

Ünsal Çimen

ORCID [0000-0003-0575-6053](https://orcid.org/0000-0003-0575-6053)

Muş Alparslan Üniversitesi (Muş, Türkiye)

u.cimen@alparslan.edu.tr; cimen.trky@gmail.com



Giordano Bruno, Science, and Religious Reasons for His Execution: A Reconsideration

Abstract

While some researchers argue that Giordano Bruno is often thought to have been condemned for supporting Copernican astronomy, the plurality of worlds, or an infinite universe, others disagree, claiming that Bruno's persecution was religious rather than scientific in nature. For these scholars, the official summary document of his trial demonstrates that little emphasis was placed on philosophical or scientific issues during his interrogations, while his religious mission remained central.

Consequently, the longstanding legend that Bruno was prosecuted for his bold cosmological ideas can no longer be sustained, as his crimes were fundamentally religious, regardless of his views on the structure of the cosmos.

This article argues, however, that not all of Bruno's alleged crimes mentioned in the summary document – crimes that Bruno did not deny – were religious in nature; instead, a significant portion concerned natural philosophy, that is, science understood as the study of nature.

Keywords: *Giordano Bruno, Galileo, Copernicanism, Church, infinite universe, plurality of worlds*

PUBLICATION INFO		e-ISSN 2543-702X ISSN 2451-3202		 DIAMOND OPEN ACCESS
Çimen, Ünsal 2026: Giordano Bruno, Science, and Religious Reasons for His Execution: A Reconsideration. <i>Studia Historiae Scientiarum</i> (FirstView Article). DOI: 10.4467/2543702XSHS.26.006.22695 .				
RECEIVED: 08.04.2025 ACCEPTED: 26.08.2026 PUBLISHED ONLINE: 10.10.2026	ARCHIVE POLICY OPEN POLICY FINDER	LICENSE 		
WWW	https://ojs.ejournals.eu/SHS/ ; https://pau.krakow.pl/Studia-Historiae-Scientiarum/archiwum			

Giordano Bruno, nauka i religijne powody jego egzekucji: ponowne rozważenie

Abstrakt

Chociaż niektórzy badacze twierdzą, że Giordano Bruno był często potępiany za wspieranie astronomii kopernikańskiej, teorii mnogości światów czy nieskończonego wszechświata, to jednak inni się z tym nie zgadzają, twierdząc, że prześladowania Bruna miały charakter religijny, a nie naukowy. Dla nich oficjalny dokument podsumowujący jego proces pokazuje, że podczas przesłuchań nie przywiązywano dużej wagi do kwestii filozoficznych ani naukowych, za to w centrum uwagi pozostawała jego misja religijna.

W związku z tym długoletnia legenda, że Bruno był ścigany za swoje śmiałe idee kosmologiczne, nie może być dłużej podtrzymywana, ponieważ jego przewinienia miały charakter religijny, nie zależały od jego poglądów na strukturę kosmosu.

Niniejszy artykuł dowodzi jednak, że nie wszystkie domniemane przestępstwa Giordana Bruna wymienione w dokumencie końcowym – którym on sam nie zaprzeczał – miały charakter religijny; natomiast znaczna ich część dotyczyła filozofii przyrody, czyli nauki rozumianej jako badanie natury.

Słowa kluczowe: *Giordano Bruno, Galileusz, kopernikanizm, Kościół, nieskończony wszechświat, mnogość światów*

1. Introduction

It is generally believed that Giordano Bruno was killed for his Copernicanism. For example, Andrew Dickson White says of Bruno in his book *The Warfare of Science*:

He [Bruno] was hunted from land to land, until, at last, he turns on his pursuers with fearful invectives. For this he is imprisoned six years, then burned alive and his ashes scattered to the winds. Still the new truth lived on; it could not be killed. Within ten years after the martyrdom of Bruno, after a world of troubles and persecutions, the truth of the doctrine of Copernik was established by the telescope of Galileo (White 2009, p. 130).

Another who says Bruno was executed for his advocacy of Copernicanism is the astronomer, Cecilia Payne-Gaposchkin:

At the end of the sixteenth century the theory of Copernicus was warmly, if not hotly, upheld by Giordano Bruno, who welcomed its aid in his attack on Aristotle. Bruno was imprisoned, excommunicated, and burned at the stake in 1600, and scientific men of succeeding generations cannot have been unmindful of his fate (Payne-Gaposchkin 1954, p. 163).

Again, Hugh F. Kearney, in his work *Science and Change 1500–1700*, says the following about Bruno, his Copernicanism, and his execution by the Church:

Bruno was the most enthusiastic exponent of the heliocentric doctrine in the second half of the century. He lectured throughout Europe on it and in his hands Copernicanism became part of the Hermetic tradition. [...] Bruno transformed a mathematical synthesis into a religious doctrine. [...] Inevitably these views brought him into conflict with the orthodox academics (Kearney 1971, p. 106).

However, there are those who oppose this view, claiming that Copernicanism was not the reason for Bruno's execution. Jole Shackelford, for example, gives more weight to what Kearney said because he realized that Bruno was using the Copernican astronomical model in a religious context, rather than a scientific (natural philosophical) one (see Shackelford 2009, p. 61). Ronald L. Numbers agrees, saying:

No scientist, to our knowledge, ever lost his life because of his scientific views, though, [...] the Italian Inquisition did incinerate the sixteenth-century Copernican Giordano Bruno for his heretical theological notions (Numbers 2009, p. 6).

Again, David Hutchings and James C. Ungureanu agree with Numbers and Shackelford as they quote their words in their book (see Hutchings, Ungureanu 2022, pp. 141, 153). Another person who thinks that Copernicanism was not the reason for Bruno's execution is Michael Newton Keas; he says:

Many people think he was executed because he believed in Copernican astronomy, extraterrestrial intelligence, and an infinite universe (Keas 2019, p. 57).

Thomas M. Lessl also says,

Bruno, who was not a scientist at all, was persecuted for religious rather than scientific reasons (Lessl 1999, p. 146).¹

I would also like to cite the following statement by Frances A. Yates, who shares a similar perspective:

Thus, the legend that Bruno was prosecuted as a philosophical thinker, was burned for his daring views on innumerable worlds or on the movement of the earth, can no longer stand. That legend has already been undermined by the publication of the *Sommario*, which shows how little attention was paid to philosophical or scientific questions in the interrogations, and by the writings of Corsano and Firpo, laying stress on Bruno's religious mission (Yates 1964, p. 355).

Referring to Luigi Firpo, Yates also says:

We do not have enough evidence (the *processo* being lost) from which to reconstruct Bruno's trial and condemnation (Yates 1964, pp. 354–355).

When we consider the above words of Yates, we should ask: if it is impossible to reconstruct Bruno's trial perfectly based solely on the surviving summary document, how can one argue that it became clear – after the publication of that summary – that Bruno was not executed for his scientific views? Since proponents of the view that Bruno was not executed for his scientific (natural philosophical) views rely on this same document, I will likewise employ it to challenge their arguments.

Shackelford refers to Angelo Mercati, who discovered the summary document of Bruno's trial. Drawing on Mercati's interpretation of the trial and conviction, Shackelford argues as follows:

¹ When Shackelford and others speak of a 'scientific context,' 'scientific view,' or 'scientist' in relation to Bruno, they must be using the term 'science' in the sense of the study of nature, not in its modern sense. In Bruno's time, the term 'natural philosophy' was used instead of 'science'; it referred to a branch of philosophy concerned with the investigation of the structure, operations, and fundamental principles of nature. The terms 'science' and 'scientist' were coined later. Science became separated from natural philosophy in the nineteenth century, when it developed into a specialized field of study with a distinct method. The first person to use the word 'scientist' was William Whewell (see Ross 1962, p. 72).

Bruno's crimes were clearly of a religious nature, no matter what his views of the structure of the physical cosmos (Shackelford 2009, p. 62).

Again, regarding Mercati's opinion on Bruno's trial, Martínez says:

In 1942 Angelo Mercati argued that the 'Summary' of Bruno's trial shows he was not prosecuted for scientific claims (Martínez 2018, p. 90).

In this article, I argue that the claim that Bruno's crimes were clearly religious in nature is misleading. The difficulty in asserting that Bruno was executed solely for crimes of a religious nature lies in the tendency to interpret his natural philosophical propositions as inherently religious. I do not claim that all the charges for which the Church condemned Bruno were grounded in natural philosophy; nevertheless, it would be mistaken to disregard the influence of such propositions on his execution by simply asserting that 'Bruno's crimes were clearly of a religious nature.'

This study grounds its argument in the propositions preserved within the official summary of Bruno's trial. In the second section of this paper, based on this summary, I argue that there are sufficient natural philosophical (and cosmological) elements to demonstrate that the accusations brought against Bruno by the Church were not entirely religious in nature. The third section will discuss another argument, which is likewise based on the nature of the propositions contained in the summary of Bruno's trial. According to this argument, the conflict between Bruno and the Church should not be understood as a conflict between science and religion, but rather as one between philosophy and religion. I argue that framing the conflict between Bruno and the Church as a conflict between philosophy and religion obscures the role of Bruno's natural philosophical (or scientific) arguments in the dispute. However, I want to emphasize that my intention is not to reduce this conflict to merely a matter between science and the Church. Of course, there is a religious dimension to the conflict, but I aim to show that it is misleading to claim that all of Bruno's crimes were religious in nature.

2. Were Bruno's Crimes Merely Religious in Nature?

As mentioned above, Numbers argues that Bruno was burned at the stake by the Inquisition for his heretical theological ideas; Lessl argues that Bruno was persecuted for religious rather than scientific reasons; and, according to Shackelford, Bruno's crimes were clearly religious in nature. In this section, I will present Bruno's propositions that were considered heretical by the Church, and argue that most of them are natural philosophical.

Below, I have listed eleven theses that were considered objectionable by the Inquisition, as quoted by Maurice A. Finocchiaro from Mercati's summary document:²

1. The universe is eternal, or temporally infinite.
2. The universe is spatially infinite.
3. There exists an infinite plurality of worlds similar to ours in many ways, such as having intelligent life.
4. The individual immortality of the human soul is a questionable proposition.
5. Substance can neither be created nor destroyed, but only changed in its manifestations, that is, substance is 'conserved'.
6. The earth moves with the several Copernican motions.
7. The stars are animate, that is, possess rational souls.
8. The earth is animate, that is, possesses a rational soul.

² For articles 1, 2, 3, and 7, see Bruno's *De l'infinito, universo e mondi* (Bruno 2014). For articles 4, 5, 8, 9, and 10, see his *De la causa, principio et uno* (Bruno 2004). For article 6, see his *La cena de le ceneri* (Bruno 2018).

9. On the question of the relationship between soul and body, the human soul is not the form of the body but is a spiritual substance inhabiting the body in a manner analogous to how a pilot guides a ship.
10. The Holy Spirit may be identified with the soul of the universe.
11. There is evidence for the pre-Adamite thesis that some human beings existed prior to Adam and Eve.³

Are these propositions theological, religious, or natural philosophical? I would like to address this question using two of the propositions mentioned above, and then evaluate the others in light of these examples. The example propositions are the claims that ‘the universe is eternal, or temporally infinite’ and that ‘the Earth moves with the several Copernican motions.’ Regarding these two propositions, my answer is that they are neither theological nor religious. Could a non-Christian make these propositions? Certainly. A theist or an atheist could make these claims without appealing to religious authority. Both claims are natural philosophical in nature, and their validity does not depend on religious belief.

However, we can say that the Church considers the proposition that “the universe is temporally finite” a matter of faith, because Genesis 1:1 states, “In the beginning God created the heavens and the earth.” Since this proposition is consistent with that passage of the Holy Bible, the Church regards it as a matter of faith, and any claims to the contrary are considered heretical.

Let me elaborate on my opinion with an analogy from the Galileo case. As is well known, Galileo was found guilty of advancing claims considered contrary to Scripture. First of all, the proposition “the Sun moves around the Earth” is not a religious or theological proposition, but it can be accepted as a matter of faith by Christians. This proposition is, in fact, an interpretation of certain passages of the Holy Book, such as the passage concerning the prophet Joshua, and there may be Christian believers who interpret these passages differently. For example, Galileo interpreted this passage as being compatible with the heliocentric model rather than the geocentric model. In Joshua 10:12–13, he commands the Sun to stop in order to prolong the day so that he could continue fighting the enemy. However, at that time, it was widely and officially accepted that if the Sun was ordered to stop, then it must be moving; therefore, the heliocentric model, which claims that the Sun stands at the center of the universe, had to be wrong.

Galileo believed that the heliocentric model did not contradict the Bible and presented the propositions that “the Sun is at the center and the Earth revolves around it” as claims of natural philosophy.⁴ However, these propositions were considered heretical by Church authorities, as the motion of the Sun and the immobility of the Earth were regarded as matters of faith. Since the Church at that time considered these propositions matters of faith, she placed Galileo under house arrest, even though he renounced his claims. The crucial point is that the Church did not define the motion of the Sun or the immobility of the Earth as intrinsically religious propositions. Rather, while conceding that, with respect to their subject matter, these claims belonged to the domain of natural philosophy, the Church nevertheless held that they

³ Finocchiaro 2016, p. 61. This summary list can also be found in Mercati 1942, pp. 55–119 and in Firpo 1993, pp. 247–304. Martínez says the following about these propositions: “The ‘Summary’ that Mercati discovered consists of ten propositions. Luigi Firpo reproduces all ten, but then adds two others from a later account by Gaspar Schoppe. Maurice Finocchiaro closely follows Firpo, but interpolates yet another: ‘the individual immortality of the human soul is a questionable proposition.’ I find no evidence for this interpolated proposition. Instead, Bruno repeatedly claimed: ‘I hold that souls are immortal’” (Martínez 2018, p. 48).

⁴ For Galileo’s explanation that the heliocentric model does not contradict the Bible, see his *Letter to the Grand Duchess Christina* (Galileo 2008).

were to be treated as matters of faith with respect to the speaker. This means that the Church recognized that Galileo's offenses – namely, claiming that the Sun stands still at the center and that the Earth moves – were propositions of natural philosophy. However, these assertions were deemed to be in conflict with opposing propositions – namely, the motion of the Sun and the immobility of the Earth – which were likewise propositions of natural philosophy with respect to their subject matter, but were treated as matters of faith with respect to the speaker. Cardinal Bellarmine's letter to Paolo Antonio Foscarini in 1615⁵ contains a crucial theological/epistemological distinction in the context of the Galileo debates. He distinguishes between:

- a) Propositions that are, by their very nature, matters of faith.
- b) Propositions that become matters of faith because of the authority of the speaker.

Examples of propositions that are matters of faith by their nature include statements such as "God is one in three persons (the Trinity)" and "Jesus Christ is fully God and fully man." By contrast, propositions such as "The sun is at the center of the universe" and "The Earth is motionless" are, by their subject matter, scientific or natural philosophical rather than religious. However, they can become matters of faith when Holy Scripture or the Church's teaching authority issues a binding judgment on them.

In propositions that are matters of faith because of the speaker, the speaker is not just anyone. Ultimately, the "speaker" is God, and those authorized to interpret God's word are indirectly considered the speakers as well. These are the holders of the Church's teaching authority (the magisterium), namely the Pope and the Ecumenical Councils.⁶ Even if a proposition concerns natural science, once it is bindingly expressed by these authorities, it enters the realm of faith. Thus, the proposition "the Earth is immobile" creates an obligation of faith insofar as it is associated with the Church's authoritative teaching.

Bellarmino also states in the same letter that if conclusive evidence were presented demonstrating that the Earth moves, then the relevant biblical texts would need to be reinterpreted. This implies that the status of the proposition "the Earth is immobile" as a matter of faith is not absolute or immutable. If the authoritative interpretation changes, the obligation of faith likewise ceases. Therefore, such a proposition is not a matter of faith by its very nature; rather, it becomes a matter of faith conditionally, because of the speaker.

Let us now consider the propositions "the Earth is temporally infinite" and "the Earth is temporally finite." The latter proposition is consistent with the Bible, whereas the former appears to contradict it. Nevertheless, both propositions belong not to theology or religion but to natural philosophy. If a theist or an atheist were to claim that "the Earth is temporally finite"

⁵ See Bellarmine 2008, pp. 146–148.

⁶ Regarding this, Bellarmine says the following:

"Our adversaries agree with us that the Scriptures ought to be understood in the spirit in which they were written, that is, in the Holy Spirit. The Apostle Peter teaches this in 2 Peter 1, when he says, «Understand this first, that no prophecies are due to individual interpretation. For the prophecies are never derived from human effort; rather the holy men of God spoke as inspired by the Holy Spirit.» By this St. Peter proves that the Scriptures ought not to be explained by the individual mind but according to the dictates of the Holy Spirit, because they were not written by the human mind but by the inspiration of the Holy Spirit.

The whole question, therefore, comes down to this: Where is that spirit? We maintain that, although this Spirit is often absent in many individual persons, still it is certainly to be found in the Church, that is, in a council of bishops established by the highest pastor of the whole Church, or in the highest pastor with a council of the other pastors. We do not wish to enter into a discussion here about the highest pontiff and councils, as to whether the pontiff alone or a council alone can define something. We will deal with this in its own place. Rather here we say in general that the judge of the true meaning of Scripture and of all controversies is the Church, that is, the pontiff with a council, on which all Catholics agree and which was expressly stated by the Council of Trent, Session 4" (Bellarmine 1991, p. 191).

and justify this claim through philosophical reasoning, could we say that they have made a religious or theological proposition? The answer is no. Although the proposition “the Earth is temporally finite” is a matter of faith for a Christian, this does not make it, in itself, a religious proposition. In terms of its linguistic and conceptual structure, it remains a proposition of natural philosophy. For a Christian, epistemological certainty derives from revelation and theology; for an atheist philosopher, this certainty does not come from theology.

Therefore, we can say that there is no difference between “the universe is eternal” and “the Earth moves with the various Copernican motions,” because both are propositions of natural philosophy, and Bruno himself states that he makes these claims as a philosopher.⁷ What is then interesting is why Numbers, Lessl, and Shackelford did not mention Galileo. For the sake of consistency, they should have mentioned him as well. They might respond by arguing that Galileo, unlike Bruno, was a true scientist and was not burned at the stake. First of all, I must point out that using the term scientist for Galileo is itself anachronistic too. I use this term deliberately to refer specifically to the study of nature because Numbers states, “To our knowledge, no scientist has ever lost his life because of his scientific opinions,” and Lessl claims that “Bruno was not actually a scientist at all.” I readily acknowledge that Galileo was far closer to a scientist than Bruno in the modern sense. Even within their historical context – given that Bruno and Galileo lived roughly in the same period – Galileo should indeed be regarded as a more accomplished natural philosopher than Bruno. However, the issue here is not who was better.⁸ I should also emphasize that Galileo was placed under house arrest after renouncing his claims; but what would have happened if he had not? On the other hand, Bruno never renounced any of the eleven theses mentioned above, but what would have happened if he had? Galileo advanced the immobility of the Sun and the mobility of the Earth as a natural philosopher, and these propositions – also advanced by Bruno – are natural philosophical propositions.

Regarding the above-mentioned propositions, considering today’s scientific understanding, only the sixth proposition can be considered scientific because it is an argument we can observe to prove or disprove. However, in Bruno’s time, articles 1, 2, 3, 5, 6, 7, 8 and 9 were considered purely natural philosophical propositions in terms of their subject matter. The fourth one is a metaphysical proposition, in the Christian context, since the immortality of the soul is a matter of faith, this proposition can be addressed from a theological perspective. Regarding the tenth proposition, the claim that the Holy Spirit is the soul of the universe should be considered a metaphysical and theological proposition. Similarly, the eleventh proposition – that is, the pre-Adamite thesis – is primarily theological; however, Bruno never explicitly defended it in his writings.

Now, let me clarify that items 7 and 8 are arguments from natural philosophy, illustrated by an example from Galileo, and that item 2 is illustrated by an example from Copernicus.

⁷ Regarding this, Ingrid Rowland states that “Bruno never made any secret of his profession; from beginning to end, with unflinching consistency, he called himself a philosopher. Sometimes, more specifically, he described himself as *il Nolano*, ‘the Nolan,’ and his philosophy as ‘the Nolan philosophy,’ after the small city east of Naples where he spent the first fourteen years of his life” (Rowland 2009, p. 14).

⁸ Regarding the comparison between Bruno and Galileo, Rowland states the following: “The fact that Bruno was more interested in models of the universe than in the gathering of precise observational data does not make him less “scientific” than colleagues like Brahe – science as we know it did not yet exist, and besides, in its present-day form it still depends as vitally on thought problems as on the gathering of data. His ability to treat models of the universe as just that – models – was an ability that modern scientists still recognize as an essential part of their own discipline. It is indicative of Bruno’s own training in natural philosophy, however, that he could feel free to rewrite the mythology of the constellations at the same time that he could redraw the geometry of the universe – and did so, as a mature philosopher, in a way that modern scientists find much more valid than the universe of Galileo. His mind, in our terms, was both artistic and scientific. In his terms, both casts of mind were philosophical: one derived from Plato, one from Aristotle” (Rowland 2009, p. 69). For Bruno as a natural philosopher, see also Gatti 2002; Rossini 2020.

According to Galileo, there are two types of natural-philosophical (or physical) propositions. He states:

Here it should be noticed, first, that some physical propositions are of a type such that by any human speculation and reasoning one can only attain a probable opinion and a verisimilar conjecture about them, rather than a certain and demonstrated science; an example is whether the stars are animate. Others are of a type such that either one has or one may firmly believe that it is possible to have, complete certainty on the basis of experiments, long observations, and necessary demonstrations; examples are whether or not the earth and the sun move, and whether or not the earth is spherical (Galileo 2008, pp. 128–129).

As we have seen, whether the stars are animate or not is a type of physical proposition, and one can only hold a probable opinion about it. However, the other type of physical question is definite, and one can demonstrate the truth about it. This division of propositions regarding nature resulted from Galileo's new physics, and if you recall, two of the above-mentioned theses, which were the reasons for Bruno's execution, were that the stars and the earth are animate.

We can give another example concerning the infinity of the universe from Copernicus, who said the following:

But let us leave to the philosophers of nature the dispute as to whether the world is finite or infinite (Copernicus 1995, p. 17).

As can be seen, whether the universe is infinite or not cannot be determined from astronomical observations, so natural philosophers must address this issue. Therefore, Bruno's proposition that the universe is spatially infinite is a natural philosophical proposition. These two examples can be extended to other propositions, with the exception of items 4, 10, and 11. Therefore, the idea that "Bruno's crimes were clearly of a religious nature, no matter what his views of the structure of the physical cosmos," is misleading.

3. Is the Conflict Between Philosophy and Religion, or Between Science and the Church?

Another unacceptable argument is that the conflict between Bruno and the Church is seen as a conflict between philosophy and religion, not a conflict between the Church and science. For example, Martínez writes the following regarding Mercati's summary of Bruno's case:

In Bruno's writings, a topic such as the Earth's motion was not defended on the basis of experiments, mathematics or astronomical observations, but on philosophical arguments, for example that the Earth must orbit the Sun to partake of the seasons. Thus Bruno's trial was not essentially a conflict between science and religion (Martínez 2018, p. 90).⁹

Before continuing with Martínez's words, in which he considers Bruno's arguments to be philosophical rather than scientific, let me pause and say a few words about Bruno's lack of mathematics. It should be noted, however, that mathematics was not generally considered a tool for natural philosophical investigations at that time. Aristotle was not a mathematician, but he did write a book entitled *Physics*. In Bruno's time, there was a general acceptance that separated natural philosophy from mathematical sciences such as astronomy, mechanics, and optics. Copernicus represented a new kind of natural philosopher who, as a mathematician, advanced claims such as that the sun is stationary and that the world moves. As a mathematician (or

⁹ Hutchings and Ungureanu also complain that Bruno's mathematics was not great (see Hutchings, Ungureanu 2022, p. 139).

astronomer), he violated the disciplinary boundary between mathematics and natural philosophy.¹⁰ Francis Bacon, who can be considered a contemporary of Bruno, was not a mathematician either, but he, too, as a natural philosopher, presented a physical model of the cosmos in his work *Theory of the Heaven* (see Bacon 1996; for Bacon's anti-Copernican model, see Jalobeanu 2015). In Bruno's time, mathematics was not regarded as something applicable to natural philosophical investigations, so it was not regarded as something a natural philosopher needed to know.

Here we see that the use of the term 'science' in reference to Bruno is taken to imply that the conflict between him and the Church was not a conflict between science and religion, but rather a conflict over philosophical arguments, since Bruno did not defend the Earth's motion on the basis of experiments, mathematics, or observations. As noted above, however, using this term in its modern sense to describe Bruno and his time is anachronistic; the term 'natural philosophy' should be used instead. If we use the term 'science' in the broad sense of the study of nature, that is acceptable, but we cannot apply the term in its modern sense to Bruno. Therefore, we cannot conclude that the conflict between him and the Church was not a conflict between science and religion simply because Bruno did not defend his arguments on the basis of experiments, mathematics, or observations. Since Martínez uses the terms 'experiment', 'observation', and 'mathematics' to define science, it is clear that he employs the term in its modern sense and applies it to Bruno, which is anachronistic and therefore cannot be accepted. As mentioned above, for Bruno's period, the term 'science' may be used, but only in the broad sense of the study of nature, not in its modern meaning. In this broad sense of the term 'science', scientific studies (that is, natural philosophy) do not necessarily rely on experiments, observations, or mathematics. For example, Descartes' vortex theory was not defended on the basis of observation, experiment, or mathematics. Even though Descartes was a highly competent mathematician, this theory was based on philosophical speculation and serves as an example of a philosophy of nature established through *a priori* reasoning. Descartes's theory of vortices was a scientific theory for its time, but it does not qualify as a scientific theory according to our modern understanding of the term. Similarly, Bruno's arguments concerning the Earth's motion, the infinity of the universe, and even the vitality of the stars should be regarded as scientific theories according to the standards of Bruno's time, rather than judged by modern criteria. Therefore, it is misleading to include experiment, observation, and mathematics as necessary components of Bruno's understanding of science. By this, I do not mean that experiment, observation, or mathematics were not used in the study of nature in Bruno's time; rather, I want to emphasize that they were not required for the development of theories about natural phenomena in that period.

Now we may turn to Martínez's words, who, after stating the paragraph above, continues:

Mercati overlooked the fact that some of the important censures against Bruno had a distinctly philosophical significance, instead of religious or scientific. [...] There were certainly substantial conflicts between Catholicism and Bruno's philosophy. So Finocchiaro rightly characterized the trial as involving a conflict between religion and philosophy. Yet the present analysis reveals a neglected dimension: many of Bruno's main philosophical and religious heresies were directly rooted in the ancient Pythagorean religion and its interpretations in the Renaissance. Even seemingly scientific notions, such as the Earth's motion, were linked to pagan ideas: that it has a soul. The idea that there are many worlds like Earth was connected to the Pythagorean belief that the beings living in such worlds can embody the souls of persons who once lived on Earth. The idea that the universe is infinite was

¹⁰ For an analysis of the disciplinary boundary between natural philosophy and mathematics, see Westman 1980.

connected to the Pythagorean denial that the world was created (Martínez 2018, pp. 90–91).

As can be seen, Martínez believes the conflict is not between science and the Church, but between philosophy and religion. He also mentions Finocchiaro, who shares a similar perspective. Finocchiaro says in his work *Philosophy versus Religion and Science versus Religion: the Trials of Bruno and Galileo*,

If the trial of Galileo epitomizes the conflict between science and religion, then the trial of Bruno may be said to epitomize the clash between philosophy and religion (Finocchiaro 2016, p. 54).

Keas thinks similarly to them and says,

This suggests that Bruno was a martyr not for science but for pagan religion and pagan philosophy (Keas 2019, p. 67).¹¹

Martínez believes that the main reason behind Bruno's heresies was the Pythagorean religion/philosophy, and that even his scientific (natural philosophical) ideas are connected to pagan thought. As he states in the above-cited words:

Even seemingly scientific notions, such as the Earth's motion, were linked to pagan ideas: that it has a soul. The idea that there are many worlds like Earth was connected to the Pythagorean belief that the beings living in such worlds can embody the souls of persons who once lived on Earth. The idea that the universe is infinite was connected to the Pythagorean denial that the world was created.

I consider Martínez's claim unacceptable. While Pythagorean philosophy may have influenced Bruno, his mentioned natural philosophical (scientific) ideas cannot be dismissed merely because the Pythagoreans also espoused similar notions. These natural philosophical claims cannot be dismissed simply by labeling them as philosophical. If we were to claim that the conflict between the Church and Bruno was philosophical rather than scientific, we would once again be acting anachronistically, since this would impose the modern separation of science from philosophy onto the sixteenth century and could obscure the role of Bruno's natural philosophical (scientific) arguments in the conflict. Natural philosophy was a sub-discipline of philosophy, and when Bruno defined himself as a philosopher, he did not exclude the fact that he presented his ideas on natural philosophy in this role. Therefore, viewing the conflict between Bruno and the Church solely as a conflict between religion and philosophy presents only one side of the issue. We cannot ignore his contributions to natural philosophy by claiming they were Pythagorean, philosophical, or religious in nature. The Pythagoreans put forward propositions concerning natural philosophy, mathematics, music, ethics, theology, and more. Pythagorean, Stoic, and Epicurean philosophies each possess distinct characteristics and comprise ethical, epistemological, and natural philosophical propositions. Consequently, if we define the conflict between Bruno and the Church as merely a conflict between philosophy and religion, we fail to recognize how his views on natural philosophy influenced the circumstances of his execution.

¹¹ Shackelford also says the following about this: "How did this defrocked monk and unrepentant heretic who denied the doctrine of the Holy Trinity – the key to Catholic teaching of redemption and eternal life – come to be «the world's first martyr to science»?" (Shackelford 2009, p. 63). Shackelford agrees with the positivist view of history that Bruno was not a martyr for science because he was not a scientist at all (see Shackelford 2009, p. 62; Wightman 1972, pp. 127–128). In Christianity, a person who is killed for his faith in Jesus is called a martyr, but I am sure that is not what those who see Bruno as a martyr for science mean. I must say that trying to refute those who see Bruno as a martyr is like trying to refute the idea that Richard the Lionheart had the heart of a lion.

Martínez pieced together the charges against Bruno from Firpo's *Il processo di Giordano Bruno* and Gaspar Schoppe's letter to Konrad Rittershausen.¹² Martínez says that Firpo listed 34 charges and Finocchiaro listed forty, but Finocchiaro's list contains several repetitions and omissions and one addition (see Martínez 2018, p. 77). Martínez, however, made a more comprehensive list of 54 charges, which he divided into the following five categories:

1. Departures from Catholic practices.
2. Heresies against the Bible and dogma.
3. Heresies against prophets and Church Fathers.
4. Blasphemies against Christ and God.
5. Beliefs about substance, worlds and souls (Martínez 2018, pp. 77–87).

Then Martínez says:

It is striking that under interrogation Bruno directly denied *nearly all* charges in the first four categories, but he refused to recant most of the accusations listed in the fifth: beliefs about substance, worlds and souls. Of the fifteen accusations in that category, Bruno apparently denied only two: having said that human souls can be reborn in animal bodies, and he denied that previously he had lived as a swan. [...] In his trial depositions and his replies to book censures, apparently Bruno boldly asserted or defended *thirteen* of those fifteen censured claims. *Fourteen* of the fifteen accusations were Pythagorean [...] (Martínez 2018, p. 87).

Among the five categories, Bruno's charges related to natural philosophy are included in the fifth category, and Martínez says that Bruno rejected almost all of the charges in the other four categories. He even rejected two of the charges in the fifth category: that human souls can be reborn in animal bodies and that he had previously lived as a swan. Let me now quote the fifteen charges in the fifth category:

1. The consultors of the Inquisition complained that Bruno argued that substance cannot be created or destroyed, but only transforms, in accord with the teachings of Pythagoras.
2. The consultors also complained that Bruno denied Solomon's statement in Ecclesiastes 1:14, that the true being of individuals is vanity, because Bruno held that the underlying substance of all things is eternal, not illusory.
3. Also, five accusers testified that Bruno believed that the universe is eternal, not created by God.
4. The consultors seemed to complain (second proposition) that Bruno believed that the universe is spatially infinite.
5. Six accusers, plus the consultors and Inquisitors, also complained that Bruno believed that many worlds exist, infinitely many, and that all the stars are worlds; another necessary consequence of God's infinite power.
6. Also, two accusers plus the consultors said that Bruno believed that the other worlds are similar to ours and are inhabited by rational beings.
7. The consultors of the Inquisition further complained that Bruno argued, against Aristotle and Catholic dogma, that the soul is not the form of the body, but that,

¹² Gaspar Schoppe, in a letter to the jurist Konrad Rittershausen, says that he was present when Bruno knelt before the Inquisition to receive his sentence (see Martínez 2018, p. 71).

instead, it is a spiritual substance that inhabits the body, ‘as a captive in a prison’, and controls it like a ship.

8. Three accusers said that Bruno believed in the transmigration of souls between human bodies, even into other distant worlds.

9. Two accusers said that Bruno also believed that human souls can transmigrate into animal bodies and that the souls of some of his own friends might presently inhabit animal bodies.

10. One accuser claimed that Bruno himself said he remembered having lived previously in another body, and that his soul, ‘in another time in the world had been a swan’, which made the other prisoners laugh. Another accuser twice testified that Bruno claimed to recall living in another body, whether human or animal.

11. The consultors of the Inquisition twice complained that Bruno believed that the Earth has a soul, and that Earth is a living and rational animal.

12. The consultors also complained that Bruno said that the Earth moves, which he said shows the Earth’s rational mind.

13. The consultors complained that Bruno said that stars are angels: visible and animated rational bodies that convey the divine voice.

14. The Inquisitors interrogated Bruno about his belief that the Holy Spirit is the soul of the universe, what he called ‘the Pythagorean doctrine’.

15. Finally, the consultors also complained about Bruno’s claims about how human souls originate (Martínez 2018, pp. 84–87).

When we examine these charges, we can observe that most of them are natural philosophical claims. Bruno rejected most of the charges in the first four categories and also denied the two mentioned above in the fifth category. Therefore, it becomes clear that most of the remaining thirteen accusations concern natural philosophical claims: the stars are animated, rational bodies; the Earth moves; the Earth is animated; other worlds are inhabited by intelligent beings; there are infinite worlds in the universe; the universe is spatially infinite; and the universe is eternal. When we consider the first six propositions, as well as the twelfth, in terms of their subjects, it becomes clear that they are purely natural philosophical propositions. Thus, seven of the thirteen charges that Bruno accepted in this list can be classified as natural philosophical. Bruno, however, rejected the ninth and tenth propositions. With the exception of the fifteenth proposition, the seventh, eighth, eleventh, and thirteenth propositions can also be regarded as natural philosophical, in addition to their theological and metaphysical aspects, since they examine immaterial entities –such as souls and angels– in relation to matter and the cosmos. Only the fourteenth and fifteenth propositions appear to be purely metaphysical and theological.

Therefore, natural philosophical charges are not an insignificant number, and it is not correct to ignore the fact that they are propositions that concern natural philosophy by qualifying them as philosophical or Pythagorean. The fact that Pythagoreans or others make similar claims does not change the fact that these claims are natural philosophical claims.

Martínez also states that some of Bruno’s propositions are semi-Copernican and that these propositions are related to cosmology. For example, according to Martínez, the plurality of worlds is one such semi-Copernican proposition. Consequently, we can infer that another semi-Copernican proposition must be the infinity of the universe. These propositions are not Copernican, but they are still natural philosophical (or scientific in the sense of being a study

of nature) propositions.¹³ We should not hide their scientific (natural philosophical) nature by calling them semi-Copernican.

4. Conclusion

In this article, I have sought to refute the claim that all of Bruno's propositions that were listed among the reasons for his execution in the summary document of his trial are religious in nature. Contrary to this claim, I have suggested that most of the above-mentioned arguments advanced by Bruno were natural philosophical, or scientific, not in the modern sense of the term, which would be anachronistic if applied to Bruno's time, but in the sense of the study of nature.

Among the eleven theses cited by Finocchiaro and found objectionable by the Inquisition, we can see that eight are natural philosophical theses. As for Martínez's extensive list of 54 charges, which he divided into five categories, he informs us that Bruno rejected most of the charges in the first four categories two of the charges in the fifth category. When we look at the other thirteen charges, we see that most of them are natural philosophical propositions. Among these theses or charges, propositions such as the immobility of the sun and the mobility of the earth, as well as propositions such as the infinity of the universe, the plurality of worlds, and even propositions such as the stars are animated, should be accepted as natural philosophical propositions. Thus, the claim that all of Bruno's crimes were religious and none were scientific is misleading.

Propositions of natural philosophy, such as "the Earth does not move" and "the universe is not infinite," were considered consistent with the Bible by the religious authorities of the time. Consequently, Church officials treated these propositions as matters of faith, not because of their subject matter, but because of the speaker. In contrast, truly inherently religious propositions include statements such as "Jesus is the Son of God" or "The Virgin Mary was conceived by God," which are religious by nature. However, natural philosophical claims, whether they align with or contradict Scripture, do not depend on Christian belief for their defense.

I have also argued in this article that labeling Bruno's arguments as merely philosophical or Pythagorean is also misleading, as it obscures the propositions of natural philosophy that I have sought to present above.

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¹³ Although propositions such as the infinity of the universe and the plurality of worlds cannot be derived from the Copernican astronomical model (see Kokowski 2009, pp. 88–89, 97, 348–349, 355–356), Ernan McMullin therefore does not regard Bruno as a Copernican (see McMullin 1987). Bruno, however, considered these propositions to be natural consequences of the Copernican model, maintaining that Copernicus had made a significant discovery without fully grasping its implications (see Bruno 2018, p. 31). In this sense, Stillman Drake characterizes Bruno's position as an "extended Copernicanism" (see Drake 1975, p. 178), a view echoed by Hilary Gatti, who emphasizes Bruno's extension of the Copernican hypothesis to infinite dimensions (see Gatti 2004, p. 26).

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