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RESEARCH ARTICLE

Using one's talents in honor of God: Lambert ten Kate (1674-1731) and Isaac Newton's natural philosophy

Steffen Ducheyne

Centre for Logic and Philosophy of Science, Vrije Universiteit Brussel, Brussels, Belgium
Email: steffen.ducheyne@vub.be

Argument
Lambert ten Kate (1674-1731), the scholar of language, religious writer, art theoretician and collector, and natural philosophy enthusiast, was part of an informal network of Amsterdam-based mathematics and natural philosophy enthusiasts who played a pivotal role in the early diffusion of Newton's natural philosophical ideas in the Dutch Republic. Because Ten Kate contributed to several areas of research, it is worth asking whether connections can be found between his different scholarly activities and, more specifically, whether his oeuvre as a whole was shaped by his religious views, as has been suggested. In this essay, I shall argue that his oeuvre was indeed shaped by his religious beliefs, which reflect elements typical of Dutch *doperdom*, but also reflect a more general Christian orientation that transcends confessional divides. More particularly, I aim to show that, if we want to understand why Ten Kate was drawn to the natural philosophy of his day, and especially to Isaac Newton's (1642-1727), and why he sought to promote it, we also need to pay attention to this broader Christian orientation in his thought. Along the way, I shall add nuance to earlier characterizations of how ten Kate mobilized Isaac Newton's natural philosophy according to his own agenda.

Keywords: Lambert ten Kate; Isaac Newton; Dutch *doperdom* and Calvinism; Dutch physico-theology; appropriations of Isaac Newton's natural philosophy; Dutch Republic

"Know your talents, oh people; know your obligations arising from them" (Ten Kate and Ten Kate 1728, 38).[1]

Lambert ten Kate: A versatile Amsterdam *doopsgezinde*

Lambert ten Kate Hermansz. was born in Amsterdam on 23 January 1674.[2] His father Herman ten Kate (1644-1706), who was born in Deventer and settled in Amsterdam in the early 1660s, seems to have been a grain broker. Ten Kate joined his father's company when he reached adulthood in 1696. When his father died ten years later, he seems to have left the company which, together with what must have been a substantial inheritance, provided him with the leisure to dedicate his time

[1]"*Ken uwe Talenten, ô Mensche, ken uwe Verpligtingen daer uit*." Unless otherwise stated, all translations are mine. In order to enhance readability, I have at times opted for free translations, without doing harm to the original.

[2]As has been pointed out in Ten Cate 1987, 141-142, n. 6, Ten Kate's nephew, Herman ten Kate Hermansz. Jr. (1705-28), composed a poem on the occasion of his uncle's fiftieth birthday which is dated on 23 January 1724 (Ten Kate and Ten Kate 1928, 264). Decisive evidence that Ten Kate was born on 23 January 1674 is to be found in Doop-, trouw- en begraafregisters, Archive 298, 4, in ACA.

to scholarly matters (ten Cate 1987, 16-21).[3] Shortly thereafter, on 18 April 1706, he was baptized in the *doopsgezind* congregation "Lamb and Tower" ("Lam en Toren").[4] Ten Kate has been characterised as "an ingenious and tireless prier of all arts and sciences," (anon. 1732a, 13) and indeed he was a versatile *curioso* who delved into a variety of different subjects: the study of language, religion, biblical studies, art (theory), and natural philosophy. He died unmarried on 14 December 1731, and was buried in the Noorderkerk on 20 December (Doop-, trouw- en begraafregisters, Archive 1075, 116 and Archive 1082, 154, in ACA).

Given the diversity of Ten Kate's work and the fragmented manner in which it has been studied, an important question that remains to be addressed is whether his different scholarly activities were connected and, more specifically, whether they were shaped by his religious views (and, if so, to what extent). Few attempts have been made to get a firm grasp on the matter. In 1812, H. Tollius (1742-1822) suggested that Ten Kate's oeuvre is unified by his religious views, and more precisely by his endeavour "to make known the greatness of God through His works and to promote Christian virtue, lowliness [*ootmoed*], and joy" (Tollius 1812-17, vol. 1, 35).[5] Following Tollius' lead, Henk Th. van Veen has argued that Ten Kate's views on ideal beauty fit hand in glove with the *doopsgezind* convictions epitomised in other works (van Veen 1995). In the literature, Ten Kate's engagement with natural philosophy has often been explained against the background of his *doopsgezind* beliefs (Zuidervaart 1999, 63, 450, n. 124, 610-1; Hamm 2012a, 35-36; Dijksterhuis 2012, 160, 166).

In this essay, I shall show that Ten Kate's oeuvre was shaped by religious beliefs which were *doopsgezind,* but which also reflected a general Christian orientation. Moreover, I argue that, in order to fully understand Ten Kate's interest in and engagement with the natural philosophy of his day and especially Newton's, we also need to take into account the hitherto unnoticed, more general Christian orientation in his thought. This will help us understand his view on "the proper use of one's talents" and ultimately his enthusiasm for natural philosophy, especially Newton's. Finally, I shall add nuance to our understanding of how Ten Kate mobilized Newton's natural philosophy according to his own agenda by showing that Ten Kate's main target for opposition was Descartes and not Spinoza.

In the wake of Jonathan I. Israel's work on the Radical Enlightenment, which emphasizes the centrality of Spinoza for seventeenth-century and eighteenth-century intellectual debates and singles him out as "the supreme philosophical bogeyman of Early Enlightenment Europe" (Israel 2001, 159), scholars have portrayed supporters of Newton in the Dutch Republic as being heavily concerned with refuting the ideas of Spinoza. It has in fact been argued that a deep-seated fear of Spinoza's philosophical system, and especially his *Ethica ordine geometrico demonstrata* (*Ethics Demonstrated in Geometrical Order*), which was published in his *Opera posthuma* (1677), played a major role in the early diffusion and acceptance of Newton's natural philosophy in the Dutch Republic (Vermij 2003, 190-1; Jorink 2009, 29; and Jorink and Zuidervaart 2012, 17-19). In this essay, I shall show that such an exclusive focus on Spinoza is unwarranted, since there were Dutch supporters of Newton in the Dutch Republic who were primarily concerned with refuting Descartes's philosophy, such as Ten Kate and his friend Jean Le Clerc (1657-1736).

[3]This is confirmed by Jacob Christoph/Christoffel Le Blon's testimony: "*having naturally took to Learning, and being wealthy enough, he* [ten Kate] *laid aside Commerce, in order to cultivate his Studies*" (Le Blon 1732, i).

[4]Inventaris van het archief van verenigde doopsgezinde gemeente van Amsterdam en rechtsvoorgangers, Archive 1120, inventory no. 213, 168 in ACA. After the relatively more conservative "Zonist" camp left the congregation "Lamb" in 1664 due to their uneasiness with Galenus Abrahamsz. de Haan's more liberal religious stance, the Waterland congregation the 'Tower' joined the 'Lamb' in 1668, as a result of which 'Lamb and Tower' was founded. After the split, the 'Zonists' met at the former brewery 'De Zon' ('The Sun'), which explains their name. See Zijlstra 2000, 420; Voolstra 2014, 176 for more background.

[5]"Van daar de ijver, die in alle zijne schriften doorstraalt, om niet alleen Gods grootheid uit zijne werken overtuigend te doen kennen, maar ook Christelijke deugd, ootmoed en vergenoegdheid te bevorderen."

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In the following section, I set the stage by looking at a number of important developments in Dutch *doperdom* that explain why Ten Kate's *doopsgezind* background is relevant to understanding his interest in natural philosophy. In the third section, I aim to show that his *doopsgezind* ideas are not sufficient to illuminate Ten Kate's fascination for natural philosophy. I do this by looking at two of his works in which Ten Kate's religious convictions were explicitly voiced, and arguing that Ten Kate's religious beliefs were unmistakably *doopsgezind*, but with an added, more general Christian bent. This more general Christian orientation can be gathered, as will be explained, from his repeated plea that one should use one's God-given talents in honor of God and for the benefit of one's fellow man. In the fourth section, I briefly discuss the popularity of Newton's work in the Dutch Republic in the wake of the appearance of the second edition of the *Principia* in 1713, a context which is highly relevant to understanding Ten Kate's interest in Newton's natural philosophy. Finally, I focus on those of Ten Kate's works in which he engaged with Newton's natural philosophy. There, I shall argue that Ten Kate's religious beliefs played a decisive factor in explaining why he was drawn to Newton's natural philosophy.

Ten Kate in context: The Rise of the *Doopsgezinden*

In 1557 the Waterlanders, a Dutch Anabaptist minority group who were concentrated in the western coastal area of Friesland and the region between Amsterdam and Alkmaar, were ousted by the influential Anabaptist religious leader Menno Simons (1496-1561). At some point in the sixteenth century, they began to call themselves *doopsgezinden* in order to distinguish themselves from the Mennonites (Visser 2007a, 329-331, 313). *Doopsgezinden* were characterised by pragmatism, piety, an open-mindedness which protected them from internal divisions, and an austere lifestyle that emphasised personal and spiritual faith (Visser 2007a, 314). Because of their austere lifestyle they described themselves as being "in the world but not of the world" (Kuipers 1980). The *doopsgezinden* were primarily autodidacts (Zilverberg 1980, 188-189; Visser 1989, 96). Since they considered personal reading of the Bible, and especially the New Testament, as a key religious activity, illiteracy was quite rare among the them (Visser 1989, 95). The majority of the *doopsgezinden* were not university trained. They studied neither theology nor law, since they were barred from studying the former, and excluded from political, administrative, military and judicial functions until the end of the eighteenth century, avoiding any involvement in state and church (Driedger 2002, 104-105). The only way they could profit from university education was thus to study medicine, which some of them did.

According to Piet Visser, there were at least important two phases in the socio-economic and cultural assimilation of the *doopsgezinden*. The first phase was achieved through economic participation. During the Dutch Golden Age in particular, many *doopsgezinden* were economically active in trade and industry, especially in the food sector, the wood and textile industries, and the publishing industry and book trade (Sprunger 1994, 2009; Visser 2007a, 340, 2007b, 135). Unlike their Calvinist competitors, *doopsgezinde* printers and book sellers were not subject to the censorship of the Reformed Church. As a result, a portion of them became extremely wealthy (Visser 2007a, 341). A second phase of assimilation occurred in the aftermath of the disaster year in the Dutch Republic in 1672, when many wealthy *doopsgezinden* granted low-interest loans to the government, which needed large sums of money to defend the Republic from English, German and French aggression. In return, they received long-awaited religious freedom and certain political rights (Visser 2007a, 340). By the second half of the seventeenth century, the *doopsgezinden* had become more and more interested in worldly affairs, and an increasing number of *doopsgezinden* studied medicine (Dekker 1955, 178; Kuipers 1980; Visser 2007b, 133).[6]

[6]Examples of *doopsgezinden* who studied medicine during the second half of the seventeenth century include: Pieter Adriaensz. Verduin (c.1625-c.1700), Anthonie van Dale (1638-1708), Samuel Apostool (1638-1699), Govert Bidloo (1649-1713), his nephew Nicolaas Bidloo (1674-1735), Jacobus van Zanten (1658-1750), Herman Schijn (1662-1727),

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Over the course of time, the *doopsgezinden* became avid consumers of culture, and of natural and experimental philosophy (Dekker 1955, 178-179; Zilverberg 1980; Visser 1989, 95-98; Mijnhardt 1992, 203; van Veen 1995, 69-76; Roberts 1999, 373-374; Zuidervaart, 2006; Visser 2007a, 340-342; Hamm 2011, 2012a, b). They collected art, and amassed *naturalia*, *artificialia*, books, curiosities and physical instruments, which they displayed in art cabinets, cabinets of curiosities, and physical cabinets.[7] Their *Wunderkammern* and physical cabinets were considered sites in which to exhibit the wonders of God's creation (van der Veen 1992, 248). The cabinet of the wealthy cloth merchant Levinus Vincent (1658-1727) is a well-known example (Jorink 2010, 337-341; Spary 2004, 6-9). According to Vincent, the investigation and contemplation of the wonders in his collection would incite visitors to praise and venerate God (Vincent 1706, 24, 1715, A 2^{v}).[8]

The country houses of the *doopsgezinden*, where they escaped from city life, often had exquisitely landscaped gardens. The gardens at *Zijdebalen* along the Vecht river in Utrecht, owned by the silk merchant David van Mollem (1670-1746), to whom van Musschenbroek dedicated his *Beginselen der natuurkunde* (1736) (van Musschenbroek 1736, Dedication), is a beautiful exemplar (de Jong and Snoep 1981-1982; de Jong 2000, 98-121).[9] The gardens were next to van Mollem's silk factory, which was equipped with hydro-powered machinery (de Jong 2000, 102-103). Van Mollem's gardens testify to a distinct religious ethos that highlights the many wonders of God's works (de Jong 2000, 117-118).

During the eighteenth century, *doopsgezinden* contributed significantly to the popularization of natural and experimental philosophy, and promoted physico-theology (Dekker 1955, 179; Visser 2007b, 137-138). According to both Ernst P. Hamm and Huib J. Zuidervaart, *doopsgezinden* like Ten Kate were drawn to the new experimental philosophy of Newton, not only because, given their religious outlook, they considered study of the "Book of Nature" an important source of divine knowledge and easily embraced the idea that there are laws of nature installed and maintained by God, but also because those laws revealed the manipulability of nature, which paved the way for economic and technological innovation and thus for the bettering of mankind (Hamm 2007, 656; Zuidervaart 2006, 82; 2010, 235).[10] Ten Kate's *doopsgezind* background is therefore certainly relevant to understanding his interest in natural philosophy. However, to account for his fascination for and promotion of natural philosophy, and Newton's natural philosophy in particular, it is necessary to consider his more general Christian attitude as well.

Worldly vanities and Christian virtues

In this section, we will take a closer look at two works that open up a window into Ten Kate's religious convictions, namely his *Drie gewigtige bedenkingen* (*Three Weighty Considerations of the Soul*) (Ten Kate and Ten Kate 1728) and his 1720 essay on ideal beauty in art, entitled "Verhandeling over het denkbeeldig schoon der schilders, beeldhouwers en dichters"

Christoffel Tirion (c.1675-1711), Joachim Targier (?-?), Abraham van Loon (1697-1720), and others. This information was retrieved from [Schagen] 1745.

[7]For discussion of Dutch cabinets of curiosity, see van de Roemer 2004. For a survey of ninety seventeenth- and early eighteenth-century Amsterdam cabinets, including eleven owned by *doopsgezinden*, see van der Veen 1992. For the broader European perspectives, see the Grote 1994 and Impey and MacGregor 1987. On Dutch physical cabinets, see Zuidervaart 2013. For an example of a physical cabinet owned by a *doopsgezinde*, see Bierens de Haan 1957 esp. pages 114-118.

[8]For discussion, see van Gelder (1992), page 35.

[9]This chapter in de Jong 2000 was originally published as de Jong 1993.

[10]Although they developed similar claims, it should be remarked that, while Hamm's account is intended to be explanatory of interest in Newton's natural philosophy at the *Doopsgezinde kweekschool,* which was founded in 1735, and where experimental philosophy was taught starting in 1761, Zuidervaart's account is meant to explain earlier eighteenth-century *doopsgezind* interest in the Cantabrigian's work as well. For further details on the *Doopsgezinde kweekschool* see Muller 1850, 67-197; Kuhler 1918; and Brüsewitz 1985.

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("Treatise on the Ideal Beauty of Painters, Sculptors and Poets") (Ten Kate, 1869).[11] In a letter to the Danzig-based physician and naturalist Johann Philipp Breyne (1680-1764) on 1 November 1729, Ten Kate pointed out that the study of language was "the least of his pet subjects" (Noordegraaf 2007, 100).[12] Instead, much more to his liking, he wrote, was the subject matter addressed in *Den Schepper en Zyn bestier te kennen in Zyne Schepselen; Volgens het licht der Reden en Wiskonst. Tot opbouw van eerbiedigen Godsdienst en Vernietiging van alle grondslag van atheistery: als mede tot een regtzinnig gebruyk van de philosophie* (*The Creator and his Governing Revealed from his Creatures according to the Light of Reason and Mathematics for the Instalment of an Honorable Religion and the Abolition of all Foundations of Atheism, and also for a Proper Use of Philosophy*) (Ten Kate 1716) and in "Tweederhande natuerkundige beschouwingen omtrent den groey, bloey, 't onderhoud en de vruchtmaking der plantgewassen" ("Two Physical Considerations on the Growth, Bloom, Maintenance and Fertilisation of Plant Crops") (Ten Kate 1748), because they direct him, according to his own statement, to "something higher."[13] Of all his publications, however, he found the most delight in his *Drie gewigtige bedenkingen des gemoeds* (Noordegraaf 2007, 100).

His edifying *Drie gewigtige bedenkingen* (1728) contains three essays written between 1725 and 1727.[14] In the first essay, he argues that humility or lowliness (*ootmoedigheid*), which he characterized as "a veritable conviction and sincere inner feeling of the nullity of our own worth and merits, without even taking into account our sins or flaws" (Ten Kate and Ten Kate 1728, 14),[15] is the *doopsgezind* virtue *par excellence*. When considering humans as such (i.e. without regarding their relation to God and their fellow humans),[16] the virtue of *ootmoedigheid* was identified as one of the key *doopsgezinde* virtues by one of the most influential *doopsgezinde* thinkers, Galenus Abrahamsz. de Haan's (1622-1706).[17] Ten Kate criticized the heathen ethics of the Greek and

[11]A recent transcription of Ten Kate's "Verhandeling over het denkbeeldig schoon" is to be found in Miedema 2006a, vol. 2, 212-241. A slightly extended version of Ten Kate's essay, which was made in 1724, appeared in Richardson and Richardson 1728, vol. 3, iii-lxxii. This French version was subsequently abbreviated and translated into English (Le Blon 1732). For discussion of Ten Kate's "Verhandeling over het denkbeeldig schoon," see Miedema 2006a, vol. 2, 205-212, 2012, 16-24.

[12]"Niettemin, schoon deze stoffe [i.e. the study of language] veel arb[eid] na zig gesleept heeft door 't aangroeyen van beschouwing op beschouwing, egter is ze nog van mijne minste liefhebberij gebleven." See Ten Kate 1710, 1723 for Ten Kate's study of language. For discussion, see Ducheyne (forthcoming).

[13]Ten Kate 1748 contains translations of excerpts from Blair 1720, the lemma on vegetation in Harris 1704, which describes some of John Woodward's experiments on the growth of plants, and Pontedera 1720. Ten Kate, who completed the work between 1721 and 1724, emphasized that these works contribute to the contemplation of "the creator's wonderful wisdom and providence" (Ten Kate 1748, *4^{v}). Note that '*4^{v}' refers to the verso side of signature mark *4. Signature marks are letters, numbers, and symbols (or combinations of them) at the bottom of the first portion of a signature, i.e. a set of sheets folded in half bound together as a unit. Signature marks were used to help book binders arrange the sheets of a book in the correct order. Here I refer to the signature mark, because the introductory section in Ten Kate 1748 is not page numbered. On signature marks see, McKerrow 1927, 26-26, 73-81, 188-194.

A short essay on the reproduction of mosquitos by Ten Kate's nephew Herman ten Kate Hermansz. Jr. was joined to this text. Ten Kate may have very well been the author of *Beschryving van het planetarium, dienende tot een vervolg op den korten inhoud der philosophische lessen, van D^{r}. J. Th. Desaguliers* (anon. 1732c), which contains a description of Desaguliers' Copernican orrery, which the latter brought to the Dutch Republic in 1731 (Zuidervaart 1999, 79, p. 450, n. 124). Desaguliers, who had family ties in Amsterdam, visited the Dutch Republic on several occasions between 1730 and 1732. During these trips, he lectured on experimental philosophy. The details of Desaguliers' trips are covered in Zuidervaart 1999, 71-82.

[14]Here I shall consider only the first and second essays. In the third essay, Ten Kate recommended that in all our doings we should consult God (Ten Kate and Ten Kate 1728, esp. *4, 80).

[15]"*Eene waeragtige Overtuiging en een opregt innerlyk Gevoelen van Nietigheid onzer eigene Waerde en Verdiensten, zelf zonder aenmerkinge van onze zonden of gebreken.*"

[16]When considering man in relation to God or his fellow man, the two cardinal *doopsgezinde* virtues according to Galenus Ambrahamsz. are love of God and love of one's neighbor (de Haan 1707, 8, 54). I am grateful to Piet Visser for directing me to Ambrahamsz.'s work. On de Haan, see Fix 1991, ch. 4.

[17]In de Haan 1682, 23 *ootmoedigheid* is defined as: "Ootmoedigheid is die grond- en hooftdeugd / waer door den mensche kleyn-gevoelig is van hem selven / sig van harten onder God / en om Godes wille / gaerne onder syn evenmensch onderwerpt / uyt grondige anmerking van zijn eygen nietigheid / en door sig selfs veroorzaakte onwaerdigheid." (cf. de Haan 1977, 76 and

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Roman philosophers because they sought salvation in themselves, made idols out of themselves, were desirous for glory and fame, and despised those who excel less (Ten Kate and Ten Kate 1728, 8-9, 37-38). They completely lost themselves in, as Ten Kate wrote, "the splendor and illusion of excelling above the crowd" (Ten Kate and Ten Kate 1728, 37).[18] If one is absorbed by worldly pursuits, one will forget one's true path to salvation, Ten Kate warned (Ten Kate and Ten Kate 1728, *4). When one practices the *doopsgezind* virtue of lowliness, he argued, one will be able to counter overbearingness, self-complacency, and lust, and to control one's passions (Ten Kate and Ten Kate 1728, 27).[19] The themes addressed in the first chapter – lowliness, control of the passions, and the rejection of worldly desires – are typical of the *doopsgezind* milieu to which Ten Kate belonged (van Veen 1995, 80-89). *Drie gewigtige bedenkingen* thus clearly bears the marks of Ten Kate's *doopsgezinde* convictions. The same holds for his 1720 essay, as van Veen has shown in a highly fascinating article (van Veen 1995).

In the introduction to Herman ten Kate Hermansz. Jr's *Theotimus. Of de weg tot Heil* (*Theotimus or the Path to Salvation*), which was joined to *Drie gewigtige bedenkingen*, Ten Kate pointed out that his nephew, who translated Philippe du Plessis-Mornay's (1549-1623) *Excellent discours de la vie et de la mort* (1576) and wrote an essay on the reproduction of mosquitos that was appended to 'Tweederhande natuerkundige beschouwingen',[20] used his talents "in honour of his Creator, and for the benefit of himself and his fellow man" (Ten Kate and Ten Kate 1728, H2-[H2^{v}]).[21] In the preface to his posthumously published evangelical harmony *Het leven van onzen heiland Jezus Christus* (*The Life of our Savior Jesus Christ*) (1732), Ten Kate stated that in compiling the work he used his God-given talents for the benefit of others and to sing God's praises (Ten Kate 1732, [***3]-[***3^{v}]).[22] These two examples reflect a sentiment that is made clear by the second essay in *Drie gewigtige bedenkingen*, namely that, for Ten Kate, the talents granted to us by God come with certain obligations (Ten Kate and Ten Kate 1728, *3-[*3^{v}]).

According to Ten Kate, we have received our talents from God and they are to be used in His honor and to the benefit of our fellow man. A human being "who received certain talents from God, is obliged to use those gifts in honor and love of his Creator, and, because of God's will, for the benefit of one's fellow men as well, since they are fellow creatures of the same Creator, Lord

de Haan 1707, 121-124). De Haan constrasted *ootmoedigheid* to self-complacency (*hoogmoed*), which he defined as follows: "die zonde waar door de mensch hoog- ofte groot-gevoelig is van hem zelven, het zy dan ten aanzien van uitstekende begaaftheden, zoo der ziele als des lichaams, waar mede hy zig waant boven andere begaaft te zyn; of ten opzigt van eenige uitwendige voordeelen van eerampten ofte tydelyke rykdommen, die hem zouden mogen toegevallen zyn: ontstaande deze verwaande verbeeldingen uit onkunde van eigen nietigheid en onwaardigheid, waar in hy staat voor de oogen Gods." (de Haan 1707, 124). Other examples of *doopsgezinde* accounts of *ootmoedigheid* include: Stevensz. 1683, 245; Stol 1688, 162; Van Dooregeest 1698, 30; Feddriks 1698, 52; and van Eeghem 1715, 233, 294, 341.

[18]"in den pronk en waen van hare Uitstekentheid boven 't Eenvoudiger Gemeen." Ten Kate subjoined his own translation of Georgios Gemistos Plethon's (ca.1355-ca.1454) account of virtues, in which he recognized "not only the marrow and what is most dignified of what is contained in the entire Platonist or Socratic ethics, but also to some extent the light of evangelical ethics [*niet alleen het Merg en waerdigste van de gantsche* Platonische *of* Socratische *Zedekunde begrepen is, maer ook eenig sints het Licht van de Evangelische*]," to Herman ten Kate Jr.'s translation of Philippe du Plessis-Mornay's (1549-1623) *Excellent discours de la vie et de la mort* (1576) (Ten Kate 1728b, 85).

[19]"Hy nu, die zulke *Wellust*-, *Schat*-, en *Eer*-klippen voorby, en zulke Maelstroomen te boven is, kan te vryer en met te meerder Vrugtgewin zyne *Talenten* besteden, Zig-zelf te leeren kennen, Zig-zelf te overwinnen, en te heerschen over zyne hertstogten; om *Zedig*, *Nedrig*, en in *Matigheid* te Leven."

[20]On Herman ten Kate Hermansz. Jr., see footnotes 13 and 18.

[21]"ter Eere van Zynen Schepper, en tot nut van Zig-zelf en van zynen Evenmensch." H2 and [H2^{v}] are signature marks. See footnote 13 for explanation. H2^{v} is put between square brackets because the signature mark was omitted in this case.

[22]In this monumental posthumously published work, Ten Kate painstakingly compiled roughly thousand-page-long detailed evangelical harmony, (i.e. a compilation of verses from the four canonical Gospels), providing a chronological account of the events they report on and an overview of their correspondences. Based on his research, he reached the conclusion that the Gospel of John was written with knowledge of the other gospels, and that the Synoptic Gospels (Mark, Matthew and Luke) were written independently from each other, a view that is obsolete in modern Biblical studies (Ten Kate 1732, 922). Here, Ten Kate reached the same conclusion as his friend Le Clerc in his *Harmonia evangelica* (1699) (de Lang 1993, 185). A review of *Het leven van onzen heiland Jezus Christus* appeared in *Maendelyke uittreksels, of boekzael der geleerde werelt* (anon. 1732).

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and Master" (Ten Kate and Ten Kate 1728, 14).[23] It is misguided to believe, Ten Kate argued, that we owe our talents to ourselves and that they are to be used for our own benefit (Ten Kate and Ten Kate 1728, [*3ᵛ]).[24] In addition, those who have "received many talents will have a lot to answer for" (Ten Kate and Ten Kate 1728, 39).[25] In the same essay, he singled out natural philosophy as a worthy subject to which one can devote one's talents in honor of God, and noted that "he who in all humility applies his intellect to read [lit.] God's praises from his works and governing will receive a higher happiness than he who is inconversant with these matters" (Ten Kate and Ten Kate 1728, 70).[26]

Ten Kate's conviction that humans should use their talents in honor of God and for the benefit of their fellow man is not specifically *doopsgezind*, but instead reflects a more general Christian orientation, as I shall show.[27] The Bible contains several verses indicating that our talents are gifts from God—for instance, Exodus 31:5-7, 1 Corinthians 4:7, and, more explicitly, James 1:17, which states that: "every good gift and every perfect gift is from above, and cometh down from the Father of lights."[28] Additional verses state that we are to make good use of them, as conveyed in Exodus 35:10, in Romans 12:4-8, in Ephesians 2:10, and of course in the Parable of the Talents (Matthew 25:14-30) or Pounds (Luke 19:11-27).[29]

The moral of the Parable of the Talents or Pounds was endorsed and promoted by figures belonging to a variety of confessional backgrounds. Among the Catholics, its message was promoted by Jacob Rosant (?-1665), a Catholic priest active in North-Holland, in his *De evangelische triumph-wagen* (*The Evangelical Victory Chariot*) (1654) (Rosant 1654, 340-341). Members of the Reformed Church, such as Wolterus ter Burgh (?-?), Hieronymus Sweerts (1627-96), and Philippus van Sorgen (?-1677) also brought the moral of the parable to the fore in their songs, prayers and poetry (ter Burgh 1665, 56, 86-87; Sweerts 1673, xlvii; van Sorgen 1688, 44). The Collegiants, Joachim Oudaen (1628-92), who tutored Ten Kate's friend Adriaen Verwer (1654/5-1717), and Claes Stapel (?-1686), the author of *Het lust-hof der zielen* (*The Pleasure Garden of Souls*) (1681), a work that was very popular in *doopsgezind* circles, also endorsed the moral of the parable (Oudaen 1680, A2v; S. 1681, 687).

The New Testament furthermore contains verses prompting Christians to use their talents in God's honor and to the benefit of their fellow man, such as Matthew 5:16 ("Let your light shine before men, that they may see your good works, and glorify your Father which is in heaven."), 1 Corinthians 12:4 and 7 ("Now there are diversities of gifts, but the same Spirit. . . . But the manifestation of the Spirit is given to every man to profit withal."), 1 Peter 4:10 ("As every

[23]"dat hy, een Schepsel zynde van GOD met zekere *Talenten* beschonken, verpligt is die Panden te besteden ter Eere en Liefde van zynen Schepper, en, om Diens wille, tot nut van zyne Evennaesten, vermits zyne Medeschepselen van eenden zelfden Maker, Heer en Meester." Cf. Ten Kate and Ten Kate 1728, [*3ᵛ], 43-44. Using one's talents in God's honor is a theme that also features in Herman ten Kate Jr.'s *Theotimus* (Ten Kate and Ten Kate 1728, 144, 267).

[24]"als of die Talenten waren van en voor ons-zelf, terwyl we nogtans die ontfangen hebben van een Hooger-hand, om besteed te worden ter eere van HEM." Cf. Ten Kate 1732, 324, note (f).

[25]"hy, die vele *Talenten* ontfangen heeft, 'er velen . . . zal hebben te verantwoorden."

[26]"die gene, die in Ootmoed zyne Verstandigheid aenlegt, om den Lof des Scheppers uit Zyne Werken en Zyn Bestier te lezen, daer uit een hooger geluk als anderen die dés onkundig zyn genieten kan." Cf. ibid., pp. 108-9: "de gantsche Natuer, en de gantsche huishouding van GODS Heilige Verbond, . . . , leveren overal stof, om met HEM tot Zynen nooit-volprezen Lof te spreken. Byzonderlyk hy, die veel Opmerkings- en Beschouwings-kragt van den Hemel ontfangen heeft, kan 'er nog ongelyk meerder stof tot Verwondering in vinden, . . . : want hem, die naeuwkeurig in- en door-ziet, verstrekken, onder 't *Wandelen met GOD*, al de menigvuldige fraeyigheden van 't Geschapene voor schoone Lovens-lessen uit de Goddelyke *Bybel der Nature*."

[27]When working on this paragraph, I have benefited from the expertise of Jon Balserak, Jan Wim Buisman, Philip Joseph Benedict, Charles Partee, Jo Spaans, M.G.K. van Veen, Piet Visser, Alfred R. van Wijk, and Randall Zachman. It should not be assumed, however, that they endorse the claims I defend here.

[28]All translations of bible verses cited here are taken from the King James bible: Robert Carroll and Stephen Pricket (eds), *The Bible: Authorized King James Version* (Oxford: Oxford University Press, 1997).

[29]For discussion of the Parable of the Talents or Pounds, see e.g. Hultgren 2000, 272-90 and the literature cited therein.

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man hath received the gift, *even so* minister the same to one another, as good stewards of the manifold grace of God.").

The Amsterdam Collegiant Reinier Rooleeuw (1627-84) wrote in one of his religious songs that human beings should use their talent "to serve God and one's fellow man" (Rooleeuw 1702, 82).[30] Like the composer of Reformed worship songs Wiete Ringers (1660-1725), Stapel stated that his songs were written with the purpose of honoring God and edifying one's fellow men (Ringers 1686, 189; S. 1681, *4r).[31] François Halma (1653-1722) and Hendrik Uilenbroek (?-?), both members of the Reformed Church, urged that human pursuits and labor should be aimed at honoring God and being useful to one's fellow man (Halma 1712, ***8r; Uilenbroek 1713, 4.[32] In other words, the idea that humans should spend their God-given talents in honor of God and their fellow man was shared across Christian denominations in the Dutch Republic and had is Biblical foundations in the verses mentioned above.[33] As a result, *Drie gewigtige bedenkingen* is reflective not only of typical *doopsgezind* ideas, as van Veen pointed out, but also of a more general Christian orientation.

Not only apologists of certain confessional groups, but natural philosophers too were concerned with using their talents in accordance to God's plan. A case in point is that of the Amsterdam microscopist Johannes Swammerdam (1637-80). Swammerdam, whose religious beliefs are hard to pin down and require further scrutiny, at some point in his career suffered from a religious-spiritual crisis, in which he became convinced that science is a sinful enterprise (Jorink 2003, 81-107). Thereupon, he decided to end his scientific career and, as a farewell, he published *Emphemeri vita* (1675), which contains a study of the mayfly. This study is interspersed with religious and autobiographical remarks. In it, Swammerdam expresses concerns about whether he has used his God-given talents appropriately and notes that, when he was no longer convinced that he was doing so, he decided to "withdraw his heart from the fruit of this forbidden tree of sciences" (Swammerdam 1675, 244).[34] Swammerdam later regained his mental composure, and in the last four years of his life he completed the manuscript of *Bybel der natuure* (*Bible of Nature*), which was published in 1737 by Herman Boerhaave (1668-1738). During the writing process, he regained confidence that he had adequately spent his talents by pursuing his research. He stressed that humans should not bury their talents like the unfortunate servant described in Matthew 25:14-30 and Luke 19:11-27, but that each should "praise and enlarge him [i.e. God], according to their own talent, for which purpose I wish that these observations will benefit from my talent" (Swammerdam/Swammerdamius 1737, 193).[35]

[30]"Laat u dan Uw Talent zoo diep ter harten gaan, / Dat gy zoo well un klein' als groot' ontfangen gaven / Tot dienst van uwen Heer, en naasten legget / aan."

[31]"maar lees en sing de selve tot Gods eere, ende tot uwer ende uwes naasten stichtinge."; "Doch alles en alleen door de meede-werkenden genaade des H. Geests, die God aan den Godvruchtigen zangers, welken niet en zingen uit losheid, onaandachtigheid en zucht tot ydele leere, maar in needrigheid en een-voudigheid des herten, om God te eeren en hunnen naasten te stichten, of hun zelfs op te wekken, pleegd meede te delen."

[32]"dat onzen arbeidt gedye tot eere van Godt, en stichtinge onzes naasten."; "Schikt al uw *werk* tot *Godes eere*: / En 's *naasten* voordeel, dienst en goedt." I retrieved the Dutch works mentioned in the paragraph at hand through extensive online queries using https://www.nederlab.nl/onderzoeksportaal/ [accessed 27-8 August 2020], which I limited to the period between 1650 and 1728, i.e. the year in which Ten Kate's *Drie gewigtige bedenkingen* came out.

[33]I readily admit that the above survey is highly fragmentary. A thorough study of Christian views on the use of talents during the seventeenth and eighteenth century in the Dutch Republic and other European regions still needs to be written. Completeness is not my aim here. All I wished to establish is that the view that humans should spend their God-given talents in honor of God and to the benefit of their fellow man is not unique to any one Christian denomination in the Dutch Republic.

[34]"dat ick *mijn hert van de vrucht deese verboode boom der weetenschappen af-trecke*."

[35]"*Volgende de voetstappen van onsen Borgh en Saligmaker JESUS CHRISTUS, waar in, en waar door, dat GODE al ons werk aangenaam is: en is syn navolginge en leeven niet in ons, soo syn wy die moetwillige dienstknegten gelyk, dewelke haare talenten in de aarde begraaven hebben: dat GODT verhoede, en hy geeve, dat alle Geesten, volgens haar talent, hem loven en groot maaken, waar toe ik wensch, dat deese ondervindingen van myn talent dienen sullen*." Outside the Dutch Republic, Francis Bacon (1561-1626), warned that with respect to the aim of knowledge it must be remembered that "the least part of knowledge passed to man by this so large a charter from God must be subject to that use for which God hath granted

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Eight years before the publication of *Drie gewigtige bedenkingen*, Ten Kate, who was an avid art lover and collector,[36] wrote an essay on ideal beauty, entitled "Verhandeling over het denkbeeldig schoon der schilders, beeldhouwers en dichters" ("Treatise on the Ideal Beauty of Painters, Sculptors and Poets"). According to Ten Kate, Raphael (1483-1520) "excelled in the most lofty parts of art" (Ten Kate 1869, 126). He argued that, though in his early career Rafael had studied the fine Greek and Roman works of art, which in general "enchant the physical, rather than the spiritual eye," he later surpassed them, as evidenced by his paintings and especially his drawings of "the characters of the sacred histories, and especially ... the characters of the New Testament" (Ten Kate 1869, 126-127). These characters require a different approach, Ten Kate underscored:

> They require dignified and lofty gestures, not drawn from courtiers, nor from the distinguished education of history's greatest men, or the finicking wisdom of worldly philosophers, but gestures that correspond to the low birth of simple fishers, who, supported by spiritual and supernatural virtues, are only honorable for their sincere modesty and divine zeal. (Ten Kate 1869, 126-127)[37]

By way of example, he discussed Raphael's drawing "Study of the Heads of Two Apostles and of their Hands" (ca. 1519-20; Ashmolean Museum of Art and Archaeology, University of Oxford, accession n° WA1846.209), which Raphael made in preparation for two central figures in his last painting *The Transfiguration* (1516-20), now preserved in the *Pinacoteca Vaticana*.[38] With respect to the older man on the right of the drawing, which was part of his collection (anon. [1732b], 4),[39] he remarked:

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it; which is the benefit and relief of the state and society of man; for otherwise all manner of knowledge becometh malign and serpentine," upon which he quoted from 1 Corinthians 8:1 ("Knowledge puffeth up, but charity edifieth.") (Bacon 1857-74, vol. 6, 33-34; Carroll and Pricket 1997, 212). Furthermore, according to Bacon: "Men have entered into a desire of learning and knowledge, sometimes upon a natural curiosity and inquisitive appetite; sometimes to entertain their minds with variety and delight; sometimes for ornament and reputation; and sometimes to enable them to victory of wit and contradiction; and most times for lucre and profession; and seldom sincerely to give *a true account of their gift of reason, to the benefit and use of men*: as if there were sought in knowledge a couch, whereupon to rest a searching and restless spirit; or a terrace, for a wandering and variable mind to walk up and down with a fair prospect; or a tower of state, for a proud mind to raise itself upon; or a fort or commanding ground, for strife and contention; or a shop, for profit or sale; and not a rich storehouse, *for the Glory of the Creator and the relief of man's estate*" (Bacon 1857-74, vol. 6, 134 [italics added]). Accordingly, Bacon promoted the view that "the gift of reason" is to be used to God's glory and the benefit of mankind, and that, consequently, knowledge serves the Christian virtue of *caritas*. For discussion and contextualization, see Vickers 1984; Lessl 1992; Harrison; 2001; Gascoigne 2010; and Corneau 2015. Bacon's influence in the Dutch Republic has not been studied in detail, despite the fact that by 1700 there were two different Dutch translations and about 40 Dutch editions of his works (Elena 1991).

[36]On Ten Kate's art collection, see van Gelder 1970; Ten Cate 1987, 92-104; and Miedema 2012, 35-181. For the oldest description of the works of art owned by Ten Kate, which also contains a brief description of some of the curiosities that Ten Kate collected, see von Uffenbach 1753-54, vol. 3, 651-656. Von Uffenbach's visit to Ten Kate occurred on 19 March 1711. These curiosities are listed in anon. 1732, 87-96. Ten Kate probably started collecting at the start of the eighteenth century (van Gelder 1970, 152).

[37]"Zy verëisschen deftige en verhevene gebaarden, niet ontleend van hovelingen, noch van de deftige opvoeding van de grooten der aarde, of van de gemaakte wysheid der waereldsche wysgeeren, maar gebaarden die overeenkomstig zyn met de laage geboorte van eenvoudige visschers, die alleen om hunne oprechte zedigheid en Goddelyken yver, door geestelyke en bovennatuurlyke deugden ondersteund, achtbaar zyn."

[38]A slightly more extended description of Raphael's "Study of the Heads of Two Apostles and of their Hands" is to be found in the unpublished "Uitbreiding en beschryving van het vermaarde kabinet van wylen den heere Lambert ten Kate, Hermansz. Van eenigen zyner teekeningen," which is a copy made by Ploos van Amstel (1726-1798) of Ten Kate's own (now lost) description of the drawings he owned ("Uitbreiding en beschryving van het vermaarde kabinet van wylen den heere Lambert ten Kate, Hermansz. Van eenigen zyner teekeningen," Special Collections, OTM, I C 24 in AUL). The relevant fragment is transcribed in Miedema 2006a, vol. 2, 247-248, 2012, 45-7.

[39]The majority of Ten Kate's art collection comprised drawings (Miedema 2012, 25-28).

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> The other apostle ... has a judicious and tranquil face. He has somewhat raised his face and hands, which he turns outwards. He seems to be accosting the others, and contemplating the divine power. His entire posture is humble and pious, but sad and astonished, and one could image him addressing the others in the following way: "Unjustly we think, my brethren, that we possess the supernatural power that accompanied us when we were sent by our mighty master to Judea. What else are we than powerless creatures! Nothing, nothing is due to ourselves. We only receive undeniable power from above, from God or his beloved son, our divine master, to cast out these kinds of devils." ... The entire work is completely distinct from the Greek and Roman works of art. It puts on the stage the most noble and humble greybeard that one could imagine without possessing a hint of self-complacency or overbearingness which seems to be peculiar to nobility. (Ten Kate 1869, 134)[40]

In his description of "Study of the Heads of Two Apostles and of their Hands," Ten Kate praised Raphael for depicting the apostle as humble and devoid of any trace of self-complacency and overbearingness, which fits hand in glove with the virtues and vices that he discussed in *Drie gewigtige gedachten*. As has been shown by van Veen, Ten Kate's "Verhandeling over het denkbeeldig schoon" cannot be considered as an isolated, compartmentalized activity; rather, the ideas he put forward in his discussion of ideal beauty correspond to the religious orientation of *Drie gewigtige gedachten* (van Veen 1995, 79-89). Van Veen remarks that Ten Kate's *doopsgezind* notion of ideal beauty occurred when, in contrast to earlier developments, Dutch *doopsgezinden* went public with their religious convictions in the works of art they commissioned (van Veen 1995, 72-77).[41]

Ten Kate concluded his "Verhandeling over het denkbeeldig schoon" with a discussion of the determination of the bodily proportions of "ideal beauty," upon which basis he discovered a harmonious relation between bodily proportions and musical intervals (Ten Kate 1869, 135-141).[42] Unearthing hidden harmonies was religiously significant for Ten Kate because they reveal God's hand at work. As will be shown in the paper's fifth section, Ten Kate's interest in such hidden harmonies helps to understand why he was drawn to a specific experiment in Newton's *Opticks*. Contrary to Renaissance theory of human proportions, Ten Kate took the chest and not the head as the basic unit upon which to determine ideal bodily proportions (Margócsy 2014, 181). He determined the bodily proportions of tall, midsized and short people who have a different head to neck ratio (Ten Kate 1869, 136). According to Ten Kate, the head of a tall person should be 1 unit long and the neck 1/2 unit long; the head of a midsized person 11/8 unit long and the neck 3/8 unit long; and the head of a short person 11/4 unit and the neck 1/4 unit. Based on this proposal, he found that the proportion between the head of a tall person and that of a midsized person is 1 divided by 11/8 or 8 to 9, that the proportion between the head of a midsized person and that of a small person is 11/8 divided by 11/4 or 9 to 10, that the proportion between the head of a tall person and that of a small person 1 divided by 11/4 or 4 to 5, that the proportion between

[40]"De andere Apostel ... vertoont ons een verstandig en bedaard gelaat: hy heeft het hoofd en de handen eenigzins verheven, welke hy naar buitenwaarts keert: hy schynt de anderen aan te spreken, en de Goddelyke magt te overweegen. Men vindt zyne gantsche houding nedrig en godvruchtig, doch bedroefd en verwonderd, en men zoude zich verbeelden dat hy hen in deezer voege aansprak: "Ten onrechte verbeelden wy ons, myne Broeders, dat wy de bovennatuurlyke magt bezitten, die ons verzelde toen wy door onzen Meester naar Judea gezonden wierden. Wat zyn wy anders als onmagtige schepselen! – niets, niets door onszelven: het is alleen van boven, alleen van God, of van zyn' beminden Zoon, onzen Goddelyken Meester, dat wy de ontegenstrydbaare magt ontfangen, om deeze foorten van Duivelen uit te werpen." ... Het gantsche werk is zeer onderscheiden van het Antieke: echter vertoont hy tevens de edelste en nedrigste grysäart, die men zich zoude kunnen verbeelden, zonder iets te bezitten dat naar hoogmoed of verwaandheid, die zo eigen aan den Adeldom schynen, zweemt."

[41]According to van Veen, the contrast can be seen for instance by comparing the grisailles that were painted by Gerard Lairesse (1640-1711) between 1675 and 1683 on the house in the Herengracht of the *doopsgezinde* silk trader Philips de Flines (1640-1700) and the portrait made by Nicolaes Verkolje (1673-1746) in 1740 of David van Mollem's family in Zijdebalen (for discussion, see Snoep 1970, 177-189 and ten Molen-den Outer 1975, 500-504).

[42]For discussion, see Miedema 2006b, 120-4 and Margócsy 2014, 179-181.

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the neck of a tall person and that of a midsized person is 1/2 divided by 3/8 or 4 to 3, that the proportion between the neck of a midsized person and that of a small person is 3/8 divided by 1/4 or 3 to 2, and, finally, that the proportion between the neck of a tall person and that of a small person is 1/2 divided by 1/4 or 2 to 1 (Ten Kate 1869, 137).

Ten Kate's interest in bodily proportions began at least as early as 1706, when on 20 December he sent a first letter on the matter to Hendrik van Limborch (1681-1759), a painter and engraver from the Hague, and nephew of Philipp van Limborch (1633-1712), who was professor of theology at the Remonstrant Seminary (Miedema 2006a, vol. 1, 26-27).[43] From another letter sent to him, dated 18 December 1710, it is clear that Ten Kate was exploring the relation between bodily and musical proportions long before his "Verhandeling over het denkbeeldig schoon" (Miedema 2006a, vol. 1, 177). Ten Kate was ecstatic to discover that in musical theory these ratios correspond to the intervals of, respectively, the major second, the minor second, the major third, the perfect fourth, the perfect fifth, and the octave: "Behold in what wonderful way the foundations of music ... correspond to the proportions of ideal beauty. Oh, what wonderful harmony! Which delightful songs nature sings incessantly in honor of its divine creator!" (Ten Kate 1869, 138).[44] In the fifth section, I shall discuss Ten Kate's interest in Newton's natural philosophy. In the following section, I will first discuss the popularity of the second edition of the *Principia* in the Dutch Republic.

The impact of the second edition of the *Principia*

In 1716, Ten Kate completed an essay and a book in which Newton featured prominently.[45] At the time Ten Kate completed these works, an increasing number of his compatriots were being drawn to Newton's natural philosophy. An important factor that contributed to Newton's increased popularity was the appearance of the second edition of the *Principia*, which contains, apart from technical changes and improvements, two major additions. First, the editor of the second edition, the Plumian Professor of Astronomy and Experimental Philosophy at the University of Cambridge, Roger Cotes (1682-1716), composed an editorial introduction, in which he provided an accessible overview of Newton's accomplishments in the *Principia* and an outline of his methodology (Newton 1999, 385-399). In his editorial introduction, Cotes furthermore conveyed that the laws of nature established by Newton reveal "many traces of the highest wisdom and counsel ..., but no traces of necessity," that the phenomena "lead us ... to principles in which the best counsel and highest dominion of an all-wise and all-powerful being are most clearly discerned," and that "Newton's excellent treatise will stand as a mighty fortress against the attacks of atheists" (Newton 1999, 397-398). Moreover, the second edition contains the theologically charged and methodologically significant General Scholium, in which Newton, amongst other things, urged that the system of the world is dependent on "the design and dominion of an intelligent and powerful being," that gravity does not act "in proportion to the quantity of the *surfaces*

[43]In 1707, Ten Kate worked with van Limborch and Jacob Christoph Le Blon (1667-1741), who settled in Amsterdam at the start of the eighteenth century before moving to London and later to Paris, and who invented a color printing and color weaving technique (Margócsy 2014, 182-189), to investigate how red, yellow and blue paint could be mixed with black and white without affecting the hue (Miedema 2006a, vol. 1, 86ff). For discussion, see Miedema 2006b, 125-128; Dijksterhuis 2011; Miedema 2011, 174-187).

[44]"Zie daar, op welk eene wonderlye wyze de gronden van de Muzyk ... met deze proportien van het Denkbeeldige schoon overeenstemmen. O! welk eene verwonderlyke saamengepaardheid! Welk verrukkende Liederen zingt onöphoudelyk de schoone Natuur ter eere van haaren Goddelyken Schepper!"

[45]These were "Proef-ondervinding over de scheyding der coleuren, bevonden, door een prisma, in de volgorde der musyk-toonen, in navolging eener proef-ondervindinge in Newtons gezigt-kunde" ("Experiment with a Prism on the Separation of Colors Ordered in Musical Tones, in Imitation of an Experiment in Newton's *Opticks*") and *Den Schepper en Zyn bestier te kennen in Zyne Schepselen* (*To Know the Creator and his Governing in His Creatures, according to the Light of Reason and Mathematics*), respectively. Both texts will be discussed in greater detail in the next section.

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of the particles on which it acts (as mechanical causes are wont to do) but in proportion to the quantity of *solid* matter," that he has "not as yet been able to deduce from phenomena the reason for these properties of gravity" and that he did "not feign hypotheses" on the matter; that since "whatever is not deduced from the phenomena must be called a hypothesis," that "hypotheses, whether metaphysical or physical, or based on occult qualities, or mechanical, have no place in experimental philosophy," and that in experimental philosophy "propositions are deduced from the phenomena and are made general by induction" (Newton 1999, 940, 943).[46]

As a result of these additions, the second edition of the *Principia* became more popular than the first edition (Zuidervaart 1999, 23: van der Wall 2004, 495). Soon after the publication of the second edition of the *Principia*, a pirated version appeared in print in Amsterdam in 1714, as I. H. van Eeghen pointed out (Newton 1714).[47] This pirated edition was announced, for instance, in the *Journal litéraire* (1713-1737) in 1713 (anon. 1713, 483).[48] It was printed through a partnership of publishers who used a vignette with an equilibrium with two scales attached on each side, balanced on a fasces surrounded by two cherubs and two cornucopias, and accompanied by the motto "*vis unita major*" (van Eeghen 1960-1978, vol. 5, 326-327; see also vol. 4, 70). This partnership of publishers had been active since 1710, but unfortunately little is known about the group, except that it had connections with the *Journal litéraire* (van Eeghen 1960-1978, vol. 5, 326-331; Jorink and Zuidervaart 2012, 57, n. 62.).

Once the second edition was published in 1713, Newton's readers could discern its physico-theological significance and methodological orientation more clearly. The physico-theological contents of the second edition of the *Principia* drew the attention of scholars in the Dutch Republic, where there was an already existing tradition of "natural theology with strong physico-theological overtones" (van der Wall 2004, 498).[49] This tradition in some sense culminated in the publication of Bernard Nieuwentijt's (1654-1718) massive *Het regt gebruik der werelt beschouwingen* (*The Right Use of Contemplating the World*) (1715), in which Newton's theory of universal gravitation is discussed (Nieuwentijt 1725).[50] In the same year, Boerhaave delivered his rectorial address *Sermo academicus de comparando certo in physicis* (*Academic Discourse on the Certainty that is to be Established in Physics*) (1715), in which he spelled out the epistemological ramifications of Newton's method in the *Principia* (Boerhaave 1715; Ducheyne 2017b, 118-121).

In 1715-16, (i.e. before he became professor of mathematics and astronomy at the University of Leiden in 1717), Dutch mathematician and natural philosopher Willem 's Gravesande went on a diplomatic mission to England, during which he met Newton and his experimental assistant at the Royal Society John Theophilus Desaguliers (van Besouw 2016, 231, 238).[51] As has been recently shown by Jip Van Besouw, by that time 's Gravesande, originally trained as a lawyer, had established himself as a skilled mathematician who was in touch with Europe's finest mathematicians (van Besouw 2016, 238-242). In 1715, he was elected Fellow of the Royal Society upon the proposal of his old university friend William Burnet (1683-1744) (Maas 2012, 121). As one of the founding editors of the *Journal litéraire*, 's Gravesande defended Newton's natural philosophy in his journal before his trip to England (van Besouw 2016, 241). According to his own statement, in his influential *Physices elementa mathematica, experimentis confirmata. Sive introductio ad philosophiam Newtonianum* (*Mathematical Elements of Physics Confirmed by Experiments or an Introduction to the Newtonian Philosophy*) published in 1720-1, he followed "the Newtonian method of philosophising" to discover the laws of nature, which according to him

[46]For discussion, see Snobelen 2001 and Ducheyne 2006.

[47]A second edition appeared in 1723.

[48]"Une Compagnie de Libraires imprime ici [i.e. in Amsterdam], *Philosophiae Naturalis Principia Mathématica*, de Monsieur *Newton*; sur la seconde Edition; qui vient de paroître en Angleterre."

[49]Cf. Evers 1988 and Jorink 2010, 396-399.

[50]For discussion, see Bots 1972, ch. 1; Vermij 1988, 1991, 76-83, 2006; Jorink 2010; and Ducheyne 2017a.

[51]On Leiden as an important center for the teaching of Newton's natural philosophy, see Ruestow 1973, ch. 7; Wiesenfeldt 2002, 229-334; van der Wall 2004, 495-496; Jorink and Zuidervaart 2012, 32-36, 45-48.

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consists in establishing regularities by mathematical demonstration from phenomena and in proving by induction that these regularities are general laws of nature ('s Gravesande 1720-1, vol. 1, [*3ᵛ], [**3ᵛ], p. 2). Since God governs the universe by the laws of nature, he emphasized, physics is "an investigation of divine wisdom" ('s Gravesande 1720-1, vol. 1, *3).

In his review of the second edition of the *Principia* in the *Bibliothèque ancienne et moderne* (1714-27), Jean Le Clerc, the Swiss polyhistor, theologian and professor of philosophy, Hebrew, classics and ecclesiastic history at the Remonstrant Seminary in Amsterdam, focused, not surprisingly, entirely on Cotes' editorial introduction and the General Scholium ([Le Clerc] 1714).[52] Ten Kate's friend Le Clerc dutifully followed Cotes' introduction and the General Scholium and emphasized that Descartes, whom he mentioned several times in his review, and the "Cartesians" base their natural philosophy on hypotheses, and that their "*tourbillons*" are "hypotheses," "uncertain conjectures," and "occult causes" ([Le Clerc] 1714, 70-71, 79, 80-82). By contrast, Le Clerc pointed out, Newton rejected hypotheses and only admitted principles "that one could demonstrate from phenomena" ([Le Clerc] 1714, 71). Here I want to call attention to two features of Le Clerc's review that are relevant to our discussion of Ten Kate's interest in Newton's natural philosophy.

First, when Le Clerc dealt with the physico-theological repercussions of Newton's natural philosophical work, he was more concerned with underscoring that the Cantabrigian's work refuted the objectionable consequences of the natural philosophy of Descartes and his followers, rather than of Spinoza's *Ethics*. Only once did he mention Spinoza in his review, namely when he called attention to Newton's rejection in the General Scholium of "blind metaphysical necessity" (Newton 1999, 942), which he saw as providing ammunition against Spinoza, who, as he pointed out, failed to distinguish between God and his creation, and his followers ([Le Clerc] 1714, 90-91).[53]

That around the same time Le Clerc was primarily concerned with mobilizing physico-theological arguments against Descartes's rather than against Spinoza's philosophy is confirmed by another review. In his review of the sixth edition of John Ray's *The Wisdom of God Manifested in the Works of Creation*, Le Clerc discussed the usefulness of physico-theology and, more particularly, how it can be mobilized to refute Descartes's philosophy. There he recorded that in his *A Disquisition about the Final Causes of Natural Things* (1688) Robert Boyle (1627-91) had shown the absurdity of Descartes's rejection of final causes, and that final causes provide a much clearer way of arguing for the existence of God than Descartes's "absurd" argument, which is based on the supposedly innate idea of God. In addition, he wrote that Ray made a case for divine wisdom and against the "blind mechanism [*Méchanisme* aveugle]" of "Descartes and his disciples" ([Le Clerc] 1715a, 355-356, 363-364). Here, again, the focus is on Descartes, while Spinoza is considered a disciple of Descartes.

The second feature I wish to address is that, contrary to Nieuwentijt, when Le Clerc mentioned Spinoza, he did not put forward the argument that Spinoza's *Ethics* was methodologically flawed because it relied on a fallacious mathematical method. In his *Gronden der zekerheid* (*Foundations of Certitude*), Nieuwentijt distinguished between pure and mixed mathematics (Nieuwentijt 1720). Whereas pure mathematics is based on ideas that do not correspond to something that actually exists, mixed mathematics is based on ideas that exist *in rerum natura*. According to Nieuwentijt,

[52]Le Clerc was an avid reviewer of Newton's work. He also reviewed the first edition of the *Opticks* (Le Clerc 1706). At the end of his rather descriptive review, he pointed out that Newton proved several conjectures of the "Cartesians" wrong (Le Clerc 1706, 317). He later reviewed Pierre Coste's (1668-1747) 1720 translation of Newton's *Opticks*, which was based on the 1717 edition of the *Opticks* ([Le Clerc] 1719). In his review, Le Clerc focused on the newly added queries.

[53]"Mr. *Newton* fait voir par-là que *Spinosa* & ceux qui suivent son sentiment, qui consiste à ne reconnoître aucun Dieu distinct du Monde, abusent de ce mot; duquel ils feroient mieux de s'abstenir, en attribuant tout à une Necessité aveugle; qui est la plus grande chimere, qui soit jamais tombée dans l'esprit humain." ("Mr. Newton shows hereby that Spinoza and those who follow his opinion, which consists in not recognizing any God distinct from the world, abuse this word, from which they would better abstain, attributing everything to blind necessity which is the greatest chimera that has ever been conceived.").

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although the *Ethics* proceeds like a work of pure mathematics, Spinoza made claims about things that actually exist – such as God. Thus, in Nieuwentijt's understanding, Spinoza's *Ethics* commits a self-refuting methodological fallacy (Vermij 1991, 83-86; Ducheyne 2017a). Le Clerc, by contrast, used only physico-theological arguments to refute Spinoza's *Ethics*. As we will see in the following section, Ten Kate followed him in this regard.

Improving upon Newton's musical division of the spectrum and fortifying the proof of God's being and governing with "more than hundred pillars"[54]

Ten Kate's essay "Proef-ondervinding over de scheyding der coleuren, bevonden, door een prisma, in de volgorde der musyk-toonen, in navolging eener proef-ondervindinge in Newtons gezigt-kunde" ("Experiment with a Prism on the Separation of Colors Ordered in Musical Tones, in Imitation of an Experiment in Newton's *Opticks*")reports on an experiment he performed in 1716.[55] The aim of the experiment was to order prismatic colors according to the tones in the octave. The experiment was a direct response to Experiment VII in Proposition III, Part II of Book I in Newton's *Opticks* (1704), in which Newton divided the spectral colors produced by refraction through a prism based on the division of the tones in the octave. When discussing the result of Newton's original experiment, Ten Kate referred to page 104, which, as has been observed by F.J. Dijksterhuis, entails that Ten Kate used the first Latin edition of the *Opticks*, the *Optice* (1706) (Newton 1706, 104; Dijksterhuis 2012, 163). According to Dijksterhuis, Ten Kate must have been aware of the contents of the *Opticks* earlier, for in 1706 his close acquaintance Le Clerc reviewed it in his *Bibliothèque choisie* (Dijksterhuis 2012, 164; [Le Clerc] 1706). Ten Kate repeated Newton's experiment and argued that the rectilinear sides of the oblong dispersion pattern are not as the numbers 1, 8/9, 5/6, 3/4, 2/3, 3/5, 9/16, and 1/2, as Newton thought, but instead as the numbers 1, 8/9, 5/6, 20/27, 2/3, 16/27, 5/9 and 1/2 (Ten Kate 1757, 20; Newton 1704, 92). As he eagerly pointed out, his division led to only 6 out of 28 false consonants, whereas Newton's led to 12 out of 28 (Ten Kate 1757, 19, 21). Ten Kate, however, admitted that the difference between his musical division of colors and Newton's cannot be detected by the eye, but - since "the more one gets to know the works of nature, the more they are found to be perfect" - he concluded that his own musical division is more veridical (Ten Kate 1757, 21).[56] In other words, he preferred his own musical division of color because it was more harmonious than Newton's.

It should be noted that Ten Kate was already fascinated with musical harmonies well before he read the *Opticks*/*Optice*. His 1699 "Verhandeling over de klankkunde" contains a section on the ratios between musical tones ("Verhandeling over klankkunde," Special Collections, OTM, I C 21, pt. 2, 17-23 in AUL).[57] Moreover, as we have seen in the previous section, Ten Kate was exploring the relation between bodily and musical proportions at least as early as December 1710. Given his preoccupation with these topics, Ten Kate was, as it were, "naturally" drawn to Experiment VII in Proposition III, Part II of Book I of the *Opticks*/*Optice*. According to Dijksterhuis, Dutch interest in Newton's *Opticks*/*Optice* was quite selective. For instance, in his review of the *Opticks* in the *Bibliothèque choisie*, Le Clerc omitted the mathematical and technical parts, paid little attention to Parts I and II of Book II, and neglected Newton's account of colors in thin films (Dijksterhuis 2012, 164-165). Similarly, Ten Kate did not discuss the optical theories proposed in the *Opticks*/*Optice* in any detail (Dijksterhuis 2012, 162-163, 166, 173). Instead, he focused on a highly

[54]This is a reference to Ten Kate 1716, [**5^{v}].

[55]The essay was published more than four decades later in 1757. For discussion, see Boskamp 2009, 122-124 and Dijksterhuis 2012, 160-163.

[56] "vermits de Werken der Natuer, hoe meer men gekent, hoe volmaekter dat ze gevonden worden, de myne voor de egtste houde."

[57]A portion of this material appeared in Ten Kate 1723, vol. 1, 139-40. For discussion, see Miedema 2006a, vol. 2, 196-198.

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specific experiment in the *Opticks*/*Optice*, while abstracting from Newton's broader natural-philosophical views on color and light.

With *Den Schepper en Zyn bestier te kennen in Zyne Schepselen* (*To Know the Creator and his Governing in His Creatures, according to the Light of Reason and Mathematics*) Ten Kate sought to, as he explained in the dedication to his uncle Wijnand Harmensz. Blaupot (1649-1719), "mathematically fortify" the foundations of religion (Ten Kate 1716, Opdragt, *3).[58] The book contains a Dutch translation of excerpts taken from the second edition of George Cheyne's (1672-1743) *Philosophical Principles of Natural Religion* (1705), to which Ten Kate added his own explanatory notes (Ten Kate 1716, Opdragt, *3-[*3^{v}]; Cheyne 1715). Ten Kate first learned about Cheyne's book through Le Clerc's lengthy summary of its second edition, which was printed in 1715 by the same publisher, in the *Bibliothèque ancienne et moderne* (Ten Kate 1716, Voor-reden, **3; [Le Clerc] 1715b). Le Clerc was keen to review other English physico-theological works, such as, as we have seen in the previous section, the sixth edition of John Ray's *The Wisdom of God manifested in the Works of Creation* (1691) published in 1714, and William Derham's *Physico-theology: Or, a Demonstration of the Being and Attributes of God* (1713) and his *Astro-theology: Or A Demonstration of the Being an Attributes of God, from a Survey of the Heavens* (1715).[59]

Based on Martin Schagen's *Naamlyst der doopsgezinde schryveren en schriften* (*List of Mennonite Authors and Writings*) (1745), it can be argued that Ten Kate was one of the first *doopsgezinden* to translate a foreign physico-theological work. In doing so, he foreshadowed a wave of popularization of experimental philosophy in the Dutch Republic in the 1730s (Zuidervaart 2010). Later, other *doopsgezinden* followed his example, such as the physician Abraham van Loon (?-?), who in 1728 translated William Derham's (1657-1735) *Physico-theology* (1713), and Job Siewertsz Centen (?-1764), who in 1729 translated his *Astro-theology* (1715) (Derham 1728, 1729).[60] According to Piet Visser, the popularizing efforts of these *doopsgezinden* should be seen as a public manifestation of the *doopsgezind* "social-ethical sense of responsibility" that was originally practiced internally (Visser 2007b, 138).

According to his own testimony, Ten Kate found much delight in reading Cheyne's book, and, moreover, "much agreement with the conclusions which I myself previously found and reached concerning physics" (Ten Kate 1716, Voor-reden, **3).[61] It is unfortunately unknown to which conclusions Ten Kate referred and to what extent they were informed by his reading of Newton's work. In *Philosophical Principles of Natural Religion*, Cheyne showed that "all the *Appearances* of Nature, which are above the Powers of *Mechanism* (which are innumerable) are so many undeniable Proofs of the *Being* of a *God*" (Cheyne 1715, 189). For a number of years, Ten Kate, again according to his own testimony, tried to find the time to compose a physico-theological work, and the appearance of the second edition of Cheyne's *Philosophical Principles of Natural Religion* provided him with the opportunity to address the topic (Ten Kate 1716, Voor-reden [**3^{v}]).[62] He mainly followed

[58]Ten Kate's title may have been a reference to the Haarlem based *doopsgezinde* Jan van Westerhoven, in whose *Den Schepper verheerlijkckt in de schepselen (The Creator Glorified in the Creatures)* (1685) the wonders indicating God's hand are explored during seven imaginary walks through the surroundings of Haarlem. For discussion, see Jorink 2010, 391-394.

[59]For the reviews of these works, see [Le Clerc] 1715a, c, d. A separate review of the second edition of Cheyne's *Philosophical Principles of Natural Religion* appeared in [Le Clerc] 1715e. See Evers 1988 for discussion. Physio-theological works also received a lot of attention in the Hague-based journal *Journal litéraire* (Bots and de Vet 1986).

[60]Cf. Zuidervaart 2010, 241-2, where Jan Siewertsz Centen is mentioned instead of Job Siewertsz Centen.

[61]"... en sedert [ik] het Engelsche *Tractaetje* [i.e. Cheyne's *Philosophical Principles of Natural Religion*] zelf in handen kreeg, vond ik zo veel vermaek in dit verzamelde Fraey, en zo veel overeenkomst van besluyten, omtrent alles wat ik voorheen in 't Natuerkundige ondervonden en zelf opgemaekt had, dat ik ... lust kreeg om in 't Nederduitsch hier van een Uyttreksel te maken."

[62]'t Is vele Jaren lang dat ik voornemends geweest ben, om eens ter gelegener tyd over deze gewigtige Stoffe, zo vol van onverzadelyke Zielsgeneugte, te handelen, dog nu vond ik de gelegentheyd ryp, om in een kort beslag, onder 't byvoegen myner Aenteekeningen, 't Voornaemste van dit myn Oogmerk te voldoen."

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Le Clerc's account, but he added fragments of Cheyne's work that he deemed relevant, and removed fragments that he considered too conjectural (Ten Kate 1716, Voor-reden, [**3^{v}]-**4).[63]

In the introduction to *Den Schepper en Zyn bestier te kennen in Zyne Schepselen*, Ten Kate argues that the application of mathematics to natural phenomena, as recently promoted by Galileo Galilei (1564-1642) and Giovanni Borelli (1608-1679), results in the most certain form of knowledge (Ten Kate 1716 Voor-reden, *3-[*3^{v}]). It is highly surprising, Ten Kate observed, that "Descartes, who came after Galileo, relied so little on geometry and experiments in his physical contemplations and especially those concerning the heavenly system, although he was one of the greatest mathematicians of his time" (Ten Kate 1716, Voor-reden, [*3^{v}]).[64] Instead, according to Ten Kate, Descartes proposed speculative vortices for which there is no evidence that they really exist, and contended that once God put matter into motion at the creation the whole system of the world is eternally maintained in motion by "*mechanismus*," namely "by direct contact, and mechanical push from body to body" (Ten Kate 1716, Voor-reden, [*3^{v}]).[65] Others, claimed Ten Kate, who built upon "the foundation of *mechanismus*," have gone as far as to ascribe necessity to our thinking so that there is no free will, except the free will exerted by "the first cause of everything" (Ten Kate 1716, Voor-reden, [*4^{v}]-*5). The latter has, however, been entirely eliminated by Spinoza and his followers, who ultimately amalgamated the creator with the creation, and contended that everything is the result of "blind fate." Ten Kate considered this contention "the greatest chimera and whimsical notion ever invented by man" - (Ten Kate 1716, Voor-reden, *5-[*5^{v}]), a remark that is highly similar to Le Clerc's statement on the matter.[66] The philosophies of Descartes and Spinoza, argues Ten Kate, are not based on experience, but on arbitrary suppositions, unbridled imagination and sheer delusion (Ten Kate 1716, Voor-reden, [*6]).[67] Others, who have relied on sustained experimental investigation or on the application of mathematics within natural philosophy, have contributed to a more adequate understanding of nature.[68] Here Ten Kate is referring to the importance of the contributions of the members of the

[63]"In dit Uytreksel [from Cheyne's *Philosophical Principles of Natural Religion*] heb ik doorgaends het Fransche van Hr. *Le Clerc* naegevolgt, uytgenomen dat ik hier en daer uyt het Engelsche vry wat ingevoegt heb, en wederom van de andere zyde iets uytgelaten." Le Clerc reviewed *Den Schepper en Zyn bestier* ([Le Clerc] 1715f).

[64]"Maer 't is ten uyterste te verwonderen dat midlerwyle *Descartes*, die na *Galileus* opquam, schoon hy een van de grootste Wiskonstenaers zyner tyd was, in zyne Natuerkundige Beschouwingen, voornaemelyk van 't Hemelsche Gestel, zo weynig met de Meetkonst, of met zekere Proefnemingen te rade gegaen heeft."

[65]"door een onderlinge Aenraking, en Mechanische Voortschuyving van Lichaem op Lichaem."

[66]"ja dit laetste wierd by sommigen ook ingetrokken, voornaemlyk by die genen, die, op 't geleyde van eenen *Spinosa*, alle de Werkingen van de OORSPRONK van 't Geheel-al, Onvrywillig en als Noodzaekelyk in zig zelf, ons afschilderen, en HEM, een-wezig en een-zelvig met al de Gewrogten; vermengende aldus den Schepper en 't Schepsel. . . . 't *Blinde Nootlot*, . . . de grootste Harsenspook en grilligste bevatting, die immer eenig Mensch verzonnen heeft." ("indeed the latter [i.e. the free will of the first cause of everything] was denied by some, chiefly by those following Spinoza who depict all the operations of the origin of everything as unvoluntary and necessary of themselves and Him [i.e. God] as one and identical to all creatures, thereby confounding the Creator with creation. . . . Blind fate [is] the greatest chimera and most whimsical conception that has ever been made up by man.") (Ten Kate 1716, 59-62, n *). Later on, Ten Kate argued that humans have free will and that God has freely created the world. For more on Le Clerc's opinion of Spinoza's necessitarianism and that of his followers, see footnote 53.

[67]"die Harsenschildery van Ketenwerk rustede niet op eene trapsgewyze kennisse van Ervarendheden, nogte op een lange oeffening van geregelde Wetenschap; maer slechts op een blood zeggen, of Onderstellen van eygen goeddunken."

[68]Cf. Ten Kate 1716, Voor-reden, [*8]: "Men heeft 'er midlerwyle niet weynigen gevonden, die voorzigtiger spoor hielden, en met bedaerder gedagten de Overwonderlyke Gesteltheyd der Nature benevens de Wetten van hare beweging' gade sloegen; en daer onder sommigen, die haer werk maekten van naeukeurige en omzigtige Proeven te nemen; anderen, die 't Licht der Wiskonst in alle hare onderzoekingen gebruikten; om alzoo, niet op verzierde Onderstellingen, maer op ordentlyke Gronden, indien niet schielyk, ten minsten meer en meer te konnen vorderen." ("Meanwhile a considerable number [of scholars] have been found who have trodden a more cautious path and have observed with more reticent thoughts the most wondrous constitution of nature together with the laws of its movement. Among these [scholars] there are some who make it their business to experiment accurately and carefully while others use the light of mathematics in all their research. In this way, they proceed not on imagined hypotheses but on orderly grounds, if not swiftly, then at least gradually.")

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Royal Society of London and the *Académie des sciences*, and also of Huygens, who showed "the deficiency of the Cartesian *mechanismus* and his imagined vortices" (Ten Kate 1716, Voor-reden, [*8^{v}]).[69]

In his book, ten Kate singles out one individual in particular who has made the most decisive contribution to the advancement of natural philosophy. "The most famous mathematician" Newton, who disliked "the uncertainty of hypotheses" and pursued "*Philosophia Experimentalis*," combined experiment and mathematics in his *Principia mathematica philosophiae naturalis*, in which he "geometrically revealed the laws of motion of the heavenly bodies" by building on "a few simple principles" that can be derived from "the experience of the phenomena," as a result of which he put natural philosophy on a much firmer foundation.[70] Newton discovered the laws of gravitation, Ten Kate argues, and in doing so completely shattered Descartes's mechanicist and hypothetical natural philosophy, which provided no room for final causes (Ten Kate 1716, Voor-reden, **-[**^{v}], 98). According to Ten Kate, the certainty obtained by Newton's systematic integration of mathematics and empirical findings would allow natural philosophy to steer away from the speculative hypotheses that had led to the atheistic doctrine of "*mechanismus*." In his opinion, Newton had destroyed the "supposition of an eternal *mechanismus* of the universe without the intervention of a supreme ruler, upon which however all atheism is exclusively built" (Ten Kate 1716, Voor-reden, **2).[71] He notes that the force of gravity "cannot be produced by a mechanical motion" and "finds its origin in the Creator and Ruler of all things visible and invisible" (Ten Kate 1716, Voor-reden, [*6^{v}], 37-42, note (a)). Like Le Clerc, Ten Kate is referring to Corollary IV to Proposition VIII of Book III in the first edition of the *Principia*, which states that "God placed the planets at different distances from the sun so that each one might, according to the degree of its density, enjoy a greater or smaller amount of heat from the sun," and which is in fact the only reference to God in the first edition of the *Principia* (Newton 1999, 814; Le Clerc 1696, 36; Ten Kate 1716, 3, note *).

If one follows Newton's way of pursuing natural philosophy – as Cheyne, according to Ten Kate, did in his *Philosophical Principles of Natural Religion* (Ten Kate 1716, Voor-reden, **3) – one will be forced to acknowledge "God's hand in the phenomena" (Ten Kate 1716, Voor-reden, **2-[**2^{v}]).[72] Thereupon, Ten Kate approvingly quotes from Newton's General scholium, we must conclude: "That this most elegant system of the Sun, the planets, the comets and fixed stars have their origin in nothing other than the intent, creation, and governing of a single, all-wise, all-knowing, almighty, eternal, infinite and immaterial being that really rules everything, not as a world soul, but as the overlord of everything" (Ten Kate 1716, Voor-reden, [**2^{v}]).[73] "All science," Ten Kate underscores, "that does not lead us directly or indirectly to our origin [i.e. to God] or cannot lead to it, is in the best case nothing more than the best among vanities, and, it is the filthiest poison of our soul, if it is twisted and abused" (Ten Kate 1716, Voor-reden, [**6]). Ten Kate then continues, as follows:

[69]"de gebreklykheyd van 't *Cartesiaensche Mechanismus*, en van zyne verzierde Vloeden van Hemelstoffe."

[70]The term "experimental philosophy" featured prominently in the second edition of the *Principia* and was used by Newton for polemical reasons (Shapiro 2004). That one of Newton's most important methodological contributions consists in rejecting hypotheses, on the one hand, and combining mathematics and experiments, on the other, was widely accepted in Dutch "proefondervindelijke wijsbegeerte" [experimental philosophy] (see e.g., 's Gravesande 1723, **3r-[**3^{v}] and van Musschenbroek 1741, 64-72).

[71]"alle Onderstelling van een Eeuwig *Mechanismus* van 't Geheel-al, zonder tusschen-komen van eenig Opperbestierder (waer op dog eeniglyk alle *Atheïstery* gebouwt word)."

[72]"GODES HAND in die Verschynselen ter erkennen."

[73]"*Dat dit allerschoonste Samenstel van Zon, Planeten, Cometen, en Vaste Sterren, zynen Oorspronk niet anders heeft kunnen hebben, dan door 't Voornemen, Schepping, en Bestier van een* EENIG, ALWYS, ALWETEND, ALMOGEND, EEUWIG, ONEINDIG, en ONSTOFFELYK WEZEN; *dat alles met der daed regeert, niet als een Ziele der Wereld, maer als een OPPERHEER van alles*." Here Ten Kate amalgamated different sentences from the General Scholium (Newton 1999, 940).

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> How can something be known, that is useful to our community or sharpens our reason, which does not induce us to be grateful for such talents? For this reason, we cannot bring a more appropriate offering to our CREATOR for the fruits of the talents which he bestowed to each of us than when we conscientiously consider the glory of his power and his praise in everything. (Ten Kate 1716, Voor-reden, [**6]-[**6^{v}])

This, argues Ten Kate, is precisely what Newton did. By carefully applying his talents in mathematics and experimentation, Newton provided compelling arguments for God's providence and his government of the world. In other words, by using his talents, Newton directed us to the very source of those talents, viz. God. "How joyful it is," Ten Kate pondered, "to find God's inscrutable wisdom, omnipotence, and unfathomable goodness in the attentive contemplation of the order of nature, and thus to get to know his immediate and constantly supporting arm not dimly, but closely and tangibly to kiss GOD's finger with thankful and humble reverence" (Ten Kate 1716, Voor-reden, [**6^{v}]-[**7]).[74]

As we have seen, in *Drie gewigtige bedenkingen* (1728) Ten Kate emphasized that the talents we receive from God are to be used in honor of Him. We have also seen that he saw natural philosophy as a worthy subject to which one can devote one's talents in honor of God. The introduction to *Den Schepper en Zyn bestier te kennen in Zyne Schepselen* shows that Ten Kate was already endorsing these views in 1716. Moreover, there he identified Newton as someone who used his exceptional talents in God's honor, and urged others to follow his lead. Accordingly, one of the reasons Ten Kate was drawn to Newton's natural philosophy was that it pointed to the possibility of using one's God-given talents to establish God's governance and providence and, thus, to direct us to the source of these talents. It is not unlikely that Ten Kate saw his own work on the harmonious relation between bodily proportions and musical intervals and on the musical division of the color spectrum in a similar light: by uncovering harmonious relations instilled by God in nature, Ten Kate believed that he was using his God-given talents to God's honor.

Like Le Clerc, Ten Kate heavily relied on Cotes' division between the certainty of Newton's mathematical and experimental philosophy and the hypothetical nature of Descartes's natural philosophy (Newton 1999, 393-394). Contrary to Verwer and Nieuwentijt (Verwer 1683; Nieuwentijt 1720, 1725), Ten Kate was not primarily concerned with Spinoza's philosophical system, but rather with Descartes's mechanicist system of the world, which does not seem to require a divine ruler. Whereas he mentioned Spinoza only once in *Den Schepper en Zyn bestier te kennen in Zyne Schepselen*, namely as a mere epigone of Descartes's natural philosophy, he mentioned the author of the *Principia philosophiae* (1644) several times. In addition, unlike Nieuwentijt (Nieuwentijt 1720, 2, 10),[75] Ten Kate never criticized Spinoza by arguing that the mathematical method in his *Ethica* is flawed, nor did he draw upon the distinction between pure and mixed mathematics to contrapose Spinoza's philosophy and Newton's experimental philosophy. Instead, Ten Kate's key argument was that by applying mathematics to natural phenomena

[74]"Alle Wetenschap, die ons niet of regtstreeks of by omwegen tot onzen OORSPRONK opleyd, nogte opleyden kan, is, op het beste genomen, niet meerder dan de beste onder de Ydelheden; en zo ze tot het tegendeel verdraeyt of misbruykt word, is zy 't vuylste vergift onzer Ziele. ... Hoe kan 'er iets geweten worden, dat nut is voor onze onderlinge Gemeenschap, of tot opscherping dient van ons Verstand, 't gene ons niet noodigt tot dankbaerheyd van zulke gaven? Hierom kunnen we ook aen onzen SCHEPPER geene gevoeglyker offerhande van de vrugten der Talenten, met welken hy wel eer yder van ons beschonken heeft, toebrengen, dan wanneerwe [sic] den Roem zyner Mogendheyd, en zynen Lof in alles betragten. ... Hoe heuchlyk is het, in 't aendachtig beschouwen van de Order der Natuer, GODES onnaspeurlyke Wysheyd; ..., GODES Almagt; en ... GODS ondoorgrondelyke Goedheyd te vinden; om alzoo zynen dadelyken en alles gestaeg-ondersteunenden Arm, niet schemeragtig, maer van naby, en als handtastelyk te leeren kennen, om den Vinger GODS met neerslagtigen en dankbaren Eerbied te kussen."

[75]The crux of the argument was already spelled out in *Het regt gebruik der werelt beschouwingen* (*The Right Way of Contemplating the World*), in which Nieuwentijt primarily used physico-theological arguments to counter Spinoza's philosophical system (Nieuwentijt 1725, 9-10).

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Newton succeeded in establishing a number of natural philosophical claims with certainty, and that based on such claims solid physico-theological arguments could be developed that refuted Descartes's and Spinoza's philosophy.

This distinction adds nuance to earlier findings on the "Amsterdam mathematical amateurs," as this group of thinkers, to which Ten Kate belonged, have been called in a seminal paper by Rienk Vermij Ten Kate(Vermij 2003). Members of this group included the *doopsgezind* merchant Adriaen Verwer (1654/5-1717), the enigmatic broker Jan Makreel, who seems to have been a member of the Reformed Church, Le Clerc, and Nieuwentijt, a physician and politician from Purmerend. Although the members of this Amsterdam circle came from different confessional and professional backgrounds, they were, Vermij claims, united in their endeavor to respond to "the challenge of Spinozism" (Vermij 2003, 189). The mathematical format of the *Ethics* gave its readers the impression that Spinoza's ideas, which were considered religiously disastrous by religious fractions, were established demonstratively. The members of the Amsterdam circle are said, more specifically, to have used Newton's ideas to "demonstrate the fallaciousness of Spinoza's geometrical method and uphold revealed religion" (Vermij 2003, 183).

These claims have been endorsed recently a number of scholars. Emma Mojet has argued that: "Their solution [i.e. the solution of the members of the Amsterdam circle] was to emphasize the difference between what Spinoza was doing and their own goal, arguing for a distinction between Spinoza's pure mathematics on the one hand and true scientific method on the other" (Mojet 2017, 119). Wiep van Bunge has claimed that Verwer and Ten Kate "sought to counter the 'geometrical' pretentions of Spinozism" (van Bunge 2013, 93). Finally, Jorink and Zuidervaart have maintained that, according to Ten Kate, both Spinoza and Descartes (whom, as we have seen, Ten Kate criticized for relying too little on mathematics in his natural philosophy), abused the mathematical method.[76] As we have seen, Ten Kate was more focused on refuting Descartes than Spinoza, whose philosophy he considered as a mere offspring of Descartes's mechanicist philosophy. Moreover, when he sought to refute their philosophical systems, he relied on physico-theological arguments instead of criticizing the fallaciousness of their alleged "mathematical" method. The members of the Amsterdam circle identified in the literature disagreed significantly on whether Spinoza or Descartes posed the biggest threat, and on the arguments by means of which their philosophies were to be refuted. Enthusiasm for Newton's natural philosophy in the Dutch Republic was thus not exclusively due to anti-Spinozist sentiments.

In conclusion

In this essay, I have argued that Ten Kate's work bears the mark of his religious convictions. In order to get a grip on his religious views, I have devoted considerable attention to his *Drie gewigtige bedenkingen*, which was published in 1728. In the past, a great deal of attention has been paid to his *doopsgezind* background, which is certainly relevant to making sense of important features of his religious outlook, as is clear from the importance that Ten Kate attributed to the key virtue of lowliness (*ootmoedigheid*). Here, however, I have argued that we also need to take into account the more general Christian orientation in his thought, which is evident from his views on the appropriate use of human talents—an important topic in the second chapter of *Drie gewigtige bedenkingen* that has not received the attention which it deserves. According to Ten Kate, humans should use their God-given talents in honor of God and to the benefit of their fellow man. Furthermore, I have been able to show that Ten Kate was already endorsing this particular view on the use of human talents in *Den Schepper en Zyn bestier te kennen in Zyne Schepselen,* which was published in 1716, the year in which he also finished his paper on the musical division of the colors of the spectrum.

[76]Jorink and Zuidervaart 2012, 31.

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Armed with a more nuanced understanding of Ten Kate's religious outlook, I took a fresh look at his interest in the natural philosophy of his day, and especially in Newton's work. In this context, I have defended the view that Ten Kate was favorably inclined towards the natural philosophy of his day because he saw natural philosophy a worthy subject to which one can devote one's talents in honor of God. In addition, I have revealed that Ten Kate was particularly attracted to Newton's natural philosophy because, according to him, Newton applied his extraordinary talents in mathematics and experimentation to direct us to the very source of our talents, namely to God. I do not maintain that this is the only reason why Ten Kate was drawn to Newton's work. However, it was an important reason that has hitherto been overlooked. Moreover, I have argued that Ten Kate very likely saw his own work on the hidden harmonies between bodily proportions and musical intervals, on the one hand, and between the colors of the spectrum and the notes of the octave, on the other, in a similar light. Namely, he believed that by uncovering those harmonies he was using his talents to honor God's supreme plan of creation. For Ten Kate, the pursuit of natural philosophy thus became a religious duty for those who had the skills to do so.

In addition, I have added nuance to earlier attempts to make sense of Ten Kate's mobilization of Newton's natural philosophical work. Whereas it has been maintained that Ten Kate sought to refute Spinoza's philosophy by arguing against his methodologically flawed use of the mathematical method, I have shown that, like Le Clerc, Ten Kate never used this particular argument, and that instead, when he emphasized the mathematical nature of Newton's work, this served the purpose of highlighting the certainty of his natural philosophical conclusions. Ten Kate only used physico-theological arguments to refute Spinoza, whom he saw as secondary to Descartes. Although these findings cannot be immediately generalized, they call for additional research that may lead to further qualifications of the ways in which Ten Kate, and his group of Amsterdam natural philosophy and mathematics enthusiasts, have hitherto been characterized.

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Archival abbreviation

Amsterdam City Archives – ACA
Amsterdam University Library – AUL

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Uitbreiding en beschryving van het vermaarde kabinet van wylen den heere Lambert ten Kate, Hermansz. Van eenigen zyner teekeningen, Special Collections, OTM, I C 21, AUL.
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Steffen Ducheyne is a historian and philosopher of science interested in the transition from natural philosophy to physics and more particularly in Isaac Newton's impact on eighteenth-century physics and methodology. He holds a PhD from Ghent University and he is Full Professor at the Center for Logic and Philosophy of Science, Vrije Universiteit Brussel, Pleinlaan 2, room 5B447. He is currently working on Dutch appropriations of Isaac Newton's natural philosophy. He is the author of *"The Main Business of Natural Philosophy": Isaac Newton's Natural Philosophical Methodology*, which was published by Springer in 2012, and the editor of *Reassessing the Radical Enlightenment,* published by Routledge in 2017.

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