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The Reception of Neptune's Discovery in British and American Protestant Theology

Abstract

The discovery of the planet Neptune in 1846, first theoretically and then observationally, was a 19th-century event that went beyond the interests of the narrow group of astronomers of the time. Indeed, the significance of this event is still a subject of interest among historians and philosophers of science. During the period discussed, natural theology played a special cognitive and social role, forming the basis for arguments based on the new knowledge of nature. This article discusses how the

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discovery of Neptune was received among the community of 19th-century British and American Protestant theologians, who were always open to scientific research and discoveries.

Keywords: *discovery of Neptune*, *British and American Protestant theology*, *science and faith relationship*, *natural theology*, *history of astronomy*

Recepcja odkrycia Neptuna w brytyjskiej i amerykańskiej teologii protestanckiej

Abstrakt

Odkrycie planety Neptun w 1846 roku, najpierw teoretycznie, a potem obserwacyjnie, było wydarzeniem XIX wieku, które wykraczało poza zainteresowania wąskiego grona ówczesnych astronomów. Rzeczywiście jego znaczenie jest nadal przedmiotem zainteresowania historyków i filozofów nauki. W omawianym okresie szczególną rolę poznawczą i społeczną odegrała teologia naturalna, stanowiąc podstawę argumentacji opartej na nowej wiedzy o przyrodzie. W artykule przedstawiono jak odkrycie Neptuna zostało przyjęte wśród społeczności XIX-wiecznych brytyjskich i amerykańskich teologów protestanckich, zawsze otwartych na badania i odkrycia naukowe.

Słowa kluczowe: *odkrycie Neptuna*, *brytyjska i amerykańska teologia protestancka*, *związek nauki z wiarą*, *teologia naturalna*, *historia astronomii*

1. Introduction

Neptune, the eighth planet of the Solar System, was discovered through observations by the German astronomers Johann G. Galle (1812–1910) and Heinrich L. d'Arrest (1822–1875) on September 23, 1846. It was observed within a degree (in heliocentric longitude) of the position predicted by French astronomer Urbain Le Verrier (1811–1877).[1] For most astronomers of the time, the theoretical and subsequent observational discovery of a new planet represented a great success for celestial mechanics, which had developed from Newtonian mechanics.[2]

[1] Gapaillard 2015, pp. 57–59.
[2] Hoskin 1999, pp. 162–164.

The discovery of Neptune became one of the few episodes in the history of science, and specifically astronomy, to find a permanent place in classical works on the philosophy of cience. Indeed, William S. Jevons wrote in the second half of the 19th century:

> In recent times the discovery of Neptune has been the most remarkable instance of prevision in astronomical science. […] [T]he systematic divergence of Uranus from its calculated places was one of the latest, and was the clue to the remarkable discovery of Neptune.[3]

This view was also maintained by many scholars in the second half of the 20th century,[4] especially Carl Hempel. Despite Hempel's *Philosophy of Natural Science* being written almost a century after Jevons's book, it contains very similar statements:

> Le Verrier conjectured that they [observed irregularities in the motion of Uranus in its orbit – Z.R. & J.R.] resulted from the gravitational pull of an as yet undetected outer planet, and he computed the position, mass, and other characteristics which that planet would have to possess to account in quantitative detail for the observed irregularities. His explanation was strikingly confirmed by the discovery, at the predicted location, of a new planet, Neptune, which had the quantitative characteristics attributed to it by Le Verrier. Here again, the explanation has the character of a deductive argument whose premisses include general laws – specifically, Newton's laws of gravitation and of motion – as well as statements specifying various quantitative particulars about the disturbing planet.[5]

Additionally, in the latest review publications about the philosophy of science, the discovery of Neptune is widely cited to, for example, illustrate the concept of abduction.[6] In this case, abduction is treated as explanatory reasoning to justify a hypothesis. Despite the fact that

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[3] Jevons 1874, pp. 173; 215
[4] See e.g., Holton 1952, pp. 195–196; Popper 1959, p. 108.
[5] Hempel 1966, p. 520.
[6] Douven 2021.

there were already works questioning the anti-inductivist interpretations of this discovery among the philosophers of science of the mid-19th century, opinions that Neptune was discovered at the tip of La Verrier's pen were widely disseminated. The phrase was coined by François Arago (1786–1853), who would likely be surprised at how widely it has been adopted.[7] Even theologians could no longer, as they did in the 17th century, assume that traditional astronomy provided the only methods for calculating the positions of planets. Indeed, the discovery of Neptune proved that modern astronomy is a science capable of discovering reality. Natural theology is again becoming a subject of interest nowadays, but even in works that take its history into account,[8] episodes in its development where it interacted with astronomy are completely absent.

Since the emergence of modern mathematical and empirical sciences in the 17th century, Christian theology has not remained indifferent to new scientific discoveries, especially astronomical ones. It is enough to mention the ideas of Copernicus, Galileo's discoveries, or Newton's achievements. On the one hand, they were vividly confronted with the biblical image of the world, on the other, they became fuel for new arguments for the greatness and wisdom of God, and even for His existence, within the framework of natural theology.[9] The aim of this article is to trace the possible influence of Neptune's discovery on British and American theological thought, with this being limited in time to the 19th century. The choice of this topic was made primarily based on the relatively high level of relationships linking scientific institutions with Christian churches in the British Isles, something that was not mirrored in continental Europe at that time. It should also be highlighted that the possible repercussions of Neptune's spectacular discovery for British and American theological thought have yet to be discussed.

This article first briefly outlines the relationship between British and American Protestant theology and the natural sciences in the 19th century. By 'British and American Protestant Theology' we understand the theological thought developed in the 19th century in the British Isles

[7] Lequeux 2015, p. 50.

[8] De Cruz, De Smedt 2015.

[9] See Gingerich 2000, pp. 381–386; Mandelbrote 2013, pp. 75–99; Blair, von Greyerz 2020.

and North America (mainly in the United States) by representatives of such religious communities as, among others, Anglicans, Scottish Presbyterians, and American Congregationalists. This is a broader understanding of Protestantism than the traditional one, limited to Lutherans and Reformed churches. Despite the differences between them, all these Christian denominations have in common the historical and doctrinal tradition of "Protestatio", i.e. distancing from the institutions and doctrine of the Catholic Church.[10] Next, the article analyzes the views of English and American scientists,[11] the clergy, and theologians on the philosophical and theological ramifications of Neptune's discovery. We don't care about the doctrinal nuances of the different denominations and the relationship between parish ministry and university life. We focus primarily on the historical dimension of the views presented. We believe that some simplifications will be acceptable. The article then concludes with a summary and a few questions which would merit follow-up research beyond the scope of this paper.

2. Theologies and the natural sciences in 19th-century Great Britain

One of the characteristic features of English (and more broadly British) culture in the 18th and 19th centuries was the close connection between the natural sciences and the Christian religion, which was unheard of in continental Europe. This relationship had a strong social foundation in the contemporary relationship between British Christianity and the state. A significant aspect of this relationship concerns how scientists were also often clergy, and sometimes also influential figures in state institutions (prominent examples being two Anglican clergymen, Rev. William Whewell and Rev. Temple Chevallier). Religion and science were closely related in the mid-19th century in the view of the fact that "[…] science increasingly occupied cultural territory previously dominated

[10] Buchanan 2015, p. 488; see also Ungureanu 2019; Moore 1979.

[11] It should be remembered that the term "scientist", introduced in the 1830s by Whewell, became popular in the world of science and beyond in the second half of the 19th century. Earlier terms were "natural philosopher" and "man of science". In our article, the term "scientist" conventionally refers to researchers of nature, whether they use mathematics or not.

by an Anglican establishment".[12] This does not mean that in the 19th century, all the representatives of the Anglican Church, especially those from the conservative High Church, were unafraid of the growing institutional importance of science.[13] Nevertheless, the social legitimization of the Christianity–science relationship on a cognitive level for many decades resulted in two types of relationships developing: the first involved drawing knowledge about the natural world from the Bible as the source of Christian revelation, and confronting the biblical message with new natural knowledge, while the second was expressed through arguments for the existence of God and a search for truths about His nature based solely on human reasoning, without direct help from divine revelation, although it sometimes provided inspiration. The latter type of relationship is commonly referred to as natural theology.[14]

In the first half of the 19th century, a famous example of the relationship between revealed religion and science related to the development of geology at that time. From a theological perspective, this development came into conflict with the biblical message about the genesis of the Cosmos and the Earth. An extreme form of this dependence that was based on a literal reading of the Bible seen as the source of knowledge about nature was characteristic, for example, for the work of Rev. George Bugg (1769–1851) and his significant work *Scriptural Geology* (1826–1827). It is worth to mention O'Connor's words:

> [...] literalist earth-history enjoyed a high level of public attention, and […] formed part of a spectrum of do-it-yourself approaches to the history of the earth.[15]

In these approaches, theology and inductive philosophy were blended to different degrees. A more moderate attitude was presented in the same period by Rev. William Buckland, who tried in his *Vindiciæ Geologiæ* to reconcile the biblical message about the great flood with geological and paleontological discoveries.[16] In his opinion, science and religion were in harmony as long as the task of religion was to disclose the wisdom

[12] Finnegan 2017, p. 416.
[13] See Corsi 1988, pp. 47–48, 125.
[14] Finnegan 2017; Ruse 1975; Re Manning, 2013, pp. 1–5.
[15] O'Connor 2007, p. 390.
[16] Buckland 1820.

and goodness of God through Bible, and the task of science was to reveal His beneficent wisdom through the study of the universe. This scientist had a great influence on shaping attitudes favorable to science among professors (Edmond and Douglas 1976, 141). A naturalistic approach, which is independent of religious ideas without negating them, was taken by one of the pioneers of modern geology, namely secular scientist Charles Lyell in his *Principles of Geology* (1830–1833).[17]

Moving on an outline of the second type of relationship between British theological thought and science, namely natural theology, we need to distinguish its two variants. The first variant refers primarily to Rev. William Paley's well-known work *Natural Theology; or, Evidences of the Existence and Attributes of the Deity*. The method of reasoning it presented, which led to recognizing the existence and attributes of the Creator, referred mainly to individual examples of the properties of organisms from the world of plants and animals. For Paley, an English Anglican clergyman, such properties represented the complex structure of organisms and their organs, as well as their adaptive role in nature. His opinion on the importance of astronomy for natural theology was of interest:

> [...] it [astronomy – Z.R. & J.R.] is not the best medium through which to prove the agency of an intelligent Creator; but that, this being proved, it shows, beyond all other sciences, the magnificence of his operations. The mind which is once convinced, it raises to sublimer views of the Deity than any other subject affords; but it is not so well adapted, as some other subjects are, to the purpose of argument.[18]

For Paley, the role of "an intelligent power" was to determine the orbits in which the planets of the solar system move. Paley was convinced that God's existence had been proven using the argument from design, but God's magnificence was best revealed through astronomy.

The second variant of natural theology, and one of particular interest to us in this article, was shaped under the influence of the works of Rev. William Whewell (1794–1866) and Rev. Baden Powell (1796–1860).

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[17] Lyell 1830–1833.

[18] Paley 1802, p. 409.

Unlike Paley, who focused on the purposefulness and adaptability of living organisms, Whewell and Powell focused their attention on the mathematical sciences of the time, such as astronomy and celestial mechanics. They both emphasized the theological importance of the laws and physical regularities that govern the Earth's natural world and the celestial bodies.[19] In *Astronomy and General Physics Considered with Reference to Natural Theology*, Whewell wrote:

> God is the author and governor of the universe through the laws which he has given to its parts, […]: the institution of such laws, the selection of the quantities which they involve, their combination and application, are the modes in which he exerts and manifests his power, his wisdom, his goodness […].[20]

Similarly, Powell encouraged theologians to pursue final causes beyond Paley's style:

> […] merely in the limited sense of means and end, but in the extended meaning of the evidences of design and mind, in the order, arrangement, and harmony, of the laws of the material universe.[21]

With regard to the possibility of theoretically predicting the existence of astronomical objects such as Neptune, it was not only the sophisticated mathematical laws of celestial mechanics that gave rise to admiration and theological reflection. Indeed, the astonishing nature of the human mind, through which Le Verrier predicted the existence of an unknown planet, also became a subject of interest for Anglican natural theologians. For Rev. Thomas Chalmers, a Scottish Presbyterian minister, the harmony between theoretical concepts created by the mind and a nature that was independent of it indicated

> [...] (the) intervention of a Being having supremacy over All [...] who had adjusted the laws of matter and the properties of mind to each other.[22]

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[19] Gascoigne 1988.
[20] Whewell 1833, p. 357.
[21] Powell 1843, p. 437.
[22] Chalmers 1835, p. 159.

3. The discovery of Neptune from a theological point of view

The main representative of the natural theology that developed within Anglicanism was William Whewell, who was both an outstanding philosopher and natural theologian. As a philosopher, he developed the concept of the scientific method (i.e., induction), but he also put forward a number of arguments for the existence of God. Whewell was particularly interested in studying the influence of astronomy on natural theology, but he was not the first to do so. Astronomer (one of the leading British scientists of the 19th century) and clergyman Temple Chevallier (1794–1873), an eminent representative of Anglicanism, had strong theological interests. In his eyes, science

> […] was seen as a gift from God, engendering awe and reflecting God's sustaining of the Universe.[23]

He wrote a work entitled *On the Proofs of Divine Power and Wisdom: Derived from the Study of Astronomy; and on the Evidence, Doctrines, and Precepts of Revealed Religion*. In his book, Chevallier gathered evidence for the existence of God based on arguments from astronomical research:

> The consideration of circumstances such as these can leave no doubt upon a reasonable mind that the heavens and the earth display the wisdom of their Creator by affording explicit evidence of design.[24]

This book provided inspiration for William Whewell.[25]

References to the discovery of Neptune can be found in the works of such authors as Francis Newman (1805–1897) and Frederick Temple (1821–1902), among others. These authors played only a minor role in developing Anglican natural theology, but their work influenced the formation of attitudes toward science. It is worth noting, however, that many authors who dealt with the relationship between science and religion did not mention the discovery of Neptune at all. For example,

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[23] Wilkinson 2015, p. 24.

[24] Chevallier 1827, p. 59.

[25] "It is affirmed that this volume suggested to Whewell the fundamental idea of his Bridgewater treatise upon astronomy and general physics" (Hunt 1887, p. 216).

the influential American author, philosopher, and theologian Francis Ellingwood Abbot (1836–1903) did not write about the discovery of Neptune in the second half of the 19th century, despite being a promoter of scientific theism.

Francis W. Newman was a prominent intellectual of the Victorian era, but he is unfortunately known mostly as the younger brother of the famous Cardinal John Henry Newman. Francis Newman's work *Phases of Faith. Passages from the History of My Creed* serves as a clue for this direction of research. In his religious quest, Francis Newman started from radical Calvinism before converting to liberal Anglicanism, but he was less of a liberal Anglican than a freethinker.[26] At the time of Neptune's discovery, Newman was associated with the Liverpool Unitarians. It is worth noting that:

> To Francis Newman, science had nothing to do with religious experience, and natural theology was irrelevant.[27]

The discovery of Neptune may not have featured in this religious conversion, but according to Newman, it played a role in distinguishing logical a priori knowledge from a priori metaphysical knowledge. Newman noted that:

> [...] the current logical (not metaphysical) use of the phrase a priori: as when we say that Le Verrier and Adams demonstrated a priori that a planet must exist exterior to Uranus, before any astronomer communicated information that it does exist.[28]

References to Neptune also appeared in other authors' writings about natural theology. Frederick Temple, who was not only an esteemed scholar but also an Anglican bishop, paid more attention to Neptune's discovery in his work entitled *The Relations Between Religion and Science*. For Temple, the discovery of Neptune not only confirmed the law of gravity, but also expressed the assumption of the uniformity of nature:

> So in our own day was the planet Neptune discovered by the observation of certain facts which could not be

[26] Manwaring 1988, p. 25.
[27] Corsi 1988, p. 265.
[28] Newman 1865, p. 186.

> squared with the facts previously observed unless the Law of Gravitation was to be corrected. The result in this case was not the discovery of a new law but of a new planet; and consequently a great confirmation of the old Law. But in each case and in every similar case the investigation of the newly observed fact proceeds on the assumption that Nature will be found uniform, and on no other assumption can Science proceed at all.[29]

Temple questioned the source of this assumption, its justification, and limitations. According to him, the question of justification was first posed explicitly by David Hume.[30] This concerns the stability of the laws of nature, because according to Hume, there was no rational premise for assuming the universal nature of this stability and therefore the uniformity of nature; instead, it was just habit. The uniformity of nature for Temple, however, was not merely an assumption, in a kind of postulate of scientific reasoning, but also a certain property of nature.[31] For the theist, he argued, the uniformity of nature, the laws of nature, and even the "progress of science"[32] are manifestations of order in nature, with God being the source of this order: "Science now tells us that Order takes a rank in God's work far above where we should have placed it. It is not the highest; it is far from the highest: but it appears to be in some strange way the most indispensable. God is teaching us that Order is far more universal, far more penetrating than we should have supposed." Temple's use of the phrase "It is not the highest; it is far from the highest"[33] may refer to the order of divine revelation, which is much more important, and implicitly two books, namely nature and the Bible.[34]

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[29] Temple 1884, p. 8.

[30] Temple 1884, p. 10.

[31] This position is also adopted by William Graham (1839–1911), who also mentions Neptune in his work, albeit not in the context of its discovery (Graham 1884, p. 9). However, he maintains the thesis put forward by Temple: "Thus, then, the attributes and qualities with which man endowed God, are truly attributes of Nature, and all the emotions referred to the one are directly begotten by the contemplation and consideration of the other" (Graham 1884, p. 366).

[32] Temple 1884, p. 31.

[33] Temple 1884, p. 32.

[34] See Hinchliff 1998.

A reference to Neptune was also made in a book titled *Christianity, Science, and Infidelity*… by Rev. William Hillier, an Anglican theologian and parish priest of Wingrave in Buckinghamshire. Hillier expressed the view that "[n]ature is one great system of means and ends; and the accomplishment of the ends prove the perfect adaptation of the means. This wonderful contrivance is now seen in astronomy far beyond the conception of Dr. Paley or any other scholar who lived in his day".[35] As Hillier pointed out, that was an open allusion to William Paley's statement that we mentioned earlier, namely that astronomy is not the best means for proving the actions of an intelligent Creator,[36] although Hillier did not agree with this. It is interesting that in the narrative perspective of the argument from design, he expressed the *a priori* prediction that "it is highly probable that he [Neptune – Z.R. & J.R.] has many moons to accompany him around the great centre […]".[37] In the year his book was published, only one moon of Neptune, Triton, was known about, but today we know of fourteen of them. The publication of Hillier's apologetic book was preceded by the publication of its subsequent parts in the local newspaper *Bucks Advertiser & Aylesbury News*. The part of the book that mentions Neptune was published anonymously more than half a year earlier and was titled *The Theological Letter, No. XXIX*.[38]

In the mid-19th century, natural theology intensively developed, not just in Europe but also in America. Our research revealed that Edward Hitchcock(1793–1864), an American geologist who was ordained as a Congregationalist pastor and served in the Congregational Church in Conway, Massachusetts, wrote a book entitled *The Religion of Geology and Its Connected Sciences*. It mentions Neptune, albeit only once, to illustrate the greatness of the universe.[39] This is understandable, given that the main subject of the scientific research was geology. Enoch Fitch Burr (1818–1907), who was not only an American theologian but an astronomer, wrote much more about Neptune's discovery.

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[35] Hillier 1881a, pp. 191–192.

[36] Paley 1802.

[37] Hillier 1881a, p. 200.

[38] Hillier 1881.

[39] The discovery of Neptune increased the size of the Solar System, or the then Universe, by approximately 30 percent. At the time, however, Neptune's distance from the Sun was overestimated, and so it was thought that the Solar System had doubled in size.

He lectured extensively on the relationship between science and religion and was ordained as a pastor in the Congregational Church. Burr used Neptune to demonstrate the diversity that exists in the solar system, with planets such as Saturn and Neptune, which are relatively close to each other, having very different astronomical parameters. For example, a day on Saturn lasts less than half an Earth day, while a year on Neptune lasts 165 Earth years.[40]

Burr also used the discovery of Neptune to illustrate the vastness of the universe, and he pondered whether the new discoveries in astronomy were becoming a source of atheism, especially for French and German philosophers. Burr did not try to modify the evidence for the existence of God as he knew it, however: "No more do I need to see God in order to know of His existence. He is perturbing Neptune […]".[41] Milton Valentine (1825–1906), another American Protestant theologian, noted a deviation from the Titius–Bode law in the case of Neptune, but he did not draw from this any consequences for natural theology.[42]

James Bovell (1817–1870) was not only a great physician and microscopist but also a Church of England clergyman, theologian, and educator.[43] Bovell was, at various times, designated professor of physiology and of natural theology in the Faculty of Arts at Trinity College. He had a particularly strong influence on the physician, historian, and philosopher of medicine, William Osler (1849–1919).[44] James Bovell attempted to reconcile Lyell's geological views and Darwin's theory of evolution with the Scriptures, but these attempts are now interpreted as solutions by force.[45]

In his *Outlines of Natural Theology* written in the Paley apologetic tradition, Bovell illustrated divine goodness and wisdom through natural objects and phenomena. In this work, he made an interesting reference to the discovery of Neptune, using the discovery of a previously unknown planet by analyzing perturbations in the movement of Uranus to prove the existence of an immaterial soul:

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[40] Burr 1879, p. 254.

[41] Burr 1879, p. 254.

[42] Valentine 1885, p. 174.

[43] Bliss 1999, pp. 40–45; Ferry 2008, p. 28.

[44] Bliss 1999, p. 57

[45] "Bovell's solution was to try to force the burgeoning data of the evolutionists into the girdle of the Word" (Roland 1964, p. 813).

> Now the problem we are dealing with is of this kind. It may be thus stated: given the structure of the cerebrum, to determine the nature of the agent that sets it in action. […] since there is between these structures, and the elementary structure of the cerebrum, a perfect analogy, we are entitled to come to the same conclusions in this instance as in those, and asserting the absolute inertness of the cerebral structure in itself, to impute the phenomena it displays to an agent as perfectly external to the body, and as independent of it as are light and sound; and that agent is the soul.[46]

Another author who accounted for the impact of astronomical discoveries on natural theology within the framework of liberal Anglicanism has already been mentioned, namely Baden Powell. He wrote *The Connexion of Natural and Divine Truth: or, the Study of the Inductive Philosophy, Considered as Subservient to Theology* (1838), which resembled Whewell's monograph, although Baden Powell did not refer to Whewell in his book. Whewell's arguments were also used by Rev. William Leitch (1814–1864), another representative of liberal Anglicanism. In his book *God's Glory in the Heavens,* Leitch considered Whewell's arguments for the universality of life in space. Above all, however, Leitch mentions the discovery of Neptune and is convinced that Neptune was not the only one discovered through the study of perturbations in the motion of other planets: "The discovery of Vulcan ranks with that of Neptune".[47] He maintains that discovery of Neptune was a great triumph of human intellect. According to Leitch, Le Verrier discovered not just a planet beyond the orbit of Uranus but also one closer to the Sun than Mercury. Leitch contrasts these discoveries with the discoveries of asteroids, saying that discoveries of such celestial bodies do not require prophetic vision. Leitch, like Milton Valentine, sees not only the role of the Titius–Bode rule in the discovery of Neptune, but also notes that this rule does not apply to Neptune. Leitch, however, calls this rule a law.

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[46] Bovell 1859, pp. 96–97.
[47] Leitch 1862, p. 85.

4. Conclusion

The theoretical prediction of Neptune's existence and its subsequent observational confirmation were, as English newspapers reported, a great success of "mathematical astronomy".[48] Due to the relatively strong connections between the natural sciences and British theology that are outlined above, we may expect that this discovery also left its mark on the religious thought in Britain and America. Above all, however, this will help answer the question as to the extent to which the generally accepted story of Neptune's discovery influenced the development of natural theology.

References to the discovery of Neptune appear not just in the writings of theologians but more importantly in the theological works of naturalists, which included not just astronomers but also geologists and doctors. Indeed, the discovery of Neptune was used mainly for exemplification purposes. More specifically, the immensity of the universe (E.F. Burr), the uniformity of nature (F. Temple), the nature of a priori knowledge (F. Newman), and the wisdom of the Creator (J. Bovell; T. Chevallier) were illustrated through the widespread story about the discovery of this planet. The story of Neptune's discovery was also used as an argument for the immortality of the human soul (J. Bovell). Nevertheless, there is no justification for claiming that the widespread knowledge about this discovery among theologians contributed to creating a new type of argument for the existence of God. The story of Neptune's discovery appears not just in the writings of professional theologians but also in the works of scientists. Nevertheless, remarks about the discovery of Neptune in the works of scientists have a more confessional character than analogous remarks appearing in theological treatises.

References by theologians and scientists, as mentioned in this article, to the discovery of the eighth planet of the Solar System indicate the "resistance" of British and American Protestant theology to two types of criticism against the argument from design. The first criticism was expressed by David Hume in *Dialogues Concerning Natural Religion*,[49] while the second one was made by Pierre-Simon de Laplace during his legendary conversation with Napoleon Bonaparte.[50] Both critiques

[48] Anon. 1862, p. 3.
[49] Hume [1779] 1998.
[50] Hahn 1958.

challenged using references to God in attempts to explain the structure of the natural world.[51]

Due to length restrictions, this article has not discussed another issue that may, to some extent, relate to the spectacular discovery of Neptune in 1846. It concerns the significance of this event for debating the plurality of worlds, which also had a theological dimension in the 19th century.[52] Perhaps an even more important issue is expressed in the question whether the authors writing about the discovery of Neptune had a noticeable impact on broadly understood culture.

Another issue that could be addressed in the future is the use of Neptune's discovery in philosophical discussions. For example, Karl Pearson (1857–1936) in *The Grammar of Science* (p. 41) uses the story of Neptune's discovery to illustrate the conceptual difference between the real and the unreal, as well as between the real and the ideal. In his opinion, the reality of things depends on the possibility of their impact, at least partial, on human senses.[53] The discovery of Neptune was used by this philosopher to articulate the difference between metaphysical concepts, such as *thing-in-itself* or *mind stuff*, and empirical (scientific) concepts. It would be valuable to investigate whether the discovery of Neptune was used by other philosophers to articulate other conceptual differences.

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[51] By rejecting the introduction of the idea of God into the scientific explanation of the dynamics of the Solar System, de Laplace expressed an otherwise correct methodological principle recognizing the cognitive autonomy of physics and astronomy. Unfortunately, over time, his view was used to fight any discourse about the world that referred to the concept of God, especially theological and philosophical ones.

[52] On the theological dimension of this debate, see Crowe 1997.

[53] But on the other hand He claims "The validity of scientific conceptions does not in the first place depend on their reality as perceptions, but on the means they provide of classifying and describing perception". Pearson 1900, p. 166.

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