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

Rachel S. A. Pear, Associate Director, Abrahamic Theistic Origins Project, Israel, RachelS.A.Pear@gmail.com

Gijsbert van den Brink, Full Professor, Faculty of Religion and Theology, Vrije Universiteit Amsterdam, The Netherlands; Extraordinary Researcher, Faculty of Theology, North-West University, Potchefstroom, South Africa, g.vanden.brink@vu.nl

Rik Peels, Full Professor, Faculty of Religion and Theology, Vrije Universiteit Amsterdam, the Netherlands; Research Associate, African Center for Epistemology and Philosophy of Science, University of Johannesburg, South Africa, h.d.peels@vu.nl

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).

References

Berger, David. 1997. "Judaism and General Culture in Medieval and Early Modern Times." In *Judaism's Encounter with Other Cultures*, edited by Jacob J. Schacter, 57–141. Oxford: Rowman and Littlefield.

Brooke, John Hedley. 1991. *Science and Religion: Some Historical Perspectives*. Cambridge: Cambridge University Press.

———. 2014. "Living with Theology and Science: From Past to Present." *Theology and Science* 12 (4): 307–23. https://doi.org/10.1080/14746700.2014.954396.

Brown, Jeremy. 2013. *New Heavens and a New Earth: Jewish Receptions of Copernican Thought*. Oxford: Oxford University Press.

Cohen, Floris. 2016. *Het knagende weten* [*The Nagging Knowledge*]. Amsterdam: Prometheus.

Efron, Noah J. 1997. "Jewish Thought and Scientific Discovery in Early Modern Europe." *Journal for the History of Ideas* 58 (4): 719–32.

———. 2007. *Judaism & Science: A Historical Introduction*. Westport, CT: Greenwood Press.

———. 2009. "That Christianity Gave Birth to Modern Science." In *Galileo Goes to Jail and Other Myths about Science and Religion*, edited by Ronald Numbers, 79–89. Cambridge, MA: Harvard University Press.

———. 2010. "Sciences and Religions: What It Means to Take Historical Perspectives Seriously." In *Science and Religion: New Historical Perspectives*, edited by Thomas Dixon et al., 247–62. Cambridge: Cambridge University Press.

Efron, Noah J., and Menachem Fisch. 2001. "Astronomical Exegesis: An Early Modern Jewish Interpretation of the Heavens." *Osiris* 16:72–87.

Goren, Ahuvia. 2022. "The Scientific Method, the Atomist Theory, and the Bible Commentary of Rabbi Moshe Chefetz (1664–1712)." *Zion* 88a:75–102.

Grimm, Stephen, Rik Peels, and René van Woudenberg. 2025. *A Philosophy of the Humanities*. New York: Oxford University Press.

Harrison, Peter. 2007. *The Fall of Man and the Foundations of Science*. Cambridge: Cambridge University Press.

Holbrook, James Britt, Bart Penders, and Sarah de Rijcke. 2019. "The Humanities Do Not Need a Replication Drive." *CWTS Blog*. January 21, 2019. https://www.cwts.nl/blog?article=n-r2v2a4&title=the-humanities-do-not-need-a-replication-drive.

Hooykaas, Reijer. 1956. "Science and Reformation." *Journal of World History* 3:136–38.

———. 1959. *Natural Law and Divine Miracle: A Historical-Critical Study of the Principle of Uniformity in Geology, Biology, and Theology*. Leiden: Brill.

———. 1972. *Religion and the Rise of Modern Science*. Edinburgh: Scottish Academy Press.

Hudson, Robert. 2021. "Explicating Exact versus Conceptual Replication." *Erkenntniss* 88:2493–514. https://doi.org/10.1007/s10670-021-00464-z.

Huijnen, Pim, and Pieter Huistra. 2022. *On the Use of Replications in History*. White paper. Utrecht.

Kahana, Maoz. 2021. *A Heartless Chicken: Religion and Science in Early Modern Rabbinic Culture*. Jerusalem: Mosad Bialik.

Leonelli, Sabina. 2018. "Re-Thinking Reproducibility as a Criterion for Research Quality." Preprint, *Research in the History of Economic Thought and Methodology*. http://philsci-archive.pitt.edu/id/eprint/14352.

Lightman, Bernard, ed. 2019. *Rethinking History, Science, and Religion: An Exploration of Conflict and the Complexity Principle*. Pittsburgh, PA: University of Pittsburgh Press.

Neher, Andre. 1977. "Copernicus in the Hebraic Literature from the 16th to the 18th Century." *Journal of the History of Ideas* 38:211–26.

Numbers, Ronald L. 1992. "Review of *Science and Religion*, by John Hedley Brook." *Metascience* 1:35–39.

Panitz, Michael. 1988. "New Heavens and a New Earth: Seventeenth- to Nineteenth-Century Jewish Responses to the New Astronomy." *Conservative Judaism* 40:28–42.

Peels, Rik. 2019. "Replication and Replicability in the Humanities." *Research Integrity and Peer Review* 4.2:12. https://doi.org/10.1186/s41073-018-0060-4.

Peels, Rik, and Lex Bouter. 2018a. "The Possibility and Desirability of Replication in the Humanities." *Palgrave Communications* 4:95. https://doi.org/10.1057/s41599-018-0149-x.

———. 2018b. "Replication Drive for Humanities." *Nature* 558:372.

———. 2018c. "Replication is Both Possible and Desirable in the Humanities, Just as It Is in the Sciences." *London School of Economics and Political Science Impact Blog*. October 10, 2018. http://blogs.lse.ac.uk/impactofsocialsciences/2018/10/01/replication-is-both-possible-and-desirable-in-the-humanities-just-as-it-is-in-the-sciences/.

Peels, Rik, Lex Bouter, and René van Woudenberg. 2019. "Do the Humanities Need a Replication Drive? A Debate Rages on." Retraction Watch. February 13, 2019. https://retractionwatch.com/2019/02/13/do-the-humanities-need-a-replication-drive-a-debate-rages-on/#more-86398.

Penders, Bart, J. Britt Holbrook, and Sarah de Rijcke. 2019. "Rinse and Repeat: Understanding the Value of Replication across Different Ways of Knowing." *Publications* 7 (3): 52. https://doi.org/10.3390/publications7030052.

Ruderman, David B. 1995. *Jewish Thought and Scientific Discovery in Early Modern Europe*. New Haven, CT: Yale University Press.

Rulkens, Charlotte, Hans Van Eyghen, Rachel Pear, Rik Peels, Lex Bouter, Maartje Stols-Witlox, Gijsbert van den Brink, Edwin Buijsen, Sabrina Meloni, and René van Woudenberg. 2022. "Exploring the Strengths and Limitations of Replication in the Humanities: Two Case Studies." Center for Open Science. November 30, 2022. https://www.cos.io/blog/exploring-the-strengths-and-limitations-of-replication-in-the-humanities.

van den Brink, Gijsbert. 2009. *Philosophy of Science for Theologians. An Introduction*. Frankfurt: Peter Lang.

———. 2015. "The Reformation, Rationality and the Rise of Modern Science." In *Reformation und Rationalität*, edited by Herman J. Selderhuis and Ernst-Joachim Waschke, 193–205. Göttingen: Vandenhoeck & Ruprecht.

Vermij, Rienk. 2002. *The Calvinist Copernicans. The Reception of the New Astronomy in the Dutch Republic, 1575–1750*. Amsterdam: KNAW.