion in the past that general theses are difficult to sustain. The real lesson turns out to be complexity . . . Conflicts allegedly about science and religion may turn out to be between rival scientific interests, or conversely between rival theological factions. Issues of political power, social prestige and intellectual authority have repeatedly been at stake . . . The purpose of this book . . . is to display the diversity, the subtlety, and ingenuity of the methods employed, both by apologists for science and for religion, as they have wrestled with the fundamental questions concerning their relationship with nature and with God. (Brooke 1991, 5)

Now, let us make clear right from the start that we will not attempt to replicate this overall thesis of Brooke's book.[4] That would be far too wide-ranging and—if we may use this word once more —complex for a pilot study like this. Instead, we focus on the much more detailed but still relevant historical issue discussed in the third chapter of *Science and Religion: Some Historical Perspectives*. Here, Brooke questions the connections that have been made between the so-called scientific revolution and the Protestant Reformation(s).[5] These fall on a spectrum: at one extreme is the idea that "specific Protestant doctrines gave a direct and positive stimulus to scientific research" (Brooke 1991, 83); at the other is the suggestion that Protestantism was simply less obstructive than Catholicism (Brooke 1991, 83). Brooke proposes using responses to the Copernican heliocentric cosmology as a test case to compare receptivity to new scientific theories between Protestants and Catholics. "The results of the test are instructive, but as much for the complications they reveal as for any neat conclusion" (Brooke 1991, 83). The findings Brooke (1991, 89) suggests are threefold: "First, there are too many complications to allow the conclusion that individuals were more or less likely to be receptive [to Copernican thought] according to whether they were Protestant or Catholic. Second, if they were sympathetic, they were more likely to enjoy freedom in publicizing their

science if they were Protestants. Third, the fortunes of the new cosmology were more deeply affected by the antagonism *between* Catholic and Reformed Christianity than by the doctrinal peculiarities of either. In this there was an indirect effect of religion on science."[6]

In keeping with the definition of conceptual replications we discussed in the introductory article of this thematic section, our approach in this replication study was as follows:

1. We kept the same research question as the original study, that is: Are there indications that there was less openness to Copernican thought and the new astronomy among those who did not undergo the Protestant Reformation (in the original study this referred to Catholics, in the conceptual replication, we refer to Jews)?
2. We slightly modified the research protocol by looking at responses from a non-Christian (i.e., Jewish) religion to Copernican thought; thereby, we looked at new data, in this case, analyses of Jewish responses to Copernican thought.[7]

While the research question remained the same as that of the original study (point 1 above), for the implementation of the conceptual replication, we broke up the larger question regarding the connection between religious and scientific reform in the Jewish case into two subquestions. That is, do the Jewish responses to Copernican thought documented by historians corroborate Brooke's findings regarding:

1. the qualification of the link previously drawn between Protestants and greater openness to novel scientific ideas, and
2. the contention that social factors combine with theological ones in unexpected ways to be of primary importance in understanding the role of religion in the advancement of modern science?

We answered these two questions by examining recent historical scholarship on Jewish responses to Copernican thought. Additionally, we scheduled in-person meetings with historians and experts in two formats. First, we established an advisory committee made up of experts who could offer insights on both the direct and conceptual replications. We invited the author of the original study, John Hedley Brooke, to join the committee, and his involvement proved extremely helpful.[8] We also involved other historians and the philosopher James Holbrook, who has articulated concerns about replication in the humanities and its effect on public policy (Holbrook, Penders, and de Rijcke 2019; Penders, Bart, Holbrook, and de Rijcke 2019). The advisory board gave feedback on both this conceptual replication and a parallel direct replication, led by Hans Van Eyghen (see the article titled "A Direct Replication of John Hedley

Brooke's Chapter on Scientific and Religious Reform" in this thematic section), in which only Protestant and Catholic sources were (re-)examined.[9] Second, we met with additional experts not on the advisory committee for one-on-one consultations.[10] In line with other replication studies, we preregistered the conceptual replication with the Open Science Foundation in order to chart the way the project developed throughout its implementation.[11]

Methods and Sources

Before presenting our findings, we address some methodological challenges that emerged as we worked on the project. For instance, the second subquestion regarding social factors being of primary importance in understanding the impact of religion on the advancement of modern science raised some queries as we proceeded. Specifically, Brooke's work in 1991 pushed back against trends that assumed a theologically driven approach that focused on denominational affiliation while ignoring other factors.[12] While at the time this hard work was needed and novel, the impact of Brooke and his like-minded contemporaries was so great that what they fought hard for thirty years ago is now somewhat taken for granted. Indeed, in our review of historians' writings on Jewish responses to Copernicus, there was ready agreement with Brooke and an overt bemoaning of previous trends.[13]

For example, Jeremy Brown (2013, 105) clearly points to social rather than theological factors to explain the Jewish reception of Copernican thought: "The Jewish reception of Copernicanism was in essence a local reaction, molded by local factors and personalities. Jews elsewhere might therefore be expected to develop their own approaches to the validity of Copernicanism." Similarly, David B. Ruderman (1995, 68) draws parallels between the ways in which Jews, Protestants, and Catholics responded to the challenges of the new sciences: "Jewish discussion about demarcating spheres of physics and metaphysics . . . reflected an emerging consensus of Protestant (and Catholic) thinkers about the appropriate structural relationship between scientific learning and Christian faith in the early modern era." And, in a summative fashion, Noah Efron (2009) wrote: "Although they disagree about the nuances, today almost all historians agree that Christianity (Catholicism as well as Protestantism) moved many early modern intellectuals to study science systematically." Would these assessments that downplay denominational differences be important corroborations of Brooke's findings, or are complex social understandings of the history of science and religion already so widely assumed that the finding would be trivial? These factors pointed us to the importance of considering the development of a discipline in the implementation of replication studies.

Another challenge was assessing which Jewish sources could be considered as parallel to the Christian ones analyzed in Brooke's chapter. Which chronological periods and geographical areas should be included and which not? While Brooke included the views of both religious leaders as well as men of science

(as far as these were distinct categories), all of these individuals would have received a university education; however, this would not necessarily be the case for the authors of Jewish sources in this period. Should only the views of Jewish doctors who had the opportunity to study at university be included in the replication and not those of rabbis without the same educational background?[14] After consideration, we focused on five of the first Jewish engagements with Copernican thought. The five figures are: Judah Loew (~1512–1609), David Gans (1541–1613), Joseph Solomon Delmedigo (1591–1655), Tuviah Cohen (1652–1729), and David Nieto (1654–1728).[15] Although supplemented by additional sources, the three main books that served as key sources for this decision and the project generally were David B. Ruderman's 1995 *Jewish Thought and Scientific Discovery in Early Modern Europe*, Noah Efron's 2007 *Judaism and Science: A Historical Introduction*, and Jeremy Brown's 2013 *New Heavens and a New Earth*, which are central historical texts on the subject.

Ruderman's text is considered foundational in that it lays "the groundwork for a comparative history of Jewish and Christian attitudes towards and participation in the 'new sciences'" (Efron 1997, 720). Ruderman begins by documenting the changes in historiography that led to the recognition of the importance of the early modern period in Jewish history and positioning his work as initiating further movement in this direction.[16] Ruderman (1995, 10) argues that in the early modern period "an important ingredient of the changing culture was an acute awareness of and positive attitude towards contemporaneous medical and scientific discoveries." He cites a number of changing conditions that contributed to the involvement of Jews in science, including "the growing prominence of science and technology in the political culture of western Europe; the revolutionary impact of print . . . ; the unprecedented entrance of large numbers of Jews into university medical schools, first in Italy and eventually in the rest of Europe; the integration of a highly educated and scientifically sophisticated converso population [Jews who had been forced to convert to Christianity in Spain and Portugal and later returned to their ancestral Judaism] into Jewish communities in western and to a lesser extent, eastern Europe" (Ruderman 1995, 10–11).

Thus, Ruderman (1995, 12) explains that Jewish engagement with science "constantly intersects" with other social and cultural dimensions, some of which are unique to the Jewish experience, including antisemitism, the impact of conversos having to leave and then rejoin communal Jewish life, and later Sabbatian messianism.[17] Other social and cultural aspects in the analyses overlap with those confronted by Christian responses. Still, Jews in this period remained "consumers" of science, as physicians and popularizers, not "producers" of science like their Christian contemporaries, primarily due to lack of access (Ruderman 1995, 372). One consequence of this seems to have been that the debate on the realist versus instrumentalist interpretation of Copernicanism was less pronounced in Jewish circles than it was among Christian astronomers.[18]

While Efron's book is broader in scope than Ruderman's, with only a few chapters relating to the early modern period, Brown's book, on the other hand, is focused on Jewish responses to Copernican thought (rather than science more generally) over a period of some five hundred years, and he provides more quotations of primary sources. With this brief introduction to some of the dilemmas confronted and the decisions made regarding the main sources utilized, let us now move to the five historical figures and their views.

Results and Discussion

We now review the views of five sixteenth and seventeenth century Jewish authors on Copernicanism as analyzed by the three historians mentioned earilier.

Judah Loew

Although the first known direct mention of Copernicus in Jewish literature was by David Gans in approximately 1612, most historians begin their analysis with one of Gans's teachers, Rabbi Judah Loew, who refers to Copernicus indirectly in 1595. Specifically, in his book *Nitivot Olam* (*The Paths of the Worlds*), Loew, often known by the acronym the Maharal (which stands for "our teacher Rabbi Loew") of Prague, wrote: "A certain person known as an expert in the New Astronomy has a new description [of the universe]. As a result, he overturned the understanding that prior [astronomers] had about the motion of the stars and constellations and the heavenly laws, and described an entirely new model, although he admits that there still remain some questions that he cannot resolve" (Brown 2013, 48). According to Brown (2013, 49), "the first allusion to Copernicus in Jewish literature . . . did not actually discuss the content of the heliocentric model. Instead, Copernicus was an example of scientific uncertainty." However, this reference also could be said to illustrate a certain amount of openness.

In another work, the Maharal wrote: "It is not even appropriate to call the entire enterprise of astronomy a science. The accolade of a science is only fitting concerning a well-understood subject. You will certainly not find in their [i.e., the astronomers'] "science" even a single person who understands the subject as it truly is, and what difference is there between a great lie and a smaller lie? The truth can never really be known . . . the wise Gentiles only know the time of the orbits of the Sun, the Moon and the planets, but have no deep explanation of these phenomenon" (Brown 2013, 309n71; referenced in Efron 2007 with a slightly different translation).[19]

Despite this seemingly negative attitude towards the new astronomy of the day, Ruderman emphasizes the important positive role the Maharal played in creating a space for scientific inquiry. In this interpretation, the Maharal emphasized the hypothetical nature of science and its separation from two kinds of metaphysics: Aristotelian, which he dismissed, and Torah, which he embraced.[20] This separationist approach is thought to have lowered the stakes for engaging in science and thereby enabled the pursuit of science

by Jews. Efron stresses the difference between the Maharal's separation and demotion of natural philosophy and the approach of his Polish contemporary Rabbi Moses Isserles (1530–72), who was another teacher of Gans. Isserles integrated and elevated natural philosophy, in his case a traditional Ptolemaic and Aristotelian perspective on the structure of the universe, in his theological works.[21] This made it harder to break away from Ptolemaic cosmology.

David Gans

David Gans, sometimes known by the title of his historical work *Tzemach David* (*Offshoot of David*), was a popularizer of ideas from the liberal arts, especially natural philosophy, in Hebrew. While Gans was a student of both Isserles and the Maharal, his work was groundbreaking in terms of his focus and "systematic and unique presentation," arguing for the inclusion of up-to-date astronomical study in the "Jewish curriculum" (Ruderman 1995, 84). In Gans's discussion of Copernicus, there is not an endorsement, but certainly praise. In his history of astronomy *Nechmad Vena'im* (*Delightful and Pleasant*),[22] Gans wrote: "Nicholas Copernicus, a Prussian, was a very learned man, whose fame in astronomy surpassed all his contemporaries. Even today's wise men unanimously admire his sharp intellect and profound understanding of astronomy, and have said that there has not been an astronomer like him since Ptolemy. He has delved deeply into this science, and using his sharp mind has set his heart on proving that the earth rotates in perpetual orbit" (Brown 2013, 52).

Gans took part in astronomical observations in Prague and was personally acquainted with Johannes Kepler and Tycho Brahe. Brahe even asked Gans to translate old Hebrew astronomical tables and was "enthusiastic to discover that the rabbinic cosmology described in the Talmud tractate *Pesachim* seemed to confirm his own theories" (Efron 2007, 123). In this way, according to Efron, Brahe and Gans were united in their understanding of astronomy as reclaiming a *Prisca Sapientia,* a "First Wisdom" of the workings of the world that had, according to legend, been known to the ancients (especially the Jews) and then lost.[23] In this telling, "reclaiming" lost wisdom in the embrace of newer models of the heavens was not revolutionary but rather a return to an older and more accurate Jewish description of reality. In his work, Gans compliments the models of Ptolemy, Copernicus, and Tycho, and some historians (e.g., Efron) believe that he does not adjudicate between them, while others (e.g., Brown) contend that he seems to endorse Tycho's view, perhaps in part due to their personal relationship.[24] Still, Gans is considered unique for his experiences with great astronomers of the day and his writing on astronomy in Hebrew for a Jewish public. Lastly, Efron (2007, 124) points out that the spirit in Prague experienced by Gans that allowed him to take part in astronomical observations was short lived, "and by the start of the Thirty Years' War, after the death of (Emperor) Rudolf [II], after the replanting of the Hapsburg [Habsburg] court in Vienna, it had all but vanished."

Joseph Delmedigo

At the beginning of the seventeenth century, Italy's universities offered opportunities to a small number of Jews who began graduating from Padua's renowned medical school. Ruderman (1995, 104) and others have shown how Padua in particular was "a major vehicle for the diffusion of . . . scientific culture . . . within the pre-emancipatory Jewish communities of Europe." This fraternity of physicians, amounting to hundreds of graduates over two centuries, could be considered a "scientific society" (Ruderman 1995, 115),[25] and the next three Jews whose views on Copernican thought we discuss—Delmedigo, Cohen, and Nieto—all graduated from Padua.[26]

Joseph Delmedigo is known for endorsing the Copernican system for the first time in Hebrew literature. He is sometimes referred to as the YaShaR, an acronym for his name and profession—Yoseph Shlomo, the doctor (*rofeh* in Hebrew)—which also means the "straight one." Delmedigo was born and raised in Crete before embarking on his many travels. After an intensive Jewish education in his early years, at age fifteen (around 1606) Delmedigo began studying in Padua, where one of his instructors was Galileo. It is not clear, however, whether Galileo was already teaching heliocentrism at that time (Efron 2007, 127).[27] After working throughout much of Europe as a physician, Delmedigo arrived in Amsterdam around 1629, where he became the *haham* (rabbi) of the congregation Bet Israel (Efron 2007, 128–29). Menasseh ben Israel, who was among the first in Amsterdam to own a Hebrew printing press, agreed to publish Delmedigo's 1629 book *Sefer Elim* [*Book of Palms*]. This book was structured as a series of questions from a Karaite friend[28] and Delmedigo's responses.

Delmedigo wrote that "according to Copernicus the orbit of the planets is easily grasped . . . there is no need to bend the facts in order to fit in with Aristotelian theory; rather, the theory should fit the facts if we want the theory to be true" (Brown 2013, 75). In apprising this endorsement, Brown (2013, 75) states that: "In order to better appreciate just how improbable was Delmedigo's Copernicanism [in 1629], we should remind ourselves . . . it was not until 1634 that the first full-fledged Copernican to hold a Dutch chair was appointed." Ruderman has worked to show that Delmedigo was "a less isolated figure" than earlier historians had portrayed, given "his proclivity to integrate kabbalah, Neoplatonism, magic and science" (Ruderman 1995, 133). Rather, Ruderman, Efron, and Brown emphasize Delmedigo's acceptance within traditional Jewish communities, illustrated for instance in the approbations for *Elim* by leading rabbis (e.g., Ruderman 1995, 133, and chapter 4 more generally).[29]

Tobias (Tuviah) Cohen

However, Delmedigo's endorsement was not a turning point in the Jewish reception of Copernican thought, as linear progressive assumptions regarding the reception of science might prompt one to expect. Within eighty years of

Delmedigo's work, Tobias (Tuviah in Hebrew) Cohen, in his groundbreaking *Maaseh Tuvia* (Venice, 1708)—a complex medical encyclopedia written in Hebrew—seems to have authored the first explicit condemnation of Copernicus in Jewish literature. Son of the rabbi of Metz, who died young, Cohen experienced "poverty, displacement and war" while growing up in Poland and endured intense antisemitism when he began his medical education in Frankfurt before transferring to Padua (Efron 2007, 132–33). Efron stresses that while Cohen traveled widely as a physician, he did not share Delmedigo's feeling of being a part of the "European Republic of Letters that transcended confession" (Efron 2007, 132). Cohen's work aimed to elevate Jews' position in society by familiarizing them with "the new medicine that rests in the bosom of the physicians of our day" (Efron 2007, 132). Cohen wrote a manual that was intended to "help Jews demonstrate to Christians that they were not innocent of natural wisdom, and neither was their intellectual legacy, the Jewish tradition" (Efron 2007, 134). Ruderman contrasts Cohen's book with another popular medical text written just twenty years earlier by Jacob Zahalon, which relies solely on classical sources such as Galen, Hippocrates, and Aristotle and presents traditional knowledge as certain. Cohen's book, by contrast, "reveals a mental universe fraught with controversy, ambiguity and uncertainty" and introduced new discoveries, such as William Harvey's understanding of blood circulation (Ruderman 1995, 232–45).[30]

Despite his passion for the new sciences, however, Cohen "was fully aware of the potential dangers of pantheism or materialism [they] brought" (Ruderman 1995, 239), and he may well have associated Copernicanism with the danger of deviation from the Torah.[31] Indeed, Cohen may be best known for describing Copernicus as the "First born of Satan" in a chapter heading.[32] Still, according to Ruderman, "Tobias is expansive enough to present both sides of the argument," and "there is no doubt that he is impressed by the refreshingly consistent and utterly simple arguments of Copernicus against the Ptolemaic universe" (Ruderman 1995, 240). While Ruderman considers Cohen's defense of a traditional perspective tepid, Cohen still makes some strong statements against the Copernican view, for instance, that "every godly philosopher should certainly oppose Copernicus and those who follow him, for all the proofs that he and his supporters bring against the words of Holy Scriptures and the true prophets. It is stated in Ecclesiastes 'and the earth stands forever' (1:4) yet Copernicus believes it does not stand at all!" (Brown 2013, 93). Therefore, while Cohen is known for presenting the first illustration of the heliocentric model in Hebrew, and for describing it with care (Berger 1997), he is most well known for rejecting it.[33]

A recent analysis of Cohen's writings by Ahuvia Goren (2022) emphasizes Cohen's promotion of a cosmological model put forward by the Jesuit priest Giovanni Battista Riccioli (1598–1671).[34] This view strengthens the perspective articulated by Efron and Ruderman that Cohen was not a "head-in-the-sand fundamentalist, who rejected new information as a matter of custom and

principle" (Efron 2007, 134). The endorsement of one of the "in-between" positions available in the intellectual environment at the time could have suited Cohen and his project very well. As "Tobias believed that a knowledge of contemporary science could profitably be employed to bolster and rehabilitate Jewish culture in an age of intellectual and religious turmoil exacerbated by frenetic messianic enthusiasm" (Ruderman 1995, 244), his rejection of the Copernican model, and even his labeling it as heresy, should not be taken as a rejection of the new sciences.[35] Rather, Ruderman concludes that Cohen's presentation of chemical medicine and more shows that he "had fully imbibed the . . . scientific spirit of his age" (Ruderman 1995, 255).

David Nieto

The last person whose views we explore is David Nieto, one of the cadre of Italian rabbi-physicians. Nieto moved to England in 1701 to serve the Jewish Spanish and Portuguese community in London, including many conversos, at the new Bevis Marks synagogue.[36] Ruderman (1995, 311) works to contextualize Nieto's thought on both Jewish historiography and English political and cultural historical scholarship (chapter 11) and argues that Nieto, "one of the most original minds of eighteenth-century Jewry." was very much a part of the British milieu of Anglican proponents of the new science surrounding him in the first decades of the eighteenth century.[37] Ruderman (1995, 312) argues that "particularly in England . . . ideas about the natural world often bore a direct relation to the way people understood the social and moral order." For example, mechanical philosophies of nature, such as those put forward by Thomas Hobbes, René Descartes, and Baruch Spinoza, were linked with pantheistic materialism and radical democratization goals in tension not only with traditional Christian beliefs but also the maintenance of political stability (Ruderman 1995, 312). In this context, Ruderman suggests that Nieto's theological views generally bore striking similarities to those of his Christian contemporary Samuel Clarke, particularly as Clarke expressed them in his Boyle lectures of 1704 and 1705. "Nieto quickly learned," Ruderman (1995, 316) argues, "that Judaism could survive within English Jewish society only by both demonstrating the constant political loyalty of Jewish immigrants to the Crown and to the leadership elite and by appropriating the conceptual language and ideological underpinnings of its religious establishment." Goren, on the other hand, emphasizes Nieto's work as reflective of the Italian context, as he was the son of the rabbi of Livorno and educated at Padua, and contends that Nieto's "in-between" views were likely similar to Cohen's, non-Copernican but not Ptolemaic either.[38]

Nieto's longest work, *Mateh DaN* (1714; Spanish and Hebrew)[39] is a defense of traditional Judaism "couched in the language of science" (Ruderman 1995, 323). While Nieto is open to the possibility of a plurality of worlds, regarding Copernican thought he is skeptical and does not allow the heliocentric model to overrule scripture:

> *Haver* [lit. *Friend*]: The models of the astronomers are certainly founded on good reasoning, but we cannot accept their proposition that the Sun does not move. For in the book of Joshua it is written, "Sun, stand still in Givon," . . . This clearly proves that the Sun orbits [the Earth] like the other planets. Even those who hold this [Copernican] model struggle in vain to address this problem. Their solutions have not proven persuasive, and their model must be rejected and removed from the camp of God.
> *King*: But pray tell, how do they answer this objection?
> *Haver*: They claim that the prophet used this language so that the ordinary person could understand it, for [ordinary people] believe that the Sun moves and that the Earth is motionless.
> *King*: This answer has no value. Therefore I must agree with you that this model is "abominable and cannot be accepted." (Brown 2013, 109–10)[40]

Nieto later returns to heliocentrism in what is thought to be a more sympathetic manner:

> *Haver*: . . . there is evidence to support both [the Copernican and Ptolemaic models], such that it remains impossible to prove which of them is correct. It appears to us that the Sun orbits the stationary Earth, and this is the view of Ptolemy and others. But those who believe that the Sun is stationary at the center of the [orbit of the] planets will state that appearances prove nothing . . .
> *King*: Either opinion may be correct. I see that we remain completely undecided, as you have said, and there is no way to determine which of the two is correct. (Brown 2013, 109)

A third comment in Nieto's book is perhaps the most ambiguous of all:

> *King*: In my opinion, the models of Ptolemy and Copernicus appear more accurate than that of the sages; and if I had to pick just one I would choose the Copernican model . . . since the Copernican model does away with [epicycles and eccentricities] I prefer it, other than that it makes the Sun motionless, [which must be rejected] for the reasons stated earlier. (Brown 2013, 111)

As with Cohen, historians do not see Nieto's theological rejection of Copernican thought as a rejection of the new sciences. Why Nieto felt he needed to make this particular move could use further explication, but he may represent the end of those educated at Italian universities who did not endorse a heliocentric view.

Conclusion and Afterthoughts

We conclude that Jewish responses to Copernican thought did not follow a linear path, and historians have emphasized how these responses must be understood

in their various contexts. Ruderman and others have pointed to the significance of the Maharal's recognition of new scientific approaches as part of an initiative to make metaphysical room for science separate from religion.[41] Gans's unique familiarity with eminent astronomers of the day and his presentation of Copernican thought was a significant and noteworthy next step. The embrace of the Copernican model by Delmedigo in 1629, however, did not usher in complete agreement by Jews who followed, like Tuvia Cohen and David Nieto, both of whom actively embraced the new sciences but not the heliocentric model.[42]

Let us return to our two subquestions. First, does the spectrum of views canvassed illustrate an openness to Copernican thought among Jews in this period parallel to those found among Protestants and Catholics by Brooke? Or does this question itself pose the danger of exploring issues from an anachronistic or Christian-centered vantage point that does not capture the issues as they were perceived at the time or by the community being studied (cf. Efron 2010)? Brooke is credited as one of the historians who sought to prevent this type of imposition from the present to the past or from one community onto another community. Yet, without violating what he and others strove to promote, it can be illustrated that Jews did show an openness to scientific reform without having undergone a religious reformation. Some of the issues Jews faced were similar to those faced by Christians, such as the exegesis of critical texts from the Hebrew Bible/Old Testament and the integration of Aristotelian philosophy into earlier revered theological works that then needed intense critique. At the same time, other issues were clearly different, for instance in terms of how science related to their self-perception and inclusion in society, such as when Cohen urged Jews to appreciate their heritage to raise their self-image.

The second subquestion introduced in this article regarding a locked theological determinism that has been rejected for a broader examination of factors—especially social ones—seems easier to answer in a straightforward way, although it may well be less significant, and even perhaps trivial, as mentioned earlier. As shown, all historians surveyed after Andre Neher's 1977 article (e.g., Panitz 1988; Ruderman 1995; Brown 2013) follow the "social turn," and some explicitly criticize previous locked positions—positive or negative—regarding Judaism and science (e.g., of Leo Baeck by Michael Panitz and of Amos Funkenstein and Isaac Barzilay by Ruderman). This perspective has come along with the additional acknowledgement that theological shifts within a particular religion often affect other traditions.[43] Additionally, there has been a focus on such factors as Jewish-Christian relations, for instance by Efron, who emphasizes the connection achieved by some Jews and Christians through the study of nature and science in some moments and spaces. An example is David Gans and Tycho Brahe in Prague and their mutual interest in *Prisca Sapientia*.

Thus, the research on Jewish responses to Copernicanism provides additional evidence for Brooke's thesis regarding the relations between religious and

scientific reform and corroborates the complexity he pointed to regarding the interaction of social, cultural, and religious/theological factors.

These findings raise a number of complications as well as possibilities for further investigation. First, they raise the issue of how conceptual replications differ from comparative studies, which take place in the field of historiography all the time. We have pointed to the strict formulation of replication studies, beginning with a preregistration and following one original source in particular, but this differentiation needs further elaboration.[44] Second, there is the issue of assessing the initial study itself in its historiographical context. Third, our findings point to the need for further mapping of the various schools and perspectives within particular disciplines like history and what challenges and opportunities are posed when considering replication from each of these individual perspectives, as well as if there are some points that can be agreed upon between schools.

In conversation with historians, we noticed that the topic of replication in the humanities often sounded strange, foreign, and perhaps even threatening to them.[45] We realized that we felt drawn to a position as mediators or facilitators of dialogue in asking historians to put aside preconceived notions and associations with replications as imposed from the outside and try to consider what replication could mean from within the discipline. Some historians expressed a particular interest in maintaining a conversation with previous scholars but did not find the position of what they called "evaluating" earlier work a relevant model. Other historians gladly welcomed replications of various kinds—reproductions, direct replications, and conceptual replications—as means of reflecting on methods, transparency, reliability, and validity in historiography.

For these reasons, we strongly recommend a deliberative, inclusive model for continuing replication research as questions regarding replications in the humanities progress. When bringing diverse fields into greater contact, there is an opportunity for the articulation of tacit knowledge, but there needs to be a real openness to listening and responding across disciplinary boundaries to see if a meeting of interests is possible. Many are concerned about not only whether there will be a diversified (that is, non-monolithic) view of replications but also whether replications will be used to marginalize or promote specific forms of knowledge in the humanities, and whether replications will be mandatory and imposed or exploratory and used on a discretionary basis. While it is exciting to be at the crossroads of the present and the past as well as the theoretical and the practical, it is a daunting task to make sure all historians' questions regarding replications are taken seriously. It is our hope that this initial exploration can be of help in parsing the issues that need further attention in future considerations of replications in history, in a manner that values arguments from all angles and is open to learning through experimentation.[46]

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Notes

[1] This study was part of a larger project, Epistemic Progress in the University, at the Vrije Universiteit Amsterdam. For a description of the project, see https://www.abrahamkuypercenter.nl/portfolio/epistemic-progress-in-the-university-2020-2023/.

[2] Interestingly, this concern is sometimes accompanied by another that is contradictory to it, viz. that historians have in fact always replicated each other's work, e.g., by testing the reliability of used sources and the consistency and cogency of developed arguments, sometimes finding either of these wanting (a famous case in science and religion is Reijer Hooykaas 1956; cf. van den Brink 2009, 217–19). If it is true that historians have always been engaged in doublechecking each other's work, we would like to suggest that it is reasonable to do so in the very deliberate, transparent, and well-structured way replication studies aim to. For more on this, see our introduction and the article "Replication in the Humanities in Action: Reflections on a Direct and a Conceptual Replication in the History of Science and Religion" in this thematic section.

[3] See a recent edited volume (Lightman 2019), including an afterword by Brooke, for an analysis and survey of how thirty years of investigations inform current assessments. Noah Efron (2010) argues that what we must recognize in Brooke's approach is "moral complexity," a striving to understand historical actors rather than judge them based on prejudices and orthodoxies, and not "narrative complexity" for its own sake; see also Brooke's (2014) own autobiographical reflections, in which he cites Efron.

[4] Therefore, any flaws to be found (according to the reader) in the other chapters of the book will not be spotted in this replication study.

[5] In contemporary historical scholarship, it is sometimes argued that we cannot speak of one "Protestant Reformation" since there was in fact a plurality of such reformations in the sixteenth century; we note this point here but are not dogmatic in avoiding the singular.

[6] For example, in response to Protestant claims that the Bible should speak for itself, the Council of Trent decreed in 1546 that it is forbidden to read the scriptures "contrary to the unanimous consensus of the Fathers." As a matter of fact, (one could almost say: by coincidence) this consensus included a geostatic cosmology.

[7] As mentioned in our introduction to this thematic section, we agree that the boundary between a conceptual replication study and a comparative study is vague and calls for further investigation. The differences we have identified include the preregistration used in a replication study, the focus on laying out the methodology in a well-ordered way and the emphasis on being as transparent as possible.

[8] While the Dutch Research Council (NWO) initially insisted on avoiding close contact with the original investigators of replication studies they sponsored, they have now abandoned this position.

[9] The larger research project involves a third replication (both a reproduction and a conceptual replication) of the attribution of a painting whose authorship is contested to Rembrandt; this study has a different advisory committee with art historians and relevant experts. For additional information, see Charlotte Rulkens et al. (2022). We have left this other replication out of this thematic section since it differs from the replication studies at hand in that it also uses a variety of methods commonly used in the natural sciences, such as scanning macro X-ray fluorescence.

[10] Through one of these individual meetings, we learned about an advanced graduate student, Ahuvia Goren, who is completing his PhD on Jewish receptions of Copernicus and the new science and currently producing significant material for this study (e.g., Goren 2022). Unfortunately, Goren is not yet able to share all of his research; we plan on following his progress for updates.

[11] The preregistration of the conceptual replication can be found at https://osf.io/j8n59. See the article entitled "Replication in the Humanities in Action: Reflections on a Direct and a Conceptual Replicationin the History of Science and Religion" in this thematic section for a discussion of some of the challenges encountered in the process of preregistering the project. For the preregistration of the direct replication, see https://osf.io/xndwt.

[12] In this context, "theologically determinist" refers to approaches according to which people's stance towards the new sciences was fully determined by their confessional/denominational beliefs. See van den Brink (2015) for further analysis of the difference between approaches that apologetically favor a specific religious tradition by making "facile generalizations" and using "mono-causal interpretations" as opposed to more nuanced approaches that connect theological content to other (e.g., social) factors. These latter approaches stay clear of triumphalism regarding a specific religious perspective.

[13] In the scholarship of Jewish responses to Copernican thought, two strains of previously deterministic, essentializing writing are critiqued. On the one hand, Jeremy Brown criticizes Andre Neher (1977) for his unfounded view that Jewish thinkers were necessarily more open to science than Christians, and Michael Panitz (1988) makes a similar claim regarding Leo Baeck. On the other hand, David B. Ruderman (1995) critiques previous readings by Isaac Barzilay and Amos Funkenstein, also discussed by Goren (2022), for their unfounded assumption that more devout Jewish approaches would be more closed to the new science.

[14] We would like to thank Ahuvia Goren for bringing this important point, which was then also brought up by others, to our attention. Goren contends that geography and education are central here, that students' views were very much reflective of the education they received, for instance at Padua (Goren, personal communication, 2022, and in press).

[15] We chose these figures as they are well documented in the scholarship. A difference from the Christian material is that most of these authors were writing as individuals rather than as representatives of institutions such as churches, universities, etc. (Goren, personal communication, 2022). As we will discuss, the "progress" the reception of Copernican thought finds in the Jewish writings is perhaps counterintuitive, in that some of the early figures seem more open to an embrace while some later ones were closer to a rejection of Copernican thought.

[16] Ruderman (1995, 6) wrote that earlier historians saw this period as one of "heightened hostility to Jews, expulsions, and political, economic, and cultural dislocation and decline" that was responded

to with mysticism, messianism, and a turning inwards after engagement in the Renaissance. His focus on the growing interest in science during this period, therefore, comes to qualify these perspectives and fill a lacuna.

[17] Sabbatai Zevi (1626–76), a rabbi and Kabbalist who was proclaimed to be the Jewish Messiah in 1666, attracted many followers worldwide and unsurprisingly became a very divisive figure in Jewish life.

[18] See Noah Efron and Menachem Fisch (2001; this point was also confirmed in personal communication with Efron in late April 2023). In general, historians at our June 2023 Amsterdam workshop stressed the importance of not imposing the contours of the debate from other contexts onto the Jewish discussions. Therefore, while the change in status of the heliocentric hypothesis over the period covered (that is, its realist interpretation gradually becoming predominant) is crucial to recognize as a backdrop, its significance bears differently on authors depending on their societal positionality and the knowledge that was available to them. In general, "consumers" of science like rabbis were mostly focused on writing primers for school children and householders rather than on the actual pursuit and interpretation of science (cf. Efron and Fisch 2001 on David Gans). We are grateful to one of the *Zygon: Journal of Religion and Science* anonymous reviewers who pressed us to provide greater clarity on this issue.

[19] For this replication study, we relied on the translations provided by the historians whose work we took as our starting point rather than the original passages in the primary sources—another issue touched upon in the article entitled "Replication in the Humanities in Action: Reflections on a Direct and a Conceptual Replication in the History of Science and Religion" in this thematic section.

[20] See Ruderman's discussion of other scholarship on the Maharal that points to the influence of the Protestant Reformation as well as nationalism and the urban context of Prague on his thinking (e.g., Ruderman 1995, 63–66, 96–99).

[21] Isserles is known for some heated give and take on this stance, including the accusation that his students wrote a prayer for Aristotle. Isserles defended the value of the study of nature, writing: "[The earlier rabbis] did not forbid the words of the scholars and their investigations on the essence of reality and its natures, on the contrary, through this [study], the greatness of the Creator of the world, may he be blessed, is made known" (Ruderman 1995, 73). It is also important to note that Isserles's "astronomical knowledge was based entirely on an indigenous tradition of Hebrew sources: he had access to Peurbach's standard textbook only through a Hebrew translation and . . . he sanctioned the study of the sciences among Jews only with respect to works written in Hebrew" (Ruderman 1995, 69–70).

[22] This book was originally written under the title *Magen David (Shield of David)* in approximately 1612, just before Gans's death. Although copies of the manuscript were circulating earlier—for instance, Delmedigo had a copy in his library (Brown 2013, 61)—the book only saw publication in 1743 under the title *Nechmad Vena'im*.

[23] Pesachim 94b: "The wise men of Israel say that during the day the Sun travels under the *rakia* [the firmament], and at night it travels above the *rakia*. And Gentile wise men say: during the day the Sun travels under the *rakia* and at night under the Earth. Rabbi [Yehudah Hanasi] said: their view is more logical than ours for during the day springs are cold and at night they are warm." See Brown (2013, 55) for how the passage was interpreted by Gans and Brahe.

[24] Ruderman argues that Gans surrounded himself with other Jewish supporters of the emerging sciences such as the "moderate rationalist" Mordehai Yaffe, "who shunted medieval philosophy aside while highlighting scientific and kabbalistic studies as separate but legitimate fields," and Yom Tov Heller, who was "less comfortable with kabbalistic metaphysics and appears increasingly unhappy with the turn in that direction among his contemporaries" (Ruderman 1995, 87–91).

[25] "Between 1617 and 1816, at least 320 Jews received medical diplomas from Padua, and assuredly many more attended classes without matriculating. This is a dramatic rise from twenty-nine graduates who were recorded between 1520 and 1605" (Ruderman 1995, 105). Still, Jews were required to pay more in tuition and additional taxation and received a lower level of certification.

[26] This fraternity can be divided into three groups: (1) those like Leone Modena (1571–1648) who strongly opposed Kabbalistic mystical teaching and "fully committed to integrating rabbinic culture with the secular world and to explaining as well as possible in terms comprehensible to human reason and experience" (Ruderman 1995, 119); (2) Kabbalists less focused on the sciences; and (3) perhaps "the most important of the three intellectual circles," kabbalists who were open to and involved in sciences, "yet firmly opposed to philosophy and especially Aristotelian metaphysics," such as Joseph Hamiz (d. ca. 1676), Avraham Yagel, 1553–1623, and seemingly Joseph Delmedigo (Ruderman 1995, 121–22). Ruderman reviews the scholarship on Delmedigo from nineteenth-century Reform scholars like Abraham Geiger who project Enlightenment aims on their subject.

[27] Galileo made his pro-Copernican stance unambiguously public in 1613 as a mathematician and philosopher in the Medici court.

[28] Karaism is a movement characterized by its recognition of the written Hebrew Bible alone as the supreme authority in Jewish religious law and theology. Unlike mainstream Rabbinic Judaism, which considers the Oral Torah, codified in the Talmud and subsequent works, to be the authoritative interpretation of the Torah, Karaite Jews do not.

[29] We do not include the views of the famous Dutch philosopher and "apostate Jew" Baruch Spinoza (1632–77) in our survey as, rather than being appointed to honorary positions in the traditional Jewish community, he was put in excommunication (e.g., Efron 2007, 144–49). See also Maoz Kahana (2021) regarding rabbinic responses to the early Enlightenment and Rienk Vermij (2002) regarding Calvinist Copernicans in the Dutch republic, especially chapters 9 and 10.

[30] See Ruderman (1995, 245–49) for more on Cohen's stance towards "iatrochemists" (Paracelsians) and a description of his own transitional position, which has some parallels to heliocentrism. See also his discussion of the "mental climate [of the medical school in Padua that Cohen attended], where syncretization and attempted reconciliation of old and new were more typical than . . . repudiation of the past" (Ruderman 1995, 253).

[31] Also see Ruderman's discussion of the significant space Cohen dedicates to his intense reaction against Jewish false messiahs, particularly Sabbatai Zevi (cf. footnote 17 above).

[32] "Chapter Four: which presents all the arguments and evidence of Copernicus and his camp about the sun remaining stationary and the earth moving, and know what to reply to him [as per the Mishna's injunction to know what to respond to heretics] because he is the first born son of the devil" (as quoted in Efron 2007, 133, parenthetic added).

[33] "Cohen tackled the question of the earth's mobility using a combination of biblical verses and experimental evidence . . . Cohen was aware that . . . literal interpretations could be countered by others who would understand the same verses in . . . a way that supported the Copernican position . . . [Therefore] he used a second line of support for his geocentric position: mathematics and experiments" (Brown 2013, 93).

[34] This view was similar to the Tychonian model, with Saturn and Jupiter placed in special geocentric orbits. Goren also writes extensively about the Italian author Moshe Hefez (1664–1711, Gentili), who accepted a rotating Earth but (like Tycho) not the Copernican view.

[35] Ruderman points to contemporaries of Cohen like Isaac Lampronti (1679–1756, Ferrara), a Padua-educated rabbi-doctor who headed a dual curriculum (biological sciences and Judaism) school. Lampronti was undecided regarding heliocentrism due to a "mitigated skepticism" reflective of the time (Ruderman 1995, 266). Judah Briel (1643–1722), one of Lampronti's teachers, on the other hand, accepted the Copernican view as a validation of the position of the rabbis in the Talmud, in reference to the excerpt from the Talmud mentioned above, footnote 23 regarding Gans and Tycho Brahe (in the tractate Pesachim). Despite this, Briel objected to Lampronti's drive to change religious law based on scientific discoveries. (Brown 2013, 101–3).

[36] Jews had been expelled from England in 1290 and invited back in the mid-seventeenth century.

[37] See the fuller discussion of this subject by Ruderman (1995, 312–14).

[38] Personal communication, 2022. For such an in-between model, see footnote 34 regarding the Jesuit Riccioli.

[39] The title is translated as the *Rod of Judgment*, and the letters of the second word "*DaN*" are the initials of the author's name (Brown 2013, 108). The subtitle of the book is "The Second Kuzari," referencing the work by Judah HaLevi in the twelfth century, because Nieto's book is also constructed as a dialogue between the king of the Khazars and a Jew, who is addressed as "*haver*," or "friend" in Hebrew. "I have called this work *Rod of Judgement: The Second Kuzari* for it is a powerful rod to smite the heads of the Karaites" (Brown 2013, 102). It seems that "the Karaites" may well be a stand-in for deists.

[40] The quotations in the text are from Joshua 10:12 and Leviticus 19:7.

[41] Goren seems to have a different view on this issue of the separation of domains, and we look forward to future engagements on this subject, but for the chronological argument discussed here, these differences do not necessarily seem significant.

[42] Jewish scholars' insistence on the role of "in-between" positions, e.g., Goren regarding Cohen, parallels comments made by Brooke in his original chapter.

[43] As the quotes listed from Ruderman illustrate. This may also apply to the work of Peter Harrison, for instance, which in the years following the social turn is significant for its emphasis on certain theological developments in Protestantism that have been conducive to the new sciences (e.g., Harrison 2007). Harrison does not rule out the influence these shifts may have had on other religious traditions, and the interface of his work with Brooke's deserves further attention.

[44] Questions regarding conceptual replications are not limited to the humanities (e.g., Hudson 2021). For more on what differentiates replications from comparative studies in history, see the chapter by Peels on replications in the humanities in the forthcoming volume authored by Grimm, Peels, and Van Woudenberg (2025).

[45] This was also part of the peer feedback to this article given by two anonymous reviewers (we wrote a separate introductory piece that discusses such concerns and can be read in tandem with this contribution).

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Replication in the Humanities in Action: Reflections on a Direct and a Conceptual Replication in the History of Science and Religion

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In this article, we reflect on our direct and conceptual replications, the results of which were presented in the previous two articles in this thematic section. While those articles are primarily meant to report the findings of the replications, we here seek to explore what the process and its results mean for replication in historiography. First, we discuss what we consider the main challenges we encountered in both replication studies and how we dealt with them. Then, we present what we consider the eight main lessons learned from both replication studies. Subsequently, we return to various objections and hesitations that have been raised regarding replication in the humanities in general and historiography in particular. We explore whether our findings and reflections shed new light on how those objections and hesitations should be dealt with. Finally, we draw some conclusions.

Introduction

In addition to the question of whether we could corroborate the original findings of John Hedley Brooke's chapter on the parallel between religious and scientific reformations, we had numerous other questions about replication in the humanities and in historiography that fascinated us from the start of this project.[1] For instance, who should engage in replication studies, in what contexts, with what aims, and using which parameters? Is replication perhaps primarily a didactic tool to teach students, or is it a research method relevant for routine implementation by advanced scholars? What criteria should be used to judge if a replication in history is successful? How should replications relate to the ways in which the original study was influenced by trends in the field at the time it was written? Should the original authors be consulted, for example, as to whether they have amended their conclusions based on new material published after the original study was written?[2] Our approach was to keep these questions alive while attempting a replication study to see if the implementation of a case study could shed light on these many meta-level issues.

It is now time to return to those issues. In this article, we reflect on both the direct replication and the conceptual replication, the results of which were presented in the previous two articles in this thematic section. While those articles, the research for which was led respectively by Hans Van Eyghen and Rachel Pear, are primarily meant to show the findings of the replications, we here explore what all this means for replication in historiography. First, we discuss what we consider the main challenges we encountered in the direct and conceptual replications and how we dealt with them. Then, we present what we consider the eight main lessons learned from both replication studies. Subsequently, we return to various objections and hesitations that have been raised regarding replication in the humanities in general and in history (historiography) in particular. We explore whether our findings and reflections shed new light on how those objections and hesitations should be dealt with. Finally, we draw some conclusions.

Challenges in the Direct Replication

Let us first consider what challenges we encountered in setting up and carrying out the direct replication (led by Hans Van Eyghen). Direct replications stay close to the research protocol of the original study.[3] They take the same data or sources into account along with some new data or sources.[4] Unlike conceptual replications (see following section), the aim is, therefore, to deviate as little as possible from the original study—except for drawing in new data.[5] Staying close to original research protocols is a challenge in historiography and, in fact, in the humanities in general, because research protocols are often not described in detail.[6] The original study by John Hedley Brooke did include a bibliographical essay, which at least listed the sources the original author used (Brooke [1991]

2014, 490–97). This was, however, insufficient. Arriving at a fuller description of the research protocol required a detailed look at the study itself.

Replicating the entire third chapter of Brooke's book *Science and Religion: Some Historical Perspectives* proved too ambitious for a single replication study. The replication study was, therefore, narrowed down to Brooke's discussion of the so-called Merton thesis (Brooke [1991] 2014, 147–57). By analyzing the various steps in the original study and the way in which sources were selected and assessed, the research protocol was reconstructed. Two methods were distinguished in the original study, namely, (1) counting members of scientific societies by religious affiliation, and (2) looking for traces of religious motivations for engaging in science in the writings of scientists and religious figures during the relevant time period.

We assembled an advisory board (see the subsequent section on lessons learned for its composition) that we consulted along the way in order to ensure sufficient input and feedback from professional historians of various stripes. In one advisory board meeting, Brooke himself drew attention to another challenge. He recalled that the original study was the product of a two-decade long immersion in literature on the topic (see also the next section on challenges in the conceptual replication). Some of this immersion concerned primary sources that were not cited in the study to be replicated. The immersion was instrumental in how the study took shape, e.g., in determining what sources were used and the overall line of argumentation. A similar immersion was not possible for the replication study due to time constraints and different expertise of the researchers, e.g., regarding archival work. Arguably, one's entire training as a historian is brought to bear on a project as carried out in the original study. This lack was only partly remedied by reading overviews of the development of modern science and works on English Puritanism (as mentioned in the direct replication article in this thematic section; examples of works consulted are Webster 2002 and Foster 1991).

We had no problem tracking down the sources used in the original study, apart from one (see the article entitled "Brooke on the Merton Thesis: A Direct Replication of John Hedley Brooke's Chapter on Scientific and Religious Reform" in this thematic section).

Challenges in the Conceptual Replication

As there is no preexisting methodology for conceptual replication studies in history, we proceeded through experimentation (even in other fields, the understanding of conceptual replications is still under discussion; see, e.g., Hudson 2023). For example, we wished to see if a preregistration might be a helpful way for the study to begin, and explored templates on the Open Science Foundation website that might work (for a preregistered conceptual replication project in art history carried out as part of the same overarching project, see Rulkens et al. 2022).[7] After

initially using existing templates, we switched to an "open format" preregistration, where multiple documents could be uploaded. While this format was not designed with the explicit intention that some of these documents describe progressive iterations of the preregistration, we thought it could work in this manner and decided we would upload dated versions of the preregistration with changes we felt were important.[8] We wondered if this form of "progressive" preregistration, which functions more as a time stamp than as the definitive plan that should not be altered, might hold value for other fields as well, and we will work to explore this further in continued dialogue on the subject.[9]

Another conceptual challenge relates to issues regarding the ends of historiography, the ends of replication studies, and where various versions of the two may or may not meet. Recent trends in the philosophy of history have focused on the importance of "polyphonic listening," that is, of history being the craft of picking up voices that have been previously unheard (Kleinberg 2021). Indeed, this very much seems to be part of what Brooke is doing in his skepticism of "orthodoxies" in the study of science and religion (Brooke 2014) and empathic "humanizing" of his historical subjects (Efron 2010). As Ian Hesketh (2019) writes, "What Brooke so often shows is that when interpretations are historicized in this way, often alternative interpretations become apparent in the historical record that were subsequently ignored or suppressed."[10] Therefore, the consensus that we may well be seeing among historians such as Brooke, Ruderman, and others discussed in the conceptual replication piece regarding the religious receptions of the new sciences is one that broadens the field of explanation rather than narrowing it, especially by allowing more people to be heard in a way that they themselves can recognize. It seems important, therefore, that the epistemic consolidation sought through replication and other methods be aware of movements in this direction—that is, of opening up other possible explanations than those mentioned in the original study—and not towards a narrowing or "fixating" of the field of explanation by the testing of existing hypotheses.

Keeping all of these complications in mind, we began the experiment. We worked on the two-pronged task of compiling charts of the views of historians as well as of the individuals they studied as represented in the central secondary literature on the topic (see the article on the conceptual replication). For the latter category, we compiled charts at a variety of resolutions: one that gave short overviews of each individual, a next level with some more detail for the comparison of views within in a particular period, and a third level that compiled longer quotes from referenced primary sources. These charts were then used as the basis of a conference presentation at the 2022 World Congress of Jewish Studies. This presentation was sent to the advisory board for comment and discussion, presented in other forums, and further developed into the conceptual replication study published in this thematic section.

Main Lessons Learned

Let us now spell out what we consider the main lessons learned in the two replication projects in historiography. Of course, these are lessons *we* learned and insights *we* value. Others may have different experiences when engaging in replications of studies in historiography. They may find some of these less important in their particular case or stumble upon lessons and insights we were not able to distinguish in our study. Only the future will tell, when more historians set out to systematically replicate work in historiography.

There Is a Distinct Value to Direct Replication in Historiography

We learned that replication in historiography is unmistakably different from that in other disciplines. Its specific value has to do with the background knowledge of the researchers and the interpretation of sources. Both point to the distinct character of historiography and other hermeneutical disciplines. These issues are less pressing in replications in social or biomedical sciences. As mentioned, Brooke's original study relied on his long-time immersion in the literature on the topic. That made it initially difficult to test its viability.[11] Other studies in history probably relied on a similar immersion in the literature. One may suggest that studies in the field of history are sufficiently tested through traditional means like book reviews in scholarly journals.[12] Book reviews certainly have their value in assessing the reliability of a study. In our view, however, it is quite tricky to rely on book reviews to do the same work as a replication study. Most of the time, we do not know how reviewers go about writing their reviews. They may be keen enough to find weak spots in a book's argument or use of sources (either because of the reviewers' expertise or because they have done a lot of double checking, or both), but that is in a sense coincidental. Reviewers may easily miss relevant points, even if there are multiple reviewers who work independently from one another. In a replication study, one systematically tests the robustness of a historical study, which in our view involves a more complete take on the study and leads to more reliable results. Yet, we realize that book reviews have a value of their own in that they may also canvas weaknesses that do not emerge in a replication study, since the reviewer is not (unlike the replicator) bound to the method used by the original author (conceptual replications, though, provide more room to modify the method).

Moreover, whereas reviews are usually written shortly after the appearance of a publication, replication studies can still be done after quite some time, in some cases (as in ours) after decades. In the present case, this meant that the original study bears traces of lines of thought or paradigms (here loosely defined as basic assumptions that steer what we look for) that were fashionable when the study was written. In particular, a focus on the importance of social factors rather than theological ones was gaining traction around the time the original study was written (see Brooke's article in this thematic section, and Efron

and Fish (2001)). This paradigm manifests itself in how Brooke selects and interprets sources and what conclusions he draws from them. The discipline of history in general and the study of the history of science and religion specifically have changed since, and different paradigmatic ideas have become dominant. An example is the emphasis on primary and secondary causes in more recent scholarship (see the article on the direct replication and the reply by Brooke in this thematic section).

Shifting paradigms and scholarly emphases do not prevent the possibility of replication nor do they show that replications are worthless. On the contrary, by drawing attention to the role of basic assumptions, replication studies in history can point to changes in the discipline and how these impact scholarship. Replication can also contextualize older scholarship and warn against overly positivist ideas of historiography. It seems to us that this is an important asset.

A related point that has to do with the distinct value of a direct replication concerns interpretation more specifically. The importance of interpretation is one of the key reasons replication in historiography (and perhaps the humanities at large) should be different from that in other fields. The direct replication revealed how a number of sources used by Brooke can be read in multiple, and apparently equally warranted, ways (see the article entitled "Brooke on the Merton Thesis: A Direct Replication of John Hedley Brooke's Chapter on Scientific and Religious Reform" in this thematic section for examples). On some occasions, the interpretations appeared to be guided by what again might loosely be called paradigms. That several readings of the same source are possible attests to the need for broadening the field and allowing more voices to be heard. Replication studies, however, do not merely have the role of adding new interpretations, and of course not all new interpretations are by definition (equally) warranted. Replications can also show that some interpretations do not hold water under scrutiny. This may apply to some extent to ranking Thomas Sprat as an exemplar of a renewed mentality fostering modern science (see the article in this thematic section that provides the results of the direct replication).

There Is Distinct Value to Conceptual Replication in Historiography

Working on delineating the research question addressed in a cornerstone study, assessing how it was approached in the original work, and determining how a conceptual replication could further corroborate (or weaken) its conclusions makes room for the consolidation of ideas in historiography. Regarding the example of the history of science and religion in particular, Christianity was the initial field of study for most scholars involved, including Brooke. Brooke himself, however, has also been a pioneer in pushing for further research in all religious traditions and making sure that ideas from Christianity are

not presumed to be generally accurate for all religions (see, e.g., Brooke and Numbers 2011). Therefore, probing whether theses developed from within a Christian context also hold in non-Christian contexts is one example of how to implement a conceptual replication, while other conceptual replications are certainly possible and would likely shed additional light on the original findings from other angles. As mentioned in the introductory article of this thematic section, our conceptual replication differed from "usual" comparative historical studies in how it was conceived, structured, and implemented. Yet, further discussions regarding possible differences and similarities between conceptual replications and comparative historical work are needed.

There Is Value in Combining a Direct Replication with a Conceptual Replication

Doing both a direct and a conceptual replication study not only enabled a comparison of their various outcomes but also revealed differences in how both should be conducted. The biggest initial challenge for the direct replication was reconstructing the original research protocol. This may be less of a challenge for conceptual replications, although still relevant. The biggest initial challenge for the conceptual replication, on the other hand, was framing how to apply the original research question to a different type of data so that it could be compared with the outcomes of the original study. While both the direct and conceptual replications made use of new sources, this was the only change in the direct replication in comparison with the original study, whereas conceptual replications add data but also modify the method. This suggests that direct replication may be better suited to assess the reliability of an original study and conceptual replication to test the validity of its conclusions. In this way, both can jointly constitute a more complete assessment of the replicated study.

Involving the Original Author(s) and an Advisory Board Is Helpful

The advisory board was key in providing input for the preregistrations and constructive criticism on earlier drafts of the articles. Some members also leveled criticisms or pointed to impediments to doing replications in historiography (so the members were by no means all like-minded). Some of these criticisms and impediments were considered in the introductory article to this thematic section. The members of the advisory board (John Hedley Brooke, Jeremy Brown, Ab Flipse, Britt Holbrook, and Jessica Roitman) pointed to gaps in our accounts of the methodology and research protocol. They also added background knowledge concerning paradigms and reigning ideas at the time the original study was conducted. Brooke provided additional information on the genesis of his study, for example by pointing to research he conducted earlier and explaining his motivations for conducting the original study in the first place. During the first meeting of the advisory board, a number of problems

for doing replications in history were discussed. Some members indicated how history is different from other disciplines in ways that might make replication difficult. All members saw value in doing a pilot study to see if the observed problems and impediments could be overcome. Composing an advisory board does raise some challenges. Not all scholars who aim to do replication studies may have the resources or possibilities to assemble an advisory board similar to ours. Fortunately, some of the input we received from our advisory board may also be gotten by adding more details regarding methodology and steps taken in the resulting publications, which may then be addressed by colleagues at conferences and by peer reviewers in journals.

Preregistration of Replications in Historiography Is Valuable

The preregistration proved useful in communicating the research protocol and study design to members of the advisory board and others who were interested. It was also valuable to carefully register significant changes as amendments in the preregistration. Preregistration was also useful to consciously reflect on the assumptions, methods, and aims of the replications studies before investigating the sources. Writing down the research protocol before conducting the study allowed for a stricter separation between discussion of the methodology and applying it to the sources. It documented the development of the studies and made the study protocols (describing the set-up, method, etc.) more rigorous. Again, preregistration raises challenges as well (see also the earlier section on "Challenges in the Conceptual Replication"). For example, most (if not all) formats are not tailored for historiography or research in the humanities in general. And stating the research protocol beforehand may lead to less flexibility when the research is conducted. We do not believe these disadvantages outweigh the advantages of preregistration.

Replications Teach Us Much about Interpretation

Historians are generally aware that their discipline is a hermeneutical one in which sources are continuously interpreted. Obviously, interpretation also occurs in other disciplines. For example, curve fitting or reading graphs in the social sciences involves interpretation to some degree. It is, however, less salient and important in those disciplines. The replications show how interpretation is to some extent subjective. Background knowledge, meta-norms (such as about what counts as solid or enough evidence), and other features guide how sources are read and what conclusions are drawn. Our two replication studies also show, though, how interpretations are not immune to replications and can even be improved by them. A reinvestigation of the sources used by Brooke showed where his interpretations were warranted and not (or not as exclusively as suggested). It also pointed to other possible and arguably equally warranted interpretations that can exist alongside those of Brooke.

Replication Studies Can Provide Crucial Insights into Biases

Specifically, replication studies can teach us more about how biases are activated and what attempts can be made to mitigate their consequences. Much has been written about biases in research and how replication studies may prevent their activation or decrease their impact. Most discussion focuses on publication bias, that is, the tendency to only publish positive results (e.g., Francis 2012). Publication bias is less of an issue in history or the humanities in general, as null or negative results are more common (and found relevant). In fact, the outcome of Brooke's original study partly counts as a negative result, as he argued that Protestantism did not provide a much more fertile soil for scientific developments than Roman Catholicism. Another kind of bias encountered during the replication studies was a tendency to read sources through a paradigm-specific lens. To be sure, replication studies can also give rise to new biases. The replication studies that receive the most attention are those that report negative results. This suggests the danger of an inverse tendency to mainly publish negative results. Both of our replication studies showed points of criticism of Brooke's original study as well as a lot of points of agreement. Replication studies should be careful to report both (if applicable).

We noted previously that the replication studies revealed how sources may be interpreted from different points of views. Increasing the number of replication studies in historiography can shed more light on this. Whereas researchers are not always aware of how paradigms (or paradigm-like assumptions) direct their research and interpretations, a different view (from researchers with different backgrounds) can show how they influence research—though it should be kept in mind that replicators may just as well embark on their projects from certain preconceived steering assumptions that they also may be unaware of. Having replications conducted by multiple researchers from various backgrounds can contribute to mitigating the effects of such assumptions, even though (given their often-collective nature) there is of course no recipe for excluding their influence altogether.

There Is a Need for Increased Transparency and Documentation

Reconstructing the original research protocol required considerable work and consultation with the original author. More documentation at the front end on what steps were taken and what choices made can make future replications easier to perform. Of course, there is a limit to what can and should be documented. Some steps or choices are opaque to the historian, and some details are not needed for doing replications. Increased attention to methodology and reflection on what would be needed to make a study replicable could go a long way to making sure replication can be conducted more easily. Providing such information is in the interest of the original researchers, as their work could then more easily be tested and (hopefully) corroborated.

Revisiting Hesitations Regarding Replication in History

In the introduction to this thematic section, we noted that some scholars have hesitations regarding replication in the humanities, particularly historiography. Now that we have actually carried out the two replications and explained what lessons we learned from them, let us revisit some of those objections and see whether what we have done sheds new light on them. We believe this is particularly important because replication is still an underdeveloped issue in the humanities and historiography, and we ought to take any objections and hesitations seriously in order to find out whether we should encourage the project of replication in historiography.

Britt Holbrook, Bart Penders, and Sarah de Rijcke (2019) argue that "the desirability of replication in the humanities is local, situated and limited—far from the universal desirability Peels and Bouter assume." Here, they refer to earlier publications from our group (e.g., Peels 2019; Peels and Bouter 2018a, 2018b, 2018c; Peels, Bouter, and Van Woudenberg 2019). Stressing the need for sensitivity to the variety of epistemic cultures in the humanities, they state that "for some epistemic cultures, and under some circumstances . . . [replications] would be disastrous," as "understanding cultural phenomena . . . depends on the diversity of arguments and positions to help develop global solutions. Interpreting classical or medieval literature requires the continuous development of alternative, competing readings and interpreting the writing of philosophers similarly benefits from the diversity it produces" (Holbook, Penders, and de Rijcke 2019). They express particular concern with the "political" consequences of a replication drive: "If fields of research exist for which replication is an unreasonable epistemic expectation, then policies for research that universalise the replication drive will perpetrate (some might say perpetuate) an epistemic injustice, ghettoising the humanities and hermeneutic social sciences as either inferior research or not really research at all" (Penders, Holbrook, and de Rijcke 2019).

In terms of the relevance of replication studies to the study of history, Penders and colleagues (2019) expand a scheme initiated by the philosopher of science Sabina Leonelli (2018) in which she gives examples of "types of research design/methods and related understanding of reproducibility." Leonelli (2018; see Table 1) offers history as an example of "[r]eproducible [e]xpertise: any skilled experimenter working with the same methods and materials would produce similar results." This is number four in her schema of six categories, ranging from computer engineering (number one) to participant observation in anthropology (number six). However, in the expanded chart in Penders et al. (2019; see Figure 1), history is offered as an example in the last category of participant observation (number six), which was designated by Leonelli as "[i] rreproducible [o]bservation: different observers are assumed to have different viewpoints and produce different data and interpretations."[13]

Type of research	**Example**	**Degree of control on environment**	**Reliance on statistics as inferential tool**	**Reproducible in which sense?**
Software development	Computer engineering, informatics	*Total*	High	*Computational R*: Obtain same results from the same data
Standardised experiments	Clinical trials, environmental safety controls	Very high	High	*Direct R*: Obtain same results from different runs of the same experiment
Semistandardised experiments	Behavioural economics, experimental psychology, research on model organisms	Limited	Variable	*Scoping R:* Use differences in results to identify relevant variation. Indirect R: Obtain same results from different experiments. Hypothetical R: corroborate results implied by previous findings.
Non-standard experiments & research based on rare, unique, perishable, inaccessible materials	Research on experimental organisms, archeology, paleontology, history	Low	Low	*Reproducible Expertise*: Any skilled experimenter working with same methods and materials would produce similar results
Nonexperimental case description	Case reports in medicine, (types of) multi-sited ethnography	None	Low	*Reproducible Observation*: Any skilled observer would pick out similar patterns
Participant observation	Ethology, participant observation in anthropology	None	None	*Irreproducible Observation*: different observers are assumed to have different viewpoints and produce different data and interpretations

Table 1: Synoptic view of types of research design/methods and related understanding of reproducibility (Leonelli 2018).

This position in Figure 1 seems to be supported by Utrecht historians Pim Huijnen and Pieter Huistra in a recent white paper based on their experiments with replication studies in which they draw their conclusions from attempts at replication by research masters students. Specifically, Huijnen and Huistra (2022) argue in favor of only reproductions in history in order to "complement

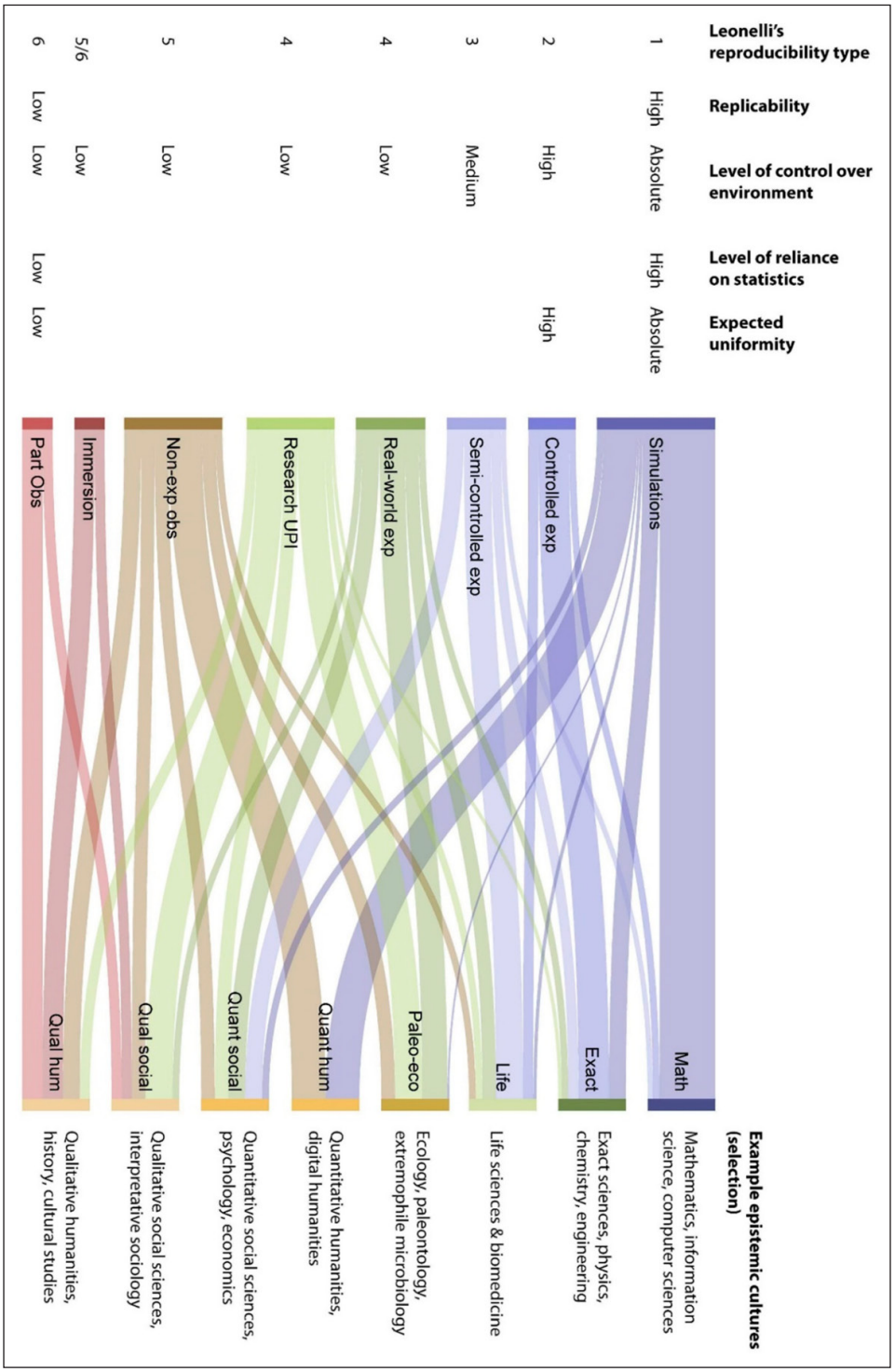

Figure 1: A taxonomy of replicability (Penders et al. 2019).

and improve existing mechanisms of historical quality control" as well as to "help to uncover the rules guiding historical work and . . . , in turn, improve the degree of methodological articulation and sophistication of historians," thus leading to "epistemic consolidation." These reproductions would entail a "backward" process of looking at the sources a historian cited in footnotes and following how these sources led to their conclusions. However, Huijnen and Huistra (2022, 8) further argue that systematic replications (both direct and conceptual), which intentionally begin with the same research question as the original scholar and proceed to "answer" this question, would go against their understanding of the discipline of history: "If historiography is a deliberately subjective discipline, in which the person and the background of the scholar, rather than a hindrance, are a necessary precondition for acquiring knowledge, then no two scholars, except perhaps identical twins, can be expected to produce the same outcomes." In this sense, Huijnen and Huistra seem to align themselves with a view that assumes an intense and unavoidable subjectivity in historiography that prevents any form of replication that could corroborate previous findings.

Our project as recorded in this thematic section took an intermediate stance regarding the critiques that have been raised. On one hand, we agree that the development of what replications should look like in various disciplines must be sensitive towards the particularities—unique methods, styles, etc.—within particular disciplines and certainly not imposed as a one-size-fits-all model from the sciences onto the humanities. In other words, we take the issues raised regarding the differences between various epistemic communities seriously. On the other hand, we are not convinced that this sensitivity to the context of each field precludes the relevance of replication across the board of historical research, and we think there is sound reason to further explore how replication studies could be relevant to the field. In fact, the many lessons we laid out in the previous section show how valuable replication in history can be. The stance that only identical twins can be expected to produce the same outcomes seems to us a somewhat extreme position (apart from the fact that even identical twins may have different educational trajectories, etc. that would influence their projects). We are fully aware that the disciplinary field of history is not monolithic and that there are many different schools and approaches within the discipline (cf., e.g., the limited survey in a well-known students' guide to historiography by Anthony Brundage (2018, 1–16); for a large-scale historical overview, see Breisach (2007)). Therefore, it is very well possible that different approaches to replication would be embraced by members of different schools of historical research. So, while the path ahead is complicated, we believe it is worthwhile to further explore what replication in historiography stemming from the field itself might look like, including what obstacles may emerge in attempting such studies and what might be learned from them.[14]

Conclusions

It is time to draw our reflections to a close. In this article, we sketched the main obstacles we encountered in the direct and conceptual replications. Though they were serious, we explained why we do not believe they are lethal. We also laid out the main lessons (including some hard ones) we learned in the process. It turns out that there is important value in both direct and conceptual replications in historiography. Finally, we returned to the debate on replication in the humanities, particularly historiography. In reply to the criticisms by Bart Penders, Sarah de Rijcke, and Britt Holbrook, as well as Pim Huijnen and Piet Huistra, we pointed out that replication projects in historiography should always remain sensitive to features such as methods, approaches, styles, relations between scholars and their objects of study, and epistemic cultures unique to the humanities and historiography in particular, specifically when it comes to issues of meaning and interpretation. In our view, however, it is not clear why that should distract from the value that is to be gained from replication studies in historiography and the humanities at large.[15]

Notes

[1] There is a well-known and rather unique ambiguity in the word "history" in that it can refer both to a discipline and to that discipline's object of study, i.e., some past event or series of events (so whereas sociology studies society and economics the economy, history studies history). If we want to make sure a reference is (also) to the discipline, we use the word "historiography" next to or instead of "history."

[2] In our case, this could be relevant, e.g., with regard to the work of Peter Harrison (2001, 2007), who at a later stage (i.e., after Brooke's book appeared) highlighted the impact of Protestant—or, more broadly, Augustinian—theology on the development of the natural sciences.

[3] See the introduction to this thematic section ("Introduction: Replicating John Hedley Brooke's Work on the History of Science and Religion").

[4] See also the article on the direct replication included in this thematic section.

[5] Some argue that it often makes sense to also improve on the original research protocol by taking disciplinary innovations or improved methods into account. That is why conceptual replications are relevant as well.

[6] It is telling that the vast majority of publications in the social and biomedical sciences include methodology sections, whereas very few papers in historiography do the same.

[7] Preregistrations have become standard procedure in scientific studies over the past twenty years; see, for instance, https://clinicaltrials.gov and https://osf.io/. The underlying idea is that in this way research trajectories become more transparent, and researchers cannot retrospectively tinker with their research protocols so as to suggest a smoother connection with their findings than has actually been the case. Being aware of recent trends to include preregistration for qualitative research (Haven et al. 2020), we looked into whether one of these new templates might be suitable, but a good fit was not found, and we suggest that future projects seek to fill this lacuna.

[8] We later learned that unfortunately uploading new iterations within the original preregistration file was not possible and so needed to create a new preregistration within the same project.

[9] We held a workshop on replication in the humanities on June 8, 2023 at Vrije Universiteit Amsterdam, bringing together experts from different parts of the humanities (especially history) and social sciences.

[10] Brooke wrote to one of us (Rachel S. A. Pear) in personal communication (February 21, 2023): "I did see myself retrieving positions and nuances that were effectively blotted out by the master narratives of conflict and harmony."

[11] We may consider, though, that such immersion makes more of a difference in the context of discovery than in the context of justification; that is, in justifying one's choices, one should always make clear what sources one is leaning on (as Brooke indeed did).

[12] This point was suggested by Brooke himself during the workshop held at Vrije Universiteit Amsterdam (see above, footnote 9).

[13] In an advisory board meeting for this project, coauthor J. Britt Holbrook stated that he did not think all historical studies necessarily need to be in category six, and that in his view the current project would likely be within the rubric of category four.

[14] Although replication in the humanities has been added to the third round of pilot replication studies by the Dutch Research Council, none of the chosen projects are parallel to the case explored in our study, as can be seen here: https://www.nwo.nl/en/projects?f%5B0%5D=nwo_projects_program%3A56725&sort_bef_combine=date_start_DESC. We are also taking part in a meta-study of replications: https://replicationinaction.blog/.

[15] For helpful comments on the setup of both replication studies and the project as a whole, we thank the advisory board members John Hedley Brooke, Jeremy Brown, Ab Flipse, James Holbrook, and Jessica Roitman. We also thank the members of the Theoretical Philosophy Research Group at the Vrije Universiteit Amsterdam for their valuable comments and suggestions. For good questions and feedback, we thank the audiences at the Summer Seminar on Philosophy of the Humanities at the Vrije Universiteit Amsterdam, August 23–25, 2023, the Workshop Replication in the Humanities: Reflections on Two Case Studies at the Vrije Universiteit Amsterdam

on June 8, 2023, the Biases in Acquisition and Consideration of Evidence at the University of Bielefeld on May 12, 2023, the MetaScience 2023 conference in Washington (US) on April 26, 2023, and Aarhus University on February 7, 2023. Finally, we thank the Templeton World Charity Foundation, whose support of the project Epistemic Progress in the University (TWCF0436) made publication of this article possible. The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Templeton World Charity Foundation.

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Open Library of Humanities

On the Experience of Being Replicated

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This article provides an informal account of the experience of being replicated, with a summary of the original author's earliest misgivings. It then identifies features of the third chapter of the book *Science and Religion* that may make it peculiarly resistant to replication. Then, the questions are addressed whether and how a replication itself should be replicated. Finally, the article provides reflection on the value of replication by responding to the earlier contributions led by Hans Van Eyghen and Rachel S. A. Pear in this thematic section.

Introduction

This is not, as its title might suggest, an article about identity theft. It is about a very different and less menacing challenge. It came as no small surprise to learn that a book I published more than thirty years ago, and more specifically a chapter I began writing in the early 1980s, was to be given prominence in a project on the feasibility of replication studies in the humanities (Brooke 1991, 82–116; 2014, 110–57). When I received the invitation to serve on the project's advisory board, it was impossible to suppress feelings of gratitude that my book was still enjoying such recognition, but these feelings were also laced with apprehension. What exactly was a replication study? Should I be concerned by the prospect of having my work forensically dissected? What value could there possibly be in reevaluating a text that, however influential, was now showing its age?

I therefore begin my informal account of the experience of being replicated with a summary of my earliest misgivings. I then identify features of my third chapter—a commentary on possible parallels between scientific and religious reform—that I believe made it peculiarly resistant to replication. Then to the mischievous question: whether, and how, a replication should itself be replicated! I finally reflect on the value of replication by responding to the judicious contributions of Hans Van Eyghen and Rachel S. A. Pear. As this is an informal contribution, I do not engage with the deepest theoretical questions discussed by Rik Peels and his colleagues at Vrije Universiteit Amsterdam.

Initial Reservations

My original misgivings arose from what I saw as a potentially high degree of disanalogy between replication practices that may constitute an idealized scientific methodology but seem largely foreign to the culture of many humanities disciplines. The elimination of the subject, a conventional ideal in the protocol of the experimental sciences, struck me as impractical and largely foreign to a discipline such as history, where evidence of the cultural formation and predilections of authors in the selection and interpretation of their data is not only tolerated but almost expected. Moreover, if in the replication of a piece of historical writing the main aim is the validation or a deeper questioning of the original research, what are the criteria for validation when, in both context and content, scholarship has advanced beyond what was available at the time of writing—the 1980s for my *Science and Religion*? For example, in the salient chapter, I was both sympathetic to and critical of Robert Merton's famous thesis concerning Puritan values and the stimulus they allegedly gave to the practical sciences in seventeenth-century England. But suppose I had argued trenchantly in its favor. How would the replicator deal with the embarrassing fact that Merton later came close to disowning his thesis and that, by 2000, its numerous flaws had been fully exposed and succinctly expressed (Davis and Winship 2002, 125–28)?

I had other reservations. How is it possible to replicate a methodology that may not be explicit in the original text? In retrospect, I have tried to reconstruct the route I took to the methodology that was tacitly used in the research for, and composition of, my book. In this rational reconstruction, I could identify seven distinct stages in the refinement of my own approach to my sources, both primary and secondary. The details need not detain us, but my skeptical thought was how could someone who had not traveled that same route validate a tacit methodology that had its own history in the life of the author? Is the replicator obliged to study, where possible, the author's biography or autobiography? Underlying my skepticism was a creed I had often heard my historian colleagues express, namely, that the writing of good history is more a craft skill than a scientific exercise.

Even in the sciences, as Harry Collins (1985) points out, the practice and evaluation of a replication are not straightforward tasks. It matters who repeats an experiment or study, who counts as a legitimate peer, and how their relationship to the original experimenter is evaluated (cf. Penders, Holbrook, and de Rijcke 2019). There are questions to be asked about the perceived competence of the replicator as well as that of the original experimenter. The same must be true in the humanities. One of the several distinguished historians of science to teach at Vrije Universiteit Amsterdam, Martin Rudwick (1985), drew attention to what he calls a gradient of perceived competence among participants in scientific controversies and its influence in shaping outcomes, in shaping what counts as scientific knowledge. The perceived stature of the person undertaking the replication, whether in the sciences or the humanities, has to be considered, and this is an inescapably social matter.

If I was originally skeptical, it was for the reasons I have just adduced. Having participated in the project, primarily as an observer but occasionally as an advisor, some of those reasons now seem less incisive. Their applicability would seem to vary with the subject and type of replication undertaken, making generalization difficult. In my comments on the contrasting modes of replication pursued by Van Eyghen and Pear, I shall give examples of what I have found valuable in their work. Accordingly, rather than multiply grounds for skepticism, I turn now to their respective presentations, complimenting them both on the courtesy and fairness with which they have treated my work. It is a compliment they deserve, not least because there were features of my third chapter that might almost have been designed to deter any would-be replicator!

Chapter 3 and Its Resistance to Replication

Among the propositions in chapter 3 of my *Science and Religion* that might almost have been inserted as a defense against future replication studies, one was a feature of the book as a whole, another a feature of my treatment of Merton's thesis, with which Van Eyghen engages. I was discussing Merton because his

celebrated study of *Science, Technology, and Society in Seventeenth-Century England* (Merton 1938, 1970) was germane to my question of whether there were significant parallels between scientific and religious reform. His thesis was that a god-centered involvement of Puritans in the world would encourage the growth of science. There could be real connections between the spiritual injunction to glorify God and a quest for knowledge that would not only demonstrate the Creator's power but also alleviate suffering. It was an argument that bore a certain similarity to that deployed by another of Vrije Universiteit Amsterdam's distinguished historians of science, Reijer Hooykaas (1972), in his work on Calvinism and science.

In my response to Merton, I was compelled to introduce a complication. However plausible the parallel between scientific and religious reform, testing it was extremely difficult (Brooke 1991, 112–16; 2014, 151–57). The strategies in place at the time, which often involved head-counting in incipient scientific societies to see if there was a disproportionately high number of Puritans in their membership, were inconclusive and the numbers open to different interpretations. My frustration was compounded by a lack of consensus on how to define "Puritanism," how best to differentiate it from other expressions of Protestant thought, and how to cope with its changing complexion as political circumstances in mid-seventeenth-century England changed. Sometimes, the terms Puritan and Protestant were used interchangeably, occasionally even by Merton himself. This meant there was a deterrent to easy replication embedded in my text. How would a replicator thirty years later be able to navigate the same frustrations?

The feature of the book as a whole that might repel replication is its openness to complexity when researching the relations between scientific and religious thinking. I had adopted this as a historiographical principle, in contrast to the restrictive master narratives of conflict or harmony I wished to critique. Somewhat to my embarrassment, this has been labelled "Brooke's complexity thesis," whereas I see it as a heuristic prescription for enlarging openness to, and grasp of, the richness and diversity of the arguments and positions defended in the past and (as a corollary) in the present. It is not so much a thesis with explanatory pretensions as a methodological principle that facilitates the critique of master narratives that have dominated polemical literature (Harrison 2017, 223–26). It is also a principle that assists the retrieval of lost understandings and the generation of new historical perspectives (Hesketh 2017, 191–92). But it does so at a price. It could make the validation of my historical analyses more challenging because the validator will have to contend with the same levels of complexity and inconclusiveness as those identified in my original text. Were my replicators irritated by my relish for complications? Did what I experienced as difficulties in testing the idea of parallels between scientific and religious reform translate into difficulties they might have experienced in conducting their replication?

Replicating the Replication?

I have subsumed my next few words under this cheeky heading because it is impossible to read reviews of one's own work without forming an impression of their fairness and accuracy. And who is to adjudicate the cogency of the replication? Preparing for the workshop held at Vrije Universiteit Amsterdam in June 2023, I had the opportunity to read a preliminary draft of Hans Van Eyghen's article, which I found reassuring. On minor points I had a few concerns I was able to transmit to him. But my overriding impression was of fairness and sensitivity when summarizing my line on Merton, as in the extract below:

> Brooke's interest does not lie in evaluating Merton's portrayal of the Puritan sentiment that allegedly fostered scientific legitimacy. Instead, his focus is on whether that sentiment led to greater acceptance of science. Brooke does add that science may have been valued by Puritans because it affords a useful diversion from sensuality—from bags, bottles, and mistresses, as Robert Boyle would put it (Brooke [1991] 2014, 148). Brooke ([1991] 2014, 149) does slightly rephrase Merton's original thesis to state that "Puritan values helped to create an audience receptive to programs for the improvement of man's estate." Brooke therefore stresses the increased legitimacy of practical science rather than all of science—an element also at work in Merton's original defense.

I would happily settle for that. Nevertheless, as a critic, I should perhaps give an example of a remark that puzzled me. In the course of his exposition, Van Eyghen mentions at least three different ways in which a Puritan religiosity might have been a catalyst for the applied sciences, such as medicine and agriculture. A stimulus might have come from the belief that the application of science to mitigate human suffering should count as a good work, not (it should be emphasized) as a means of earning salvation but as a duty of faith. A second might have been through the hope of finding greater assurance of one's own salvation through the experience of God's blessing in one's worldly endeavors. A third might have come from a different hope, that the application of science might go some way to restore the dominion over nature Adam had lost at the Fall. What surprised me was the remark that "Brooke's emphasis on undoing sin or setting the image of God right by science is . . . somewhat strange." It would have been if I had used those words. But even in Francis Bacon's potentially secular vision of a science-based utopia it was not claimed that science could undo sin. That was only possible through divine initiative and mediation. I certainly doubt that a Puritan cleric such as William Perkins, who Van Eyghen is discussing at that point, would have warmed to Bacon's program. I was, however, following the lead of Charles Webster (1975, 21–31), who in his book *The Great Instauration*, recognized a millenarian streak in exemplary Puritans who were attracted to Bacon's reformist agenda. There are of course

ways in which the doctrine of the Fall could have been obstructive to imaginative scientific theorizing. However, as Peter Harrison showed in *The Fall of Man and the Foundations of Science*, the pursuit of science for altruistic purposes could also have been married to a Puritan eschatology. With its biblical justification in the prophetic message of Daniel 12:4, that "many shall pass to and fro, and knowledge shall be increased," it could have been seen as hastening the millennium and Christ's return (Harrison 2007, 186–88).

There is a hint of self-defense in that last paragraph, but is there not also a pointer to the value of a replication study if it persuades an author to revisit a former self? In my case, I was impelled to reread Harrison on the Fall and his debt to Webster. At this juncture, having now reintroduced the question of value, I shall look more closely at some examples from the conclusions of both Van Eyghen and Pear of what, as the author in the hot seat, I found valuable in their studies.

The Value of Replication

Can there really be value in a replication study, particularly when the text under review, in some respects at least, will almost certainly have been superseded? It has occurred to me latterly that a project designed to investigate the reasons certain books win acclaim when others in the same domain are less successful could have a general value. Here, I simply select two features of Van Eyghen's investigation that were valuable to me, in that they drew attention to two kinds of omission in my text. In one case, the omission was of a geosocial group, the New England Puritans. In the other, the omission was of a possible correlation between the growing acceptance of science in late seventeenth-century England and a growing indifference to religion, a growing secularity, among natural philosophers.

Van Eyghen finds among New England Puritans a range of positions on divine activity in nature, the consideration of some of which, he implies, would have enhanced my discussion. Among them is a willingness to say that God can make use of natural forces as secondary causes to achieve "God's purposes"—purposes that might include meting out punishment for moral transgression. The rationalization of earthquakes had a high profile in that context. The key point is that it was not a case of either a naturalistic or a supernatural explanation. It was a case of both/and. Theological strategies for admitting the simultaneous coexistence of two levels of causality were important for the natural sciences and it is good to be reminded of this. Although I did discuss this issue in chapter 4, with reference to the providentialism of Robert Boyle in the context of his "mechanical philosophy," I probably did say too little about it when dwelling among the Puritans in chapter 3. It is worth adding that the changing status of scientific naturalism within Christian thought from the seventeenth century onwards is the subject of an outstanding recent book by Peter Jordan (2022) *Naturalism in the Christian Imagination*.

I was helped to see my second omission by the fact that Van Eyghen found something in one of my secondary sources that he considered too important to neglect. The source was an essay by Lotte Mulligan (1973) on "Civil War Politics, Religion and the Royal Society." In this, she traces the religious background of more than 150 early members of London's premier scientific society. I had been attracted to her conclusion because it added weight to critiques of Merton. What had she found? "The typical background of a science enthusiast in the 1660s was not middle-class, mercantile, puritan, politically radical, unacademic or utilitarian. Rather, our typical Fellow was a royalist, Anglican, university-educated gentleman" (Mulligan 1973, 108).

The Puritan minority was as small as one in twenty of her sample. Mulligan did concede that, within that group, there was a disposition towards the practical sciences. Might this in itself give limited support to Merton's position? This is the context in which Van Eyghen rightly detects my greater sympathy for the alternative to Merton's thesis favored by Barbara Shapiro—namely, a correlation between science and the moderate, latitudinarian wing of the Anglican Church in which a spectrum of non-fundamental doctrinal positions was tolerated. This latitudinarianism was epitomized by the mathematician (and eventual bishop of Chester) John Wilkins, England's most proactive Copernican, who, especially after the restoration of the monarchy in 1660, displayed a broad-minded tolerance of religious dissent and a distaste of Puritan dogma (Shapiro 1969, 1983). I had not seen any real tension between Mulligan and Shapiro, but, by contrast, Van Eyghen does. He describes Mulligan's conclusion as "starkly different" from mine. This is because she opines that acceptance of new ideas in the Royal Society might have had more to do with a waning interest in religious disputes and the waning influence of religious ideas than with any specific religious mentality. As a result of this replication study, I have been reminded that my book did not sufficiently address some of the possible links between science and religious indifference, or between science and secularization. There is surely value in that, at least for me.

With reference to Rachel S. A. Pear's polished conceptual replication, it was gratifying to learn that her study of Jewish historians and their treatment of Jewish responses to Copernican astronomy was judged to be consonant with the historiographical principles for which I had argued. For example, she found a similar pushing back against denominational, deterministic perspectives in which scientific preferences had been too neatly and narrowly ascribed to specific religious allegiances: "The impact of Brooke and his like-minded contemporaries was so great that what they fought hard for thirty years ago is now somewhat taken for granted." I was particularly intrigued to read her work because I knew of historians of "Judaism and science" who had taken my historiography seriously, resulting in one case in a vivid description of how it had changed the framing of his doctoral project and even the young scholar

himself (Efron 2010, 247–50, 255–58). I was also intrigued by Pear's discovery that, where there was openness among Jewish commentators to scientific reform, and specifically to the new astronomy, no religious reform comparable to that released by the Protestant Reformation had been a prerequisite. There are interesting issues here, not least in the scope for new research on the Catholic Reformation and its representation in scientific education, notably in the sphere of mathematics, in which Jesuit educators were prominent and where popular religious imagery could still be involved (Castel-Branco 2021).

I particularly value the opportunities Pear's study presents for serious comparative work. I should introduce my first example with reference to an epistemological distinction, fundamental to an understanding of the reception of Copernican astronomy. In broad terms, this was the instrumentalist/realist distinction. Are the mathematical models of the astronomer representations of a physical reality (does the Earth really orbit the sun, as Galileo believed?) or are they typically instruments for the prediction of planetary motions? Within the Ptolemaic tradition, mathematical models were essentially for predictive purposes; cosmological representation belonged more to the domain of Aristotelian philosophy. The distinction can, and should, complicate the determination of what a reformist position might be. It could be more radical to accept that mathematical astronomy can describe a real cosmological system, even while rejecting the Copernican hypothesis, than to accept a heliocentric model as the most mathematically elegant while excluding, in principle, that it could ever be presumed to describe a physical reality.

I wondered whether this instrumentalist/realist distinction was also pinpointed by Jewish historians as a complication—a question I put to Pear. From an essay by Noah Efron and Menachem Fisch, to which she guided me, I learned that this was not such an issue among early Jewish commentators on heliocentrism. For example, rabbi David Gans was willing to say that Tycho Brahe had "proven clearly" that the planets Mercury, Venus, Mars, Jupiter, and Saturn had orbits centered not on the Earth but on the sun (Efron and Fisch 2001, 74). He also praised the sharpness of Copernicus, who wanted to prove that the Earth is not stationary but perpetually revolving. But when it came to deciding between the Ptolemaic, Copernican, and Tychonic systems, Gans would not conclude that any one was superior to the others. There is a contrast with Western astronomers, yet there are so many nuances in Gans's position that it provides extra confirmation that speaking of a reformation in science is no straightforward matter (Efron and Fisch 2001, 74–75).

My second example concerns a citation Pear gives from a book by David Nieto, an Italian rabbi-physician who moved to England in 1701 to serve the Jewish, Spanish, and Portuguese community. His book *Mateh DaN* (1714) raises the question of whether the motion of the Earth can be accepted, given that Joshua's famous command was to the sun (not the Earth) to stand still. One of

the speakers in Nieto's dialogue says decisively that the Copernican model must be rejected for that reason. His partner in the dialogue asks how that objection is answered, eliciting the reply that "they claim that the prophet used this language so that the ordinary person could understand it, for [ordinary people] believe that the Sun moves and that the Earth is motionless." The response is abrupt and decisive: "That answer has no value" (quoted in Brown 2013, 109–10).

Here, an answer is dismissed that many Protestant reformers, including John Calvin, and many Protestant natural philosophers, including Isaac Newton, found attractive (Snobelen 2008a, 491–530; 2008b, 691–732). It is often called the accommodation theory because the language of scripture is understood to be "accommodated" to the needs of ordinary people. Seeing that stratagem so cursorily dismissed in Nieto's dialogue prompts me to ask a further question: How widespread was this accommodation principle among Jewish commentators on science and the Hebrew Bible? For the most radical Jewish commentator, Baruch Spinoza, scripture simply cannot be accommodated to the new sciences (Rudavsky 2008, 558), but what of those with "softer" views? This is just one example of the fertility I see in Pear's replication study precisely because of its stimulus to such further comparative work.

A Final Question

I began this essay on a rather negative note as I reported my initial misgivings. I end with a question that might also appear subversive, though I think it is worth asking. It applies more to a direct than a conceptual replication. Having said that Van Eyghen's study reminded me of omissions in my book, there are reasons I had to say "reminded." Primarily, this was because there were reviews at the time of publication in which gaps and deficiencies were identified. The most rigorous of these was an essay review by the historian Scott Mandelbrote published in *Annals of Science*. It was the kind of review one dreams of, in which he wrote of my book that "it must now become the standard against which to measure all future ventures into this field" (Mandelbrote 1993, 373). Nevertheless, it did not escape criticism, and two or three of his reservations stuck in my mind. One was my high dependency on secondary sources, even for quotations. Interestingly, one of those instances was my discussion of the Merton thesis in chapter 3, where, as my accompanying bibliography shows, I was striving to navigate a veritable library of recent secondary literature (Brooke 1991, 361–66; 2014, 490–97).

A particular lacuna Mandelbrote regretted was that I had not said more about putative connections between science and secularization. I hope that I have at least partially remedied that in subsequent publication (Brooke 2010). The resemblance between Mandelbrote's observations and some of those made by Van Eyghen does, however, lead to a question. What ultimately can be gained from the direct replication of a historical text that could not be gained simply

by reading a cross section of reviews written around the time of publication? Responding to that question at the Vrije Universiteit Amsterdam workshop on replication in the humanities, Van Eyghen adroitly pointed out that once a reputable replication is in place, it could save those interested in the quality of a book the considerable labor involved in locating and reviewing the reviews. It is difficult to quarrel with that, though it is a reply that raises different questions. From where will the necessary replicators be found? What proportion of professional historians, for example, would prefer to replicate the work of their colleagues rather than pursue their own research projects?

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Crisis, Confidence, and the Limits of Replication

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There have been calls for a program of replication in the humanities. Although usually thought of as confined to the hard sciences, replication may, under the correct conditions, be a useful tool for historians who propose an explanation of why a set of events occurred. But the program of replication in the humanities is challenged when we consider degrees of freedom, i.e., the number of independent parameters that function within a system. Evidence from the sciences has revealed that experimental variables once thought of as unimportant might in fact be critical. Change just one of them and the experimental result changes in ways that were at first unimaginable. How then, are we to know if the degrees of freedom offered as part of a historical explanation are indeed satisfactory? There are constraints to what may be replicated, but this is the case for the sciences no less than for the humanities.

A Divided Court

In 2008, the Supreme Court of the United States ruled 5–4 that the Constitution protected the right of an individual to possess a firearm for protection within their home. This right, wrote Justice Antonin Scalia for the majority, was based on a reading of the Constitution's Second Amendment, in which an individual's right to possess a firearm was unconnected with service in a militia.[1] In a strongly written dissent, Justice John Paul Stevens opined that, in fact, "the Amendment is most naturally read to secure to the people a right to use and possess arms in conjunction with service in a well-regulated militia." The Supreme Court justices could not agree on the meaning of some words written only 250 years ago in a language in which they are both fluent, and with a legal training common to all. How the Constitution is read, and what its framers may have had in mind (and whether or not that is important), potentially has life-threatening consequences.[2] Historiographical disputes, less so. But, like justices of the Supreme Court, historians often disagree on the meaning of a document or a series of events. The historian Arthur Schlesinger Sr. (1888–1965), for example, wrote that the American Revolution was prompted by economics, not politics: "Less intent on politics than business, the merchants as a class did not ordinarily concern themselves with political questions. But when their interests were jeopardized they entered politics with a vim, and might be expected to carry things their own way" (Schlesinger 1957). In contrast, Daniel Boorstin (1914–2004) claimed that the American Revolution had only political goals: "The political objective of the Revolution, independence from British rule, was achieved after one relatively short effort. 1776 had no sequel and needed none: the issue was separation, and separation was accomplished" (Boorstin 1989).

In an effort to adjudicate between these and other hypotheses about history, there have been calls for a program of replication in which the evidence supporting differing models can be reexamined in an effort to establish their epistemic status.[3] This article addresses this program by comparing—and contrasting— it to recent replication efforts in the basic and clinical sciences. There is much to be gained from understanding the reasons for and approaches to replication in the sciences and delineating what can and cannot be reasonably expected from such efforts.

Before proceeding, I should note that the observations I make about history also apply in large part to many of the other disciplines that make up the humanities. Here, I follow the lead of Rik Peels and others who include archeology, history (and its various subdisciplines such as the history of science and the history of religion), linguistics, philosophy, theology, and religious studies, along with several other areas, as belonging to the humanities. Other disciplines, such as basic and clinical medical research, physics (though not necessarily theoretical physics), chemistry, and the biological sciences are included in the broad category of the sciences (Peels 2019, 11n).

As I discuss in some detail, the call for replication in the sciences was the result of a crisis. Many experiments, some published to great fanfare and media acclaim, could not be replicated, and the scientific enterprise urgently needed a correction. In contrast, the call for replication in the humanities seems to have originated from a position of confidence. While not always explicitly stated, calls for a program of replication in the humanities stem from the belief that the stakes for a theory in the humanities matter in a way similar to the stakes for a laboratory experiment or clinical trial. A useful example was suggested by Peels. In 1993, Samuel Huntington published *The Clash of Civilizations and the Remaking of World Order*, suggesting that future wars will be increasingly fought between ideologies rather than between countries. This premise, which was widely cited and discussed, had "important repercussions in cultural anthropology, history, peace and conflict studies, political theory, and theology and religious studies" (Peels and Bouter 2018), and, I might add, has critical implications for the allocation and prioritization of enormous defense budgets. The call to see if Huntington's hypothesis could be replicated did not originate from a position of crisis but rather from one of confidence. The hypothesis has real-world implications, and its replication was therefore not just an interesting intellectual exercise. It was a practical matter of considerable urgency.

I begin with a description of three types of history and explain what kind of replication may be expected for each. I then briefly describe replicating my own work in the history of science and religion, and then outline the recent replication movement in the sciences. I show that although there may only be limited opportunities for replication in the humanities, this is also a feature of replication in the sciences. The penultimate section introduces the statistical concept of degrees of freedom and how it presents a challenge to replication in both the humanities and the sciences. In my concluding remarks, I clarify the limits of scientism and the need for the humanities to demarcate what should and should not be replicated.

Some Remarks on the Nature of History

Within the humanities in general, and history in particular, what is the relationship between a falsifiable scientific hypothesis and the ideas of rigor and reproducibility? To answer this, it must be decided what reproducibility in history is attempting to do. To answer that, it must be decided what is meant by history. This is, of course, an enormous question, but broadly, there are three goals a historian might have.

The Facts

The first goal is simply to uncover facts, that is to say, the dates on which events occurred and the identities or location of its participants. For example, the date on which the German army invaded Poland is September 1, 1939. The evidence

for this fact includes eyewitness accounts, photographs, and contemporary newspaper reports of the events of the day.[4] The German army was not present on Polish soil on August 31 and was seen crossing the German-Polish border on September 1. The World Trade Center was attacked by hijacked planes, the first of which struck at 8:46 a.m. local time on September 11, 2001. Evidence for this fact also includes eyewitness accounts, photographs, and contemporary newspaper reports of the events of the day. Marie Antoinette was executed on October 16, 1793. This too is a fact. But other facts have yet to be uncovered, and it is perfectly reasonable for an academic historian to draw their university salary in their pursuit of them.

It is important to pause here and emphasize that the work of uncovering facts is neither straightforward nor easy, and many historical "facts" turn out to have been incorrect. Galileo never muttered "*eppur si muove* (yet it moves)" as he recanted his heliocentric beliefs (see, for example, Livio 2020); contra Hobsbawn, the number of troops deployed against the Luddites between 1811–13 did not "greatly exceeded in size the army which Wellington took into the Peninsula in 1808."[5] Alleged facts need to be checked. Moreover, facts of the past should not be confused with historical facts, which is to say, the facts a historian chooses to include in their account of what happened. "It is the historian who has decided for his own reasons that Caesar's crossing of that petty stream, the Rubicon, is a fact of history," writes E. H. Carr (1961), "whereas the crossing of the Rubicon by millions of other people before or since interests nobody at all … The belief in a hard core of historical facts existing objectively and independently of the interpretation of the historian is a preposterous fallacy, but one which it is very hard to eradicate." It is for this reason that a second goal of the historian should be considered.

The Account

Germany invaded Poland on September 1, 1939, and Polish forces counterattacked the German army at the Battle of the Bzura, which began on September 9. The attacks on 9/11 involved nineteen hijackers, some of whom had been trained at flight schools in the United States. The Austrian roots of Marie Antoinette made people wary of her loyalties. In giving an account of what happened, the historian must first choose which facts to include, and, no less importantly, which to exclude. Facts are, as Carr notes, the raw materials out of which a narrative account is constructed. But it is the historian "who decides to which facts to give the floor, and in what order or context" (Carr 1961, 5). (Historical fiction might include some of the same facts but makes no claim that an imagined dialogue is factual.)

Facts by themselves are not enough to describe what happened. The historian of the Second World War cannot simply rattle off the facts of the war, like who invaded whom and which battles were fought and where. These facts do not tell

the reader how to understand them, how one event led to another, and which were more decisive. For that, an account is needed, also called the story or the narrative. The historian can provide (one version) of that story. First the facts, then the story.

The Explanation

The historian first establishes the facts of what happened, distills them into the ones that they consider historically important, and then weaves them into a story. But there is a third step beyond the account of what happened. It is the story of why it happened, and that narrative is not only broader but also even more subjective. Why did Germany invade Poland on September 1, 1939? Was it the conditions of the Treaty of Versailles or the unstable political system in which Hitler was able to flourish? Why did terrorists attack the World Trade Center on September 11, 2001? Was it poverty in parts of the Arab world, the Russian invasion of Afghanistan that resulted in radicalization, or United States policy in the Middle East? The history of the 9/11 attacks is more than the date on which they occurred. It is the story of how and why, an explanation in which facts are necessary but not sufficient.

One might propose that the history of each of these events be open to replication, allowing others to review the evidence for the facts, the account, and the explanation. As noted, if facts cannot be agreed upon, historians cannot reliably proceed to an account. Facts may be incorrect, but even if they are assumed as stipulated, there may be debate as to which rise to the level of a historical fact.[6]

An Example from the History of Science and Religion

Like any author, the works I know best are the ones I have written. In giving an account of the Jewish reception of Copernican thought, I first had to establish facts of the past (Brown 2013). Which was the very first Jewish text to mention Copernicus by name? Which was the first to accept his heliocentric theory, and which the first to reject it? Until these and many other facts of the past had been established to my satisfaction, it was not possible to begin an account of the Jewish reception of Copernican thought. But in telling that story, which is to say, in giving an account of what happened, I had to make more subjective choices, not only about which facts of the past were important and therefore should be included but also the way to tell that story. Should it be based chronologically on what happened first and what happened next? Perhaps instead it should be arranged geographically, wherein the facts of the past are accounted for not exclusively based on when they occurred but also where. If another historian of science and religion were to tell the same story, would their choices be the same as mine? Could my account be replicated? This is a question that should address each part of my work.

I uncovered data, much of it previously ignored, that showed whether and when Jews (but not Judaism) accepted the Copernican model.[7] Did I get the dates correct? Did I overlook a fact or mistake a historical fact for a fact of history? Would another historian, given the same documentary facts, produce the same account? Would my explanation of why personalities took their particular pro- or anti-Copernican stances be the same as those of another? At each level, a degree of replication can be expected, and if my work could not be replicated, how else should this story and explanation be crafted?

For each part of the work of the historian, the replication effort will vary. Rather than question whether there can be a replication program in history (or literature, or art, or whatever), they need to be very explicit about what kind of history we are attempting to replicate. This should not be thought of as a weakness that applies to replication in the humanities and not in the sciences, because as I will discuss, replication in the sciences is only available for a limited subset of scientific experiments.

A Brief History of the Replication Crisis

The crisis of replication perhaps began around 2010, when two science journalists launched a website to publicize not only scientific papers that had been retracted but also the story of why (Collier 2011). Some of these retractions were based on fraudulent data, in which a published paper described a scientific experiment that may never have been performed or used data that may have been wholly or partially fabricated. But the results of a scientific experiment need not be based on fraudulent data to be misleading. They may be unlikely outcomes that occurred as a matter of chance but cannot (and this is important) be replicated.

Perhaps the most infamous example of this is the 2010 paper by Dana R. Carney, Amy J. C. Cuddy and Andy J. Yap on the effect of high-power poses ("expansive positions with open limbs") on testosterone and cortisol (two hormones associated with "dispositional and situational status and dominance and feelings of power"). Forty-two volunteers were randomly assigned to a high-power-pose or low-power-pose condition, and the results demonstrated, at least to the satisfaction of the authors, that high-power displays (as opposed to low-power displays) caused "physiological, psychological, and behavioral changes consistent with the literature on the effects of power on power holders—elevation of the dominance hormone testosterone, reduction of the stress hormone cortisol, and increases in behaviorally demonstrated risk tolerance and feelings of power" (Carney, Cuddy, and Yap 2010). One of the authors, Cuddy, went on to have a highly successful if somewhat brief career in the popular press as an expert on the use of power poses in industrial psychology. At the time of this writing, she had given the second most highly watched TED talk of all time, amassing over sixty-nine million views. And four years after the paper, she published *Presence: Bringing Your Boldest Self to Your Biggest Challenges*,

which was a *New York Times* bestseller, and one of the *Forbes* 15 Best Business Books of 2015.

There was just one problem. Almost no one could replicate this study. A 2015 paper published in the same journal as the original power-pose study reported that in experiments with 200 volunteers (a sample size some four times larger than used in the original study) there was no effect on hormonal levels or on any of three behavioral tasks (though it did effect self-reported feelings of power) (Ranehill et al. 2015). The authors of the original study responded with a common retort: the methods of the 2015 study were different. At least seven other attempts at replication failed to find any change in preregistered behavioral or hormonal outcomes (Loncar 2021; Jonas et al. 2017). Carney (2016), the first author of the original paper, has since disavowed its findings. "As evidence has come in over these past 2+ years," she wrote, "my views have updated to reflect the evidence. As such, I do not believe that 'power pose' effects are real."

The power-pose paper exposed a problem that is now of major concern: many results of experiments performed in the social sciences cannot be verified. In 2015, the Open Science Collaboration (2015) published its efforts to replicate 100 experimental and correlational studies that had been reported in three psychology journals. They found that replication, which may be variously defined, was limited. The mean effect size in the replication studies—a quantitative measure of the magnitude of the experimental finding—was only half of that seen in the original studies, and although 97% of the original studies reported statistically significant results ($p = < 0.05$), only 36% of the replicated studies did. This problem of replication has also been found in what might be called the hard sciences. "Across multiple criteria," the authors of one basic cancer biology study wrote, "the replications provided weaker evidence for the findings than the original papers" (Errington et al. 2021). For example, the median effect size for the replications was 85% smaller than the median of the original effect sizes. It has been difficult to replicate the success reported in many early drug trials for cancer. When, over a decade, the biotechnology giant Amgen tried to replicate the findings of fifty-three "landmark" hematology and oncology studies, they could do so in only six (11%) (Begley and Ellis 2012). So, a failure to successfully replicate, by which of course I mean to confirm the findings of earlier studies, is clearly not confined to the social sciences. Some 52% of those working in the basic sciences believe that there is a significant crisis of reproducibility, (although perhaps somewhat counterintuitively, 74% said they think at least half of the papers in their field can be trusted) (Baker 2016). Several other disciplines have noted a crisis in reproducibility, including chemistry (Bergman and Danheiser 2016), economics (Camerer et al. 2016), hydrology (Stagge et al. 2019), neuroanatomy (Marek et al. 2022; Poldrack et al. 2017), and human clinical trials (Van Noorden 2023).

What Do We Talk about When We Talk about Replication?

Any early attempts to verify results reported in the social sciences or basic sciences literature must first address an important question: What are we talking about when we talk about replication? What, precisely are the criteria for a successful replication? There are several candidates, and the ones which are chosen will determine whether or not the replication was successful.

Some might suggest using the effect size as the criteria for a successful replication. This is a measure of the magnitude of the difference and direction between the (means of the) two groups compared, and provides a context in which to consider the practical significance of the results. Indeed, for several years some of the major journals have required that the effect size (and not just the *p* value) be reported in all experimental papers (Durlak 2009). But even a goal as clear as this has another degree of complication, centering on the question of which statistical tests should be deployed. There are many statistical measures that might be legitimately used, including raw group differences, Cohen's *d*, which is used to measure the effect size of the means of two groups, and the odds ratio, which provides the odds of a successful outcome in the intervention group relative to the control group. Another measure could also be the direction of the outcome—whether or not there was, overall, a positive or negative finding that matched the direction found in the original study.

The decision about which tests, or group of tests, are to be used in a replication study is far from an objective process. Consider a case in which a replication study results in a finding in the same direction as the original but whose effect was much smaller. Is this to be considered to be a successful or unsuccessful replication? The 100 replication studies undertaken by the Open Science Collaboration used four quantitative markers of replication. But there was also a surprising question that had a yes–no answer and was itself a subjective measure: Did it replicate?

There are three further points I want to emphasize. First, there are some experiments, particularly in clinical science (where they are called trials), that are technically impossible to reproduce. Some clinical trials include many thousands of subjects across multiple countries, cost many millions of dollars, and take many years to perform. The use of energy, resources, and limited research funds to reproduce one's results, while a desideratum certainly of great value, is all but guaranteed not to happen.[8] Second, a failure to reproduce a scientific finding does not in itself indicate that there was misconduct (KNAW 2018). As the previous director the National Institutes of Health notes, a number of other factors may have contributed to a failure, including the poor training of researchers and prior publications that did not report important elements of experimental design, making their replication very challenging (Collins and Tabak 2014). Third, even if a study is successfully replicated, it should not automatically be concluded

that it was credible. "Successful replication increases confidence that the finding is repeatable," the group from the Center for the Open Sciences writes, "but it is mute to its meaning and validity" (Errington et al. 2021). They continue: "For example, if the finding is a result of unrecognized confounding influences or invalid measures, then the interpretation may be wrong even if it is easily replicated. Also, the interpretation of a finding may be much more general than is justified by the evidence. The particular experimental paradigm may elicit highly replicable findings, but also apply only to very specific circumstances that are much more circumscribed than the interpretation" (Errington et al. 2021).

Over many decades, those in drug development have learned that replication in different genders and ethnicities is vital. A new drug found to be successful in women may be less so in men (Soldin and Mattison 2009; Tamargo et al. 2017). Some drugs have an enhanced effect in certain ethnic groups compared to others (Chekka et al. 2021). But beyond these known differences, there are cases in which researchers have been oblivious to the profound effects of "unrecognized confounding influences" (Errington et al. 2021). If this is certain in the sciences, it is likely so in the humanities. This may be the greatest challenge to the replication program.

Degrees of Freedom

I now turn to what I believe is the fundamental challenge to replication in the humanities, and it comes from a statistical measure called degrees of freedom: the number of independent parameters that function within a system. Degrees of freedom may be thought of as the number of independent bits of information used to calculate a statistic, although the calculation can vary between statistical tests (Lazic 2010). Scientists can of course only account for degrees of freedom when they know about them; the challenge is that sometimes unknown or unrecognized confounding influences turn out to be additional degrees of freedom that were originally discounted.

Here is an example that, while necessarily detailed, is illustrative of this effect. Let us assume a researcher is interested in developing a new analgesic. To do so, the candidate drug must first be tested for safety and efficacy in animals. But how, precisely, can the analgesic ability of a drug on, say, a laboratory mouse be measured? Since it is known that humans grimace when in pain, it seems reasonable to assume that this response might be present in other mammals, including mice. The team develops a mouse grimacing scale that will give a reliable and reproducible measure of the subjective degree of pain felt by a mouse (Langford et al. 2010). The next step is to inflict pain on the mice, perhaps by injecting an irritant into their ankle joints. The laboratory technician may then observe the degree to which the mice grimace from the pain with and without the experimental analgesic.

These were the very steps taken by a team of researchers led by Robert Sorge from McGill University (Sorge et al. 2014). However, as they proceeded, they noticed that their experimental mice failed to grimace in ways that would be expected. But this changed when the laboratory technician left the room. Once alone, the mice began to exhibit their usual behaviors, including grimacing, associated with pain. Somehow, the presence of the technician was affecting the behavior of the mice; it appeared to provide them with a degree of analgesia. But this was (quite literally) only half the story, because it only happened when the technician was male. The presence of female technicians did not prevent the usual grimacing. Eventually, the team recognized that the mice were responding to the smell rather than the presence of a male technician, because the same grimace repression occurred in the presence of clothing that had been worn by a male. In fact, the team learned that the smell of any number of males from different species could prevent grimacing: the mice reacted to the presence of the smells from male guinea pigs, male cats, and male dogs in the same way they reacted to the presence of a male laboratory technician.[9]

I have detailed this episode because it highlights the challenge of reproducibility and the number of degrees of freedom. Before this gender-based finding was observed, were a team to reproduce the original experiments by Sorge and his colleagues, they might have used the same strains and gender of mice and the same technique for inducing pain. But would they have performed the experiment at the same times of the day or during the same season as the original? Would they have used a technician who was the same gender? If these were thought to be extraneous factors that would not alter the outcomes of the experiment, then these independent parameters, these degrees of freedom, would not have been replicated. If the original experiment had been performed on a rainy day when the barometric pressure was low, it could reasonably be repeated on a sunny day when the pressure is high, if, and only if, this degree of freedom (the barometric pressure) was thought to be inconsequential. But it turns out that even in the controlled environment of a laboratory setting, some discounted degrees of freedom can unexpectedly become critically important. And one of these that had been previously ignored was the gender of the technician. The effects of the gender of the experimenter have also been found in different human studies. (I am cognizant of the irony of citing the following experiments, which may not yet have been replicated.) People seem to perform better on memory tests when the experimenter is of the opposite sex; they may also have better physical performance when the experimenter is of the opposite gender. Men have elevated testosterone when the experimenter is a woman and seem to tolerate more pain than if the experimenter were male (Chapman, Benedict, and Schiöth 2018). This previously unrecognized confounding influence has introduced a new degree of freedom into the experimental method.

Are there limits to what degrees of freedom are allowed for? It is always assumed that there are, because some must be discounted to avoid a paralysis of investigation. For example, when replicating experimental conditions in the basic or social sciences, the astrological configuration is not controlled for; the experimenter is not required to perform their test when Jupiter is in the constellation of Aires (or whatever) because those were the astrological conditions under which the original experiment was performed. Astrology is discounted as a degree of freedom, just as the gender of the experimenter once was. Might we change our minds about astrology? Of course. If the evidence demonstrated that astrological conditions influenced the behavior of subjects, be they human or non-human animals or cells, then it would be correct to include this variable as another degree of freedom, just as the gender of the experimenter is now included in some rodent experiments. So far, of course, there is no such evidence, and so astrology is correctly discounted as not being of any importance, of adding a degree of freedom, in the replication of previous work (Thagard 1978; Moberger 2020).

The Encroachment of Scientism

If a program of replication is achievable for (at least some parts of) the humanities, what becomes of the road towards scientism, the belief that the world is more explainable with the help of basic scientific principles? Might its claims be strengthened? The minimalist or weak version claims that the methods of science are the best ways of securing knowledge of anything, and the maximalist or strong version claims that the methods of science are the only reliable ways (van Woudenberg 2023). But both versions might encourage those in the humanities to focus only on those disciplines that allow for some kind of replication. Only they would be considered worthy of academic study. It is not hard to imagine a scenario in which professors of literature or history would be expected to support their salaries and PhD students with research funding, just as is now the case with academics who study and teach the basic sciences (Boss and Eckert 2004). Only the humanities—or better, only parts of the humanities—that allow for replication would be supported. Work outside this niche would no longer be welcome in the fellowship of higher education.

This danger must be addressed by those who would advocate for an agenda of replication in the humanities. University undergraduates are already leaving the liberal arts for degrees that focus on health, technology, and business, and this trend will only worsen if scientism ascends.[10] Leon Wieseltier (2013) has warned that as a result of scientism, "the humanities are the handmaiden of the sciences, and dependent upon the sciences for their advance and even their survival," and the replication agenda may well increase this dependence, in

terms of both methodology and financial support. Beware of the unintended consequences that flow from a stance of confidence in the humanities.

Putting It All Together

In one of the first papers on this topic, Peels (2019) describes four potential obstacles to replication in the humanities. First, that the object or event under study is unique. Second, the methodologies employed in the humanities do not lend themselves to replication. Third, many of the objects of study in the humanities "are normative in the sense that they are objects of value and meaning, whereas this is not the case in many of the natural and biomedical sciences." And fourth, even though replication may well be possible in the humanities, "it is not particularly desirable—not something to aim at or invest research money on—because there is simply too much disagreement in the humanities for there to be a successful replication sufficiently often." To each of these obstacles, Peels offered a rejoinder: few events are really unique (there was only one French Revolution, but there were many other revolutions); many different kinds of methodologies are used in the social sciences, and some (but not all) may indeed be replicable (those that are empirical but not those methods that are deductive); even when the humanities are concerned with meaning (and the sciences with molecules,) it may be possible to replicate that meaning multiple times; and finally, disagreement, or better, differing schools of thought, are a feature of many disciplines outside of the humanities, such as economics and quantum physics, and yet these disciplines may still be subject to replication.

It is now clear that while Peels believes that replication in the humanities may be possible but only in a limited and circumscribed way, this should not be thought of as a constraint that applies only to the humanities. As I have carefully noted, replication in a limited and circumscribed way is also a feature of basic and clinical research. Some degrees of freedom are replicated, while others, thought not to be important, are not. It will take time and further effort to determine whether these were correct. But at its core, this article has demonstrated that there can be a replication program in some of the humanities and that a constricted version of replication does not *ab initio* suggest that the program is of little value.

Let us return to the three kinds of history and see how they are each affected by the choice of degrees of freedom. First, I noted that historians choose from a pool of facts that they decide are to be considered historical. These facts are subject to replication, or better, verification. But the choice of facts, the decision to declare Caesar's crossing of the Rubicon, but not that of millions of other people before or since, a fact of history is far more subjective and falls outside of a replication program. In addition, there may be historical facts that had a previously unnoticed effect. Once discovered, they, like the gender of the laboratory technician, may no longer be discounted.

Second, the decision to develop the chosen historical facts into an account may also be subject to replication. But the danger from unknown degrees of freedom increases as ever more expansive accounts are developed and as historians move from the facts to the account and then to the explanation. One historian may include previously discounted degrees of freedom and produce a historically coherent account that is at odds with another's. When challenged, each may simply explain that their account includes degrees of freedom that were deliberately or accidentally discounted by the other. This is particularly obvious when it comes to the third kind of history told: the explanation of what happened. One historian believes Napoleon's doomed march on Moscow failed because of the poor logistics and a failure to supply his forward forces. A second claims that another degree of freedom needs to be accounted for: the weather. For a third, there is a new degree of freedom: the altitude of the terrain. A fourth claims that the pivotal degree of freedom, one that had been overlooked (and so was an unrecognized confounding influence), was the failure of Napoleon's subordinates to properly command and control their forces (Keefe 2015). As the degrees of freedom expand, the likelihood for any meaningful replication diminishes. But, as demonstrated by the gender of lab technicians, this is also true of the sciences.

Ever since Karl Popper, most believe that a scientific statement is one that at its basis is subject to falsification.[11] It only takes one black swan to disprove the thesis (which in this case is nothing more than an observation) that all swans are white. The concept of falsifiability is to empirically test a theory or hypothesis to see if it is false. Replication is the accepted way of verifying this. But let us remember that not all hypotheses or observations are scientific, in so much as they cannot be falsified. But this does not make them less important. $E = mc^2$ is a scientific explanation; proclaiming that "I love you" is not. But both are enriching. What then, is to be done with non-falsifiable theories in the humanities, those that do not lend themselves to verification? Discard them as unscientific, or embrace them because they too enhance our lives? A scientific account of the pigments that make up the eyes of Johannes Vermeer's *Girl with a Pearl Earring* will do nothing to explain why her gaze is so haunting. For that, the non-verifiable and non-falsifiable explanations of emotion, empathy, and passion are still needed.

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Notes

[1] The Second Amendment is brief: "A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed."

[2] This is not the place for a discussion of textualism versus originalism.

[3] See the articles in this thematic section, particularly the Introduction (Peels et al.), the conceptual replication (Pear, van den Brink, and Peels), and the article by Brooke.

[4] See, for example, the front page of London's *Evening Standard* newspaper on September 1, 1939, available at https://time.com/5659728/poland-1939/.

[5] Hobsbawn first made this claim in a paper published in 1952 and repeated it in his book *Labouring Men,* published in 1964 (see Hobsbawn 1952, 58; 1965, 6). For an analysis, see Kevin Linch (2011, 4–5).

[6] These ways of "doing" history are of course not meant to be exhaustive. Understanding what an event meant to the people who lived through it is another, and no less important, way of writing history.

[7] Since the destruction of the Second Temple and the dissolution of the Sanhedrin, there has been no central authority for all of Jewish practice. In eastern Europe for example, most towns had their own rabbinic authority and rabbinic court.

[8] It is for this reason that it is so important to get it right the first time.

[9] On reflection, this finding should not have been surprising. Mouse olfaction is highly developed; the scent of mouse urine transmits information about the individual identity of its owner, as well as its reproductive status, health, and food resources (see Hurst and Beynon 2004, 1288–98).

[10] In the United States, there has been an enormous rise in the numbers of STEM undergraduate degrees: over the past ten years, there has been a doubling of the percentage of bachelor's degrees awarded in computer and information science, a 32% increase in mathematics and statistics degrees, and a 47% increase in undergraduate degrees in engineering. These come at the expense of the liberal arts. Over the same period, there was a 10% decrease in the number of bachelor's degrees awarded in social sciences and history, a 16% decrease in philosophy and religious studies degrees, and a 32% decrease in English degrees. Data extracted from National Center for Education Statistics (2023).

[11] Most, but not all. There are other accounts of what make a statement "scientific," but for the sake of space, only the Popperian definition is addressed. For a survey of the other definitions see, for example, https://plato.stanford.edu/entries/pseudo-science.

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IN THIS ISSUE

EDITORIAL

ARTICLES

REPLICATING JOHN HEDLEY BROOKE'S WORK ON HISTORY OF SCIENCE AND RELIGION