ADRIAEN VERWER (1654/5–1717) AND THE FIRST EDITION OF
ISAAC NEWTON'S *PRINCIPIA* IN THE DUTCH REPUBLIC

by

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The Amsterdam-based merchant and mathematics enthusiast Adriaen Verwer (1654/5–1717) was one of the few in the Dutch Republic to respond to the first edition of Newton's *Principia* (1687). Based on a close study of his published work, his correspondence with the Scottish mathematician and astronomer David Gregory (1659–1708), and his annotations in his own copy of the first edition of the *Principia*, I shall scrutinize the impact of Newton's ideas on Verwer's thinking. The proposed analysis, which will add nuance to earlier findings, also has broader implications for our understanding of the introduction of Newton's ideas in the Dutch Republic, as will be shown.

Keywords: Adriaen Verwer; Isaac Newton; David Gregory;
Spinoza; early Dutch 'Newtonianism'

PREAMBLE: ONE OF NEWTON'S 'MOST VALIANT SOLDIERS'?

When the main character of this essay, Adriaen Verwer (1654/5–1717), was buried in the Oude Kerk in Amsterdam,¹ the Rotterdam poet Jan Suderman (1680–1724),² who was married to Verwer's niece, wrote the following verses on the occasion of his uncle's death:

Oh, eternal honour of the English,
Oh, great Newton, who carries the torch of that knowledge for others,
Whose wisdom supports Christ's religion,
You lose, now Verwer is buried,
One of your most valiant soldiers.³

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1 Doop-, trouw- en begraafregisters (henceforth DTB) 1048, p. 61, Amsterdam City Archives, Amsterdam (henceforth ACA).

2 Igor Gerardus van de Bilt, 'Landskaartschrijvers en landverdelers: Adriaen Verwer (ca.1655–1717), Adriaan Kluit (1736–1807) en de Nederlandse taalkunde van de achttiende eeuw', PhD thesis, Vrije Universiteit Amsterdam (2009), p. 35, n. 23.

3 *Lyk gedachtenis van den heere Adriaen Verwer, 't Amsterdam overleden den 23sten, en aldaer begraven den 31sten der lentemaent CIO IJ CCXVIII* (s.n., s.l., 1717) (*Eulogy for Sir Adriaen Verwer, deceased in Amsterdam on 23 March and buried on 31 March 1718*), p. [5]: 'O eeuwige eer der Engelanderen, / O groote Newton, die voor anderen / De fakkelt van die kennis draegt, / Wiens wysheit Christus godsdiensts schraegt, / Gy mist, nu VERWER legt begraven, / Een' van uw klokste letterbraven.'

In these verses, Suderman presents Isaac Newton as an important figure whose natural philosophy buttressed Christian faith, and Verwer as one of Newton's most ardent supporters. Was it the case, one might ask, that Verwer was one of Newton's 'most valiant soldiers'? Does Suderman's poem indeed coincide with historical reality, and, moreover, what was the impact of Newton's work, and especially the first edition of the *Principia*,⁴ on Verwer's intellectual project? In this essay, I seek to provide answers to these questions.

In a seminal paper, Rienk Vermij argued that, 'mainly under the influence of informal contacts with David Gregory and his circle', 'Newtonian ideas' were put to use by a group of 'mathematical amateurs' in Amsterdam of which Verwer was part, to 'demonstrate the fallaciousness of Spinoza's geometrical method and uphold revealed religion'.⁵ The group was, in Vermij's view, united in their endeavour to respond to 'the challenge of Spinozism'.⁶ The members of this group were extremely unhappy that 'the mathematics they cherished as a way to truth should really lead to unacceptable conclusions', as became clear from Baruch Spinoza's (1632–77) *Ethica ordine geometrico demonstrata* (*Ethics Demonstrated in Geometrical Order*), which was published as part of his *Opera posthuma* (1677). According to Vermij, Newton's work did not radically transform Verwer's thought; rather, the latter picked up elements that fitted well with his own 'frame of mind' so that Newton's ideas, which spread, 'not over ideological interest-groups, but by way of existing scholarly networks', were fitted 'into Verwer's preconceived world view'.⁷

Eric Jorink and Huub Zuidervaart, who have picked up on Vermij's idea of the 'use(fulness)' of Newton, have gone so far as to claim that 'Newton became so successful not because he was right, but because he was useful' for responding to local needs, such as providing a response to Spinoza's thought.⁸ Recently, Emma Mojet has tried to provide substance to Jorink and Zuidervaart's claim by looking at Verwer's case. Based on new sources—namely Verwer's copy of the first edition of the *Principia*, which contains numerous annotations made by him,⁹ and his correspondence with David Gregory—she has concluded that, 'In order to refute Spinoza, Verwer searched for a different mathematics and a better mathematical method, and he found models of it in Newton's *Principia*.' Moreover, 'With Newton's example of proper mathematical reasoning, Verwer could argue that there was indeed an active God in the universe, thereby refuting Spinoza',¹⁰ which suggests that Newton's *Principia* was significant for Verwer's project,

4 The historical records keep us in the dark about Verwer's response to the *Opticks/Optice* (1704/1706), and to the second and third editions of the *Principia* (1713, 1726).

5 Rienk Vermij, 'The formation of the Newtonian philosophy: the case of the Amsterdam mathematical amateurs', *Br. J. Hist. Sci.* 36, 183–200 (2003), at p. 183.

6 *Ibid.*, p. 189.

7 *Ibid.*, pp. 193, 199.

8 Eric Jorink and Huub Zuidervaart, "'The miracle of our time': how Isaac Newton was fashioned in the Netherlands", in *Newton and the Netherlands: how Newton's ideas entered the Continent* (ed. Eric Jorink and Ad Maas), pp. 13–65 (Leiden University Press, Amsterdam, 2012), at p. 26.

9 MAG: Rariora Qu 291, Utrecht University Library, Utrecht (henceforth UUL), which contains the annotation 'Ex libris Adriani Verwer. 1687'. A scanned version of it can be consulted at <http://abo.annotatedbooksonline.com/#binding-31-5> (accessed 5 December 2018). For discussion, see Bart Jaski, 'Newton door de ogen van een amateur', April 2013, <http://bc.library.uu.nl/node/670> (accessed 5 December 2018).

10 Emma (G. E. N.) Mojet, 'Early modern mathematics in a letter: Adriaen Verwer to David Gregory on mathematics and natural philosophy', *Lias* 44, 117–142 (2017), at p. 131, and see also p. 117.

and especially for his criticism of Spinoza. In this essay, I would like to add nuance to these earlier findings. In addition, by contextualizing Verwer's theological views, I shall shed new light on his work.

Verwer's case is significant, because he was one of the few in the Dutch Republic who studied the first edition of the *Principia*. Therefore, he is vital for our understanding of early responses to Newton's work in the Republic. Once the *Principia* came off the press in July 1687, Christiaan Huygens (1629–1695) and Burchard de Volder (1643–1709) each received a presentation copy.¹¹ Although de Volder never endorsed nor taught Newton's natural philosophy, he is reported to have intensely studied the *Principia* after its publication.¹² Jean Le Clerc (1657–1736), the Swiss polymath, theologian and professor of philosophy, Hebrew and classics at the Remonstrant Seminary in Amsterdam, also studied the first edition, as we will see in what follows.¹³

Huygens, who joined the Royal Society in 1663, was very knowledgeable about the *Principia*. He encountered Newton's work early on: in 1672, the secretary of the Royal Society, Henry Oldenburg (c.1618–1677), informed Huygens about Newton's reflecting telescope, and shortly afterwards about his new theory of light and colours.¹⁴ Huygens' response to Newton's telescope was favourable, and he deemed Newton's theory of light 'very plausible', although he raised several issues of concern.¹⁵ As a result of the exchange of thought between Huygens and Newton, through letters sent via Oldenburg, Newton modified certain claims relating to his theory of the heterogeneity of white light in 1673.¹⁶ In the same year, Huygens' *Horologium oscillatorium* was published, a work which Newton greatly admired.¹⁷ Also in 1673, a letter by Huygens on Newton's telescope appeared in a volume of the *Journal des sçavans*, which was published in Amsterdam.¹⁸

When Nicolas Fatio De Duillier (1664–1753) reported that Newton's *Principia* was about to be published, Huygens wrote back stating that he wanted to see it, but hoping that it would not contain the supposition of attraction.¹⁹ A year later, Huygens told his brother Constantijn that he wanted to meet Newton, and that he admired the 'inventions' in the *Principia*.²⁰ In June 1689, he travelled to England to visit his brother. During his trip, he met Newton on several occasions,

11 Christiaan Huygens, Letter to Constantijn Huygens, 30 December 1688, in Christiaan Huygens, *Oeuvres complètes*, 22 vols (Martinus Nijhoff, The Hague, 1888–1950), vol. 9, p. 305; Burchard de Volder, Letter to Isaac Newton, 4/14 August 1687, in A. Rupert Hall, 'Further Newton correspondence', *Notes Rec. R. Soc. Lond.* 37, 7–34 (1982), at pp. 11–12.

12 [Jean Le Clerc], 'Eloge de feu Mr. De Volder Professeur en philosophie & aux mathématiques, dans l'Academie de Leide', *Bibliothèque choisie* 18, 346–401 (1709), at pp. 379–380. On one occasion, de Volder stated that Huygens' vortex theory had a high degree of probability (Burchard de Volder, Letter to the Directors of the East India Company, 22 July 1689, in Huygens, *op. cit.* (note 11), vol. 9, p. 340).

13 As can be seen from Jean Le Clerc, *Physica sive de rebus corporeis libri quinque* (George Gallet, Amsterdam, 1696).

14 Henry Oldenburg, Letter to Christiaan Huygens, 25 January 1672, in Huygens, *op. cit.* (note 11), vol. 7, pp. 128–129; Henry Oldenburg, Letter to Christiaan Huygens, 21 March 1672, in *ibid.*, vol. 7, p. 156.

15 Christiaan Huygens, Letter to Henry Oldenburg, 27 September 1672, in Huygens, *op. cit.* (note 11), vol. 7, p. 228.

16 Isaac Newton, Letter to Henry Oldenburg, 23 June 1673, in Isaac Newton, *The correspondence of Isaac Newton* (ed. H. W. Turnbull, J. F. Scott, A. R. Hall and L. Tilling), 7 vols (Cambridge University Press, Cambridge, 1959–1977), vol. 1, pp. 292–294. For discussion, see Alan E. Shapiro, 'The evolving structure of Newton's theory of white light and color', *Isis* 71, 211–235 (1980), at pp. 223–225.

17 Niccolò Guicciardini, *Reading the Principia: the debate on Newton's mathematical methods for natural philosophy from 1687 to 1736* (Cambridge University Press, Cambridge, 1999), p. 30.

18 Christiaan Huygens, 'Extrait d'une lettre de M. Huygens de l'Academie Royale des sciences à l'auteur du Journal des sçavans, touchant la lunette catoptrique de M. Newton', *Journal des sçavans* 3, 26–28 (1673).

19 Christiaan Huygens, Letter to Fatio De Duillier, 11 July 1687, in Huygens, *op. cit.* (note 11), vol. 9, p. 190.

20 Christiaan Huygens, Letter to Constantijn Huygens, 30 December 1688, in Huygens, *op. cit.* (note 11), vol. 9, p. 305.

and he gave an account of his *Traité de la lumière... avec un discours de la cause de la pesanteur* (1690) at the Royal Society.²¹ Although, as is well known, to Huygens the notion of attraction seemed unintelligible and ‘absurd’,²² he was genuinely impressed by many of the results obtained in the *Principia*, and he endorsed the inverse-square law, at least for celestial bodies, which indicates that Huygens was critical of *universal* gravitation.

However, it is important to note that Huygens offered empirical arguments against universal gravitation. He tried to marshal evidence for his own spherical vortex theory by drawing on measurements with seconds-pendulums taken during an expedition on the *Alcmaer* from the Cape of Good Hope to Texel in 1687. He wrote a report on the measurements that were collected during the expedition to the directors of the Dutch East India Company, which he later mentioned in *Traité de la lumière*.²³ Whereas, in Huygens’ account, variation of gravity with latitude results only from the centrifugal forces produced by the earth’s rotation, according to Newton it results from both centrifugal forces and gravitational forces on a non-spherical earth. As a result, the variation of surface gravity with latitude is larger according to Newton’s theory than it is according to Huygens’. Having determined that the centrifugal effect of the earth’s rotation is 1/289th of the force of gravitation at the equator,²⁴ Huygens could calculate how much seconds-pendulums needed to be shortened at different latitudes. He then compared the results of his calculations with Newton’s and with the observed measurements. Although based on a limited set of data, the measurements collected on the *Alcmaer* favoured Huygens’ theory.²⁵

Huygens sent the report to both Johannes Hudde (1628–1704) and de Volder for review, which means that they may have been aware of the importance of the empirical argument that Huygens was putting forward against universal gravitation. Hudde, who was indisposed owing to a fever, replied that he had no time to study the report in detail.²⁶ De Volder sent a generally positive report on Huygens’ results to the directors of the Dutch East India Company, in which, however, he cast doubt on Huygens’ value for the difference in longitude between the Cape of Good Hope and Texel.²⁷ The Scottish mathematician and astronomer David Gregory (1659–1708), to whom we will return in

21 Christiaan Huygens, Letter to Constantijn Huygens, 3 September 1689, in Huygens, *op. cit.* (note 11), vol. 9, p. 333, note 1; Huygens, *op. cit.* (note 11), vol. 22, pp. 742–747; Richard S. Westfall, *Never at rest: a biography of Isaac Newton* (Cambridge University Press, Cambridge, 1980), pp. 488, 493.

22 Christiaan Huygens, Letter to Leibniz, 18 November 1690, in Huygens, *op. cit.* (note 11), vol. 9, p. 538.

23 Huygens’ report is to be found in Christiaan Huygens, Letter to the Directors of the Dutch East India Company, 24 April 1688, in Huygens, *op. cit.* (note 11), vol. 9, pp. 272–291. For the relevant section in *Traité de la lumière... avec un discours de la cause de la pesanteur*, see Huygens, *op. cit.* (note 11), vol. 21, pp. 466–471. Here I am greatly indebted to two marvellous studies: Eric Schliesser and George E. Smith, ‘Huygens’ 1688 report to the Directors of the Dutch East India Company on the measurement of longitude at sea and its implications for the non-uniformity of gravity’, *De zeventiende eeuw* 12, 198–212 (1996), and Eric Schliesser and George E. Smith, ‘Huygens’ 1688 report to the Directors of the Dutch East India Company on the measurement of longitude at Sea and the evidence it offered against universal gravity’, *Arch. Hist. Exact Sci.* (forthcoming). On Huygens’ spherical vortex theory, see H. A. M. Snelders, ‘Huygens and Newton’s theory of gravitation’, *Notes Rec. R. Soc. Lond.* 43, 209–222 (1989).

24 Christiaan Huygens, Letter to the Directors of the Dutch East India Company, 24 April 1688, in Huygens, *op. cit.* (note 11), vol. 9, p. 275.

25 Later geodetic expeditions favoured Newton’s theory. For discussion, see John L. Greenberg, *The problem of the Earth’s shape from Newton to Clairaut: the rise of mathematical science in eighteenth-century Paris and the fall of ‘normal’ science* (Cambridge University Press, Cambridge, 1995).

26 Johannes Hudde, Letter to Christiaan Huygens, 30 April 1688, in Huygens, *op. cit.* (note 11), vol. 9, p. 294. The historical records are silent about Hudde’s response to the *Principia*. On Hudde, see n. 110.

27 De Volder, *op. cit.* (note 12), p. 341.

what follows, was fully aware of the significance of Huygens' argument, as is clear from a memorandum he composed on 11 November 1691.²⁸

Little is known about the distribution of the first edition of the *Principia* in the Dutch Republic. Once it had appeared in early July 1687, Edmond Halley (1656–1742), who published Newton's *magnum opus* at his own expense, made over a portion of the edition to the London bookseller Samuel Smith (1658–1707). Many of these 'Smith' copies were exported to the Continent.²⁹ In a letter in 1687 from the Amsterdam-based publisher and bookseller Johannes Janssonius van Waesberge II (1644–1705) to Smith, an order of '100 Newton' is mentioned, at a total cost of £966 10s.³⁰ The high price might be an indication that the books ordered were copies of the *Principia*.³¹ There is no way of telling how many of these copies were sold, nor when or to whom. In the summer of 1687, Smith visited the Dutch Republic in August and Flanders in the first half of September, and he may have sold copies of the *Principia* during his trip.³² Two or three years after the publication of the *Principia*, the Leiden publisher and bookseller Pieter van der Aa (1659–1733) returned to Smith seven of the 12 copies of the *Principia* that he had tried to sell in Frankfurt.³³ In a letter of 1690 from the Rotterdam-based publisher Reinier Leers (1654–1714), whom Verwer called a 'friend',³⁴ to Smith, Leers mentioned the possibility of returning 'some copies of Newton', which may have been copies of the *Principia*, as a way of paying Smith.³⁵

A MENNONITE MERCHANT IN AMSTERDAM

Adriaen (Pieterszoon) Verwer was born in Rotterdam in 1654 or 1655.³⁶ His father, the merchant Pieter (Adriaenszoon) Verwer, was a deacon of the Mennonite congregation of the Waterlanders in Rotterdam. The Waterlanders derived their name from Waterland, a region in the north of the Dutch Republic. They were more liberal and progressive than other Mennonites, and they did not have a negative attitude towards worldly affairs. They began calling themselves 'Waterlanders' ('doopsgezinden') in order to distinguish

28 Gregory Ms. 247, f. 72r, Royal Society Library, London: 'Huygens makes only one cause of the different gravity [at the equator] from the greater vis centrifuga in the greater parallels, but Newton ~~make~~ adds another of the different centripetation according to the different distances on the surface not equally spherical.' I became aware of this source through Schliesser and Smith, 'Huygens' 1688 report ... against universal gravity', *op. cit.* (note 23).

29 A. N. L. Mundy, 'The distribution of the first edition of Newton's *Principia*', *Notes Rec. R. Soc. Lond.* **10**, 28–39 (1952), at pp. 33–34.

30 P. G. Hoftijzer, 'Het Nederlandse boekenbedrijf en de verspreiding van Engelse wetenschap in de zeventiende en vroege achttiende eeuw', *Jaarboek voor Nederlandse boekgeschiedenis* **5**, 59–71 (1998), at p. 70. Hoftijzer also mentions an order in 1690 by van Waesberge of 21 'Newton *Astronomia Britannica*', which he takes to refer to copies of the *Principia* rather than to copies of John Newton's *Astronomia Britannica* (1657).

31 P. G. Hoftijzer, personal communication, 19 December 2018.

32 Marja Smolenaars, personal communication, 24 December 2018 and 9 January 2019.

33 Hoftijzer, *op. cit.* (note 30), pp. 70–71.

34 Adriaen Verwer, Letter to Reinier Leers, 11 October 1697, OTM Hs Bl 87, f. 1r, University of Amsterdam, Special Collections, Amsterdam (henceforth UASC).

35 Quoted from Otto S. Lankhorst, *Reinier Leers (1654–1714). Uitgever & boekverkoper te Rotterdam* (APA-Holland Universiteits Pers, Amsterdam/Maarssen, 1983), p. 231.

36 No documents containing Verwer's date of birth have been preserved. We know however that, when he married on 19 March 1688, he was 33 years old (DTB 696, p. 76, ACA). If his birthday occurred after 19 March, then he was born in 1654; if it occurred before 19 March, then he was born in 1655.

themselves from other Mennonite parties.³⁷ Many Mennonites were economically active, and interested in cultural and scientific matters.³⁸ In 1655 five Rijnsburg Collegiant teachers were admitted to the congregation of the Waterlanders, including the surgeon Jacob Ostens (1630–1678).³⁹ Adriaen's father and others supported the admittance of these Rijnsburg Collegiants. Given their liberal and tolerant stance, Collegiants openly discussed Socinianism, millenarianism and chiliasm, and the teachings of René Descartes (1596–1650) and Spinoza.⁴⁰ Collegiants, who were characterized by an anti-clerical, anti-confessional and anti-formalist attitude, endorsed 'free prophecy', namely the interpretation of the Scriptures by the individual believer, and freedom of speech during their meetings ('colleges'), which were held in the vernacular language; and they practised charity, tolerance and piety. They promoted a return to the original apostolic church and they were particularly averse to churches, dogma and clerical supervision.⁴¹ The Rijnsburg principles, however, came into conflict with the views of the more conservative members of the Mennonite congregation, which resulted in tensions. Eventually, the two parties split and went their own ways.

Pieter Verwer was also a member of an Erasmus-inspired, irenic and tolerant circle of friends who met regularly from 1656 to discuss literary, political, philosophical and religious issues.⁴² The group was composed of individuals from different confessional and professional backgrounds, including the Collegiant tile manufacturer and poet Joachim Oudaen (1628–1692); the translator, publisher and bookseller Frans van Hoogstraten (1632–1696), who was drawn to Jansenism; the Remonstrant publisher Isaac Naeranus (?–1717); the Collegiant poet Joost van Geel (1631–98); the Remonstrant regent Adriaen Paets (1632–1686); the Walloon Reformed painter and poet Heijmen Dullaert (1636–1684); the Remonstrant preacher Gerard Brandt de Jonge (1657–1683); Herman van Zoelen (1625–1702), who was a member of the Rotterdam city council; the Remonstrant merchant and poet Frans de Haes (1656–1690); the Collegiant wine merchant and weaver Johannes Bredenburg (1643–91); Oudaen's brother-in-law; and the surgeon Ostens. Very little is known about Verwer's early years and his education, but Oudaen, who gave philological instruction to some of the younger members of the Erasmus-inspired circle, seemed to have played a significant role in his education.⁴³ While initially being receptive

37 Piet Visser, 'Mennonites and Doopsgezinden in the Netherlands, 1535–1700', in *A companion to Anabaptism and Spiritualism, 1521–1700* (ed. John D. Roth and James M. Stayer), pp. 299–345 (Brill, Leiden and Boston, 2007), at pp. 313–314.

38 Ernst Hamm, 'Mennonites, natural knowledge, and the Dutch Golden Age', *Conrad Grebel Review* 30, 4–23 (2012); Ernst Hamm, 'Improving Mennonites in an age of revolution', *Conrad Grebel Review* 30, 24–51 (2012).

39 J. C. van Slee, *De Rijnsburger Collegianten* (HES Publishers, Utrecht, 1980), pp. 95–135; Louis van Bunge, 'Johannes Bredenburg (1643–1691): een Rotterdams Collegiant in de ban van Spinoza', PhD thesis, Erasmus University Rotterdam (1990), pp. 33–40; Michiel Wielema, *Filosofen aan de Maas. Kroniek van vijfhonderd jaar wijsgerig denken in Rotterdam* (Ambo, Baarn, 1991), pp. 36–37.

40 Wiep van Bunge, *Spinoza past and present: essays on Spinoza, Spinozism, and Spinoza scholarship* (Brill, Leiden and Boston, 2012), pp. 51–56. On Spinoza and the Collegiants, see Wiep van Bunge, 'Spinoza and the Collegiants', *Philosophia Osaka* 3, 13–29 (2012); Jonathan Israel, 'Spinoza and the religious radical Enlightenment', in *The intellectual consequences of religious heterodoxy 1600–1750* (ed. Sarah Mortimer and John Robertson), pp. 181–204 (Brill, Leiden and Boston, 2012).

41 Van Slee, *op. cit.* (note 39), pp. 267–287; Andrew Cooper Fix, *Prophecy and reason: the Dutch Collegiants in the early Enlightenment* (Princeton University Press, Princeton, 1991).

42 Jori Zijlmans, *Vriendenkringen in de zeventiende eeuw. Verenigingsvormen van het informele culturele leven te Rotterdam* (SDU Uitgevers, The Hague, 1999), p. 252, n. 1. The activities of the members of this informal circle are described on pp. 149–74, and in Wielema, *op. cit.* (note 39), pp. 55–59.

43 Zijlmans, *op. cit.* (note 42), p. 156; G. R. W. Dibbets, 'Joachim Oudaen en de taalvoorschriften', in *Zin dat het heeft. Een liber amicorum voor Jan van Bakel* (ed. Bas van Bakel, Peter-Arno Coppens and Piet Rolf), pp. 145–157 (Coppens, Nijmegen, 1993), at p. 156, n. 6.

to Spinoza's earlier work, Oudaen vehemently opposed the *Ethics*,⁴⁴ and in 1683 he sent a letter to Verwer in which he expressed his doubts about the successful outcome of his refutation of the *Ethics*, 't *Mom-aensicht der atheistery afgerukt* (*The mask of atheism torn off*) (1683), to which we will return later.⁴⁵

The first traces of Adriaen Verwer in our historical records appear in a professional context. Between 1676 and 1678, he worked as a servant for the Rotterdam merchant Willem Pedy (c.1636–1710), who initiated him into the world of sea trade and maritime law.⁴⁶ Verwer rapidly acquired expertise in maritime law and, because of this expertise, he was consulted during the preparation of the *Ordonnance de la marine* (1681), which was established under Jean-Baptiste Colbert's administration during the reign of Louis XIV.⁴⁷ Later Verwer published a treatise on maritime law, average and bottomry.⁴⁸ In 1680, he moved to Amsterdam 'because of the trade' ('om den Koophandel'), where he would die on 23 March 1717.⁴⁹

In 1680 the Amsterdam population had grown to approximately 210,000–220,000 inhabitants.⁵⁰ During the Dutch Golden Age in the seventeenth century, Amsterdam was one of the wealthiest cities in the world, one of the most important centres of (transit) trade, a site of information exchange⁵¹ and conspicuous consumption,⁵² and an important centre for the production of luxury goods and books in Europe, 'boasting over 270 booksellers and printers in the period between 1675 and 1699'.⁵³ The principal seat of the Dutch East India Company, which was founded in 1602, was in Amsterdam. Although during the second half of the seventeenth century the Amsterdam trade continued to grow, it did so to a lesser degree than it had done during the first half. And even in Amsterdam, one of Holland's most tolerant cities, there were clear limits to what could be uttered and published.⁵⁴

44 J. Melles, *Joachim Oudaen. Heraut der verdraagzaamheid, 1628–1692* (Kemink & zoon, Utrecht, 1958), pp. 103–111; Wielema, *op. cit.* (note 39), pp. 55–56; Jonathan I. Israel, *Radical Enlightenment: philosophy and the making of modernity 1650–1750* (Oxford University Press, Oxford, 2001), pp. 366–367.

45 Joachim Oudaen, Letter to Adriaen Verwer, 2 July 1683, OTM: hs. Gl 30a, f. 1r, UASC.

46 B. H. D. Hermesdorf, 'Adriaen Verwer (1655–1717) en de *Ordonnance de la marine* (1681): een Amsterdammer geworden zoon van Rotterdam als mens en schrijver', *Rotterdams Jaarboekje* (series 7) 5, 227–261 (1967), at pp. 229–230.

47 *Ibid.*, pp. 227–9. On the genesis of the *Ordonnance*, see Jean Chadelat, 'L'élaboration de l'*Ordonnance de la marine* d'août 1681', *Rev. historique de droit français et étranger* (series 4) 4, 74–88 (1954); René Warlomont, 'Les sources néerlandaises de l'ordonnance maritime de Colbert', *Rev. belge philol. hist.* 33, 333–344 (1955). It is unknown whether Verwer had any university-based legal training.

48 Adriaen Verwer, *Nederlants see-rechten; avaryen; en bodemeryen* (*Dutch maritime laws, damages and bottomries*) (Jan Boom, Amsterdam, 1711). For discussion of this work, see Hermesdorf, *op. cit.* (note 46).

49 A. V. [Adriaen Verwer], 't *Mom-aensicht der atheistery afgerukt* (Willem Goeree, Amsterdam, 1683), [**3v]; see also Verwer, *op. cit.* (note 48), p. 166.

50 Clé Lesger, 'Vertraagde groei: de economie tussen 1650 en 1730', in *Geschiedenis van Amsterdam, Zelfbewuste staat 1650–1813*, 4 vols (ed. Willem Frijhoff and Maarten Prak), vol. 2.2, pp. 21–87 (SUN, Amsterdam, 2004–2007), at p. 21.

51 Clé Lesger, *The rise of the Amsterdam market and information exchange: merchants, commercial expansion and change in the spatial economy of the Low Countries c. 1550–1630* (Routledge, London and New York, 2006). See also Woodruff D. Smith, 'The function of commercial centers in the modernization of European capitalism: Amsterdam as an information exchange in the seventeenth century', *J. Econ. Hist.* 44, 985–1005 (1984), on the notion of 'information exchange'.

52 Simon Schama, *The embarrassment of riches: an interpretation of Dutch culture in the Golden Age* (Collins, London, 1987), p. 320.

53 G. C. Gibbs, 'The role of the Dutch Republic as the intellectual entrepôt of Europe in the seventeenth and eighteenth Centuries', *BMGN* 86, 323–349 (1971), at pp. 323–324.

54 Simon Groenveld, 'The Mecca of authors? States assemblies and censorship in the seventeenth-century Dutch Republic', in *Too mighty to be free: censorship and the press in Britain and Holland* (ed. A. C. Duke and C. A. Tamse), pp. 63–86 (Walburg, Zutphen, 1987); H. Bots, 'Tolerantie of gecultiveerde tweedracht: het beeld van de Nederlandse tolerantie bij buitenlanders in de zeventiende en achttiende eeuw', *BMGN* 107, pp. 657–669 (1992); Jonathan I. Israel, 'The intellectual debate about toleration', in

Verwer embodied what the humanist Casparus Barlaeus (Caspar van Baerle; 1584–1648) had called the *mercator sapiens* in the inaugural address which he delivered in 1632 on the occasion of the foundation of the Athenaeum Illustre of Amsterdam.⁵⁵ Barlaeus argued that commerce, wealth and learning could and should go hand in hand, thereby promoting the ideal of the *mercator sapiens*, a hybrid figure who was to be well versed both economically and intellectually. More importantly, Barlaeus tried to free commerce from the religious suspicion and moral anxieties that it incited; in his mind ‘the merchant could do good even when keeping the benefit of his activities rather than only by giving away his wealth; commerce could itself be among the best pursuits of human life’.⁵⁶

In 1688 Verwer married Hester Pellewijk, with whom he had three children: Elisabeth (b. 1691), Jo(h)anna (b. 1694) and Pieter (b. 1696).⁵⁷ The Verwer family is known to have lived in Keizersgracht at what is now no. 232.⁵⁸ Verwer and his wife were baptized on 9 February 1689 in the Mennonite congregation of the Lamb and Tower (Lam en Toren).⁵⁹ He also served as a deacon for the Lamb and Tower between 1697 and 1702.⁶⁰ Verwer’s *Inleiding tot de christelyke Gods-geleertheid* (*Introduction to Christian theology*) appeared in 1698.⁶¹

In 1707 Verwer published a linguistic study of the Dutch language and its grammar.⁶² According to him, the Dutch language was originally characterized by regularity; an important part of his linguistic project was therefore to uncover the rules underlying Dutch grammar. He argued that analogy (‘analogie’) was one of the methodological tools to accomplish this, and that it was founded on ‘the natural axiom’ according to which ‘like arises from like’.⁶³ Jan Noordegraaf has claimed that this axiom finds its origin in Newton’s second *regula philosophandi*,⁶⁴ according to which ‘the causes assigned to

The emergence of tolerance in the Dutch Republic (ed. C. Berkvens-Stevelinck, J. Israel and G. H. M. Postumus Meyjes), pp. 3–36 (Brill, Leiden, New York and Cologne, 1997).

55 Casparus Barlaeus, *Mercator sapiens, sive oratio de conjugendis mercaturae & philosophiae studiis* (Willem Blaeu, Amsterdam, 1632). For discussion of the *mercator sapiens*, see Marika Keblusek, ‘*Mercator sapiens*: merchants as cultural entrepreneurs’, in *Double agents: cultural and political brokerage in early modern Europe* (ed. Marika Keblusek and Badloch Vera Noldus), pp. 95–109 (Brill, Leiden and Boston, 2011). On the Athenaeum, see Dirk van Miert, *Humanism in an age of science: the Amsterdam Athenaeum in the Golden Age, 1632–1704* (Brill, Leiden and Boston, 2009).

56 Harold J. Cook, *Matters of exchange: commerce, medicine, and science in the Dutch Golden Age* (Yale University Press, New Haven and London, 2007), p. 70.

57 DTB 298, p. 19, ACA.

58 In 1703, Verwer’s house is described as being ‘on the west side of the Keizersgracht, the fifth house to the north of the Reestraat, where Lelienvelt is above the door’ (‘opde westzyde vande Keijzersgracht, het vijfde huijs benoorden de Reefstraet, daer Lelienvelt boven de deur staet’) (Archive 5061, inventory no. 2174, ff. 244v–245r, ACA). Around 1683, he lived nearby in ‘the Herengracht near the Hartenstraat’ (‘de Heeregracht, bij de Hartestraat’) (Joachim Oudaen, Letter to Adriaen Verwer, 2 July 1683, OTM Hs GL 30a, f. 1v, UASC).

59 Archive 1120, inventory no. 213, p. 109, ACA.

60 Hermesdorf, *op. cit.* (note 46), p. 254, n. 17.

61 Adriaen Verwer, *Inleiding tot de christelyke Gods-geleertheid* (Jan Rieuwertz, Amsterdam, 1698).

62 Anonymus Batavus [Adriaen Verwer], *Linguae Belgicae idea grammatica, poetica, rhetorica* (François Halma, Amsterdam, 1707). See van de Bilt, *op. cit.* (note 2), pp. 49–68, for an in-depth analysis of Verwer’s linguistic views.

63 Anonymus Batavus [Adriaen Verwer], *Brief aen den heere Adriaen Reland, professor der Oostersche talen in de academie tot Utrecht* (*A letter to Sir Adriaen Reland, Professor of oriental languages at the University of Utrecht*) (Willem Broedelet, Utrecht, 1709), p. 36.

64 Jan Noordegraaf, ‘Amsterdamse kringen: taalkunde en theologie rond 1700’, in *‘Teekenrijke Woorden’ voor Henk Duits* (ed. Fred de Bree, Marijke Spies and Roel Zemel), pp. 235–252 (Stichting Neerlandistiek VU/Nodus Publikationen, Amsterdam/Münster, 2002), at p. 242. See also Jan Noordegraaf, ‘From “Radical Enlightenment” to comparative historical linguistics: the study of language in the Netherlands around 1700’, in *The history of linguistics in texts and contexts / Geschichte der Sprachwissenschaft in Texten und Konzepten*, 2 vols (ed. Gerda Haßler and Gesina Volkmann), vol. 1, pp. 155–168 (Nodus Publikationen, Münster, 2004), pp. 157–158. Noordegraaf’s analysis has recently been endorsed in Mojet, *op. cit.* (note 10), pp. 130–131.

natural effects of the same kind are the same'.⁶⁵ However, in linguistics, analogy had been in use long before the *Principia* became available,⁶⁶ and refers to an agreement between words, on the basis of which existing words can take on a different form or new words can be formed. Analogy in linguistics has little to do with the contents of the second *regula philosophandi*, which stipulates that causes that have been shown to be necessary and sufficient for their effects should be minimized as far as possible.⁶⁷ The claim that it finds its origin in Newton's second *regula philosophandi*, which Verwer did not mention in his published work, is therefore to be dismissed as speculation. Verwer's linguistic studies did not embody what has been called 'linguistic Newtonianism'.⁶⁸

CHAINING THE HELLHOUND

When in 1677 Spinoza's *Ethica* was published, many of Verwer's contemporaries were outraged, and as a consequence Spinoza's claims were vehemently attacked. The Dutch Reformed authorities took action, and managed to convince the Supreme Court of Holland, Zeeland and West Friesland to place an embargo on the *Opera posthuma* in 1678, which was shortly afterwards also put on the index of forbidden books by Rome.⁶⁹ Verwer's contemporaries were appalled by the claims which Spinoza defended, *inter alia* his credo 'Deus, seu Natura', his necessitarian thesis in Proposition 33 of Part 1 according to which 'things could not have been produced by God in any other order than is the case',⁷⁰ and his attack on final causes in the appendix to Part 1, by which he undermined the foundations of physico-theology.⁷¹ They were especially incensed by the geometrical order, i.e. by its 'intimidating array of definitions, axioms, propositions, demonstrations and corollaries',⁷² which Spinoza used to demonstrate his ideas, because this gave the impression to its readers that they were established demonstratively with absolute certainty.⁷³

In his *Dictionnaire historique et critique* (1697), the Rotterdam-based philosopher Pierre Bayle (1647–1706) described Spinoza as 'the first to have reduced atheism to a system and to have made a doctrine out of it that is connected and bound together in the ways of

65 Isaac Newton, *Philosophiae naturalis principia mathematica* (Joseph Streater for the Royal Society of London, London, 1687), p. 402: 'effectuum naturalium ejusdem generis eadem sunt causae'. I have quoted from the first edition of the *Principia* because it is this edition that supposedly influenced Verwer's *Brief aen den heere Adriaen Reland*. Rule II was then Hypothesis II.

66 Van de Bilt, *op. cit.* (note 2), pp. 54–55.

67 See Steffen Ducheyne, 'The main business of natural philosophy': Isaac Newton's natural-philosophical methodology (Springer, Dordrecht, 2012), pp. 113–114, for discussion.

68 Georges Gusdorf, *Les sciences humaines et la pensée occidentale, Tome VI. L'avènement des sciences humaines au siècle des lumières* (Les Éditions Payot, Paris, 1973), p. 398.

69 Jeroen van de Ven, 'Life', in *The Bloomsbury Companion to Spinoza* (ed. Wiep van Bunge, Henri Krop, Piet Steenbakkers and Jeroen van de Ven), pp. 1–57 (Bloomsbury, London, 2011), at p. 46.

70 B.d.S. [Baruch Spinoza], *Opera posthuma: quorum series post praefationem exhibetur* ([Israël de Paull], [Amsterdam], 1677), p. 29 (see Rindert Jagersma and Trude Dijkstra, 'Uncovering Spinoza's printers by means of bibliographical research', *Quaerendo* 43, 278–310 (2013), for evidence that de Paull (1630–1680) was the printer of the *Ethics*); Baruch Spinoza, *Complete Works*, ed. Michael L. Morgan, trans. Samuel Shirley (Hackett, Indianapolis, 2002), p. 235.

71 B.d.S., *op. cit.* (note 70), pp. 34–35; Spinoza, *op. cit.* (note 70), pp. 239–240. See Eric Jorink, *Reading the book of nature in the Dutch Golden Age, 1575–1715* (trans. Peter Mason) (Brill, Leiden and Boston, 2010), on Dutch physico-theology.

72 Steven Nadler, *Spinoza's Ethics: An Introduction* (Cambridge University Press, Cambridge, 2006), p. 35.

73 Vermij, *op. cit.* (note 5), pp. 190–191; Eric Jorink, 'Honouring Sir Isaac, or, exorcising the ghost of Spinoza', in *Future perspectives on Newton scholarship and the Newtonian legacy* (ed. Steffen Ducheyne), pp. 23–34 (Royal Flemish Academy for Science and Arts, Brussels, 2009), at p. 29; Jorink and Zuidervaat, *op. cit.* (note 8), p. 18.

the geometers'.⁷⁴ In *Wederlegging van de Ethica of Zede-Kunst (Refutation of Ethics or Morality)*, the Dordrecht-based grain-broker Willem van Blijenbergh (1632–1696) warned that many of the readers of the *Ethics*, especially the unskilled, would be inclined to endorse the claims developed in it because it had the appearance of a mathematical work.⁷⁵ In 1678, the apostolic vicar of the Dutch Mission, Jan van Neercassel (1625–1686), reported to Rome that Dutch non-Catholics were enticed by Spinoza's 'philosophy and the hollow fallacy according to the teaching of geometrical people'.⁷⁶

A first strategy for refuting the *Ethics* was to take issue with Spinoza's definitions and axioms. This strategy was followed, for instance, by the Socinian Frans Kuyper (1629–1691), who anonymously published a repudiation of the *Ethics* in which he called the veracity of Spinoza's key definitions and axiom into question. His refutation was appended to the Dutch translation of Henry More's (1614–1687) criticism of Spinoza's concept of substance.⁷⁷ Kuyper vehemently rejected the idea that Spinoza had proven 'his atheistic theses mathematically, that is infallibly'.⁷⁸ Another strategy to counter the *Ethics* was to argue that the very method which Spinoza used was fundamentally flawed. As we will see in what follows, this was the strategy followed by Verwer.

Three years after his arrival in Amsterdam, Verwer's '*t Mom-aensicht der atheïstery afgerukt (The Mask of Atheism Torn Off)*' was published; according to Jonathan I. Israel, it 'provides an intriguing glimpse into the fraught world of amateur philosophical debate in Amsterdam in the early 1680s'.⁷⁹ It contains a refutation of Spinoza's *Ethics* (1677).⁸⁰ Oudaen's accompanying poem, which he sent on 5 July 1683, after having received a copy of '*t Mom-aensicht*', as Verwer recorded at the end of a letter which Oudaen sent on 2 July,⁸¹ stated that, in this work, Verwer had 'chained the hellhound [i.e. Spinoza] and subdued its barking from three throats'.⁸² Verwer was exposed to Spinoza's writings for the first time in 1682, upon which he immediately started working on '*t Mom-aensicht*,

74 Pierre Bayle, *Dictionnaire historique et critique*, 2 vols (Reiniers Leers, Rotterdam, 1697), vol. 1, p. 1083: 'le premier qui ait réduit en système l'Atheïsme, & qui en ait fait un corps de doctrine lié & tissu selon les manieres des Geometres'.

75 Willem van Blijenbergh, *Wederlegging van de Ethica of Zede-Kunst, van Benedictus de Spinosa* (by de Weduwe van Jasper and by Dirck Goris, Dordrecht, 1682), p. 3 (in the chapter 'Wederleggingh over het eerste deel der Zedekunst van God. Door B.D.S.').

76 Quoted from W. N. A. Klever, 'Letters to and from Neercassel about Spinoza and Rieuwerts', *Studia Spinozana* 4, 329–340 (1988), at pp. 338–339: 'per Philosophiam et inanem fallaciam secundum traditionem hominum Geometrarum'.

77 [Frans Kuyper], *Korte en bondige wederlegging van het wiskunstig bewijs van B. D. Spinosa* (s.n., s.l., 1687), pp. 75–114. For more background, see Michael John Petry, 'Kuyper's analysis of Spinoza's axiomatic method', in *Spinozas Ethik und ihre frühe Wirkung* (ed. Konrad Cramer, Wilhelm G. Jacobs and Wilhelm Schmidt-Biggemann), pp. 1–18 (Herzog August Bibliothek, Wolfenbüttel, 1981).

78 [Kuyper], *op. cit.* (note 77), p. 87: 'zijn Atheïstische stellingen, wiskunstiglijk, dat is onfeilbaarlijk'.

79 Israel, *op. cit.* (note 44), p. 309.

80 Anthony J. Klijnsmit, 'Spinoza en Verwer: een zeventiende-eeuws meningsverschil over de grondslagen van de wetenschap', in *Accidentia. Taal- en letteroefeningen voor Jan Knol* (ed. Jan Noordegraaf and Roel Zemel), pp. 9–22 (Stichting Neerlandistiek VU, Amsterdam, 1991); Gerrit Jongeneelen, 'Disguised Spinozism in Adriaen Verwer's *Momaensicht*', in *Disguised and overt Spinozism around 1700: papers presented at the International Colloquium held at Rotterdam, 5–8 October 1994* (ed. Wiep van Bunge and Wim Klever), pp. 15–21 (Brill, Leiden, New York and Cologne, 1995); Israel, *op. cit.* (note 44), pp. 309–310; Vermij, *op. cit.* (note 5), pp. 190, 191, 193–194; van de Bilt, *op. cit.* (note 2), pp. 39–42; Wiep van Bunge, 'The waning of the Radical Enlightenment in the Dutch Republic', in *Reassessing the Radical Enlightenment* (ed. Steffen Ducheyne), pp. 178–193 (Routledge, Abingdon and New York, 2017), at pp. 182–183; and Steffen Ducheyne, 'Constraining mathematical imagination by experience: Nieuwentijt and van Musschenbroek on the abuses of mathematics', *Synthese* (forthcoming).

81 Joachim Oudaen, Letter to Verwer, 2 July 1683, Erasmuszaal 14 A 13:2, f. 2v, Central Library Rotterdam, Rotterdam. This letter contains a longer poem in which Oudaen, who had not read '*t Mom-aensicht*' at that point (f. 4v), expressed his uncertainty about the positive outcome of the publication: 'Oh Verwer, is that battle potent enough to outweigh the fear of danger or the advantage of victory?' (f. 1r). For a transcription, see Melles, *op. cit.* (note 44), pp. 191–194.

82 A. V., *op. cit.* (note 49), [***3v]: 'Den Hel-hond vast gelegd, en 't bassen uyt die kelen/Bedwongen'.

which he finished shortly thereafter, according to his own testimony.⁸³ He came to know Spinoza's work through contact 'with some wise men, now mostly deceased'.⁸⁴ According to Verwer, in his *Ethics* Spinoza 'tricked the entire world', because he demonstrated the consequences of certain hypotheses without proving these very hypotheses.⁸⁵ Followers of Spinoza blindly endorsed Spinoza's unproven suppositions.⁸⁶

Verwer argued that all demonstrations of the truth of a proposition are based on principles (*gronden*) that are grounded either in *entia realia*, i.e. in things that actually exist and that can only be known a posteriori,⁸⁷ or in *entia rationis*, i.e. things that are simply presupposed by our reason (*verstand*). If a demonstration is based on *entia realia*, which is the case in physics for instance, then the conclusion derived from this demonstration—supposing that the conclusion is inferred correctly—will make a truthful statement about the world. If, however, a demonstration is based on *entia rationis*, which is the case in mathematics, then the conclusion derived from this demonstration—again, supposing that the conclusion is inferred correctly—will simply deduce the consequences of what is being presupposed. Whereas demonstrations based on *entia realia* have 'an undeniable persuasiveness for any intellect', demonstrations based on *entia rationis* have no such persuasiveness.⁸⁸ This epistemological distinction testifies to Verwer's empirical bent. He did not criticize the usefulness of mathematics as such; rather he wanted to convey that mathematics cannot provide us with truths about the actual world. Correspondingly, he advocated the idea that, if we wish to obtain real knowledge, we should rely on 'pure natural reasoning' ('suyvere' or 'bloote nateurlijke redenering'), i.e. on reasoning drawn from phenomena, and thus freed from the yoke of arbitrary suppositions. If we rely on 'natural' reasoning, we will be able to uncover both eternal and temporal truths, he asserted.⁸⁹

In 't *Mom-aensicht*, Verwer tried to show that the doctrine of dependence (*dependentie*), according to which creation depends on God, is correct, while the doctrine of independence (*independentie*), according to which creation is independent from God, is mistaken. He pointed out that the doctrine of independence is endorsed by atheists (*God-verloochenaers*) such as Niccolò Machiavelli, Lucilio Vanini, Thomas Hobbes and Spinoza.⁹⁰ In order to prove the doctrine of dependence 'by means which our opponents approve in their own writings',⁹¹ Verwer argued that local motion (*motus localis*) is not essential to bodies. If it were essential to bodies, then there would be no bodies at rest. He also argued that the first cause of local motion is to be found in a cause that is different from and external to matter, and that this cause is God.⁹² Verwer used proofs grounded in what he believed to be empirical considerations to argue for God's existence.

83 *Ibid.*, p. 75.

84 *Ibid.*, [*3v]. It is unclear through whom Verwer learned about Spinoza's philosophy. Johannes Bouwmeester (1630–1680), Lodewijk Meyer (1629–1681) and Jarig Jelles (1619/20–1683) are potential candidates.

85 *Ibid.*, [*3v].

86 *Ibid.*, p. 78.

87 *Ibid.*, p. 17.

88 *Ibid.*, p. 3.

89 *Ibid.*, pp. 45–6. See also Adriaen Verwer, Letter to David Gregory, 25 January 1703 ['XIII Kalend. Februar. MDCCIII'], Add. Ms. 9597.13.5, ff. 246r–247v at f. 247r, Cambridge University Library, Macclesfield Collection, Cambridge: 'per naturale ratiociniūm'; Stephen Jordan Rigaud (ed.), *Correspondence of scientific men of the seventeenth century*, 2 vols (The University Press, Oxford, 1841), vol. 1, pp. 251–252.

90 A. V., *op. cit.* (note 49), p. 6.

91 *Ibid.*, ***.

92 *Ibid.*, pp. 10–11.

Immediately before providing the proofs for these claims, he pointed out that the figments of the defenders of independence are shattered 'against the firm-standing wall of experience'.⁹³ His proofs are structured as follows. First, there is a statement of the proposition (*voorstel*) that needs to be proved; second, there is a demonstration (*betooging*) of that proposition; and, third, there is a concluding *scholium* (*leering*) explicating the broader significance or implications of what has been proved. Verwer's proofs are structured 'mathematically', i.e. they follow the format *propositio*–*demonstratio*–*scholium*, but the premises used are drawn from phenomena, showing yet again that there is a significant empirical orientation in his thinking. He remarked that his conclusion that God is the direct or indirect cause of local motion, and other conclusions concerning God's attributes, are 'obtained solely from natural reason'.⁹⁴

Verwer referred to Johannes Bouwmeester's Dutch translation of *Philosophus autodidactus* (1671), which contained the story of a fictitious feral child living alone on a deserted island who through critical inquiry acquires knowledge about himself, nature and God 'without any human interaction or divine revelation'.⁹⁵ When this individual finally enters the civilized world at an adult age, he notices that the knowledge he has acquired through critical inquiry corresponded to the ideas expressed in the Qur'an. Verwer pointed out that, when Bouwmeester's translation appeared, some fanatics used this story 'to prove that through reason one could rise as high as through the revelations in our New Testament'.⁹⁶ Therefore, contrary to what has been claimed,⁹⁷ Verwer did not endorse the view according to which *all* religious truths can be learned through natural reason.

After having summarized the main theses developed in Spinoza's *Ethics*,⁹⁸ which is written in 'an order that is common in mathematics',⁹⁹ Verwer painstakingly analysed Spinoza's argumentation. Without going into further detail, the upshot of his analysis is that Spinoza's *Ethics* assumes independence rather than proving it:

When one realizes that this [doctrine of] independence, which is the only bedrock of Spinoza's philosophy, is not only presupposed but also by its very nature devoid of any proof so that it is and will be impossible for him or anyone else ever to substantiate it, and, moreover, when one has already learned that the [doctrine of] dependence is on solid ground, what can be concluded about the entire building that is based on independence? Nothing else than that it will crumble down in an instant as soon as the storms and winds of dependence strike it with force.¹⁰⁰

⁹³ *Ibid.*, p. 10: 'tegen de pal-staende muer der ondervinding'.

⁹⁴ *Ibid.*, p. 42: 'gehaelt sijn uyt de enkele naturelijke Reden'.

⁹⁵ [Johannes Bouwmeester], *Het leeven van Hai Ebn Yokdhan, in het Arabisch beschreeven door Abu Jaaphar Ebn Tophail, en uit de Latijnsche overzettinge van Eduard Pockock (The life of Ḥayy ibn Yaqzān, described in Arabic by Ibn Ṭufay and translated into English by Edward Pockock) (Jan Riewerts., Amsterdam, 1672)*. Edward Pococke's *Philosophus autodidactus* was a translation of Ḥayy ibn Yaqzān, whose author was the twelfth-century Andalusian Muslim scholar Ibn Ṭufay.

⁹⁶ A. V., *op. cit.* (note 49), pp. 43–44: 'om te bewijzen, dat men door de Reden soo hoog konde opklimmen in de kennis der Geestelijke saken, als door de Openbaringen onses Nieuwen Verbonds'.

⁹⁷ Jongeneelen, *op. cit.* (note 80), p. 17.

⁹⁸ A. V., *op. cit.* (note 49), pp. 50–63.

⁹⁹ *Ibid.*, p. 54: 'een ordre, die in de Wis-konst gebruykelijk is'. Verwers also remarked that Spinoza pulled his so-called *Ethics* through the reel of a mathematical order (*ibid.*, **3v).

¹⁰⁰ *Ibid.*, p. 66: 'Wanneer men dan aldus, . . . , siet, dat dese *Independentie*, die d'eenigste grondslag der Filosofie van *Spinoza* is, by hem niet alleen is voor-onderstelt; maer ook uyt hare nature soo verre ontbloomt is van bewijs, dat het noch hem, nochte yemand ooyt mogelijk is of sijn sal om die te konnen vast maken; en daer en tegen, hiervoor gesien heeft dat de *Dependentie* op onverwrikbare voeten staet: wat valt hier uyt te beslyuten van het heele Gebouw, 't welk daer op gesticht is? niets anders, dan dat, soo dra de stormen en winden der *Dependentie* daer met kragt op aen ruysschen, het in een oogenblik ter neder stort.'

It has been claimed that Verwer's opinion of Spinoza's analysis of the passions is positive.¹⁰¹ However, he clearly rejects Spinoza's treatment of the passions insofar as it is 'grounded in independence'.¹⁰² In '*t Mom-aensicht*', he offers 'mathematical' demonstrations, in the sense that his proofs are structured according to the scheme *propositio–demonstratio–scholium*, a scheme that structurally corresponds to the form of argumentation of Spinoza's *Ethics*.¹⁰³ However, epistemologically there is a major difference between Verwer and Spinoza, for the former urges that proper knowledge about the world is to be based, not on *entia rationis*, but on *entia realia*.

ENTERING THE REPUBLIC OF LETTERS

Verwer corresponded with David Gregory,¹⁰⁴ who studied mathematics at the University of Leyden and left his position as professor of mathematics at the University of Edinburgh to become Savilian Professor of Astronomy at the University of Oxford in December 1691. Newton had recommended Gregory for the professorship in July;¹⁰⁵ the two men frequently corresponded, and Gregory became one of Newton's *intimi*. Only two letters from Verwer to Gregory have been preserved,¹⁰⁶ and it is unclear how frequently they corresponded. It has been observed that letters helped 'to create a community of learned persons inside and outside universities, who were interested in the advance of knowledge'.¹⁰⁷ In May and June 1693, Gregory made a visit to the Dutch Republic, during which he met Hudde and Frederik Ruysch (1638–1731) in Amsterdam, and Huygens, with whom he corresponded, at Hofwijck in Voorburg and Leyden.¹⁰⁸ In a memorandum which was written in Leyden and dated 29 June 1693, Gregory created a

101 Jongeneelen, *op. cit.* (note 80), p. 19. Jongeneelen seems to have based his judgement on: 'Concerning the passions one finds clever ways of distinguishing in the *Ethics*' (Verwer, *op. cit.* (note 49), p. 83).

102 A. V., *op. cit.* (note 49), p. 84.

103 See also Edwin M. Curley, 'Spinoza's geometric method, *Studia Spinozana* 2, 151–169 (1986); van Bunge, *op. cit.* (note 40), pp. 40–44.

104 On Gregory, see W. G. Hiscock (ed.), *David Gregory, Isaac Newton and their circle: extracts from David Gregory's memoranda, 1677–1708* (printed for the editor, Oxford, 1937); Christina M. Eagles, 'David Gregory and Newtonian science', *Br. J. Hist. Sci.* 10, 216–225 (1977); Christina M. Eagles, 'The mathematical work of David Gregory, 1659–1708', PhD thesis, University of Edinburgh (1977); Anita Guerrini, 'The Tory Newtonians: Gregory, Pitcairne and their circle', *J. Br. Stud.* 25, 288–311 (1986); and John Friesen, 'Archibald Pitcairne, David Gregory and the Scottish origins of English Tory Newtonianism, 1688–1715', *Hist. Sci.* 41, 163–191 (2003).

105 Westfall, *op. cit.* (note 21), p. 500.

106 Namely Adriaen Verwer, Letter to David Gregory, 23 August 1691 ['X kalendas Septembris anni MDCXCI'], Tanner Ms. 26, ff. 46r–47v, continued on f. 42r, Bodleian Library, Oxford; and Verwer, *op. cit.* (note 89). For a discussion of both letters, see Vermij, *op. cit.* (note 5), pp. 186–188 and 193–194. See Mojet, *op. cit.* (note 10), pp. 132–142, for a transcription of Verwer's 1691 letter. Verwer's 1703 letter to Gregory is transcribed in Rigaud, *op. cit.* (note 89), vol. 1, pp. 248–253. Gregory mentioned Verwer's 1691 letter to Newton: 'Yesterday [i.e. on 26 August] I gott letters from those Amsterdammers of whom I spoke to you' (David Gregory, Letter to Isaac Newton, 27 August 1691, in Newton, *op. cit.* (note 16), vol. 3, p. 166).

107 Gabrielle Del Lungo Camiciotti, 'Letters and letter writing in early modern culture: an introduction', *J. Early Mod. Stud.* 3, 17–35 (2014), at p. 27.

108 Memorandum by David Gregory on 30 June 1693, in Newton, *op. cit.* (note 16), vol. 3, p. 274, n. 1. Gregory visited Huygens in May and June. The memoranda of his conversations with Huygens are dated 16, 17 and 18 May and 6 and 30 June 1693 (Coll-33/Quarto A [8], f. 20r; Coll-33/Quarto A [31], f. 37v; Coll-33/Quarto A [8], f. 20v; Coll-33/Quarto A [4], f. 18r; and Coll-33/Quarto A [14], f. 24r, Edinburgh University Library, Special Collections, Edinburgh (henceforth EULSC), respectively). On these occasions they discussed *inter alia* dioptrics, centripetal and centrifugal forces, de Duillier's account of gravitation, Huygens' pendulum clock and his criticism of Newton's work, including his notion of absolute space (Coll-33/Quarto A [4], ff. 18r–19r; and Coll-33/Quarto A [8], f. 20r–v, EULSC). In Amsterdam Gregory visited Hudde on 27 May 1693 to discuss mathematics (Coll-33/Quarto A [9], f. 21r–v, EULSC), and Ruysch on 24 May (Coll-33/Quarto A [10], f. 22r–v, EULSC).

to-do list which contains the following items: ‘To talk with M^r Huygens about his Dioptricks and mine’ and ‘To settle a correspondence with Volder, Leers Verwer, vander Aa’.¹⁰⁹

In a letter written in August 1691, Verwer provided an overview of the state of the art of Dutch mathematics. He told Gregory that Hudde was heavily distracted by his duties as a member of the Amsterdam *vroedschap*, and that it was unlikely that he would return to his mathematical studies.¹¹⁰ He also informed Gregory that he was unaware of what Huygens had been up to since the publication of *Traité de la lumière* (1690), but that it did not seem that he had said farewell to his scholarly pursuits. He reported, moreover, that de Volder, who seems to have only occasionally visited Amsterdam as reported by Le Clerc,¹¹¹ was affected by the censorship installed by the orthodox Calvinist Frederic (Friedrich) Spanheim the Younger (1632–1701) at the University of Leyden.¹¹² In passing, he mentioned some of Gerard Kinckhuysen’s (c.1625–1666) contributions to mathematics, and he noted that Abraham de Graaf (1635–1717), whom he knew personally, had not been very active mathematically since the publication of his *De beginselen van de algebra of stelkonst* (*Principles of Algebra*) (1672).¹¹³

Verwer thanked Gregory for sending him a copy of his *Excercitatio de geometrica de dimensione figurarum* (1684), and asked him to thank Archibald Pitcairne (1657–1713), who would briefly become professor of medicine at the University of Leyden between

109 Gregory Ms. 247, f. 81r, Royal Society Library, London. This memorandum was first mentioned in Vermij, *op. cit.* (note 5), p. 186, n. 15.

110 Hudde became an alderman of Amsterdam in 1667 and burgomaster in 1672. In 1682 he told a correspondent of Leibniz that he had spent little to no time on mathematics over the last fifteen years, i.e. since 1667 (Jan A. van Maanen, ‘Korrespondenten van G.W. Leibniz: 11. Johan Jacob Ferguson’, *Stud. Leibnitiana* 22, 203–216 (1990), at p. 206; Johan Jacob Ferguson, Letter to G. W. Leibniz, 11 January 1682, in G. W. Leibniz, *Leibniz. Sämtliche Schriften und Briefe, Reihe III. Mathematischer, naturwissenschaftlicher und technischer Briefwechsel* (ed. Archiv/Leibniz-Forschungsstelle Hannover), vol. 3, p. 537 (Akademie Verlag, Berlin 1923–)). On Hudde, see Karlheinz Haas, ‘Die mathematischen Arbeiten von Johann Hudde (1628–1704), Bürgermeister von Amsterdam’, *Centaurus* 4, 235–284 (1956); Rienk Vermij, ‘Bijdrage tot de bio-bibliografie van Johannes Hudde’, *Gewina* 18, 25–35 (1995); Wim Klever, *Mannen rond Spinoza (1650–1700). Presentatie van een emanciperende generatie* (Verloren, Hilversum, 1997), pp. 53–60; Theo de Jong and Huib Zuidervaart, ‘*Philosophus et mathematicus incomparabilis*: Johannes Hudde (1628–1704), de Verlichte burgemeester van Amsterdam’, *Studium* 11, 26–54 (2018); and Wiep van Bunge, ‘Hudde en Spinoza: waarom er maar één God is’, *Studium* 11, 55–61 (2018).

111 [Le Clerc], *op. cit.* (note 12), p. 347. De Volder, Hudde and Spinoza held meetings in Amsterdam during and after 1665 (P. Baert, Letter to Christiaan Huygens, 5 February 1676, in Huygens, *op. cit.* (note 11), vol. 8, pp. 3–4).

112 In 1676, Spanheim passed a prohibition of the public and private defence of some twenty theses, and of the teaching of Descartes’ metaphysics at the University of Leyden. The targets of Spanheim’s action were the followers of Johannes Coccejus (1603–1669) and Descartes (see P. C. Molhuysen, *Bronnen tot de geschiedenis der Leidsche universiteit, 1574–1211*, 7 vols (M. Nijhoff, ’s-Gravenhage, 1913–1924), vol. 3, pp. 317–321). Descartes’ natural philosophy was not targeted. De Volder was involved in the protest against Spanheim’s prohibition, which ultimately led to the dismissal of the theologian Abraham Heidanus (1597–1678). De Volder was responsible for the foundation of the *Theatrum physicum* in 1675. In the preceding year he visited Newton in Cambridge, as is clear from a letter which he sent to Newton in 1684 (Hall, *op. cit.* (note 11), p. 11). On de Volder, see C. Louise Thijssen-Schoute, *Nederlands Cartesianism* (HES, Utrecht, 1989; first published 1954), pp. 52–58; W. N. A. Klever, ‘Burchard de Volder (1643–1709): a crypto-Spinozist on a Leiden cathedra’, *Lias* 15, 191–241 (1988); Henri Krop, ‘Medicine and philosophy in Leiden around 1700: continuity or rupture?’, in *The early Enlightenment in the Dutch Republic, 1650–1750* (ed. Wiep van Bunge), pp. 173–196 (Brill, Leiden and Boston, 2003), at pp. 173–196, 186–194; Paul Lodge, ‘Burchard de Volder: crypto-Spinozist or disenchanted Cartesian?’, in *Receptions of Descartes: Cartesianism and anti-Cartesianism in early modern Europe* (ed. Tad M. Schmaltz), pp. 128–146 (Routledge, London, 2005); Gerhard Wiesenfeldt, *Leerer Raum in Minervas Haus. Experimentelle Naturlehre an der Universität Leiden, 1675–1715* (Royal Netherlands Academy of Arts and Sciences/Verlag für Geschichte der Naturwissenschaften und der Technik, Amsterdam/Diepholz, 2002), pp. 79–82, 89–93, 108–117, 124–130, 225–231; Tammy Nyden, ‘De Volder’s Cartesian physics and experimental pedagogy’, in *Cartesian empiricisms* (ed. Mihnea Dobre and Tammy Nyden), pp. 227–249 (Springer, Dordrecht, 2013); and Paul Lodge (ed. and trans.), *The Leibniz–De Volder correspondence: with selections from the correspondence between Leibniz and Johann Bernoulli* (Yale University Press, New Haven, 2013).

113 Abraham de Graaf, *De beginselen van de algebra of stelkonst, volgens de manier van Renatus Des Cartes* (Jan Rieuwertsz, Amsterdam, 1672).

1692 and 1693, where he had little impact on the spread of Newton's ideas in the Dutch Republic,¹¹⁴ for sending a copy of a book which Verwer characterized as an 'epicheirema'.¹¹⁵ He also told Gregory that he had communicated his letters, which are now lost, to his friend the broker Jan Makreel, 'a man most skilled in analytic studies' to whom he did not dare to compare himself.¹¹⁶ The enigmatic Makreel was an acquaintance and correspondent of E. W. von Tschirnhaus (1651–1708), and he brought Bernard Nieuwentijt's (1654–1718) mathematical work to the attention of G.W. Leibniz (1646–1716), who soon disagreed with its contents.¹¹⁷ Makreel was also an acquaintance of Hudde, who gave him a single-lens microscope.¹¹⁸ Nieuwentijt was also on familiar terms with Hudde.¹¹⁹ In addition, Verwer informed Gregory that one of the editors of the *Bibliothèque universelle et historique* (1686–1693; which played a significant role in the diffusion of English learning¹²⁰), Le Clerc, whom he identified as a 'friend of ours (*nobis amicus*)', would be willing to publish Gregory's work, should he have any plans to publish in the Dutch Republic.¹²¹

Le Clerc, another *savant* who studied the first edition of the *Principia*, took issue with the introduction of metaphysics into theology by Descartes, Spinoza and Bayle, as a result of which they corrupted religion.¹²² Having settled in Amsterdam in 1683, in the mid 1680s

114 G. A. Lindeboom, 'Pitcairne's Leyden interlude described from the documents', *Ann. Sci.* **19**, 273–284 (1963). For further background, see Anita Guerrini, 'Archibald Pitcairne and Newtonian medicine', *Med. Hist.* **31**, 70–83 (1987); and, more recently, Alasdair Raffae, 'Archibald Pitcairne and Scottish heterodoxy, c. 1688–1713', *Hist. J.* **60**, 633–657 (2017).

115 Verwer, *op. cit.* (note 106), f. 46r–v. On David Gregory's *Exercitatio de geometria de dimensione figurarum, sive specimen methodi generalis dimetiende quasvis figuras* (Ex officina Jacobi Kniblo, Josuae Solingensis et Johannis Colmarii, Edinburgi, 1684), see D. T. Whiteside, *The mathematical papers of Isaac Newton*, 8 vols (Cambridge University Press, Cambridge, 1967–1981), vol. 4, pp. 413–416, for discussion. The book by Pitcairne to which Verwer was referring was possibly Pitcairne's *Solutio problematis de historicis; seu, inventoribus* (see Mojet, *op. cit.* (note 10), p. 133, n. 6), which on a very general level can be considered as a plea to prefer demonstrations, i.e. proofs that show that it is impossible for the *demonstrandum* to be otherwise, over probabilities, i.e. proofs that cannot show that what is to be proven cannot be otherwise (Archibald Pitcairne, *Solutio problematis de historicis; seu, inventoribus* (Typis Joannis Reid, Edinburgi, 1688), p. 12). For discussion, see Whiteside, *op. cit.* (this note), vol. 7, pp. 5–6; and Stephen M. Stigler, 'Apollo mathematicus: a story of resistance to quantification in the seventeenth century', *Proc. Am. Philos. Soc.* **136**, pp. 93–126 (1992), at pp. 98–101. Pitcairne's *Solutio de problematis de historicis* 'could be understood to promote a general scepticism towards all historical texts' including the Scriptures (Raffae, *op. cit.* (note 114), p. 644).

116 Verwer, *op. cit.* (note 91), f. 46r–v.

117 R. H. Vermij, 'De Nederlandse vriendenkring van E.W. von Tschirnhaus', *Tijdschrift voor de geschiedenis der geneeskunde, natuurwetenschappen, wiskunde en techniek* **11**, 153–178 (1988); Huygens, *op. cit.* (note 11), vol. 10, p. 717. The books which Makreel sent to Leibniz were Bernard Nieuwentijt, *Considerationes circa analyseos ad quantitates infinite parvas applicatae principia, et calculi differentialis usum in resolvendis problematibus geometricis* (Johannes Wolters, Amsterdam, 1694) and Bernard Nieuwentijt, *Analysis infinitorum, seu curvilinearum proprietates ex polygonorum natura deductae* (Johannes Wolters, Amsterdam, 1695). For discussion of Leibniz's response to Nieuwentijt's mathematical work, see Carl B. Boyer, *The history of the calculus and its conceptual development* (Dover, New York, 1959), pp. 213–215; Rienk H. Vermij, *Secularisering en natuurwetenschap in de zeventiende en achttiende eeuw* (Rodopi, Amsterdam, 1991), pp. 24–34; Rienk H. Vermij, 'Bernard Nieuwentijt and the Leibnizian calculus', *Stud. Leibnitiana* **21**, 69–86 (1989); Paolo Mancosu, *Philosophy of mathematics and mathematical practice in the seventeenth century* (Oxford University Press, Oxford and New York, 1996), pp. 158–164; and Fritz Nagel, 'Nieuwentijt, Leibniz, and Jacob Hermann on infinitesimals', in *Infinitesimal differences: controversies between Leibniz and his contemporaries* (ed. Dursula Goldenbaum and Douglas Jesseph), pp. 199–214 (Walter de Gruyter, Berlin, 2008).

118 Tiemen Cocquyt, Marvin Bolt and Michael Korey, 'Hudde en zijn gesmolten microscooplensjes', *Studium* **11**, 78–95 (2018), at p. 87; Claas Bruin, *De lustplaats Soelen, in dichtmaat uitgebreid* (Marten Schagen, Amsterdam, 1723), p. 106, n. (a).

119 Bernardus Nieuwentijt, *Considerationes secundae circa calculi differentialis principia, & Responsio ad Virum Nobilissimum G.G. Leibnitium* (Apud Joannem Wolters, Amstelædami, 1696), pp. 35–36.

120 Hans Bots, 'Jean Leclerc as journalist of the *Bibliothèques*: his contribution to the spread of English learning on the European Continent', in *Studies in seventeenth-century English literature, history and bibliography* (ed. G. A. M. Janssens and E. G. A. M. Aarts), pp. 53–66 (Rodopi, Amsterdam, 1984).

121 Verwer, *op. cit.* (note 106), f. 42r–v.

122 [Charles Le Cène and Jean Le Clerc], *Entretiens sur diverses matieres de theologie* (Henry Wetstein, Amsterdam, 1685), a4r–a6v: 'One knows that – like Plato's and Aristotle's metaphysics introduced many things in Christian religion in the past that

he met John Locke (1632–1704), who was in voluntary exile in the Dutch Republic between 1683 and 1689,¹²³ through Philipp van Limborch (1633–1712), who had been professor of theology at the Remonstrant Seminary since 1668.¹²⁴ In order to conceal his identity, Newton planned to anonymously publish a French version of *A Historical Account of Two Notable Corruptions in Scripture* in the Dutch Republic in the early 1690s. Locke asked Le Clerc to translate it into French. By the time that the translation was finished, Newton had cold feet and he instructed Locke to annul all plans to publish it.¹²⁵ In 1688, a brief and descriptive review of Newton's *Principia* appeared in Le Clerc's journal.¹²⁶ It has been suggested the author of the review was Locke or de Duillier.¹²⁷ However, in Le Clerc's own review of the second edition of the *Principia* he noted that 'The first edition of this book appeared in 1687, and we have published a small extract composed by Mr. Locke in the eighth tome of the *Bibliothèque universelle*.'¹²⁸

In his 1696 physics textbook, Le Clerc reported that, according to Newton, the primary and secondary planets are maintained in their orbits by a force 'which he does not define (*quod non definit*)', and that this force is 'inversely proportional to the square of the distances between their centres'. He also pointed out that the 'most sharp-minded (*acutissimus*)' Newton had concluded that the hypothesis of vortices conflicted with astronomical observation.¹²⁹ Here Le Clerc referred to the *scholium* to Proposition 53 in Book II of the *Principia*,¹³⁰ which he quoted *in extenso*.¹³¹ Given Newton's demonstration in this *scholium*, 'it is difficult for the intellect [to understand] in what way the fluid matter, which encircles the sun, in no way affects [the regular motion of] the

have no connection to the doctrine of the Apostles – the metaphysics of Descartes and his followers ... has begun to introduce arguments entirely opposed to our theology which many people nevertheless want to pass for articles of faith. ... Some of his disciples have thought that there is nothing evident but their metaphysics, and that all religion is thus to be explained in terms of abstract ideas that are full of illusion and error. It is not only Spinoza who wanted to make a religion entirely metaphysical, or rather destroy every kind of religion in order to replace it with his philosophy. ... They have more particularly taken examples of erroneous [Biblical] references from Father Malebranche – not that he was the only one who used them so, but because it is him who made the greatest effort in our century to confuse metaphysics and religion. ... [I]t has been thought that one should bring errors capable of ridiculing the Christian Religion to the attention of the public if the day came that it is believed that metaphysicians are good interpreters of the Gospel'.

123 Locke's patron Anthony Ashley Cooper, the Earl of Shaftesbury, fled to the Dutch Republic because of his involvement in the Exclusion Crisis, during which unsuccessful attempts were made to exclude Charles II's Catholic brother, who would later become James II in 1685, from the succession of the throne. On the Exclusion Crisis, see e.g. Marks Knights, *Politics and opinion in crisis, 1678–81* (Cambridge University Press, Cambridge, 1994).

124 See Luisa Simonutti, 'Religion, philosophy, and science: John Locke and Limborch's circle in Amsterdam', in *Everything connects: in conference with Richard H. Popkin. Essays in his honour* (ed. James E. Force and David S. Katz), pp. 293–324 (Brill, Leiden, Boston and Cologne, 1999). On Le Clerc, see Annie Barnes, *Jean Le Clerc (1657–1736) et la République des lettres* (Librairie E. Droz, Paris, 1938); Maria Cristina Pitassi, *Entre croire et savoir. Le problème de la méthode critique chez Jean Le Clerc* (Brill, Leiden, 1987); and Israel, *op. cit.* (note 44), pp. 449–453, 464–471.

125 Westfall, *op. cit.* (note 21), pp. 490–1; Grantley McDonald, *Biblical criticism in early modern Europe: Erasmus, the Johanneine comma and Trinitarian debate* (Cambridge University Press, Cambridge, 2016), pp. 174–178.

126 *Bibliothèque universelle et historique* 8, 436–450 (1688).

127 James L. Axtell, 'Locke's review of the *Principia*', *Notes Rec. R. Soc. Lond.* 20, 152–161 (1965); J. K. van der Korst, 'Natuurwetenschappen en geneeskunde in de *Bibliothèque universelle et historique*', in *De 'Bibliothèque universelle et historique' (1686–1693). Een periodiek als trefpunt van geleterd Europa* (ed. H. Bots, H. Hillenaar, J. Janssen, J. van der Korst and L. van Lieshout), pp. 345–391 (APA-Holland Universiteits Pers, Amsterdam, 1981), at pp. 379–380.

128 *Bibliothèque ancienne et moderne* 1, 69–96 (1714), at p. 69: 'La premiere Edition de ce Livre parut en MDCLXXXVII. & nous en publimes un petit Extrait, composé par fue Mr. Locke, dans le VIII. Tome de la *Bibliothèque Universelle*.' See also J. R. Milton, 'Locke's publications in the *Bibliothèque universelle et historique*', *Br. J. Hist. Philos.* 19, 451–472 (2011), at pp. 454–455.

129 Le Clerc, *op. cit.* (note 13), p. 35.

130 Isaac Newton, *The Principia: mathematical principles of natural philosophy* (ed. and trans. I. Bernard Cohen and Anne Whitman) (University of California Press, Berkeley, 2016), pp. 789–790.

131 Le Clerc, *op. cit.* (note 13), pp. 34–5; short references to Newton are to be found on pp. 45, 42, 49, 60, 62, 63 and 155.

planets that float in it'.¹³² It has been claimed that Le Clerc described the force of gravity 'as inversely proportional to the distance (rather than to its square)',¹³³ which might lead readers to believe that Le Clerc's understanding of the *Principia* in the *Physica* was not up to scratch. However, the source consulted in order to support this claim was a later edition of Le Clerc's *Physica* that is affected by a typographical error.¹³⁴ Le Clerc also remarked that, according to Newton, the weights of the planets are proportional to their masses, and he called attention to Newton's statement 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 account of heat from the sun'.¹³⁵ Although Le Clerc was clearly not a skilled mathematician, he was well informed about the main tenets developed in the *Principia* around 1696.

In the bulk of his letter to Gregory, Verwer discussed a number of mathematical problems, some of which he discussed with Makreel, namely the determination of the centre of gravity, the properties of different sorts of curves, and the catenary.¹³⁶ He also confided to Gregory that the mind sees poorly if it loses track of the connection between all sciences, and that, if we study sciences such as mathematics, philosophy, theology and jurisprudence separately, we are like pagans who worship several deities individually. In this context, he revealed his endeavour to connect mathematics 'to the whole of knowable topics (*cum materiae scibilis toto*)'.¹³⁷ Although Verwer's plans were extremely sketchy, it is clear that he identified mathematics as the discipline that would connect different scientific branches.

VERWER AS A READER OF THE FIRST EDITION OF THE *PRINCIPIA*

Verwer's copy of the first edition of Newton's *Principia* has recently been discovered. It contains his own annotations and a set of annotations that signalled differences with the second and third editions of the *Principia* (1713 and 1726).¹³⁸ Verwer seems not to have been the author of this second set of annotations, because close inspection reveals that they were written by a later, unknown hand (see figures 1 and 2). There are therefore no indications that Verwer ever read the second edition of the *Principia*. Moreover, it cannot be inferred from his copy when exactly he studied the *Principia*. Verwer referred to the *Principia* in his 1698 *Inleiding tot de christelyke Gods-geleertheid*. From a letter to Gregory, we also know that he was studying the *Principia* in early 1703.¹³⁹ It seems that he studied it at least until 1713, because his copy contains a couple of references to his own, now lost, 'mechanical notes' (*adversaria mechanica*) of 1713.¹⁴⁰

132 *Ibid.*, p. 35: 'At difficillimum est intellectu, quomodo materia fluida, quæ circa Solem rapitur, Planetas in ea fluentes nullatenus afficiat'.

133 Rienk Vermij, *The Calvinist Copernicans: the reception of the new astronomy in the Dutch Republic, 1575–1750* (Royal Netherlands Academy of Arts and Sciences, Amsterdam, 2002), p. 351.

134 *Ibid.*, p. 351, n. 53; Jean Le Clerc, *Opera philosophica*, 4 vols (George Gallet, Amsterdam, 1700), vol. 3, p. 50.

135 Newton, *op. cit.* (note 130), p. 814, n. cc; Le Clerc, *op. cit.* (note 13), p. 36.

136 This is discussed at length in Mojet, *op. cit.* (note 10), pp. 124–127, so I do not repeat the details here.

137 Verwer, *op. cit.* (note 106), f. 46v.

138 The annotations in this second hand are to be found at MAG: Rariora Qu 291, UUL, pp. 40, 41, 42, 43, 44, 45, 47, 49, 59, 60, 106, 109, 118, 122, 150, 154, 159, 243, 256, 259, 260, 262, 264, 269, 271, 272, 274, 282, 286, 288, 289, 301, 313, 316, 321, 323, 327, 330, 332, 339, 340, 342, 345, 346, 347, 348, 349, 350, 353, 354, 363, 364, 366, 369, 370, 402, 403, 404, 405, 406, 407, 408, 411, 414, 415, 417, 419, 420, 421, 422, 424, 425, 249, 443, 456, 462, 464, 467, 468, 469, 471, 481, 485, 490, 491, 492, 493, 494, 495, 496 and 510. In my analysis, I will discard underscored pieces of text and focus on Verwer's annotations only.

139 Verwer, *op. cit.* (note 89), f. 246v; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 250.

140 MAG: Rariora Qu 291, UUL, pp. 237, 251, 374, 375.

Verwer's annotations show that he quite systematically studied the first edition of the *Principia*.¹⁴¹ The majority of his annotations occur in Book I, paying special attention to Laws 1–3 and Corollary 2 to the laws; Definitions 1–4, 7 and 8; Lemmas 1, 5, 6, 10, 11 and 14; the *scholium* to Section 1; and Propositions 1, 4 (and its *scholium*), 5, 6, 8, 9, 11, 13–17, 36, 38, 43–44 and 66. He also paid attention to Book II, Proposition 2, the *scholium* to Proposition 4, Proposition 24, the *scholium generale*, and Propositions 49, 51 and 52; and to Book III, Hypotheses 5–7, Corollaries 2–4 to Proposition 6, and Propositions 19 and 28.¹⁴² On some unnumbered pages at the end of his copy, he also summarized some of the key tenets developed in Books II and III. All in all, it was especially Book I that drew his attention.

Verwer's annotations show that he was actively engaged with Newton's *Principia*.¹⁴³ His annotations roughly fall into eight categories: *cross-references*, which serve the purpose of making sense of certain statements in the *Principia* by referring back to material that has already been explained; *references to literature*, which allowed Verwer to understand or deepen his understanding of Newton's arguments,¹⁴⁴ or, in a minority of cases, to signal points of (dis)agreement;¹⁴⁵ *explanatory notes*, in which Verwer spelled out the meaning of statements developed in the *Principia* in his own words—these notes also include formalizations of statements which Newton expressed in words rather than with the aid of mathematical symbols;¹⁴⁶ *calculations*, whereby Verwer recalculated Newton's results in order to fully grasp them; occasional *corrections*; *indices*, which provide an overview of certain claims in the *Principia*; *summaries*, which give a rundown of specific sections in the *Principia*,¹⁴⁷ or provide a synthesis of results which Verwer found important; and, finally, *comments*, in which Verwer reflected on the broader implications of certain passages in the *Principia*.¹⁴⁸

141 Verwer made annotations to Definitions 1–4, 7 and 8; to Laws 1–3 and the accompanying Corollaries 2 and 3; to Lemmas 1, 5, 10 and 11 and the accompanying *scholium*; to Book I, Propositions 1, 2, 4 (and its *scholium*), 5, 6, 8 and 9, Lemma 12, the *scholium* to Proposition 10, Proposition 11, Lemmas 13 and 14, Propositions 13–17, Lemmas 15 and 19, Proposition 24, the *scholium* to Proposition 27, Propositions 30, 36–38, 43–45 and 51, the opening of Section 11, Propositions 57–60, 65, 66 and 69 and its *scholium*, Section 12, Proposition 83, Section 13, Proposition 90, the *scholium* to Proposition 93, Section 14, and the *scholium* to Proposition 96; to Book II, Section 1, Lemma 1, Proposition 2, Corollary 4 to Proposition 3, Corollary 2 to Proposition 4 and its *scholium*, Section 2, Propositions 5 and 7, Lemma 2 and its *scholium*, Propositions 8 and 10, Sections 3 and 4, Lemma 3, the *scholium* to Proposition 16, Propositions 18, Section 5, Corollary 5 to Proposition 20, Proposition 23, Section 6, Proposition 24, Corollary 1 to Proposition 33, Proposition 35 and its *scholium*, Proposition 37 and 38, the *scholium generale*, Propositions 43 and 47–49, the *scholium* to Proposition 50, Proposition 51, and Proposition 52 and its *scholium*; and to Book III, opening, Hypotheses 5–7, Propositions 4, 6, 7, 8, 10, 11, 13, 18–22, 24, 25, 28, 30 and 36–39, Lemmas 4 and 5, and Propositions 41–42.

142 Note that, unfortunately, pages 384–399 are missing from MAG: Rariora Qu 291, UUL.

143 Here I draw on and extend the argument in Emma Mojet, 'Early Dutch interest in Newtonian mathematics: Adriaen Verwer (1654–1717) and Newton's usefulness', MSc thesis, Utrecht University (2016), pp. 46–60. On the 'active' nature of scholarly reading, see Lisa Jardine and Anthony Grafton, "'Studied for action': how Gabriel Harvey read his Livy", *P&P* 123, 30–78 (1990); and William H. Sherman, *Used books: marking readers in Renaissance England* (University of Pennsylvania Press, Philadelphia, 2008). On marginalia more generally, see H. J. Jackson, *Marginalia: readers writing in Books* (Yale University Press, New Haven and London, 2001).

144 Verwer frequently used David Gregory's work to understand the *Principia*, especially his *Astronomiae physicae et geometricae elementa* (1702). For instance, in order to understand Proposition 66 in Book I of the *Principia* he relied quite heavily on Gregory's account of it (David Gregory, *Astronomiae physicae & geometricae elementa* (E theatro Sheldoniano, Oxoniae, 1702), pp. 70–2; MAG: Rariora Qu 291, pp. 173–187, UUL). To a lesser extent, Verwer also referred to work by Isaac Barrow, Galileo Galilei, Christiaan Huygens and Euclid. See Mojet, *op. cit.* (note 143), pp. 49–53, for further discussion.

145 For instance, in an annotation to Definition 1, Verwer pointed out that, according to Descartes, gravity is not proportional to quantity of matter, whereas, according to Huygens, it is (MAG: Rariora Qu 291, p. 1, UUL).

146 See, furthermore, Mojet, *op. cit.* (note 143), pp. 55–57.

147 In Verwer's summary of Book I, Section 14, for instance, he pointed out that in this section Newton explains refraction and reflection by attractive forces (MAG: Rariora Qu 291, p. 227, UUL).

148 Verwer pointed out, for instance, that Descartes' vortices need to be abandoned, since they cannot explain the heavenly motions (e.g. MAG: Rariora Qu 291, pp. 352, 381, UUL).

[30]

vel coincidet cum tangente Ad , vel ducetur inter tangentem & curvam. Sed casus posterior est contra naturam Curvaturæ, ergo prior obtinet. *Q. E. D.*

Lemma VII.

Si idem positus, dico quod ultima ratio arcus, chordæ & tangentis ad invicem est ratio æqualitatis. Vide Fig. Lem. 6 & 8 vii.

*Ita demon-
stratio multo
facilius est
et c.*

Nam producantur AB & AD ad b & d & secanti BD parallela agatur bd . Sitq; arcus Ab similis arcui AB . Et punctis A , B coeuntibus, angulus dAb , per Lemma superius, evanescet; adeoq; rectæ Ab , Ad & arcus intermedius Ab coincident, & propterea æquales erunt. Unde & hæc semper proportionales rectæ AB , AD , & arcus intermedius AB rationem ultimam habebunt æqualitatis. *Q. E. D.*

Corol. 1. Unde si per B ducatur tangenti parallela BF rectam quamvis AF per A transeuntem perpetuo secans in F , hæc ultimo ad arcum evanescentem AB rationem habebit æqualitatis, eo quod completo parallelogrammo $AFB-D$, rationem semper habet æqualitatis ad AD .

Corol. 2. Et si per B & A ducantur plures rectæ BE , BD , AF , AG , secantes tangentem AD & ipsius parallelam BF , ratio ultima abscissarum omnium AD , AE , BF , BG , chordæq; & arcus AB ad invicem erit ratio æqualitatis.

Corol. 3. Et propterea hæc omnes lineæ in omni de rationibus ultimis argumentatione pro se invicem usurpari possunt.

Lemma VIII.

Si rectæ datæ AR , BR cum arcu AB , chorda AB & tangente AD , triangula tria ARB , ARB , ARD constituunt, dein puncta A , B accedunt ad invicem: dico quod ultima forma triangulorum evanescentium est similitudinis, & ultima ratio æqualitatis.

Nam

Figure 1. An annotation in an unknown hand. (From MAG: Rariora Qu 291, p. 30, Utrecht University Library. By permission of Utrecht University.) (Online version in colour.)

In what follows, I will focus on how Verwer responded to the *Principia* by concentrating on a number of important comments in the sense characterized above. After the second occurrence of the word 'force' in the excerpt 'a body exerts this force [i.e. the force of inertia] during a change of its state, caused by another force impressed

Figure 2. Annotations in Verwer's own hand. (From MAG: Rariora Qu 291, p. 37, Utrecht University Library. By permission of Utrecht University.) (Online version in colour.)

upon it',¹⁴⁹ which is a fragment from Newton's comment to Definition 3, Verwer inserted an asterisk which was accompanied in the margin by the statement 'an argument for the

149 Newton, *op. cit.* (note 130), p. 404.

existence of God'.¹⁵⁰ Hereby, he was implying that, according to Newton's Definition 3, bodies are impressed upon by God. This claim reminds us of Verwer's argument for the existence of God in '*t Mom-aensicht*', according to which the first cause of local motion is to be found in God. Verwer therefore saw confirmed in Definition 3 of the *Principia* what he already believed. In a comment at the end of his copy, he stated that Newton's finding that God arranged the distances of the planets from the sun according to their densities, which is in fact the only reference to God in the first edition of the *Principia*, testifies to 'God's most perfect science'.¹⁵¹ In his 1696 *Physica*, Le Clerc had already drawn attention to the physico-theological significance of Newton's claim on the matter.

The same page at the end of Verwer's copy contains a comment that has not surfaced in the literature. Here he draws attention to Newton's statement that in the *Principia* he did not consider 'the physical causes and sites of forces' and related statements.¹⁵² This is then followed by a reference to Ecclesiastes 8:16–17, in which the crucial sentence is: 'Then I beheld all the work of God, that a man cannot find out the work that is done under the sun: because though a man labour to seek *it* out, yet he shall not find *it*; yea further; though a wise *man* think to know *it*, yet shall he not be able to find *it*' (KJV). From this Verwer concluded that 'the causes of phenomena . . . are hidden'.¹⁵³ It is unclear whether he endorsed the idea that both the proximate and the remote cause of gravity are hidden.¹⁵⁴ In contrast to other compatriots, like Huygens for instance, Verwer did not believe that Newton's methodological strategy to remain neutral with respect to the cause of gravity constituted a major natural philosophical flaw. On the contrary, the fact that Newton did not succeed in uncovering the cause of gravity contains a message of epistemological humility that fitted well with Verwer's religious beliefs. Without referring to Newton, Verwer used Ecclesiastes 8:16 in his *Inleiding* as part of an argument that intended to show that humans cannot penetrate the inner workings of nature.¹⁵⁵ What needs to be emphasized here is that, among the hundreds of annotations in his copy of the first edition of the *Principia*, only in the three abovementioned instances did Verwer point to the theological repercussions of Newton's *magnum opus*. For the most part, he focused on the technical aspects of the *Principia*.

THE FOUNDATIONS OF CHRISTIAN FAITH AND NATURAL REASON

Verwer's *Inleiding tot de christelyke Gods-geleertheid (Introduction to Christian Theology)* appeared in 1698. He published it with the hope that the 'systematic reasoning' (*cogitatio systematica*) that it contained would serve as 'instruction and guideline for the education

150 MAG: Rariora Qu 291, p. 2, UUL: '* argúmentúm pro Existentiâ DEI'. Mojet, *op. cit.* (note 143), p. 58.

151 MAG: Rariora Qu 291, unnumbered page at the end, UUL: 'Dei perfectissima scientia'. See also Mojet, *op. cit.* (note 143), p. 59.

152 Newton, *op. cit.* (note 130), p. 407. In this context, Verwer also referred to the end of Newton's introduction to Section 11 (Newton, *op. cit.* (note 130), p. 561) and, more importantly, to its accompanying *scholium*, in which Newton claimed 'I use the word "impulse" in the same general sense, considering in this treatise not the species of forces and the physical qualities but their quantities and mathematical proportions, as I have explained in the definitions' (Newton, *op. cit.* (note 130), p. 588).

153 MAG: Rariora Qu 291, pp. 173–187, UUL: 'φαινόμενον causas . . . esse absconditas'.

154 According to Newton, only the remote cause of gravity was hidden (Andrew Janiak, 'Newton and the reality of force', *J. Hist. Philos.* 45, 127–147 (2007); Ducheyne, *op. cit.* (note 67), pp. 25–36).

155 Verwer, *op. cit.* (note 61), p. 12.

of our own children'.¹⁵⁶ The 'main disagreements and schisms' in religion emerge when too much or too little is believed. Correspondingly, Verwer sought to find a middle way between these extremes, so that disagreement and schism could be avoided. Superstition (*bygeloof*) occurs when too much is believed; it is 'childish or slavish, and it never advances to full-grown freedom'.¹⁵⁷ Disbelief (*on-geloof*) occurs when too little is believed. A disbeliever who lapses into 'a sweet-delusional slumber dream' is not interested in uncovering truth but only in 'extenuating his deeds and opinions'.¹⁵⁸ Religion (*godsdiens*) aims to realize eternal bliss so that in the afterlife humans can attain a state that is equal to God's.¹⁵⁹ In order to counter superstition and disbelief, Verwer sought to provide a systematic demonstration of the foundations of Christian faith. These are threefold:¹⁶⁰ first, that there is a God, who is perfect, incorruptible, 'existing separately from all other beings', necessary, supremely wise, almighty, one, eternal, unchangeable and 'the first and supreme cause of things';¹⁶¹ second, that there is an eternal bliss that cannot be attained in this life, but only in the afterlife by those who have practised Christian virtues (e.g. humble and respectful worship of God, prudence, valour, moderation, mercifulness, endurance, and endorsement of the golden rule) during their mortal life;¹⁶² third, that there is an eternal unhappiness that awaits those who have not lived in a Christian way.

Verwer endorsed a form of cessationism, since he was convinced that, after the early centuries, miracles had ceased, and he furthermore believed that from then on worldly temptations had arisen that negatively affected religiosity. Protestants believed that miracles ceased after the Apostolic Age or once Christianity was firmly established.¹⁶³ In order to restore Christian faith after the era of miracles, God supplied us with the ability to reason.¹⁶⁴ According to Verwer, once miracles had ceased, the foundations of the Christian faith could be learned and known 'only by that ingenious ability and by that strength of reason by which God almighty has desired to endow humans in particular at his creation'.¹⁶⁵ Verwer did not endorse the view according to which *all* religious truths can be known through reason, for the truths of the New Testament can only be learned through divine revelation. But why is it the case that after the early centuries the three foundations of the Christian faith can be known only by natural reason? Here Verwer's reference to Romans 1:20 is highly significant.¹⁶⁶ According to him, this verse reveals that everyone can learn at least some things about God from his creation, namely the fundamentals of the Christian faith, and that those who do not arrive at these straightforward conclusions about God from his creation by their reason are simply

156 *Ibid.*, *5v, *2v: 'tot een ordre en richtsnoer van onderwijs voor onse eigene kinderen'.

157 Verwer, *op. cit.* (note 61), *3v: 'kinds of slaefs, en stijgt nooit op tot volwassen vrydom'.

158 *Ibid.*, *4v: 'een waensoeuten sluymerdroom'; 'om sijn bedrijven en opinien goed te pleiten'.

159 *Ibid.*, p. 3.

160 *Ibid.*, p. 7.

161 *Ibid.*, pp. 7, 14, 84; see also Verwer, *op. cit.* (note 49), pp. 41–2.

162 Verwer, *op. cit.* (note 61), pp. 84–85.

163 D. P. Walker, 'The cessation of miracles', in *Hermeticism and the Renaissance: intellectual history and the occult in early modern Europe* (ed. Ingrid Merkel and Allen G. Debus), pp. 111–124 (Folger Books, Washington, DC, 1988).

164 Verwer, *op. cit.* (note 61), p. 5.

165 *Ibid.*, p. 8: 'enkel door dat vernunftig vermogen/en door die redenskracht/waer mede God Almachtig den mensch by syne schepping ... in het bysonder heeft believen te begiftigen'.

166 'For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse' (KJV).

without excuse.¹⁶⁷ In other words, God can hold the unwilling accountable given that he has provided natural reason to every human. Verwer's concept of 'reason' was thus not a secular one, but a divinely supplied ability that offered every human being the opportunity of learning the foundations of the Christian faith. He underscored that the 'word of faith' is superior to the 'wisdom of reasoning'.¹⁶⁸

Verwer wrote to Gregory in 1703 that he had handed over two copies of his *Inleiding* to Willem (Gulielmus) Moncreif (or Moncreif), a Scottish law student at the University of Leyden, who would send one to Gilbert Burnet (1643–1715), the Bishop of Salisbury, who read Dutch fluently, and the other to Newton.¹⁶⁹ In the same letter, he stated that he devoted his 'spare hour to Newton's book [i.e. the *Principia*]' and that he was 'amazed by the marvellous genius of this man'.¹⁷⁰ Initially, he planned to order his exposition entirely 'mathematically', but he ultimately decided to compose parts of it 'in a general ongoing style' because the 'mathematical order' had an unintended consequence, in that it distracted 'the unaccustomed and simpleminded'.¹⁷¹ Once he had introduced and discussed the three foundations of the Christian faith 'in a general ongoing style',¹⁷² Verwer reordered his argumentation 'in geometrical order' (*geometrico ordine*),¹⁷³ in such a way that, in his opinion, it did not suffer from the unintended consequence just mentioned. He followed a mathematical order, structuring his argumentation in the form *propositio–demonstratio–consecarium/a–scholium*, because he intended to demonstrate the Christian fundamentals beyond all possible doubt.¹⁷⁴ The structure of his argument in the *Inleiding* is thus similar to that of his '*t Mom-aensicht*'.

At the very end of the *Inleiding*, Verwer added what he called a 'geometrical analysis' of his demonstrations in the form of a cryptic Latin formula, which 'in the Newtonian form of speech' reads 'eternal felicity is proportional to pious works and inversely proportional to divine grace'.¹⁷⁵ In a letter to David Gregory on 25 January 1703, in which he summarized the contents of the *Inleiding*, and explained the meaning of his formula, Verwer stated that he tried to mathematically demonstrate this formula 'in a way that would be certain and infallible, and would not contain anything superfluous'.¹⁷⁶ He represented his formula as follows: $(Dh)/f$ is to $(Dhm)/ef \times G$ (or: $(Dh)/f - (Dhm)/ef \times G \propto 0$), where D stands for the name of God, h for man, f for God's felicity, m for means, e for end and G for God's grace. He took $(Dh)/f$ to represent man's eternal felicity, which stands 'as h to D to f ', and $(Dhm)/ef$ to represent pious works, which stand 'to man's eternal felicity as m to e ', i.e. as a means to an end.¹⁷⁷ From this result, he inferred $D \times hef - D \times hmf \times Geff \propto 0$, by multiplication with eff . Verwer seems to

167 Verwer, *op. cit.* (note 61), p. 8.

168 *Ibid.*, pp. 47–48.

169 Verwer, *op. cit.* (note 89), f. 247v; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 253.

170 Verwer, *op. cit.* (note 89), f. 246v; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 250.

171 Verwer, *op. cit.* (note 61), [*7v].

172 *Ibid.*, pp. 1–37.

173 Verwer, *op. cit.* (note 89), f. 246v; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 251.

174 Verwer, *op. cit.* (note 61), p. 37.

175 *Ibid.*, p. 86: 'Id est; *dialecto Newtonianâ*: Beatitudo æterna est in ratione compositâ ex operum piorum ratione directè, & ex Gratiae Divinæ ratione inversè.'

176 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 252. Verwer also noted that such mathematical style of demonstration had been used successfully in Pitcairne's *Solutio problematis de historicis*.

177 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 252. In the *Inleiding*, Verwer indicated that pious works stand to man's eternal felicity as a means to an end (Verwer, *op. cit.* (note 61), p. 35, see also p. 1).

have been very serious about this formula, since he sought to bring it to Newton's attention.¹⁷⁸ He also thought that it could put an end to religious disputes.¹⁷⁹

In order to understand the meaning of Verwer's formula, we need to pay attention to his theological views, and more precisely to his views on the conditions under which one can receive eternal felicity. In the second *scholium* to the fourth proposition of his *Inleiding*, he states that only those who have 'unwavering faith' and who have 'perfectly fulfilled the duties of good works' can hope to receive eternal felicity,¹⁸⁰ which implies that only a minority is able to receive it, as is clear (Verwer points out) from Matthew 20:16 and 22:14.¹⁸¹ Nevertheless, by calling on, for instance, Ephesians 2:10 ('For we are his workmanship, created in Christ Jesus unto good works, which God hath before ordained that we should walk in them'; KJV) and 1 John 1:7 ('But if we walk in the light, as he is in the light, we have fellowship one with another, and the blood of Jesus Christ his Son cleanseth us from all sin'; KJV), Verwer argued that true Christians ought to perform as many pious works as possible in order to receive eternal felicity. Therefore, eternal felicity is proportional to pious works, which corresponds to what is expressed in his formula. Furthermore, God is able to 'give some men, even if they have stumbled and fallen, eternal felicity', if he so chooses.¹⁸²

In his 1703 letter to Gregory, Verwer stated: 'More clearly expressed, it is to be said that eternal happiness really is acquired by good works and by divine grace jointly, *so that indeed a defect or weakness in good works is compensated by divine grace.*'¹⁸³ The idea is that a lack of good works can be compensated for by divine grace, or, put differently, that, when the quantity of good works is low, the quantity of divine grace can be increased so that eternal felicity can be acquired. This is the case, not when eternal felicity is proportional to pious works and inversely proportional to divine grace, but only when eternal felicity is proportional to pious works and divine grace jointly.¹⁸⁴ Given what Verwer wanted to convey theologically, it is mathematically required that eternal felicity is proportional to pious works and divine grace. That eternal felicity is proportional to divine grace is expressed as such in his formula. However, it is contrary to his explanation of his formula which he provided in the *Inleiding*. This is not the first time that attention has been called to the discrepancy between Verwer's formula and his explanation. It has been claimed previously that his formula is incorrect, whereas

178 Verwer, *op. cit.* (note 89), f. 247v; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 253.

179 Verwer, *op. cit.* (note 61), p. 36.

180 *Ibid.*, p. 48.

181 *Ibid.*, p. 68.

182 Verwer, *op. cit.* (note 61), p. 49: 'dat hij [i.e. God] sommige menschen / al sijnse gestrunkeld en gevallen / egter met de eeuwige geluksaligheid begenadigde'.

183 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 251: 'Clariore phrasi dicendum Beatitudinem æternam reapse acquiri per opera pia, et gratiam Divinam conjunctim: et quidem ita ut operum piorum defectus aut imbecillitas per gratiam suppleatur' (emphasis added).

184 In order to see this, suppose hypothetically that someone has not accomplished many pious works, and that, accordingly, the quantity of pious work which this individual has accomplished is rather low, say 2. Suppose, furthermore, that God allows this particular person to receive eternal felicity. In order to do so, he will bestow on this individual a large quantity of divine grace of, say, 1,000,000,000. If eternal felicity is proportional to pious works and inversely proportional to divine grace, then the quantity obtained for eternal felicity equals 2 divided by 1,000,000,000, i.e. 0.000000002, which does not constitute a compensation for a lack of pious works. However, if eternal felicity is proportional to pious works and divine grace jointly, then the quantity obtained for eternal felicity equals 2 times 1,000,000,000, i.e. 2,000,000,000, which counts as a significant compensation for a lack of pious works.

his explanation is sound.¹⁸⁵ Here I have argued the opposite: his formula is correct, but his explanation is unsound.¹⁸⁶

Inleiding tot de christelyke Gods-geleertheid contains a reference to Newton's *Principia*. Verwer wrote that, by considering 'the daily course and arrangement of visible things', the existence of God can be demonstrated in several ways.¹⁸⁷ As a simple example, he pointed out that the motions of the heavenly bodies do not follow a circular but an 'oval' trajectory, which, he added, is accepted by the most distinguished astronomers, such as Johannes Kepler, Ismaël Boulliau, Giovanni Domenico Cassini, John Flamsteed, Huygens and Newton. He concluded that it is impossible 'that an oval rotation can be performed and kept going somewhere without the ministry of a ruler who exists outside of things'. He then recommended Newton's *Principia* to those interested in understanding the 'oval' trajectory of the celestial bodies.¹⁸⁸ In 1703, Verwer described the motions of the planets as 'elliptic'.¹⁸⁹ The words 'oval' and 'elliptical' were used interchangeably.¹⁹⁰

Verwer frequently used Gregory's 1702 *Astronomiae physicae & geometricae elementa*, 'the first thorough mathematical introduction to the *Principia*',¹⁹¹ to help him understand the claims developed in the *Principia*,¹⁹² and in his 1703 letter he wrote to Gregory that he had duly studied his 'astronomical work' and that it 'pleases both him and others'.¹⁹³ It might have been the case that Verwer only started seriously studying the *Principia* once Gregory's *Astronomiae* was available, which would help to explain why he stated in 1703 that he was devoting his 'spare hour to Newton's book'. This contention must, however, remain speculative in view of the available sources. In his second letter to Gregory, Verwer remarked that, in order to strengthen the existence of a divine mover, he did not rely on the argument drawn from local motion, as he had done in '*t Mom-aensicht*', but instead on an argument drawn from the 'elliptical' motion of the planets, suggesting thereby that the latter was an alternative to the former.¹⁹⁴ Verwer found in Newton's *Principia* an instance of an argument of the kind he had put forward in earlier work. Although he might not have fully digested the *Principia* at the time when he published *Inleiding tot de christelyke Gods-geleertheid*, and although Newton was only one of the astronomers whom he mentioned, Verwer was one of the first in the Dutch Republic who could be seen by others to have publicly mobilized the *Principia* for physico-theological purposes.

185 Mojet, *op. cit.* (note 143), p. 67, n. 267.

186 The claim that 'Verwer used Newton's formula for the inverse square law to give the mathematical proof that "eternal happiness is proportional to good works, and inversely proportional to divine grace"' is misguided (Jorink and Zuidervaart, *op. cit.* (note 8), p. 23; see also Jorink, *op. cit.* (note 73), p. 31). Verwer did not mobilize the mathematical results in the *Principia* to prove his assertion, but merely mimicked Newton's use of proportions.

187 Verwer, *op. cit.* (note 61), p. 12: 'den dagelijcen loop en schikking der sienlijke dingen'.

188 *Ibid.*, p. 13: 'dat een Ovalese draeying ergens in kan uitgevoerd en gaende gehouden werden sonder tusschenkomste van een bestierder / die buiten deselve dinge bestaat.'

189 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 251. Newton pointed out that elliptical orbits would only occur 'if the sun were at rest and the remaining planets did not act upon one another' (Newton, *op. cit.* (note 130), pp. 817–818). In our solar system, however, 'the orbits will not be very different from ellipses' (*ibid.*, p. 568).

190 See the website of the Instituut voor de Nederlandse taal (Institute for the Dutch Language) at <http://gtb.ivdnt.org/iWDB/search?actie=article&wdb=WNT&id=M049998&lemmodern=ovaaal&domein=0&conc=true> (accessed on 28 March 2019).

191 Guicciardini, *op. cit.* (note 17), p. 187.

192 See note 144 above.

193 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 249: 'Quae de opere túo astronomico attingis, ritè ac maturè examinavi; placent et mihi et aliis.'

194 Verwer, *op. cit.* (note 89), f. 247r; see also Rigaud, *op. cit.* (note 89), vol. 1, p. 251: 'pro firmandâ existentîa motoris DEI, adduco in argûmentûm non motûm localem in universûm, sed motus speciem Ellipticam'.

IN CONCLUSION

Verwer's 't *Mom-aensicht* testifies to the empirical bent in his thinking. In order to disprove the patrons of 'independence', he put forward an argument which was, according to his own understanding, grounded in phenomena to demonstrate that God is the first cause of local motion. His fondness for this line of reasoning made him receptive to the physico-theological arguments that he later found in the first edition of Newton's *Principia*. In Definition 3 of the *Principia*, Verwer saw an echo of his own argument according to which God is the first cause of local motion. He furthermore considered Newton's statement that God arranged the distances of the planets from the sun according to their densities as having important physico-theological significance, and he regarded the elliptical motion of the planets which he found in the work of Newton and others as an indication of divine intervention. Moreover, he thought that Newton's statement that he did not consider 'the physical causes and sites of forces' contained an important message of epistemological humility that fitted well with his religious beliefs.

In contrast to the second edition of the *Principia* (1713), which contained the famous General Scholium and Roger Cotes' (1682–1716) lengthy editorial introduction in which he emphasized that Newton's *Principia* 'will stand as a mighty fortress against the attacks of atheists' and that 'nowhere you will find more effective ammunition against that impious crowd',¹⁹⁵ the physico-theological implications of the *Principia* were hardly spelled out in its first edition. That task was left to its readers. Together with Le Clerc, Verwer was one of the first in the Dutch Republic to clearly see the physico-theological potential of the *Principia*. However, as a mathematics enthusiast he spent most of his time mastering the mathematical technicalities of the *Principia*. That Newton was successful in the Dutch Republic simply because he was useful, and not because he was right, is misleading, because Dutch scholars were genuinely interested in his mathematical and natural philosophical work in its own right. The claim that the group of enthusiasts of which Verwer was a member were united in their endeavour to refute Spinoza is also somewhat misleading, since nearly all of its members were interested in mathematics, and only Verwer, Le Clerc and later Nieuwentijt are known to have criticized Spinoza's work.

Finally, there is no evidence in support of the claim that 'In order to refute Spinoza, Verwer searched for a different mathematics and a better mathematical method, and he found models of it in Newton's *Principia*.'¹⁹⁶ Verwer never compared Newton's method to Spinoza's; more specifically, he never used arguments grounded in the nature of Newton's physico-mathematics *qua* mathematics in order to refute Spinoza's *Ethica*. In his posthumously published *Gronden der zekerheid (Foundations of Certitude)*, the Purmerend-based physician, local politician and experimental philosophy and mathematics enthusiast Nieuwentijt argued for the superiority of Newton's mixed-mathematical method over Spinoza's hypothetical pure-mathematical method,¹⁹⁷ but this was not an argument of the kind ever put in writing by Verwer. To claim otherwise is, in my opinion, to read the extant sources in the light of later developments. I hope to have contributed to a more

195 Newton, *op. cit.* (note 130), p. 398.

196 Mojet, *op. cit.* (note 10), p. 131.

197 Steffen Ducheyne, 'Curing *pansophia* through *eruditum nescire*: Bernard Nieuwentijt's (1654–1718) epistemology of modesty', *HOPOS* 7, 272–301 (2017), at pp. 287–289. It is possible that Nieuwentijt's distinction between pure and mixed mathematics finds its origin in Verwer's distinction between arguments drawn from *entia realia* and *entia rationis*.

nuanced understanding of Newton's significance for the Amsterdam merchant on whom we have focused throughout this essay, and also of the piecemeal appropriation of Newton's ideas in the Dutch Republic.

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