

## Interpreting the *Kosmotheoros* (1698)

### *A historiographical essay on theology and philosophy in the work of Christiaan Huygens*

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#### Abstract

Christiaan Huygens’ cosmological work *Kosmotheoros* (1698) has often been neglected in modern scholarship. This paper gives an overview of the existing academic literature on the *Kosmotheoros* and aims to offer an explanation for the work’s problematic modern reception. Arguing for a more contextual approach to this work, some new directions will be suggested for a more comprehensive interpretation of the *Kosmotheoros* in connection to its intellectual and historical context, especially the late seventeenth-century theological, metaphysical, and philosophical debates on mechanistic philosophy. If studied more extensively, Huygen’s *Kosmotheoros* can offer valuable new insights into his thought and specifically into his interactions with the theological and philosophical debates of his time.

*Keywords:* Christiaan Huygens, *Kosmotheoros*, historiography, cosmology, teleology

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#### *Introduction*

A man that is of Copernicus's opinion, that this Earth of ours is a planet, carried round and enlightened by the Sun, like the rest of them, cannot but sometimes have a fancy, that it's not improbable that the rest of the planets have their dress and furniture, nay and their inhabitants too as well as this Earth of ours;<sup>1</sup>

These are the opening lines of the *Kosmotheoros*, the posthumously published final work of Christiaan Huygens (1629–1695).<sup>2</sup> Presented as a letter to his brother Constantijn and written in Latin, the *Kosmotheoros* consists of two books, containing a discussion of the possibility of life on other planets, an overview of the Copernican system, a critique of Cartesian vortex cosmology, and several new (and revolutionary) calculations concerning the measurements of the planets and the solar system.

The first book of the *Kosmotheoros* offers an extensive argumentation in support of the existence of a plurality of worlds in the planets. Through a series of 'probable conjectures', Huygens presents his thoughts on how these planetary inhabitants might look, how they might live, and what they might believe and know. According to Huygens, Copernican astronomy demonstrates the astronomical similarity between the Earth and the other planets in the solar system. Moreover, the development of the telescope has made it possible

\* I would like to thank Emily Thomas, Mirjam de Baar, Christoph Jedan, and the anonymous reviewer for their valuable comments. I would also like to refer to the recent article by N. Smit, "'Een filosofisch geschriftje'" Christiaan Huyens' gedachten over God in zijn *Cosmotheoros* en andere geschriften', in: *Studium* 7.1 (2014), p. 1–18. Although I agree with many of Smit's findings, I have my doubts about several aspects of her interpretation of Huygens' religious ideas, for example in relation to the identification of God and Nature. The present article was submitted before the publication of this issue of *Studium*, and therefore does not discuss Smit's article in more detail.

1 English quotations are taken, with an updated spelling and removal of unnecessary capitalization, from Chr. Huygens, *The Celestial Worlds Discover'd: Or, Conjectures Concerning the Inhabitants, Planets and Productions of the Worlds in the Planets. Written in Latin by Christianus Huygens, And inscrib'd to his Brother Constantine Huygens, Late Secretary to his Majesty K. William*, London 1698, p. 1–2.

2 Chr. Huygens, *Kosmotheoros, sive De Terris Coelestibus, earumque ornatu, conjecturae*, in: J.A. Vollgraff et al. (eds), *Oeuvres Complètes de Christiaan Huygens*, vol. XXI, *Cosmologie*, The Hague 1944.

to observe the physical resemblance of Earth to the celestial bodies, which appear to have hills, mountains, seas, and clouds. Huygens therefore argues that it is possible to theorize about life on the planets in analogy to the world we see around us. He legitimizes this by drawing on his epistemological ideas about the vital role of probability and the absence of absolute certainty in the study of nature in general, concluding that ‘enough material is available for probable conjectures’.<sup>3</sup> This argument reflects an important departure from the rationalistic and mechanistic philosophy of Descartes, which Huygens had supported in his early work, i.e. that the study of nature deals not with absolute certainties, but with degrees of probability: ‘in such noble and sublime studies as these, it is a glory to arrive at probability, and the search itself rewards the pain’.<sup>4</sup>

Despite the importance of astronomical evidence and a method based on probability and analogy, the argument for planetary life is ultimately based on a different type of reasoning. Huygens uses a teleological argument to defend that the planets are not just created for the sake of mankind, but must all have their own inhabitants:

Since then the greatest part of God’s creation, that innumerable multitude of stars, is placed out of the reach of any man’s eye; [...] is it such an unreasonable opinion, that there are some reasonable creatures who see and admire those glorious bodies at a nearer distance?<sup>5</sup>

With the formulation of this analogical method, Huygens has laid out the program for the first book. The argument is repeated time and again as Huygens discusses many different aspects of planetary life: since our planet is found to be solid, we can assume that the planets are solid; since our planet has an atmosphere, we can assume that the planets have an atmosphere as well; since life exists on earth, we can assume that life exists on the other planets; since our planet hosts intelligent life, we can assume that other planets do so as well; since humankind builds houses, we can assume that planetary intelligent inhabitants build houses too; and since we know geometry, we can assume that the planetary inhabitants do so too.

Despite its contemporary popularity, the *Kosmotheoros* is often overlooked in modern scholarship. Moreover, the speculative character of the work and especially Huygens’ frequent use of religious rhetoric have often been considered an anomaly, inconsistent with Huygens’ wider work. In this article, I will address this historiographical problem, and propose a new direction for our understanding of the work that integrates, and expands on, existing interpretations. Existing approaches can be roughly grouped in two categories. The first perspective on the work is provided by the existing scholarship on Christiaan Huygens as an early modern scientist. A second group of scholars approaches the *Kosmotheoros* in relation to the tradition of ‘the plurality of worlds’, and in relation to the study of seventeenth century scientific and fictional cosmological discourse. This article will argue that both approaches generally overlook the importance

<sup>3</sup> *Oeuvres Complètes*, vol. XXI, p. 683: ‘verisimilibus conjecturis abunde materiam praeberi’. On Huygens’ epistemological ideas about probability see for example the introduction to *Traité de la lumière*, in: *Oeuvres Complètes*, vol. XXI, p. 454.

<sup>4</sup> Huygens, *Celestial Worlds Discover’d*, p. 10.

<sup>5</sup> *Ibidem*, p. 7–8.

of the theological rhetoric in and context of the work, and I will show that precisely this aspect of the *Kosmotheoros* is often emphasized by the late seventeenth-century and early eighteenth-century reception of the work. Proposing a contextual approach, the final section of this article will suggest a new direction towards a more comprehensive interpretation that connects the *Kosmotheoros* to the late seventeenth-century theological, metaphysical, and philosophical debates on the mechanistic philosophy that constitute an important aspect of the book's intellectual and historical context. I will illustrate this new approach with a case study that shows how Huygens' thoughts on design and providence can offer new insights in his underlying theological and philosophical ideas about God and nature.

### *Kosmotheoros and the existing image of Christiaan Huygens*

The study of Christiaan Huygens has been strongly influenced by an understanding of the history of science in a narrow sense, and emphasizes his scientific achievements in the fields of mathematics, physics, and astronomy. The dominant image of Huygens that results from this approach is that of a practical scientist who concentrated his intellectual efforts on the study of separate natural phenomena and who never developed a comprehensive philosophical system. This depiction sets Huygens apart from many of his contemporary natural philosophers, such as Descartes, Spinoza, Newton, and Leibniz, who developed coherent mechanistic or mathematical world views.

Although the biographical facts of Huygens' life are quite well-known and undisputed, the interpretation of his life, thought, and work, poses difficulties. F.J. Dijksterhuis notes that writing a comprehensive biography of Christiaan Huygens is problematic, because his work does not explicate a natural philosophical programme that could provide the framework for such a 'scientific biography'. His oeuvre lacks straightforwardly programmatic or methodological texts, like Descartes' *Discourse on Method*, Spinoza's *Ethics*, or Newton's *Principia*. A coherent world view cannot be easily extracted from Huygens scientific work either. His work on the rules of collision and oscillation and on light wave theory and his astronomical observations and calculations are all expressions of his brilliance, but not necessarily of a coherent view on nature.<sup>6</sup> Portraying Huygens as a practical problem-solver therefore seems justified and offers an answer to this problem of interpretation. Huygens is also characterized as an engineer, who tackled problems as he encountered them, or as they were suggested to him by his many correspondents. This established understanding of Huygens has been explained as followed by Klaas van Berkel:

Virtuosity has become characteristic of all Huygens' further scientific work, both in a positive and negative way. In the art of science, Huygens was unmatched in his days. [...] But at the same time, almost everyone who has studied Huygens, has noticed that despite all the ingenuity he displayed, something is missing that made great contemporaries such as Leibniz and Newton more than

6 F.J. Dijksterhuis, 'Titan en Christiaan. Huygens in werk en leven', in: *Gewina* 23.1 (2000), p. 56-68.

scientific virtuosi. What that is, is not easy to say, but it has something to do with the absence of any philosophical depth in the work of Huygens.<sup>7</sup>

More recently, Rienk Vermij has partially adjusted this image, relating Huygens' scientific work to his personal life and historical context.<sup>8</sup> He identifies the 'mathematization of reality' as the leading theme of Huygens' work, and has connected this idea to Huygens' life in the Dutch Republic and Paris, and to his interaction with the scientific work of predecessors like Descartes and Galilei and contemporaries like Boyle and Leibniz. Vermij characterizes Huygens as one of the great scientists of the later seventeenth century, who implemented the scientific program of a mathematical mechanical philosophy that others (had) theorized about. Therefore, according to Vermij, it is the mathematical clarity and ingeniousness of Huygens' studies that gives significance to his life and work in his historical context. The apparent lack of systematic reflection in Huygens' work is the expression of a very practical, but nonetheless coherent scientific agenda.<sup>9</sup>

In short, the existing scholarship characterizes Christiaan Huygens as a brilliant, but very practical and in a way 'proto-modern' scientist, who fits neatly into the modern separation of academic disciplines. From this perspective, the interpretation of (especially the speculative first book of) *Kosmotheoros* has long been highly problematic. In their best-selling work *Erflaters van onze beschaving* (1938–1940) Jan and Annie Romein deemed the work 'unscientific', and wondered whether it is the product of the wisdom of Huygens' old age, or of a 'natural weakening' of his capacities.<sup>10</sup> This negative appraisal of the work was affirmed by the historian of science E.J. Dijksterhuis. In a lecture held in 1950 in honour of the completion of Huygens' *Oeuvres Complètes*, he explains:

Towards the end of his life, the intense interest with which he had always studied the planetary system entices [Huygens] to give way to his fantasy and lose himself in cosmological reflections in the *Kosmotheoros*, setting aside the demands of scientific rigor that he had followed in all his work.<sup>11</sup>

7 K. van Berkel, *Citaten uit het boek der natuur. Opstellen over Nederlandse wetenschapsgeschiedenis*, Amsterdam 1998, p. 53–54: 'Virtuositeit is kenmerkend geworden voor al het verdere wetenschappelijke werk van Huygens, zowel in positieve als in negatieve zin. Als het op de techniek van de wetenschap aankwam, had Huygens in zijn dagen zijns gelijke niet. [...] Maar tegelijkertijd is het bijna iedereen die zich in Huygens verdiept heeft, opgevallen dat hij bij al het vernuft dat hij aan den dag legde, iets miste wat grote tijdgenoten als Leibniz en Newton [...] juist maakte tot meer dan virtuelen op natuurwetenschappelijk terrein. Wat dat is valt niet eenvoudig te zeggen, maar het heeft te maken met de afwezigheid van elke filosofische diepgang in het werk van Huygens'. See also K. van Berkel, *In het voetspoor van Stevin. Geschiedenis van de natuurwetenschap in Nederland 1580–1940*, Amsterdam 1985, p. 59–60. A very similar thought is expressed in R. Hooykaas, *Experientia ac ratione. Huygens tussen Descartes en Newton*, Leiden 1979, p. 35.

8 R. Vermij, *Christiaan Huygens. De mathematisering van de werkelijkheid*, Diemen 2004.

9 Huygens is often considered to be the last great proponent of the (Cartesian) mechanical philosophy; J.G. Yoder, *Unrolling time. Christiaan Huygens and the mathematization of nature*, Cambridge 1988, p. 2.

10 J. and A. Romein, *Erflaters van onze beschaving*, Amsterdam 1977, p. 422.

11 E.J. Dijksterhuis, *Christiaan Huygens (Bij de voltooiing van zijn Oeuvres Complètes)*, Haarlem 1951, p. 25: 'Tegen het einde van zijn leven verleidt de intense belangstelling waarmee hij steeds het planetenstelsel had bestudeerd, [Huygens] er toe, met ter zijde stelling van de eisen van strenge wetenschappelijkheid, waaraan hij zich bij zijn productie steeds gebonden had gevoeld, ook eens den vrijen teugel te laten aan zijn phantasie, en zich in zijn *Cosmotheoros* in kosmologische bespiegelingen te verliezen'.

Although this negative appreciation of the *Kosmotheoros* is not reflected in later publications on Christiaan Huygens, the work has received only limited attention.<sup>12</sup> In an edited volume on Huygens from 1979, A.R. Hall connects the *Kosmotheoros* to the image of Huygens as a problem-solver: 'Of the major figures in seventeenth-century physical science, Galileo, Gassendi, Pascal, Descartes, Huygens, Leibniz and Newton, the Netherlander is the only one who is not markedly a philosopher'.<sup>13</sup> Consequently, Hall downplays the religious themes in the *Kosmotheoros*: 'The sort of comments he makes in *Cosmotheoros* about the divine design and perfection of the world and so on seem more or less perfunctory. Huygens was not a man, I think, who could have written the sort of things that Newton writes about God.' Hall's cautious explanation of this perceived difference, is that Huygens may have lacked the 'personal conviction about access to deep secrets of nature, the sort of feeling of authority which Newton clearly possessed'.<sup>14</sup>

In a lecture on Huygens 'between Descartes and Newton', Reijer Hooykaas has pointed to Huygens' silence on religious matters. At least nominally, Huygens remained true to the Calvinism of his family.<sup>15</sup> According to Hooykaas, in some of his later writings, including the *Kosmotheoros*, Huygens expresses a form of natural theology that is indebted to Stoic philosophy and its strong identification between Nature and God. On the other hand, Hooykaas argues, Huygens holds on to the divine voluntarism of protestant orthodoxy, keeping him from identifying God with Nature.<sup>16</sup> Nevertheless, Hooykaas concludes that Huygens shares not much more than a 'tip of the veil'.<sup>17</sup>

Cees Andriessé's popular biography of Huygens, titled *Titan kan niet slapen*, is the first publication that offers a more extensive interpretation of the *Kosmotheoros*. While addressing some of the philosophical themes in the first book of the *Kosmotheoros*, Andriessé emphasizes the second book and the 'revolutionary astronomical calculations' it contained – scientific achievements that accommodate the *Kosmotheoros* to the image of Huygens as a scientific genius.<sup>18</sup> With regard to the first book, Andriessé rejects the disqualification of the work by Jan and Annie Romein. He points out that the speculative cosmological nature of the first book is not uncommon in the

**12** Publications that offer extensive discussions of Christiaan Huygens and his work, but do not discuss the *Kosmotheoros*, or only in passing, are the special issue on Huygens of *De Zeventiende Eeuw* 12.1 (1996); Yoder, *Unrolling time*; F. Chareix, *La philosophie naturelle de Christiaan Huygens*, Paris 2006; A. D'Elia, *Christiaan Huygens. Una biografia intellettuale*, Milan 1985.

**13** A.R. Hall, 'Summary of the symposium', in: H.J.M. Bos et al. (eds), *Studies on Christiaan Huygens. Invited papers from the symposium on the life and works of Christiaan Huygens, Amsterdam, 22-25 August 1979*, Lisse 1980, p. 304. In the same volume, Albert van Helden characterizes the book as a popularization of Copernicanism, emphasizing the harmony of the system; A. van Helden, 'Huygens and the astronomers', in: Bos, *Studies on Christiaan Huygens*, p. 156, 159.

**14** Hall, 'Summary of the symposium', p. 306-307.

**15** Hooykaas, *Experientia ac ratione* (n. 7), p. 27-28.

**16** *Ibidem*, p. 30.

**17** *Ibidem*, p. 24.

**18** C. Andriessé, *Titan kan niet slapen. Een biografie van Christiaan Huygens*, Amsterdam 1993, p. 372-381.

seventeenth century, and briefly mentions Huygens' use of teleology, which 'gives meaning to the expanding universe'. Andriessse argues that Huygens' 'probable conjectures' do not necessarily conflict with his characteristic scientific rigor, but reflect Huygens' wider ideas about the importance of probability in scientific inquiry.

Two works by Rienk Vermij give more detailed attention to the connection of the *Kosmotheoros* to Huygens' wider work. In his book *The Calvinist Copernicans*, Vermij points out that Huygens had already raised the specific question about planetary life in his *Systema Saturnium* of 1659. Moreover, Vermij argues that the 'mathematization of nature', which he identifies as the central idea of scientific work, is also central to the *Kosmotheoros*. According to Vermij, Huygens' argument for the plurality of worlds rests on the basic idea of the universality of nature: because nature is always and everywhere the same, the differences between the planets are only differences in size and appearance, not in principle. Vermij concludes: 'Life itself, even intelligent life, has no specialised position in nature. Huygens just drew a leading idea of the scientific revolution [the universality of nature] to its (seemingly) logical conclusion.'<sup>19</sup> In his concise biography *Christiaan Huygens. De mathematisering van de werkelijkheid*, Vermij gives more attention to the religious aspects of the *Kosmotheoros*, and argues that at the time, Huygens' vision of the universality and symmetry of nature was novel and daring.<sup>20</sup> He characterizes the *Kosmotheoros* as the final (and popularizing) expression of Huygens' (essentially Cartesian) mechanistic worldview.<sup>21</sup>

A themed issue of *Revue d'histoire des sciences* dedicated to Christiaan Huygens contains two more discussions of the *Kosmotheoros*. In an article on Huygens' communication of the Copernican system to the public throughout his career, Patricia Radelet de Grave argues that the argument for planetary life of the *Kosmotheoros* strongly depends on Huygens' Copernicanism and on his scientific epistemology: physics always deals with probabilities, not with geometrical certainties.<sup>22</sup> Therefore, Radelet de Grave suggests, Huygens did not mind the lack of certainty of his 'probable conjectures'.<sup>23</sup>

In the same volume, Gianfranco Mormino discusses the role of God in Huygens' work. Mormino argues that Huygens uses his concept of God primarily in relation to his epistemological ideas, and invokes God as the almighty creator to point out the limits of mechanical explanations of Nature. Here, according to Mormino, Huygens also departs from Descartes. Rejecting the Cartesian philosophical discussions of God, Huygens points to God in the 'internal finality' or purpose in living creatures. The origins of animals and plants cannot be explained by mechanism, but their existence reveals the infinite and incomprehensible power of God. However, according to

<sup>19</sup> R. Vermij, *The Calvinist Copernicans. The reception of the new astronomy in the Dutch Republic, 1575-1750*, Amsterdam 2002, p. 152.

<sup>20</sup> Vermij, *Christiaan Huygens* (n. 8), p. 141.

<sup>21</sup> Ibidem, p. 143.

<sup>22</sup> P. Radelet De Grave, 'L'Univers selon Huygens, le connu et l'imaginé', in: *Revue d'histoire des sciences* 56.1 (2003), p. 79-112.

<sup>23</sup> Huygens also states this in the *Kosmotheoros*, see Huygens, *Celestial Worlds Discover'd* (n. 1), p. 9-10.

Mormino, Huygens nevertheless excluded the possibility of supernatural explanations, precisely because they go beyond human understanding.<sup>24</sup>

In general, modern scholarship on Christiaan Huygens is primarily interested in the *Kosmotheoros* for the scientific content of the second book: Huygens' astronomical calculations, thoughts on gravity, and rejection of Cartesian cosmology. Nevertheless, several scholars have also addressed the philosophical and theological ideas expressed in the cosmological speculation of the first book. Huygens' 'probable conjectures' have also been related to his epistemological ideas about probability and scientific method, and to what could be summarized as his mathematical Cartesianism. However, although the *Kosmotheoros* is no longer dismissed as 'unscientific', modern scholarship still struggles to reconcile the philosophical and theological ideas expressed in the work with the existing image of Christiaan Huygens the practical problem-solver.

### *Alternative approaches: the plurality of worlds*

Although existing scholarship on Christiaan Huygens gives only limited attention to the *Kosmotheoros*, the work has been studied more extensively in the academic fields of the history of ideas and the history of literature. An often quoted passage at the beginning of the first book of the *Kosmotheoros* makes clear why:

At the very birth of astronomy, when the earth was first asserted to be spherical, and to be surrounded with air, even then there were some men so bold as to affirm, that there were an innumerable company of worlds in the stars. But later authors, such as cardinal Cusanus, Brunus, Kepler (and if we may believe him, Tycho was of that opinion too) have furnished the planets with inhabitants. Nay, Cusanus and Brunus have allowed the sun and fixed stars theirs too. But this was the utmost of their boldness; nor has the ingenious French author of the Dialogues about the Plurality of Worlds [Fontenelle] carried the business any farther. Only some of them have coined some pretty fairy stories of the men in the moon, just as probable as Lucian's true History; among which I must count Kepler's, which he has diverted us with in his Astronomical Dream.<sup>25</sup>

Not surprisingly, the *Kosmotheoros* has been linked by several scholars to the speculative cosmological tradition of a 'plurality of worlds'. From this perspective, the work has been most extensively discussed in two publications from the early 1980s by Steven Dick and Karl Guthke.<sup>26</sup> Dick sets his book on the plurality of worlds against the backdrop of the modern search for extra-terrestrial life, and argues that 'most ideas undergo an evolution and a transformation to such an extent that historical antecedents often

<sup>24</sup> G. Mormino, 'Le rôle de Dieu dans l'oeuvre scientifique et philosophique de Christiaan Huygens', in: *Revue d'histoire des sciences* 56.1 (2003), p. 113–133.

<sup>25</sup> Huygens, *Celestial Worlds Discover'd*, p. 2–3.

<sup>26</sup> S.J. Dick, *Plurality of worlds. The origins of the extraterrestrial life debate from Democritus to Kant*, Cambridge 1982, and K. Guthke *Mythos der Neuzeit. Das Thema der Mehrheit der Welten in der Literatur- und Geistesgeschichte von der Kopernikanischen Wende bis zur Science Fiction*, Bern 1983. Guthke's work has been translated into English as *The last frontier. Imagining other worlds, from the Copernican revolution to modern science fiction*, trans. H. Atkins, Ithaca (NY) 1990.



bear little resemblance to their modern counterparts. [...] the historical term out of which the extra-terrestrial life debate grew is “the plurality of worlds”.<sup>27</sup> Dick compares the *Kosmotheoros* to Bernard le Bovier de Fontenelle’s *Entretiens sur la pluralité des mondes* (1686), emphasizing the differences between the two works.<sup>28</sup> He argues that Fontenelle’s assertion of planetary life depends on Cartesian vortex-cosmology, while Huygens’ argument is based on his experience with astronomical observation and his understanding of the Earth as one of the solar planets.<sup>29</sup> Dick points out that Huygens upholds the similarity of the planets (including Earth) concerning habitability, regardless of the apparent dissimilarities between the planets in other respects – such as their positions relative to the sun, discussed in the second book of the *Kosmotheoros*. According to Dick, this can be explained by the combination of Huygens’ astronomical ideas and a metaphysical principle (which Dick does not discuss in detail) that the other planets should be similar in dignity to the Earth.

Karl Guthke has studied the *Kosmotheoros* as an expression of the ‘modern myth’ of the plurality of worlds. Like Dick, Guthke discusses the *Kosmotheoros* in comparison to Fontenelle’s *Entretiens*. He argues that both are primarily works of literature based on science, rather than works of science as such.<sup>30</sup> Guthke contends that Huygens’ use of analogy based on Copernican astronomy rests on a ‘why not?’ type of argument and an appeal to teleology: the planets must have a use. According to Guthke, this expresses ‘the undogmatic piety of the Enlightenment that makes the plurality of worlds into a new gospel which says that the wisdom and goodness of the Creator are venerated not only by us on Earth but also by the rational beings on other planets’.<sup>31</sup> He explains this teleology as anti-anthropocentric in form: the planets were not created for the sake of man, but for their own inhabitants. Also, Huygens opposes the infinite diversity of the planetary worlds defended by Fontenelle: ‘For Huygens, the principle of the diversity of nature is decidedly overshadowed by that of its essential unity’.<sup>32</sup> This, according to Guthke, leads Huygens to postulate ‘a sort of cosmic egalitarianism’. Huygens not only rejects theologically motivated anthropocentrism, but also Fontenelle’s assertion that mankind held a privileged position within the mechanical universe.<sup>33</sup> On the other hand, Guthke points out the positive dialectic in Huygens’ anti-anthropocentrism: the repeated argument that the planetarians cannot be less than us, is used to stress the greatness of mankind. In relation to Huygens’ use of teleology, Guthke remarks that

<sup>27</sup> Dick, *Plurality of worlds*, p. 2.

<sup>28</sup> Fontenelle’s discussion of the plurality of worlds strongly draws from Cartesian vortex-cosmology, and emphasizes the infinite variety that Nature produces in the universe; B. le Bovier de Fontenelle, *Entretiens sur la pluralité des mondes*, ed. A. Calame, Paris 1966.

<sup>29</sup> Dick, *Plurality of worlds*, p. 128.

<sup>30</sup> Guthke, *The last frontier*, p. 239.

<sup>31</sup> *Ibidem*, p. 240.

<sup>32</sup> *Ibidem*.

<sup>33</sup> Note that scholastic anthropology was in many ways more modest than seventeenth-century anthropology – to the medieval mind, the central place of mankind was not the place of honor that many of Huygens’ contemporaries considered it to be.

the point of the ‘infinite multiplication of essentially identical worlds’ asserted in the *Kosmotheoros* remains unclear, and concludes: ‘Huygens does not discuss this matter. For if he did, he would also have to reopen the whole Pandora’s box of theological and dogmatic questions that, like other enlightened philosophers of plurality, he has so decidedly closed and pushed aside.’<sup>34</sup>

The connection between literature and science has also been the focus of two later discussions of the *Kosmotheoros*. Ladina Bezzola Lambert has argued that Huygens applies a metaphor of social hierarchy in response to telescopic observations suggesting that the surface of the moon is a lifeless desert: this discovery, discussed in the second book of the *Kosmotheoros*, does not compromise the analogy between Earth and the other planets, because there is a difference in status between planets and moons: it only suggests that other moons in the solar system are also void of life.<sup>35</sup> Bezzola Lambert explains that the ‘natural order of the universe is here placed in correspondence with the social order of French society so as to imply that its hierarchic organization represents a universal standard’.<sup>36</sup>

Another discussion of the *Kosmotheoros* is featured in a study by Frédérique Aït-Touati on the relationship between scientific and literary discourses in seventeenth-century cosmological texts. In this book, Aït-Touati argues that in the *Kosmotheoros*, Huygens aims to establish an independent scientific discourse: ‘Huygens undertakes to differentiate scientific discourse from a learned discourse that accommodated the fictional. One of the direct consequences of this rejection of fiction was the profound change in how conjectures were constructed and expressed.’<sup>37</sup> In opposition to the loose speculations of for example Fontenelle, Huygens develops a chain of logically linked conjectures. Aït-Touati examines how Huygens rejects ‘the use of imagination in the service of cosmology’ and instead tries to ‘make other worlds seen with the mind’s eye’.<sup>38</sup> What still connects the *Kosmotheoros* to the *Entretiens*, is that both works express a new approach towards the idea of the plurality of worlds, which had become credible thanks to the new astronomy and the development of the telescope: ‘It had acquired, in short, the status of conjecture. If Fontenelle chooses to present his conjectures in an explicitly fictional mode, Huygens, in contrast, insists on the systematic and logical nature of reasoning.’<sup>39</sup>

Although Aït-Touati’s main interest is for the narrative structure and the literary elements of the *Kosmotheoros*, she also gives an interpretation of Huygens’ defence of

34 Guthke, *The last frontier*, p. 243–244.

35 *Kosmotheoros* is discussed in a chapter on ‘metaphors as systems of thought’. Special attention is given to the first English translation, which refers to the moons of Saturn and Jupiter as ‘guards’ and ‘attendants’; L. Bezzola Lambert, *Imagining the unimaginable. The poetics of early modern astronomy*, Amsterdam, New York 2002.

36 *Ibidem*, p. 139.

37 F. Aït-Touati, *Fictions of the cosmos. Science and literature in the seventeenth century*, trans. S. Emanuel, Chicago 2011, p. 100.

38 *Ibidem*, p. 108

39 *Ibidem*, p. 126; this has previously also been argued by Dick and Guthke.

plurality: ‘Huygens’ conjectural demonstration relies on a limited number of principles, constantly reaffirmed in the course of the text: divine providence, the harmony and perfection of the world, and the equal dignity of the planets.’ Based on these principles, the argument of the *Kosmotheoros* is summarized by Ait–Touati as a syllogism: ‘Through providence, our Earth is the best of all possible worlds. This same providence has created all planets equally perfect; hence the beauties and perfections that we know on Earth must also exist on other planets.’<sup>40</sup>

### *The early reception of the Kosmotheoros*

While the philosophical aspects of the *Kosmotheoros* have received more attention in relation to the plurality of worlds tradition and seventeenth-century scientific and literary discourse, these approaches are primarily interested in the way theological and philosophical arguments are used to support other ideas. But how was Huygens’ work received by his contemporaries? Although the early reception of the *Kosmotheoros* has not yet been extensively studied, some material to answer this question is available in the form of the work’s publishing history, prefaces and journal reviews. The available sources are all quite positive – which of course is not surprising in the case of a preface. The publication history of the *Kosmotheoros* in itself is also significant, and shows that the work remained popular throughout the eighteenth century.<sup>41</sup> Within a few years after the publication of the Latin edition by bookseller Adriaan Moetjens in The Hague in 1698, under the full title *Κοσμοθεωρος, sive De Terris Coelestibus, earumque ornatu, conjecturae*, the book was translated into English, Dutch, French and German.<sup>42</sup> The *Kosmotheoros* remained popular and was reprinted many times throughout the

<sup>40</sup> Ibidem, p. 107.

<sup>41</sup> This popularity was not unanimous: Herman Boerhave begrudged the ‘ridiculous’ elements in the *Kosmotheoros*; C. de Pater, ‘In de schaduw van Newton. Het Huygensbeeld bij enkele Nederlandse newtonianen in de achttiende eeuw’, in: *De Zeventiende Eeuw* 12.1 (1996), p. 65.

<sup>42</sup> An English translation was published by Timothy Childe in London in 1698, titled *The Celestial Worlds Discover’d: Or, Conjectures Concerning the Inhabitants, Planets and Productions of the Worlds in the Planets*. The next year saw the publication of a Dutch edition, translated by the author of the journal *Boekzaal van Europe*, Pieter Rabus (1660–1702): *De Wereldbeschouwer, of Gissingen over de Hemelsche Aardkloten, en derzever Cieraad*. A French translation was published in Paris in 1702, titled *Nouveau traité de la pluralité des mondes* (the title alludes to the *Entretiens sur la pluralité des mondes* (1686) by Bernard le Bovier de Fontenelle, to whom Huygens in the *Kosmotheoros* refers as ‘the French author of the ingenious dialogues on the plurality of worlds’). The next year, a German edition was published in Leipzig: *Weltbetrachtende Muthmaßungen von den himmlischen Erdkugeln*. Further translations appeared in 1717 in Russian, and in 1774 in Swedish; see H.A.M. Snelders, ‘Christiaan Huygens’ *Kosmotheoros*’, in: *Christiaan Huygens, Cosmotheoros. De wereldbeschouwer*, inl. H.A.M. Snelders, Utrecht 1989, p. 12–14. At least two editions of Huygens’ collected works, *Opera Varia*, published in 1724 in Leiden, and *Opera mechanica, geometrica, astronomica et miscellanea*, published also in Leiden in 1751, also featured the Latin text of the *Kosmotheoros*. A slightly altered edition of Pieter Rabus’ Dutch translation was published in 1717 and reprinted in 1754.

eighteenth century.<sup>43</sup> In 1717 even a Russian translation was published, personally commissioned by Peter the Great, although the publication was not uncontroversial and the *Kosmotheoros* was apparently considered a ‘Satanic perfidy’ by its unwilling Russian publisher.<sup>44</sup>

The different prefaces to the translations provide some further insight as to how the work was read. The preface to the Dutch translation does not say much about the cosmological subject of the book, and simply gives praise to Huygens’ work for its ingenuity, and points to the humbling immensity of the universe. More interesting introductions accompany the English, French, and German editions. Here, the focus of the preface shifts towards the religious content of the *Kosmotheoros*, and more specifically, the possible theological objections it might raise. In the preface to the English edition of 1698, the publisher Timothy Childe defends the work against those who may suggest that ‘it renders Philosophy cheap and vulgar, and, which is worse, furnishes a sort of injudicious People with a smattering of Notions, which being not able to make a proper use of, they pervert to the Injury of Religion and Science’.<sup>45</sup> The much longer preface of the French edition first points out that the foundation of Huygens’ argumentation is the Copernican system. However, in the following pages, the religious aspects of Huygens’ focus on the universality of nature is emphasized: ‘L’Auteur de la nature ne peut ni tromper, ni être trompé, la verité éternelle est la regle de tout verité, et toutes les Creatures doivent se conduire par les mêmes principes, qui sont aussi invariables qu’ils sont infaillibles’.<sup>46</sup> So is the teleological argument for the existence of intelligent creatures on the other planets: ‘qu’on ne peut lire tout ce que Monsieur Hughs en dit, sans être persuade, que l’Auteur de la Nature n’auroit pas voulu priver les habitans des Planetes de tous ces avantages si necessaire à l’homme, et si utiles à sa perfection’.<sup>47</sup> The German edition of 1703 also addresses the ‘benefits to religion’ of the *Kosmotheoros*, emphasizing the importance of the design, teleology, and divine providence in the work.

Like the prefaces, many reviews in learned journals also indicate that Huygens’ contemporaries had a keen interest in the theological aspects of the *Kosmotheoros*. Pieter Rabus, the translator of the Dutch edition, wrote a very positive review of the *Kosmotheoros* in his *Boekzaal van Europe*. Rabus emphasizes the theological significance

43 Latin reprints were published in The Hague, 1699; Prague, 1700; Frankfurt and Leipzig, 1704. The English translation was reprinted in London, 1722; and Glasgow 1757. The French edition was reprinted in Amsterdam, 1718; and The Hague, 1754. The German edition was reprinted in Leipzig, 1743; Zürich, 1747 and 1757. The Russian edition was reprinted in 1727; see Snelders, ‘Christiaan Huygens’ *Kosmotheoros*’, p. 12–14.

44 V. Boss, *Newton in Russia. The early influence, 1698–1796*, Cambridge (MA) 1972, p. 50–67.

45 Huygens, *Celestial Worlds Discover’d* (n. 1), p. v.

46 Chr. Huygens, *Nouveau traité de la pluralité des mondes* (Paris 1702), ‘Preface’: ‘The Author of nature cannot deceive, nor be deceived; eternal truth is the rule of all truth, and all the creatures must follow the same principles that are as invariable as they are infallible’.

47 Ibidem: ‘we cannot read everything Mr. Huygens says, without being convinced that the Author of Nature would not have wanted to deprive the inhabitants of the Planets all the advantages necessary to man, and so useful to his perfection’.

of Huygens' conjectures, paraphrasing Huygens' argument against possible religious objections to his work:

Another will cry that this is contrary to scripture; But he [Huygens] reminds him that God has not chosen to explain to us everything that he has created. A third considers it frivolous and foolish to investigate what God has chosen not to reveal; but these people, according to him, overstep when they want to determine the limits of the enquiries of scholars.<sup>48</sup>

In the following, Rabus gives special attention to the (theological) implications of Huygens' speculations for his anthropology. While this is not a very important issue in the *Kosmotheoros*, Rabus discusses at some length that Huygens rejects the Cartesian understanding of animals as 'van-zelfs-bewegende konstwerken', automatic machines. He emphasizes that Huygens attributes feelings to the animals, and considers humans to be 'animals gifted with reason'. Rabus therefore raises the question what separates man from the animals. The answer, taken by Rabus from Huygens, is that mankind exceeds the other animals by its possibility to contemplate Nature, God's works, and by its practice of science, 'de oeffeningen van wetenschappen'.<sup>49</sup>

The *Kosmotheoros* was also reviewed in at least two French journals. The *Journal des Savants*, published in Paris, just gives a short summary of the questions raised by the *Kosmotheoros* in its issue for February 1699. The May 1698 issue of the reputed journal *Histoire des Ouvrages des Savants*, based in Rotterdam and edited by French Huguenot Henri Basnage de Beauval (1657–1710), contained a long and favourable review that opens with a short comparison of the *Kosmotheoros* with Fontenelle's *Entretiens sur la pluralité des mondes*, emphasizing the more serious character of the former. The review extensively discusses the theological implications of the *Kosmotheoros*. Attention is given to Huygens' argument that the universe is not created exclusively for the use of mankind. The many stars and planets in the universe, many beyond our sight, surely will be studied and contemplated by their own inhabitants. The reviewer argues that man's excellence leads us to imagine mankind to be the reason of the creation he inhabits: 'nous ne voyons rien de plus excellent que l'homme dans les ouvrages de Dieu, nous nous imaginons aisément qu'il doit être le but principal de tout ce qui lui est interieur'.<sup>50</sup> Therefore, Huygens is right to assume that the planets are dignified with their own intelligent inhabitants. It is noteworthy that this review does not assume that the removal of humanity from the centre of the universe has any negative

<sup>48</sup> *De Boekzaal van Europe, Gesticht door Rabus. September en October 1698*, Rotterdam 1698, p. 283: 'Een ander zal schreeuwen, dat dit tegen de Schriftuur strijd: maar zulk een helpt hy maar geheugen, dat God geenzins voor had, ons van al het bijzondere, dat Hy gemaakt heeft, te onderwijzen. Een derde rekent het voor ligtvaardigheid, en dwaasheid, te willen onderzoeken het gene God niet geopenbaart heeft: maar dit laatste soort van menschen gaat, zijn's oordeels, de maat te buiten; als zy willen bepalen tot hoe verre het onderzoek der geleerden mag voorttreên'.

<sup>49</sup> *Ibidem*, p. 285–286.

<sup>50</sup> *Histoire des Ouvrages des Savants. Mois de May*, Rotterdam 1698, p. 235: 'We see nothing more excellent in the works of God than man; we can easily imagine that it must be the principal goal of everything that surrounds him'.

effects for its status. On the contrary, the important place of man in the order of creation is confidently affirmed.

By and large, Huygens' seventeenth-century readers appear to have been more inclined than modern scholars to emphasize the theological issues at play in the *Kosmotheoros*. Moreover, they express an interest and appreciation for the subject of the plurality of worlds in the planet. The contemporary reception of the *Kosmotheoros* emphasized the benefits of the *Kosmotheoros* to religion, and often reflects Huygens' own defence of the theological usefulness and legitimacy of his cosmological speculations:

We shall be less apt to admire what this world calls great, shall nobly despise those Trifles the generality of men set their affections on, when we know that there are a multitude of such Earths inhabited and adorned as well as our own. And we shall worship and reverence that God the maker of all these things.<sup>51</sup>

### *Design and providence: interpreting religious rhetoric in the Kosmotheoros*

In the final section of this paper, I will discuss one of the theological aspects of the *Kosmotheoros* in more detail: although different modern scholars have pointed to the central role of teleology in Huygens' argument for planetary worlds, this use of teleology has not been further studied. Karl Guthke has suggested that the teleology in the *Kosmotheoros* remains pointless, because Huygens deliberately steered clear from 'the whole Pandora's box of theological and dogmatic questions'. In this final section I will explain why I disagree with this analysis and why I think the theological aspects of the *Kosmotheoros* deserve more attention. A brief case study of the teleological arguments used in the first book will show that Huygens' thoughts on design and providence as expressed in the *Kosmotheoros*, as well as in the related manuscripts, offer insight in Huygens' underlying theological and philosophical ideas about nature, God, and man.

In the secondary literature, the role of teleology in the *Kosmotheoros* is usually discussed in relation to the plurality of worlds: the teleological argument gives purpose or meaning to the expanding universe.<sup>52</sup> In the beginning of the first book, Huygens simply asks the rhetorical question: what use would the planets have, if they are only created for the sake of mankind?<sup>53</sup> Clearly, God must have created them for their own sake, or better still, for the sake of their own inhabitants. This is the teleological argument for plurality in its most basic form, as it has been repeated time and again in the plurality of worlds tradition by a variety of authors, including Giordano Bruno (1548–1600), John Wilkins (1614–1672), and Fontenelle: the glory of the Creator manifests itself in plenitude.

<sup>51</sup> Huygens, *Celestial Worlds Discover'd* (n. 1), p. 10–11.

<sup>52</sup> E.g. Andriessse, *Titan kan niet slapen* (n. 18), p. 377; Guthke, *The last frontier* (n. 26), p. 243–244.

<sup>53</sup> Huygens, *Celestial Worlds Discover'd*, p. 7–8, 21.

While this argumentative use of teleology is clearly present in the *Kosmotheoros*, I believe that Huygens' use of teleological language is much more complex, and serves more than just one purpose. For instance, Huygens also gives the argument an 'enlightened' twist previously used by Fontenelle, when he suggests that the belief that only the earth is inhabited would be an inappropriate expression of human pride or *hubris*. In this respect, the secondary literature has stressed Huygens' emphasis on the equality of the planets. However, as in the discussions of teleology, the secondary literature offers not much further explanation of this principle of equality.<sup>54</sup>

More interesting still, is the way in which Huygens employs teleology, through his frequent appeal to divine providence and design, to express his fundamental understanding of nature, and especially his ideas about the order and universality of nature in the mechanical philosophy. This specific use of teleology connects the *Kosmotheoros* to a wider philosophical context. For example, early in the first book, Huygens calls upon divine providence to reject atheistic materialism:

And we shall worship and reverence that God the maker of all these things; we shall admire and adore his providence and wonderful wisdom which is displayed and manifested all over the universe, to the confusion of those who would have the Earth and all things formed by the shuffling concourse of atoms [*fortuito corpusculorum concursu*], or to be without beginning.<sup>55</sup>

Similar arguments are frequently used in the *Kosmotheoros*, and reflect a widespread use of teleological and physico-theological rhetoric in both scholarly and popular writings from the 1670s onward, which was often closely connected to the appraisal of the mechanistic philosophy. Characterized by an 'argument from design' and the wider concept of the 'book of nature', it expressed a theological understanding of the natural order and the relation between God and nature. As Peter Harrison argues, in the course of the seventeenth century the collapse of medieval symbolic interpretations of nature raised fundamental questions about the meaning of nature.<sup>56</sup> This development is exemplified in the shifting use and meaning of the metaphors of the book of

**54** Several authors resort to sociological explanations. For example, Ait-Touati points to the difference between Fontenelle's hierarchy of planets and Huygens' similarity of the planets, and refers to a social explanation by Geoffrey Sutton: Fontenelle's model reflects his centralist and monarchical French background, while the 'radical egalitarianism' of Huygens' model reflects the political situation of the Dutch Republic, in which each state kept its sovereignty; *Ibidem* (n. 37), p. 110-111. See also Bezzola Lambert, *Imagining the unimaginable* (n. 35), p. 139; Guthke, *The last frontier*, p. 242-243.

**55** Huygens, *Celestial Worlds Discover'd*, p. 11; *Oeuvres Complètes* (n. 2), vol. XXI, p. 689.

**56** In late seventeenth-century and eighteenth-century physico-theology, this rhetoric would be given much importance as an apologetic weapon against 'Spinozists', deists, and all kinds of other supposed anti-Christian elements in society. However, before the eighteenth century, the theological emphasis given to the argument from design was different, less apologetic and more metaphysical in nature; P. Harrison, *The Bible, protestantism, and the rise of natural science*, Cambridge 1998; J.I. Israel, *Radical Enlightenment. Philosophy and the making of modernity 1650-1750*, Oxford 2001, p. 456-464.

nature.<sup>57</sup> Parallel to the great changes in (biblical) hermeneutics in the sixteenth and seventeenth centuries, the allegorical concept of the book of nature made way for a more 'literal' outlook on the world and a renewed interest in natural theology.<sup>58</sup> The argument from design as it was used in the later seventeenth century added an important element to this hermeneutics of nature, emphasizing the teleological structures in nature that enable plants, animals, and mankind to exist and survive. In this way, design, providence, and teleology are all elements in a wider metaphysical debate about the new mechanistic conceptions of nature, and the relation between God and Nature: is God free to create a world of his pleasing? Is nature contingent, or ruled by necessity? Can and does God interfere in the ordinary course of nature through miracles? Is man free, or determined by the laws of nature?

It is likely that Huygens was interested in these debates, despite his established image of a practical scientist without philosophical interest. Not only did he, personally or through correspondence, exchange thoughts on a wide range of scientific topics with the key participants in these debates (such as Spinoza, Leibniz, and Boyle), but in the *Kosmotheoros* Huygens also used a specific rhetoric associated with the philosophical and theological debates on the order of nature. Moreover, Huygens himself clearly did not consider the work to be at odds with his previous scientific work: acknowledging its distinctive form and content, he referred to the *Kosmotheoros* in several letters as a 'work on philosophy'.<sup>59</sup> Finally, while this religious aspect of the work is often overlooked in modern scholarship, it was emphasized in contemporary reception of the *Kosmotheoros*. I believe this indicates that to express his ideas, Huygens used theological concepts and religious language that were familiar to his contemporaries. Further study of the frequently recurring teleological rhetoric of design and providence in the *Kosmotheoros* will therefore greatly benefit our understanding of Huygens' previously overlooked philosophical and theological ideas about nature (or rather Nature).

As I have said above, the teleological arguments in the *Kosmotheoros* are not only used to support the existence of planetary worlds. The rhetoric of design and providence also supports the conjectures on the appearance and nature of the planetary worlds and their inhabitants. Using the argument of equality discussed above, Huygens

<sup>57</sup> Medieval interpretations of the book of nature were essentially symbolic. Nature was seen as 'a vast array of symbols which pointed to a transcendent realm beyond', and for example animals, plants, mountains, and meteorological phenomena could all be read like words or sentences in a text; Harrison, *The Bible*, p. 168. See also K. van Berkel and A. Vanderjagt (eds.), *The book of nature in early modern and modern history*, Leuven 2006; E. Jorink, *Het Boeck der Natuere. Nederlandse geleerden en de wonderen van Gods Schepping. 1575-1715*, Leiden 2007.

<sup>58</sup> Peter Harrison has connected both natural theology and scientific epistemology to theological anthropology in his *The fall of man and the foundations of science*, Cambridge 2007. Thomas Woolford has pointed out the paradoxical role of natural theology in the early modern Protestant tradition; Th. Woolford, *Natural theology and natural philosophy in the late Renaissance*, dissertation, Cambridge University, 2011; <https://www.repository.cam.ac.uk/handle/1810/242394>; last visit 20-05-2014.

<sup>59</sup> Huygens to the Marquis de l'Hospital, 24 December 1693, *Oeuvres Complètes*, vol. x, p. 577-579; Huygens to David Gregory, 19 January 1694, in: R.H. Vermij and J.A. Van Maanen, 'An unpublished autograph by Christiaan Huygens', in: *Annals of Science* 49 (1992), p. 507-523.



argues that the planets must have similar worlds to ours. To substantiate this principle of equality, a measure of value is required, which Huygens provides by pointing to animals and plants as the highest expression of divine providence:

I suppose nobody will deny but that there's somewhat more of contrivance, somewhat more of miracle in the production and growth of plants and animals, than in lifeless heaps of inanimate bodies, be they never so much larger; as mountains, rocks or seas are. For the finger of God, and the wisdom of divine providence, is in them [plants and animals] much more clearly manifested than in the other [inanimate bodies]. [...] For everything in them is so exactly adapted to some design, every part of them so fitted to its proper life, that they manifest an infinite wisdom, and exquisite knowledge in the laws of nature and geometry, as, to omit those wonders in generation, we shall by and by show; and make it an absurdity even to think of their being thus haply jumbled together by a chance motion of I don't know what little particles.<sup>60</sup>

Throughout the *Kosmotheoros*, many examples of this providence are given. Huygens emphasizes this sublime design in relation to the supposed universality of reproduction among animals:

And that it is much more agreeable to the wisdom of God, once for all to create of all sorts of animals, and distribute them all over the Earth in such a wonderful and inconceivable way as he has [procreation], than to be continually obliged to new productions out of the Earth?<sup>61</sup>

Further on, Huygens also indicates what divine providence ultimately amounts to: 'For the aim and design of the creator is everywhere the preservation and safety of his creatures.'<sup>62</sup> The understanding of divine providence and design that is evoked in these passages emphasizes the conservation of the natural world. This appears to be the main purpose of Huygens' use of teleology. The question that the *Kosmotheoros* answers time and again is not 'how things are', but 'how things remain'. The complexity of the chains of causality and dependency that are omnipresent in the natural world is what ultimately makes Huygens believe that 'a world' can only exist in one way – Earth's way. In his descriptions of the planetary worlds Huygens therefore points at the dependency of all life on water (or fluids in a more general sense), the inevitability of decay and death and the consequential necessity of some form of procreation, the need for senses and movement for animals to survive, the requirement of some measure of will, instinct or intelligence, and so on.

As several scholars have argued before, a teleological notion of design and providence is at the centre of Huygens' argument for the plurality of worlds. However, I believe that the primary purpose of this theological rhetoric is not a defence of plurality, nor an expression of piety, or a Christian apologetic argument from design – which of course does not necessarily imply that Huygens had no spiritual intentions with the *Kosmotheoros* at all. Huygens does not refer to design and providence to simply praise or defend God, but to emphasize the complexity and the vulnerability of creation.

<sup>60</sup> Huygens, *Celestial Worlds Discover'd*, p. 20–21.

<sup>61</sup> Ibidem, p. 29–31.

<sup>62</sup> Ibidem, p. 42.

He therefore turns the argument around: nature is not invoked to support an opinion about God, but God is invoked to support an idea about Nature. While the apologetic works of for example Robert Boyle (1627–1691) or Bernard Nieuwentijt (1654–1718) use nature to demonstrate God's glory and wisdom, Huygens appeals to divine providence to explain nature.

With regard to Christian theology, the implications of this argument can be orthodox, but they don't have to be. For example, Spinoza had formulated a very similar concept of understanding of providence in his early *Short Treatise* (c. 1660–1661):

Providence, [...] according to us is nothing but that striving we find both in the whole of nature and in particular things, tending to maintain and preserve their being. For it is evident that no thing, through its own nature, could strive for its own destruction, but that on the contrary, each thing in itself has a striving to preserve itself in its state, and bring itself to a better one.<sup>63</sup>

Concluding, the use of teleological and physico-theological rhetoric in the *Kosmotheoros* is not simply an argument in support of the plurality of worlds. To use Gutke's phrase, I think that Huygens did in fact open the 'Pandora's box of theological and dogmatic questions'. The *Kosmotheoros* offers us much insight into his epistemological ideas about the construction of reliable knowledge based on probability of nature as God's teleologically ordered creation. In his unpublished papers of the final decade of his life, Huygens discusses the metaphysical, philosophical, and theological implications of his worldview more explicitly, and in more detail.<sup>64</sup> Sometimes these texts express an orthodox piety reminiscent of the writings of Johannes Swammerdam, but they also contain thoughts similar to the ideas of Spinoza, as well as passages comparable to the metaphysics of Leibniz.<sup>65</sup> The following passage from a piece written around 1690 illustrates the kind of theological and metaphysical thoughts expressed in these private notes:

Because everything is thus arranged and perfected by God, that solely through movement and the concussion of bodies against bodies and against the souls of humans [...]; and that the whole

<sup>63</sup> B.D. Spinoza, *Short Treatise*, 1, v, ed. and trans. E. Curley, *The collected works of Spinoza*, vol. 1 (Princeton 1985), p. 84.

<sup>64</sup> Huygens' papers are preserved at the Leiden University Library, and have partially been published in *Oeuvres Complètes*. These manuscripts have recently been catalogued by J.G. Yoder, *A catalogue of the manuscripts of Christiaan Huygens including a concordance with his Oeuvres Complètes*, Leiden 2013. Wim Klever has referenced some of these unpublished writings, as well as the *Kosmotheoros*, in an interesting article on the relation between Huygens and Spinoza as physicists. Klever points out many interesting similarities between Huygens and Spinoza, but I often don't agree with his interpretations; W. Klever, 'Spinoza en Huygens. Een geschakeerde relatie tussen twee fysici', in: *Gewina* 20 (1997), p. 14–31.

<sup>65</sup> An especially interesting and useful background to Huygens' philosophical ideas are the debates on (among other subjects) natural order, necessity, determinism, and 'the best of all possible worlds'; E. Watkins (ed.), *The divine order, the human order, and the order of nature. Historical perspectives*, Oxford 2013; M.V. Griffin, *Leibniz, God and necessity*, Cambridge 2013; S. Nadler, *The best of all possible worlds. A story of philosophers, God, and evil*, New York 2008; M. Stewart, *The courtier and the heretic. Leibniz, Spinoza, and the fate of God in the modern world*, New Haven 2005. In relation to Leibniz, Gianfranco Mormino has pointed to the correspondence between Leibniz and Huygens on atomism; Mormino, 'Le rôle de Dieu' (n. 24), p. 119–124.

earth and the human kind can persist and last (a long time/forever) [perrenare]; and that in order to maintain society and the state, he implanted the love for goodness and righteousness, and on the other hand a revulsion for evil and crime; has not God freed himself of the care for separate affairs [rerum], but also from knowledge of the future? For if he has arranged with such wisdom and providence all affairs of the whole world, that afterwards will be realized through the varying movement and collision of bodies and atoms; shall we then say that these infinite corpuscular encounters and impacts have been examined in advance by God, each separate one? Or that it agrees with God's dignity to foreknow the experiences and affairs of mere humans [homunculorum], in that immense multitude of worlds? Or do we say that only this has been taken care of and provided for: that the sum of things is in order, and that good always prevails over evil, in general, but not in all individual cases. For certain, we see this happen in human affairs. Often the best [men] suffer undeservedly; innocents are slain, and this is so very often, and it happens without any apparent reason. Frequently however, the guilty are scourged, and the wicked are punished, whether by demand of the law, or the torments of conscience.<sup>66</sup>

These thoughts appear to be far removed from the often pious language of the *Kosmotheoros*, but at the same time reflect ideas present in the *Kosmotheoros* about the apparent imperfection of creation as an inspiration for virtue.<sup>67</sup> It is therefore important to note that these manuscripts are sometimes aphoristic in nature and often remain unfinished, and should be interpreted with some caution. They were not intended for publication, and they were written over a longer period of time. However, these texts do support the argument that the *Kosmotheoros* reveals much about Huygens' philosophical and theological worldview. In order to develop a better understanding of his thought, both the *Kosmotheoros* and the related unpublished papers should therefore be studied in more detail.

## Conclusion

In this paper I have argued that existing scholarship has insufficiently addressed the theological and philosophical intellectual content and context of the *Kosmotheoros* and

<sup>66</sup> My translation of: 'Cum omnia sic a Deo sint ordinata et perfecta, ut solo motu et agitatione corporum in corpora inque animas hominum [...] ut constare et perennare mundus omnis et genus humanum possint. cumque ad conservandam societatem ac rem publicam, amorem boni ac recti, ac rursus odium mali ac sceleris ingeneraverit, nunquid non solum à cura rerum singularum immunem sese Deus praestitit, sed et a futuri notitia? Nam si ea sapientia ac providentia totius mundi res ordinavit ut postea occursu vario et motu corporum et atomorum omnia peragerentur, an dicemus etiam infinitos istos occursus et reflexiones corpusculorum in antecessum Deo exploratos fuisse singulos? An praenosceret casus et eventa homuncolorum dignum Deo, in ista mundorum immensa multitudine? an hoc tantum curasse ac providisse ut summa rerum salva esset, bonaque malis semper praevalerent universè, non autem in casibus omnibus sigillatim. Certe enim ita cum rebus humanis agi videmus. saepe indigna pati optimos quosque; occidere immerentes, idque casu persaepe, nec ratione ulla quare id fiat apparente. Frequentius tamen plecti sceleratos, puniri improbos, vel legum vindicta vel conscientiae torminibus.' This passage is published as part of a piece titled 'De Rationi Impervii' in the *Oeuvres Complètes*, vol. XXI, p. 515, §10.

<sup>67</sup> Huygens, *Celestial Worlds Discover'd*, p. 78 ff.

especially the debates in which it participates. Moreover, existing interpretations are often strongly influenced by the dominant image of Christiaan Huygens as a brilliant scientist without interests in philosophy and theology. A revision of our understanding of Christiaan Huygens' *Kosmotheoros* is therefore required. The *Kosmotheoros* should no longer be approached as a problem or anomaly in Huygens' oeuvre, but as an opportunity to improve our understanding of Christiaan Huygens as a seventeenth-century scientist and intellectual.

In order to make sense of the religious language in the *Kosmotheoros*, and of Huygens' seemingly arbitrary use of teleological arguments in support of an essentially uniform plurality of worlds, the work must be related to the late seventeenth-century theological, metaphysical, philosophical debates on the mechanistic philosophy, and such themes as the order of nature and the relation between God, nature, and creation. The *Kosmotheoros* should also be studied in relation to Huygens' scientific work. Not only do the conjectures on the plurality of worlds make use of his older work on probability and astronomy, the *Kosmotheoros* is Huygens' only work that offers a comprehensive philosophical framework to his mechanical worldview, and consequently his scientific achievements. A comprehensive study of the role of the *Kosmotheoros* in Huygens' oeuvre will greatly improve our understanding of Christiaan Huygens, and re-instate Huygens as a major seventeenth-century thinker, while correcting the dominant image of Huygens as a brilliant, but only practically interested physicist and astronomer.