

Evangelische Theologische Faculteit, Leuven

ISAAC BEECKMAN (1588-1637) AND THE RISE OF MODERN SCIENCE:  
AN EXPLORATION OF BEECKMAN'S THEOLOGICAL THOUGHT IN THE  
CONTEXT OF HIS MECHANICAL PHILOSOPHY

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## PREFACE

The course 'Philosophy of Science' at the Evangelische Theologische Faculteit in Leuven taught me a hypothesis unknown to me about the history of science: the Scientific Revolution was preceded by an institutional and methodological revolution (incl. scholastic theology), which paved the way for the rise of modern science. This hypothesis aroused my interest in exploring the source texts of a seventeenth century physicist as a thesis subject, with the aim to discover how this physicist saw the relationship between faith and science. This way I could explore whether there was indeed influence of Scholastic philosophy on this physicist.

I am grateful to Prof. Dr. Antoon Vos who advised me to explore the *Journal* of Isaac Beeckman, because this natural philosopher is relatively unknown today. I thank professor Vos for his advice on defining the subject, for his inspiring lectures on the interaction between medieval will-theology and natural philosophy and for giving me his lecture notes on Beeckman and the Scientific Revolution.

In particular, I would like to thank my advisor Drs. Matthias Mangold for his regular feedback and constructive advice. His critical questions sharpened my academic attitude and skills, which helped me to focus on the research question. In addition, I am grateful to Prof. Dr. Phillip Fisk who helped me, at an earlier stage, with practical advice and translating Beeckman's Latin reference, among other notes, in *Journal 1:138*.

Furthermore, I would like to thank some other people, with a special mention to Gersom and Gerdien who supported me by reading my work and giving advice, as well as Judith, Jan-Willem and Pastor Dave, because of their willingness to read my work. I must express my profound gratitude to Cynthia who supported me throughout my studies. Because of her passion for natural science, she stimulated my interest in the relationship between theology and science. I am also grateful to my parents and my sisters for their support.

Finally, I would like to end with a quote from one of Beeckman's contemporaries, the astronomer John Kepler, who wrote at the end of one of his scientific works,

*I give thanks to Thee, O Lord Creator, Who hast delighted me with Thy makings and in the works of Thy hands have I exulted. Behold! now, I have completed the work of my profession...I have made manifest the glory of Thy works, as much of its infinity as the narrows of my intellect could apprehend. My mind has been given over to philosophizing most correctly: if there is anything unworthy of Thy designs brought forth by me...breathe into me also that which Thou dost wish men to know, that I may make the correction: If I have been allured into rashness by the wonderful beauty of Thy works, or if I have loved my own glory among men, while I am advancing in the work destined for Thy glory, be gentle and merciful and pardon me; and finally deign graciously to effect that these demonstrations give way to Thy glory and the salvation of souls and nowhere be an obstacle to that.<sup>1</sup>*

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<sup>1</sup> Johannes Kepler, *The Harmonies of the World*, trans. Charles Glenn Wallis (BiblioBazaar, 2008), 124–125.

## ABSTRACT

Isaac Beeckman (1588-1637) was a seventeenth century natural philosopher who developed a coherent mechanical philosophy in the context of matter and motion, as the Dutch historian Klaas van Berkel discovered. Beeckman left a valuable *Journal* with his personal notes on (primarily) natural philosophy. Although historians observed that religion may have played a role in the rise of modern science, little research has been directed to analyse the religious notes in the scientific works of early modern scientists. Beeckman sometimes made religious remarks in his natural philosophical notes. This thesis aims to explore the Dutch notes in Beeckman's *Journal* that contain religious information. This exploration is relevant because it sheds light on how Beeckman understood the relationship between Christian faith and his mechanical philosophy. The thesis aims to answer the question whether these religious concepts demonstrate (dis)continuity with theological ideas of medieval and Post-Reformation Scholastic philosophy. After all, Beeckman studied Reformed theology in the university of Leiden (and in Saumur). Examples of religious concepts that Beeckman mentioned are: God as the architect and author of nature, God's omnipotence and the divine will that created contingently, Ockham's Razor, the divine decree and the natural working of nature. Many of these concepts demonstrate continuity with Scholastic theology. The thesis concludes that Beeckman's religious thought was compatible with – and even conducive to – his mechanical philosophy.

*Key words: mechanical philosophy, the book of nature, will-theology and contingency, Reformed theology, religion and science.*

## INTRODUCTION

### The Discovery of Beeckman's Journal

In 1905, physicist Cornelis de Waard discovered in Zeeland (The Netherlands) the personal notebook—a *Journal*—of Isaac Beeckman (1588-1637); a forgotten seventeenth century natural philosopher, theologian and doctor in medicine. He published Beeckman's *Journal* in four volumes between 1939-1953.<sup>2</sup> One of the leading historians of science, Eduard Jan Dijksterhuis (1892-1965), described in 1950 Beeckman's place in the history of—what he calls—“*the mechanising of the world picture*”.<sup>3</sup> The Dutch historian Klaas van Berkel noticed that the *Journal* includes “innovative thoughts on almost all natural-philosophical issues that were discussed in the early seventeenth century.”<sup>4</sup> In his dissertation (1983), Van Berkel published his thesis that Beeckman developed a coherent mechanical philosophy in the context of ‘matter’ and ‘motion.’<sup>5</sup> In 2013, Van Berkel published his dissertation in English in an

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<sup>2</sup> Isaac Beeckman, *Journal Tenu par Isaac Beeckman de 1604 à 1637, publié avec une introduction et des notes par C. de Waard*, ed. Cornelis de Waard, 4 vols. (La Haye: Martinus Nijhoff; KNAW, 1939-1953).

<sup>3</sup> E.J Dijksterhuis, *De mechanisering van het wereldbeeld*, 7th ed. (Amsterdam: Meulenhoff, 1996), 364–368.

<sup>4</sup> Huib Zuidervaart, “Isaac Beeckman on Matter and Motion: Mechanical Philosophy in the Making (Book Review),” *Renaissance Quarterly* 68, no. 1 (Spring 2015): 270.

<sup>5</sup> Klaas van Berkel, *Isaac Beeckman (1588-1637) en de mechanisering van het wereldbeeld* (Amsterdam: Rodopi, 1983).



updated form (that is used in this thesis). Since the *Journal* reveals Beeckman's scientific discoveries and his coherent mechanical philosophy, Van Berkel concludes that this natural philosopher "played a crucial but not always recognized role" in the history of science.<sup>6</sup> After all, there is evidence that Beeckman deeply influenced early modern scientists, like René Descartes (1596–1650) and Pierre Gassendi (1592–1655), with his mechanical philosophy.<sup>7</sup>

Beeckman described insights that one would not expect so early in the seventeenth century. His mechanical philosophy has two new aspects, as Van Berkel discovered, in the history of physics: his "theory of matter" is grounded in mechanical explanations based on atomism; his "science of motion" is built on the principle of inertia.<sup>8</sup> The inertia principle is often associated with the first law of Isaac Newton (1642–1727) or with Galileo Galilei (1564–1642) and René Descartes (1596–1650) who also formulated this principle, but Beeckman described the inertia principle already in 1612.<sup>9</sup> However, Beeckman's mechanical philosophy not only focussed on motion or

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<sup>6</sup> Klaas van Berkel, *Isaac Beeckman on Matter and Motion: Mechanical Philosophy in the Making*, trans. Maarten Ultee and Linda Schneider (Baltimore: Johns Hopkins University Press, 2013), 1.

<sup>7</sup> *Ibid.*, 165–173.

<sup>8</sup> *Ibid.*, 76–77.

<sup>9</sup> Isaac Beeckman, "Journal," in *Journal Tenu par Isaac Beeckman de 1604 à 1637, publié avec une introduction et des notes par C. de Waard*, ed. Cornelis de Waard (La Haye: Martinus Nijhoff; KNAW, 1939–1953), 1:24; 1:44. Beeckman's oldest formulation of inertia in Latin is: "Omnis res, semel mota, nunquam

falling bodies, but also on other disciplines, like chemistry, music theory, optics, meteorology and other natural phenomena.<sup>10</sup> Henk Kubbinga points to Beeckman's atomism as the first modern "molecular" theory.<sup>11</sup> After all, Beeckman stated that all matter consists of substances (which he called 'homogenea') that causes the stability of medicines and metals.<sup>12</sup> According to Beeckman, these homogenea consisted of atoms.

Beeckman is a transitional figure: he combined mathematics with natural philosophy and mechanics; his artisanal knowledge complemented his natural science.<sup>13</sup> He was an advocate for the use of mathematics in natural philosophy (in his time these were separated domains). In his *Journal* he called his method a "physical-mathematical philosophy," but I will call it "mechanical philosophy." The word 'mechanical' had negative connotations in his days; otherwise he may have used this

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quiescit nisi propter externum impedimentum." In Dutch, Beeckman formulated the inertia principle in this way: "Dat eens roert, roert altyt, soot niet belet en wort."

<sup>10</sup> Berkel, *Beeckman on Matter and Motion*, 165.

<sup>11</sup> H. H. Kubbinga, "The First 'Molecular' Theory (1620): Isaac Beeckman (1588–1637)," *Journal of Molecular Structure: THEOCHEM* 181, no. 3–4 (December 15, 1988): 205–218.

<sup>12</sup> *Ibid.*, 211–213.

<sup>13</sup> Berkel, *Beeckman on Matter and Motion*, 4.

word to describe his philosophy.<sup>14</sup> Beeckman inspired Descartes with the combination of mathematics and natural philosophy. These two friends, who met each other in Breda, cooperated: Descartes' skills in mathematics and Beeckman's physics (concerning inertia and acceleration) complemented each other.<sup>15</sup>

### Religion and the Rise of Modern Science

The thesis will use the term 'Scientific Revolution' for the period between Nicholas Copernicus (1473–1543) and Isaac Newton (1642–1727), with the rise of heliocentrism, mechanical philosophy and experimental science as characteristics of 'modern science.' We suggest that Beeckman can also be seen as a transitional figure between mechanical philosophy and university theology. There already is the controversial hypothesis that religion played a significant role in the rise of modern science. Authors like Max Weber and Reijer Hooykaas noticed a connection between religion and the Scientific Revolution.<sup>16</sup> Hooykaas as well as Peter Harrison maintain that Protestantism was conducive to a modern scientific attitude. Hooykaas observed

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<sup>14</sup> Ibid., 82–83.

<sup>15</sup> Ibid., 24–25.

<sup>16</sup> H. Floris Cohen, *How Modern Science Came into the World: Four Civilizations, One 17th-Century Breakthrough* (Amsterdam University Press, 2010), 263–264; Berkel, *Beeckman on Matter and Motion*, 140–141; Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 2nd ed. (Vancouver, B.C. Canada: Scottish Academic Press, 2000).

that the Puritan spirit of labour contributed to a positive appreciation of experimental science, while Harrison remarked that the Protestant literal approach of the Bible was conducive to empirical science.<sup>17</sup> However, there is less research that intends the systematic study of primary sources of early modern scientists, with the purpose to understand how these thinkers themselves saw the relationship between religion and science. Beeckman is a seventeenth century scientist who wrote some religious notes in his *Journal* in the context of his natural philosophy. An analysis of these notes will shed light on how a natural philosopher in the Reformed Protestant tradition of the early seventeenth century saw the relationship between religion and mechanical philosophy.

#### Science from the Perspective of University Thought

Beeckman not only was a doctor in medical sciences, he also had theological education in Leiden and Saumur. It is relevant to observe whether Beeckman mentioned theological concepts in the context of his mechanical philosophy. An exploration of these concepts will shed light on the place of religious thought in the rise of modern physics. The main question of my thesis is which theological concepts may lie behind Beeckman's mechanical philosophy (besides other factors, like Ramism, ancient atomism and mechanics). These concepts will be discussed against

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<sup>17</sup> Peter Harrison, "The Bible and the Emergence of Modern Science," *Science & Christian Belief* 18, no. 2 (October 2006): 115-132.

the religious and theological background of Beeckman. The thirteenth century brought an institutional revolution: the rise of the European universities, with their Scholastic philosophy and theology. The question whether early modern natural scientists – like Beeckman – used theological concepts of Scholastic philosophy in the context of natural philosophy (science) has not been studied sufficiently. Our aim is to answer the question: “Do the religious concepts that Beeckman mentioned in the context of his mechanical philosophy demonstrate (dis)continuity with medieval and Post-Reformation university thought?”

The thesis will argue that Beeckman’s theological thought was supportive for his mechanical philosophy. The Dutch historians Hooykaas and Van Berkel already notice a positive influence of Beeckman’s faith on his natural philosophy, although Van Berkel warns that “there is no inevitable link between being a strict Calvinist and being a mechanical philosopher.”<sup>18</sup> However, it is still a fact that, as the founding father of modern mechanical philosophy, Beeckman was a Christian in the Reformed tradition who wrote religious remarks in his natural philosophical notes. The thesis will analyse the relationship between Beeckman’s mechanical philosophy and his theological convictions. We will argue that he used theological concepts of medieval and Post-Reformation university philosophy in his mechanical philosophy. After all, Hooykaas’

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<sup>18</sup> Berkel, *Beeckman on Matter and Motion*, 146.

hypothesis that creation theology had an influence on the development of modern physics will be defended, by pointing to Beeckman's religious notes on 'God' and 'nature' in this context.<sup>19</sup> Moreover, we noticed that Beeckman mentioned theological concepts like the divine free will and providence in some of his notes on natural philosophy. We will state that the influential concept of *God's book of nature* was the 'hermeneutical key' for a science that regarded nature as a text that can be read and analysed. We will argue that this concept was conducive to the rise of mechanical philosophy. Moreover, the thesis will explain that Beeckman's religious convictions inspired him to take distance from the influential Aristotelian explanations of his days.

### Methodology

Although Beeckman wrote letters to famous scientists of his days (which can be compared to academic articles today), he never published his ideas in a book. Therefore, there is no systematic work of his physics or theology. His *Journal* contains his rough reflections on various subjects. This requires a specific methodology for this thesis. His religious notes should be considered as personal reflections of his faith. However, most of his theological concepts are recognizable for scholars who are familiar with seventeenth century Scholastic theology, such as the 'divine providence,'

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<sup>19</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 9-16; Antoon Vos, "Scholasticism and Reformation," in *Reformation and Scholasticism. An Ecumenical Enterprise*, by Willem J. van Asselt and Eef Dekker (Grand Rapids, 2001), 99-119.

'predestination,' the 'Parsimony Principle' or 'God as the author of nature.' Beeckman's theological concepts and terms will be discussed against the background of Scholastic philosophy and theology of his time, so that more insight will be gained in how Beeckman applied these concepts or terms in his natural science. Since De Waard's edition of Beeckman's *Journal* contains 1600 pages, the systematic research will be limited to Beeckman's *Dutch* notes. Moreover, some of Beeckman's Latin notes will be discussed, but not systematically all these Latin notes. It is important to emphasize that only the Dutch religious notes *in the context of* his mechanical philosophy will be analysed, in order to focus on the relationship between faith and natural philosophy. These limitations are necessary because Beeckman left us a comprehensive work on various subjects.

In the selection of relevant Dutch religious notes for a systematic analysis, the following categories were used. Beeckman's Dutch notes on natural scientific topics that also have religious information (sometimes only a few words or terms) are the first category of relevant notes. These notes will have the primary focus in the thesis. The second category are notes that have exclusively religious content without natural philosophical information. Although the thesis will refer to these notes when Beeckman's faith will be discussed, they will only be discussed shortly because they do not have a scientific content. The final category are Beeckman's musical comments on the psalms. These notes are less relevant because they only mention musical information and not discussions on the psalms itself. Of course, these notes

demonstrate that Beeckman was especially interested in singing psalms, as was common in Reformed churches.



## CHAPTER 1. BEECKMAN'S LIFE, FAITH AND EDUCATION

### Introduction

Isaac Beeckman not only was a natural philosopher, engineer and doctor in medicine, he also was a theologian and involved in a Reformed church as an elder. Therefore, after a biographical sketch of Beeckman's life, faith, work and education, some of Beeckman's religious notes will be discussed as well as his view on piety. This discussion is necessary because seventeenth century natural philosophers sought harmony between science and religion. The following chapters will discuss Beeckman's notes concerning mechanical philosophy in relation to his faith in God as Creator and Sustainer of the universe. His personal library will be revealed since his books demonstrate both his philosophical, pedagogical and medical as well as his religious and theological interest. Moreover, his academic training will be discussed as a source of his theological thought in relation to his natural science.

### The Birth of a Craftsman, Theologian and Natural Philosopher

#### *A Protestant Family of Traders and Artisans*

Beeckman was raised in a family of traders and craftsmen. His grandfather Hendrick Beeckman traded in candles in Turnhout in Brabant; a profession that Isaac Beeckman learned from Hendrick's son. Hendrick Beeckman was a deacon in the Reformed church in Turnhout, but because of the persecution of Protestants by the

Spanish ruler, he had to leave the Southern Netherlands.<sup>20</sup> He continued his trade in London. His son Abraham moved from England to Middelburg in 1586. Abraham Beeckman and his wife Susanna van Rhee had ten children. On December 10 in 1588, Isaac Beeckman was born in Middelburg, the capital of the Dutch province Zeeland. There, he grew up in a culture that identified itself with “the Chosen People of the Old Testament,” as Reformed Christians in the Low Countries often called themselves.<sup>21</sup> His parents were excommunicated from their Reformed church in 1603 because of arguments, but in 1607 they were reconciled with the church council.<sup>22</sup> Beeckman married Cateline de Cerf on April 20, 1620, in Middelburg.

*Academic Education in Leiden, Saumur and Caen*

Beeckman had a wide academic interest. He not only was a theologian, he also studied mathematics and he was promoted in medicine in Caen. On May 21, 1607 Beeckman was enrolled at the University of Leiden by the mathematician Rudolf Snellius. He studied philosophy and theology from 1607 till 1610, together with his brother Jacob Beeckman. In 1607, the brothers Beeckman were enrolled as students in Arts and Philosophy, that prepared them for the higher faculties. Beeckman studied

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<sup>20</sup> Berkel, *Beeckman on Matter and Motion*, 10.

<sup>21</sup> *Ibid.*, 11.

<sup>22</sup> *Ibid.*, 12-13.

theology in a time that influential scholars taught in Leiden: Jacobus Arminius (1559-1609), Francis Gomarus (1563-1641) and Rudolph Snellius (1546-1613). The University of Leiden was a conducive environment for Beeckman's interest in mathematics. Mathematics was part of the preparatory program for theology studies. As will be explained further, Snellius was Beeckman's professor in mathematics. Moreover, Arminius is often associated with his conflict with Gomarus concerning election and predestination, but less known is that Arminius, as a pupil of Snellius, was "very interested in mathematics."<sup>23</sup>

In Leiden, there was no exam for theology students because it was the responsibility of the churches (the classis) to organise an exam for candidates.<sup>24</sup> But Isaac and his brother Jacob Beeckman "might be viewed as graduated" in theology, as Van Berkel remarks.<sup>25</sup> Beeckman passed the exam to become a pastor in 1613 at the classis of Walcheren (near Middelburg in the Low Countries).<sup>26</sup> Now he was allowed

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<sup>23</sup> Ibid., 155. There is no evidence of influence from Arminius mathematical interest on Beeckman, but, on the other hand, Arminius' interest demonstrates the important place of mathematics in de curriculum of Leiden.

<sup>24</sup> Ibid., 15.

<sup>25</sup> Ibid.

<sup>26</sup> Ibid., 16.

to preach in the churches that belonged to the classis of Schouwen. His brother Jacob Beeckman passed the exam in 1612.

In 1612, Beeckman continued his theological studies at the Huguenot Academy of Saumur (France), because he had the intention to become a preacher. There, he studied theology, but also philosophy and he practiced mathematics.<sup>27</sup> After the Edict of Nantes (1598) – that allowed freedom of religion – the academy of Saumur was set up by Philippe du Plessis-Mornay (1649-1623) in 1589. He organized this theological centre in Saumur “after the example of Leiden,” that he learned during his stay in the Low Countries (1578-1582).<sup>28</sup> In the early seventeenth century, Leiden was a leading Reformed university. Considering Beeckman’s studies in Leiden – and later in Saumur that was influenced by the example of Leiden – our focus will be on Leiden, as an important Reformed centre of education.

Beeckman finished his academic studies with a doctoral degree in medicine in the French University of Caen. In his dissertation (1618), he formulated some of his central arguments of his mechanical philosophy. For example, he reasoned against Aristotelian physics by stating that matter moves uninterruptedly (his inertia

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<sup>27</sup> Ibid., 16.

<sup>28</sup> Willem J. Asselt, “Scholasticism in the Time of Early Orthodoxy (ca. 1560-1620),” in *Introduction to Reformed Scholasticism*, ed. Willem J. van Asselt et al., trans. Albert Gootjes (Grand Rapids, MI: Reformation Heritage Books, 2011), 114.

principle) and by arguing the existence of vacuum.<sup>29</sup> The University of Caen acknowledged Beeckman's medical and philosophical knowledge as well as his mathematical skills and his understanding of the Greek language.<sup>30</sup>

*A Craftsman and Schoolteacher with Natural Scientific Skills*

Concerning the roots of the seventeenth century Scientific Revolution, two different kinds of explanations are given: intellectual theories and social theories.<sup>31</sup> The intellectual theories approach the development of science as an intellectual movement that was driven by philosophers who used mathematics to answer logical and natural scientific questions.<sup>32</sup> According to the social theories, the rise of modern science is rather the product of excellent artisanal work and manual labour that flourished in the seventeenth century because of talented people. It is interesting to observe that Beeckman "in a way is the missing link between artisanal knowledge and mathematical science," as Van Berkel explains.<sup>33</sup> Unlike Descartes, Beeckman was both

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<sup>29</sup> Beeckman, *Journal*, 4:40-44.

<sup>30</sup> Berkel, *Beeckman on Matter and Motion*, 22.

<sup>31</sup> *Ibid.*, 2.

<sup>32</sup> *Ibid.*, 2-3.

<sup>33</sup> *Ibid.*

a scholar and a craftsman.<sup>34</sup> Just like his father, he was a professional candle maker, a constructor of water conduits and after 1630 a lens grinder. His mechanical philosophy is a bridge between theoretical and practical knowledge.

While Beeckman preached on Sundays in a nearby village, during the week he worked in his candlemaker shop.<sup>35</sup> Later, he left his shop to his assistant, so that he could focus on more complicated crafts like the “construction, improvement, and repair of water systems for breweries and fountains for private gardens.”<sup>36</sup> In Middelburg, he was consulted in a major hydraulic project.<sup>37</sup> In his *Journal*, he wrote his reflections and observations of candle making and constructions of water conduits and pumps. This means that he combined craftsmanship with natural philosophy. In this context, it is interesting that the Dutch meteorological institute mentions Beeckman’s observatory of 1628 as the oldest weather station in the world.<sup>38</sup> In the school in Dordrecht, where Beeckman was co-rector, he placed a tower with a

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<sup>34</sup> Ibid., 4.

<sup>35</sup> Ibid., 17.

<sup>36</sup> Ibid.

<sup>37</sup> Ibid., 31.

<sup>38</sup> Nederlands Koninklijk Meteorologisch Instituut, “KNMI - 400 Jaar Weerkundige Metingen,” accessed February 27, 2019, <https://www.knmi.nl/kennis-en-datacentrum/uitleg/400-jaar-weerkundige-metingen>.

thermoscope and a weather vane. The results are lost, but in his *Journal*, Beeckman sometimes described the weather of the day, the clouds and wind direction, which is valuable historical information concerning climate research.<sup>39</sup> Moreover, Beeckman described the mechanism of air pressure.<sup>40</sup>

Beeckman not only was a craftsman and natural philosopher, he also became a schoolteacher on December 11, 1619 in Utrecht.<sup>41</sup> Later, he taught in the Latin school in Rotterdam where his brother Jacob was principal. Isaac taught logic and rhetoric and Jacob taught Hebrew in the Latin school.<sup>42</sup> Beeckman became vice-principal in 1624. When the rector of a grammar school in Dordrecht died, the professors of the University of Leiden were consulted. They recommended Beeckman to become the school principal, which happened in 1627. In his inauguration speech, Beeckman presented his *philosophia physico-mathematica* (his mechanical philosophy) to his audience.<sup>43</sup> Also, with his students he discussed scientific issues, so that he could influence his pupils with his natural philosophy. The astronomer Martinus

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<sup>39</sup> Ibid.

<sup>40</sup> Berkel, *Beeckman on Matter and Motion*, 92–94.

<sup>41</sup> Beeckman, *Journal*, 2:4.

<sup>42</sup> Berkel, *Beeckman on Matter and Motion*, 32–33.

<sup>43</sup> Beeckman, *Journal*, 4:122; Wiep van Bunge et al., eds., *The Dictionary of Seventeenth and Eighteenth-Century Dutch Philosophers* (Bristol, England: Thoemmes Press, 2003), s.v. Isaac Beeckman.

Hortensius – who received access to Beeckman’s *Journal* – is one of them as well as Frederik Stevin, the son of the Flemish mathematician and engineer Simon Stevin.<sup>44</sup>

### The Christian Faith of a Natural Scientist

#### *Beeckman’s Notes on Piety*

For Beeckman, religion played an important role in his life. Both his personal library (see further) as well as his religious notes of his *Journal* reveal his Christian faith in the Protestant, Reformed tradition. He was an active elder in his church and he was theologically trained.<sup>45</sup> He wrote many notes on the Psalms (not on the content or theology of the Psalms, but only on the musical theory of these songs that were sung in Reformed churches). Moreover, Christian charity and compassion were important values for him. Between November 23 and December 26 of 1618, he wrote that doing virtues is always mixed with sin.<sup>46</sup> In this note, he gives the example of doing good works (compassion) to be seen by others or judging a drunken man while someone

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<sup>44</sup> Berkel, *Beeckman on Matter and Motion*, 32.

<sup>45</sup> *Ibid.*, 140.

<sup>46</sup> Isaac Beeckman, *Journal Tenu par Isaac Beeckman de 1604 à 1634*, ed. Cornelis de Waard (La Haye: Martinus Nijhoff; KNAW, 1939), 1:262. “Daer is in ons niet één deucht oft daer is een sonde by, die die eygentlick bederft. Geve ic wat uyt medelyden en doe ic overspel, dit en bederft de deucht niet eygentlick, maer [wel] als ictb oock doe om gesien te werden. Beschuldich ic iemant van dronckenschap, ic mach er noch schuldiger in syn, al en weet ictc niet. Want dit syn ons verborgen sonden.”



has an addiction himself. He points to an important Christian attitude: one should consider someone else higher than himself.<sup>47</sup> In 1622, he reflected on *lies* and *deceit*. He assigns a central place to human dignity. A lie is when you deliberately deceive someone, he says.<sup>48</sup> After an explanation of different kinds of lies, he concludes that just like there are degrees of sin, there are also degrees of rejecting sin (in the context of lies and deceit).<sup>49</sup> He refers to the virtue of ‘mercifulness’ in Mat. 23:23. If you strictly *refuse* to lie (or to do other kinds of sin), but in such a manner that you harm your neighbor – for instance, you speak the truth so that an [innocent] man gets the death penalty – then following the rule ‘not to lie’ is sinful behavior.<sup>50</sup> He appeals for a sincere lifestyle and religious attitude without pride or hypocrisy.

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<sup>47</sup> Beeckman, *Journal*, 1:262. He says, “Elck achte een ander beter dan sichselven.”

<sup>48</sup> Ibid., 2:206. “Derhalven, tsy datmen al wetens ende willen ymant wat doet verstaen anders dan de waerheyt is door woorden, tsy door de pronuntiatie, tsy door gestien, tis na myn oordeel altyt een leughen.”

<sup>49</sup> Beeckman, *Journal*, 2:206. “Hierop dient voor antwoorde dat gelycker trappen syn van de sonde, datter also oock trappen syn van sich teghen de sonde te kanten.”

<sup>50</sup> Ibid. “Want indien ymant sich also teghen de hooveerdye, giericheyt, nydt etc. kandt, dat hy nochtans sich dickwils daerin verloopt, ende denselfden persoon gaet sich so kanten teghen den minsten leughen dat hy in geender manieren synen naesten daerdoor van de doot en verlost, maer sichselven of hem ter doot laet brenghen - die mach bedencken hetgene dat Christus seght teghen de Phariseen: Matth., cap. 23, vers 23: Dit moest ghy doen ende tgene niet nalaten, te weten: de barmherticheyt moet ghy voornementlick doen ende het kleyne oock wel, maer niet met sulck een neersticheyt als het andere.”

Between July and August 1618, Beeckman reflected on the question whether prayers should be said out loud or in silence.<sup>51</sup> He points to the difference between a sermon and a prayer. Unlike a sermon, a prayer should not be remembered. It is enough to be attentive to the prayer itself. Besides praying, repentance and introspection were also important for Beeckman. In 1631 he wrote, "My unbelief is so immense that I fear that I am by far the weakest believer of all Christians."<sup>52</sup> Admitting doubts was a common practice in Reformed circles, because it strengthens someone's faith in God.<sup>53</sup> He recognizes this fear also in his children. He explains that this fear is an instinct that God gave as a proof of eternal life after death.<sup>54</sup>

Beeckman reflects on the practice of the Sabbath and other religious regulations.<sup>55</sup> From these notes, it becomes clear that Beeckman sought the values behind regulations. With a reference to the Old Testament, some of Beeckman's colleagues asked him on October 10, 1618, whether pastors may drink wine in the consistory.

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<sup>51</sup> Beeckman, *Journal*, 1:199. "...Maer de gebeden worden niet gedaen gelyck de predicatie, om die te onthouden, maer het is genoeg, dat men int bidden opt gene, dat men segt, aendachtich is...."

<sup>52</sup> Beeckman, *Journal*, 3:215, quoted in Berkel, *Beeckman on Matter and Motion*, 140.

<sup>53</sup> Ibid.

<sup>54</sup> Ibid. "Sodat dit een instinctus van de nature schyndt te wesen, die Godt gegeven heeft tot bewys van het eeuwich leven hierna."

<sup>55</sup> Beeckman, *Journal*, 1:223; 1:195.

Beeckman answered them that although the Old Testament priests were not allowed to drink wine, the New Testament gives no rules in this context. He explains that if it does not harm them, they may drink wine and he even says that pastors should drink wine if it helps them in the office ministry.<sup>56</sup> He mentions another example: the rule to not touch leprosy patients is only valid if touching these people would harm us. Beeckman pays attention to the values behind religious regulations.

*The Pietistic Movement and the Dutch Further Reformation*

Beeckman's view on a pure lifestyle should be interpreted in the context of two influential movements of his time: *Pietism* and *The Further Reformation*. In Zeeland, where Beeckman lived, the Pietistic movement was influential. Moreover, Beeckman's religious faith can be linked with the new Puritan movement that Willem Teellinck (1579–1629) introduced in the Low Countries. Teellinck is the father of a new movement that was inspired by Puritanism: *The Further Reformation*. Beeckman saw Teellinck as his spiritual father and he shared Teellinck's ideas for reformation of church and society in a Puritan spirit.<sup>57</sup> However, in his notes, there are no indications

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<sup>56</sup> Beeckman, *Journal*, 1:223. "Daerom moge wy wel wyn drincken, soot ons in ons officie niet en schadicht, ja, wy moeten wyn drincken, soo sy in ons officie te betrachten, helpt."

<sup>57</sup> W.J. op 't Hof, *Willem Teellinck: de vader van de Nadere Reformatie* (Kampen: De Groot Goudriaan, 2007), 65–66; Berkel, *Beeckman on Matter and Motion*, 18; J. R. Beeke, W. J. op 't Hof, and A. P. Meeuse, *Reformatiorische spiritualiteit: een praktische studie naar de gereformeerde spirituele erfenis*, ed. J. R. Beeke (Kampen: De Groot Goudriaan, 2009), 344.

for a political agenda—his religious references are only reflections concerning faith, piety and devotion.

Beeckman's interest in Teellinck's ideas can be seen from the fact that he owned many books of Teellinck and even in the *Journal*, Beeckman referred to Teellinck and his books.<sup>58</sup> Isaac's brother, Jacob Beeckman, was interested in another proponent of *Further Reformation*, Godefridus Udemans, but the Auction Catalogue does not mention books of Udemans. After all, Isaac Beeckman was more interested in Teellinck than in the movement of Udemans.

Teellinck knew the brothers Beeckman and he recognized their solid faith and work. After all, Teellinck enrolled some of his kids in the Latin school in Rotterdam, where Isaac and Jacob Beeckman were teachers and principals.<sup>59</sup> The Latin school attracted foreign students, which demonstrates its good name. The international character of the Latin school may have played a role for Teellinck's choice for this school, but there are good reasons to assume that besides the good reputation of the school, also Beeckman's faith and view on Christian education were arguments in favour of the Latin school where the brothers Beeckman carried the flag.<sup>60</sup>

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<sup>58</sup> Beeckman, *Journal*, 2:301; 4:79-80, 145; Berkel, *Beeckman on Matter and Motion*, 18; Eugenio Canone, "Il Catalogus librorum di Isaac Beeckmann," in *Nouvelles de la République des Lettres 1991*, vol. 1, 1992, 131-138.

<sup>59</sup> Hof, *Willem Teellinck*, 65-66.

<sup>60</sup> *Ibid.*

Just like Beeckman, Teellinck was academically educated: he studied *Literature* and *Law*—and later also theology—in Leiden. From 1599 on, Teellinck visited universities in France, England and Scotland. During his international tour, he met new theological and religious movements, such as *Pietism*. After a meeting with the Puritans in England, Teellinck went back to the Low Countries to study theology in Leiden. In 1606 he finished his training as a minister—the year before Beeckman started his studies in Leiden—and he became a pastor. Teellinck set himself as one of the leading people who were zealous for religious purity in church and society. He insisted that action should be taken concerning problems on fasting evenings, fairs, sabbath desecration and other things that made life impure.<sup>61</sup>

#### *Beeckman's Personal Library*

Beeckman's personal books were sold on July 14, 1637. The *Auction Catalogue* is a valuable document that gives an insight in the books that Beeckman owned at the moment of his death (on May 19, 1637).<sup>62</sup> The *Biblioteca Angelica* in Rome has “the only extant copy,” of this Auction Catalogue.<sup>63</sup> The catalogue demonstrates that Beeckman

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<sup>61</sup> Beeke, Hof, and Meeuse, *Reformatiorische spiritualiteit*, 341.

<sup>62</sup> “Catalogus librorum di Isaac Beeckman” (Dordrecht, July 14, 1637), Biblioteca Angelica, Roma, <http://picus.unica.it/index.php?page=Filosofo&id=172&lang=en>; Canone, “Il Catalogus librorum di Isaac Beeckmann.” The auction catalogue was published on July 14, 1637, by Isaac Andreae.

<sup>63</sup> Berkel, *Beeckman on Matter and Motion*, 73, 215.

had a personal library, with 566 books (duplicates included). The catalogue arranges the books in four main parts: theology (161 books); medical (50 books); philosophy and history and others (355 books).<sup>64</sup> Almost a third of the Catalogue are theological works, which demonstrates Beeckman's interest in theology.<sup>65</sup> His personal bookcase demonstrates his interest, as a schoolteacher and scholar, in pedagogic, theology, philosophy and medicine, but standard works of natural science are missing.

Beeckman developed his mechanical philosophy in combination with reading books of ancient and modern philosophers, theologians, physicians, mathematicians and natural philosophers.<sup>66</sup> "Beeckman might have gleaned ideas from the books he read," Van Berkel explains, "during and shortly after his study at Leiden University or during the preparations for the medical degree he earned at Caen in 1618."<sup>67</sup> He wrote comments on the books he read, so these books could provide him some of the main ideas and concepts of his mechanical philosophy.

Concerning the theological part of the library, the collection of Reformed authors is noticeable, but also authors that played a role in the history of Reformation and even

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<sup>64</sup> "Catalogus librorum di Isaac Beeckman." The three main parts of the Catalogue ('theology,' 'medical' and 'philosophy, history and others') are classified according to size.

<sup>65</sup> Berkel, *Beeckman on Matter and Motion*, 73–74, 140.

<sup>66</sup> *Ibid.*, 130–131, 140–147.

<sup>67</sup> *Ibid.*, 131.

Catholic works. Both the Jesuit priest Robert Bellarmine's *Opera* as well as the reformer Erasmus of Rotterdam are mentioned (Erasmus even nine times).<sup>68</sup> The books of John Calvin are mentioned (seven times) as well as books of Martin Luther and Philip Melancthon.<sup>69</sup> Also the *Confessio Belgica* was part of the library. Moreover, Beeckman's interest in – what we today call – the *Further Reformation* is visible in the Catalogue: it mentions titles of Willem Teelinck as well as *Practice of Pietie* of the Puritan author Lewis Bayly (d. 1631).<sup>70</sup> Beeckman's library also contained books of church father Augustine of Hippo. His interest in medieval university theology is visible in the presence of two medieval theologians in the Catalogue: Thomas Aquinas and Peter Lombard.<sup>71</sup> Beeckman also had biblical interests. Beside commentaries of ancient, medieval and Reformed theologians, he had several editions and translations of the Bible in his library (including the Greek, Latin and Anglican editions) as well as concordances.

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<sup>68</sup> "Catalogus librorum di Isaac Beeckman."

<sup>69</sup> Calvin's *Institution* of 1565 as well as four commentaries on the New Testament are included in these seven titles that are mentioned in the auction catalogue. Two commentaries (on the Psalms and the prophets) of Luther are mentioned too.

<sup>70</sup> The Catalogue mentions three books of Teelinck: *Eubulus* (1616-17), *Den Christelicken Leyts-man* (1618) and *Het cieraet van Christi Bruylofts kinderen* (1620).

<sup>71</sup> "Catalogus librorum di Isaac Beeckman." The library included Peter Lombard's *Sententiae* (1548) and four volumes of Thomas Aquinas' *Opera*.

Concerning the use of the Catalogue, there is one critical remark that should be placed. Van Berkel rightly notes that the Auction Catalogue, of course, does not exactly reflect Beeckman's library. After all, Beeckman knew – as a physician – that he had symptoms of tuberculosis, so that he could prepare his own death. It is possible that he gave some books to others or family members may have kept some books. Another reason is that, according to Van Berkel, booksellers “were in the habit of adding other books they had for sale, and they also left out items they believed would not sell.”<sup>72</sup> Beeckman's *Journal* mentions his interest in books that were not listed on the Catalogue.<sup>73</sup> An example is Willem Teellinck's *Volstandighen Christen* that Beeckman mentioned in his *Journal*, but that was not listed on the Catalogue.<sup>74</sup> It is important to emphasize that no conclusions can be drawn from the absence of certain books. Van Berkel noticed the remarkable absence of important books on natural philosophy and mathematics.<sup>75</sup> Without Beeckman's *Journal*, we would not know about Beeckman's

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<sup>72</sup> Berkel, *Beeckman on Matter and Motion*, 73.

<sup>73</sup> Van Berkel mentions the example of Galileo's *Dialogue* that is not listed on the catalogue.

<sup>74</sup> Beeckman, *Journal*, 2:301. The book that Beeckman mentions in his *Journal* is Willem Teelinck's *Volstandighen Christen*. The Catalogue mentions other titles of Teelinck, but this book was not mentioned in the Catalogue.

<sup>75</sup> The Catalogue mentions one work of the Flemish mathematician *Simon Stevin* and of *Francis Bacon*, but works of Nicolas Copernicus, John Kepler and Galileo Galilei are missing.



interest in natural philosophy and mathematics.<sup>76</sup> Despite these nuances, we agree with Van Berkel that the Catalogue is a valuable document. It gives a clear impression of Beeckman's general interest in certain authors and subjects, such as religion, theology, philosophy, medicines and pedagogy.<sup>77</sup>

### Beeckman's Academic Training

#### *Sources for Beeckman's Mechanical Philosophy*

A difficult question is what Beeckman might have inspired in developing his remarkable, coherent mechanical philosophy. Van Berkel mentions the following sources of Beeckman's mechanical philosophy: 'ancient atomism,' 'modern mechanics,' 'the craftsman's background,' 'the role of religion' and 'the influence of Ramism.'<sup>78</sup> Indeed, these five are relevant sources to explain the development of Beeckman's mechanical philosophy. However, they do not explain the reason for his paradigm change. We suggest that the rise of the universities and the influence of its Scholastic theology and philosophy is an important background of Beeckman's radical philosophical change. This means that 'Scholastic theology' is a sixth source for

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<sup>76</sup> Berkel, *Beeckman on Matter and Motion*, 74.

<sup>77</sup> *Ibid.*, 73.

<sup>78</sup> *Ibid.*, 130-162.

Beeckman's mechanical philosophy. After all, the following chapters will demonstrate that Beeckman used concepts that were developed in medieval physics and theology. University theology and physics of the Middle Ages offered him the concepts that supported him in developing his mechanical philosophy.

*Ramist Pedagogical Principles*

After taking a three-month course in mathematics from a relative in Rotterdam, Jan van den Broecke, Beeckman spoke to Snellius about his interest in mathematics.<sup>79</sup> Van Berkel noticed that the list of course books that Snellius gave to Beeckman was "heavily based on Ramist principles."<sup>80</sup> Van Berkel mentions Ramism as one of the sources for Beeckman's mechanical philosophy. Peter Ramus (1515–1572) was a French pedagogical reformer, mathematician and logician, who studied in the College of Navarre – that was part of the University of Paris. Beeckman was influenced by Ramus' pedagogical principles. Unlike Aristotelianism of his time, Ramus gave logic a "more practical orientation" and he sought "simplicity" in argumentations.<sup>81</sup> This means that he tried to find the right connections (or argumentations) between things

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<sup>79</sup> Ibid., 14–15.

<sup>80</sup> Ibid., 15.

<sup>81</sup> Willem J. Asselt and Pieter L. Rouwendal, "Distinguishing and Teaching: Constructing a Theological Argument in Reformed Scholasticism," in *Introduction to Reformed Scholasticism*, ed. Willem J. van Asselt et al., trans. Albert Gootjes (Grand Rapids, MI: Reformation Heritage Books, 2011), 93.

or state of affairs. The purpose of his method was to find categories ('loci') in which these connections and argumentations could be ordered in a logical and understandable way. For Beeckman, as a schoolteacher, this method was certainly attractive for pedagogical reasons. Beeckman rejected Aristotelian physics because he sought simplicity in argumentations. Beeckman used the medieval *Parsimony Principle* (known as *Ockham's Razor*) in his mechanical explanations.<sup>82</sup> According to Willem J. van Asselt and Pieter L. Rouwendal, the influence of Ramism on Reformed theology is sometimes overestimated, but the interest of Reformed theologians in Ramism "illustrates the zeal of early orthodoxy for a suitable theological method."<sup>83</sup> It is reasonable to conclude that also Beeckman was for the same reasons interested in Ramus' pedagogical program and logical method. It is important to note that he learned Ramus' thought in the University of Leiden, through his contacts with Snellius – his professor of mathematics.

*Gisbertus Voetius (1589–1676)*

Gisbertus Voetius was a leading figure of Dutch Reformation. Voetius' thought is representative for Reformed theology in the time of high orthodoxy. On an academic level, he was trained in Scholastic theology, because of his studies at the University of

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<sup>82</sup> Beeckman, *Journal*, 1:10; 1:51; 4:122.

<sup>83</sup> Asselt and Rouwendal, "Distinguishing and Teaching," 94.

Leiden. He was pastor in Vlijmen, Engelen (1611) and Heusden (1617) and he was a delegate at the council of Dort (1618-19). In 1634, he taught theology and Semitic languages in the illustre school of Utrecht (that became a university in 1636).

For various reasons it is interesting to mention Voetius in our discussion of Beekman and his university education in Leiden. First of all, Voetius studied together with the brothers Isaac and Jacob Beekman in Leiden.<sup>84</sup> Just like Isaac Beekman, Voetius was interested in medicine and followed lectures in mathematics of Rudolf Snellius and he read the works of Peter Ramus.<sup>85</sup> A second observation is that the Auction Catalogue of 1637 mentions Voetius' *Desperata causa Papatus*, which means that Beekman knew Voetius' work(s).<sup>86</sup> Voetius finished this book in 1633, but it was printed in Amsterdam in 1635 (two years before Beekman died).<sup>87</sup> A third observation is that both Voetius and Beekman defended the ideals of the *Further Reformation*. Voetius connected "spirituality (*pietas*)" with "rationality (Scholasticism)," as Van

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<sup>84</sup> Antoon Vos, "Isaac Beekman: zijn weg naar de wetenschappelijke revolutie" (Leuven: Evangelische Theologische Faculteit, 2017), 13.

<sup>85</sup> Andreas Beck, *Gisbertus Voetius (1589-1676): Sein Theologieverständnis und seine Gotteslehre* (Utrecht: Universiteit Utrecht, 2007), 38-39.

<sup>86</sup> "Catalogus librorum di Isaac Beekman"; Canone, "Il Catalogus librorum di Isaac Beekmann."

<sup>87</sup> Beck, *Gisbertus Voetius*, 50.

Asselt explains.<sup>88</sup> Voetius considered theology as a “universal science,” that gives a foundation for scientific research and education.<sup>89</sup> For him, knowledge (theology and science) should have a practical dimension and therefore lead to “faith, hope and love.”<sup>90</sup> Concerning his passion for Christian devotion, it is interesting to mention Voetius’ interest in Thomas à Kempis’s *Imitatio Christi* (ca. 1380-1471) as well as the books of Willem Teellinck (that also inspired Beeckman).<sup>91</sup> A final similarity between Beeckman and Voetius is that both chose the position of Gomarus in the Remonstrant controversy.

Important for understanding the general theology of the seventeenth century is Voetius’ view on the divine will and contingency. After all, Beck recognizes a connection between Voetius’ thought and the theology of the Augustinian-Franciscan tradition. Just like Beeckman, Voetius believed that God is able to create other worlds—real alternatives are possible—and thus he accepted the idea of synchronic contingency.<sup>92</sup> For both Beeckman and Voetius, the ‘free will of God’ was the origin of

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<sup>88</sup> Willem J. Asselt, “Voetius, Gisbertus,” ed. George Harinck et al., *Christelijke Encyclopedie* (Kampen: Kok, 2005), 1817.

<sup>89</sup> Ibid.

<sup>90</sup> Ibid., 1717.

<sup>91</sup> Beeke, Hof, and Meeuse, *Reformatrische spiritualiteit*, 344; Beck, *Gisbertus Voetius*, 100–101.

<sup>92</sup> Beeckman, *Journal*, 1:138; 2:232; 2:358; Beck, *Gisbertus Voetius*, 263.

creation. The immutability of God's essence does not exclude His free decisions and acts, as Beck noticed.<sup>93</sup> After all, God's acts are not a result of the (immutability of the) divine essence, but of His free will. God's will is not bound by necessity; it is free and contingent "with regard to created things."<sup>94</sup> According to Beck, Voetius followed the Franciscan legacy that assigned a central role to 'the divine will.'<sup>95</sup> Beck mentions Johannes La Rochelle, Bonaventura and especially Duns Scotus as key figures in this Franciscan tradition with their emphasis on the divine will. For our thesis concerning the natural Scientific Revolution, it is important to emphasize that Beekman's connection of his mechanical philosophy to a theology that recognizes the divine free will and contingency is part of a general theology in the Post-Reformation era. This will be explained in the third, fourth and fifth chapter.

### Theology in the Time of Early and High Orthodoxy

#### *Post-Reformation Theology in Beekman's Time*

Beekman developed his theories on natural philosophy in the time between the early orthodoxy (ca. 1560–1620) and high orthodoxy (ca. 1620–1700). A discussion of

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<sup>93</sup> Beck, *Gisbertus Voetius*, 356–358.

<sup>94</sup> *Ibid.*, 356.

<sup>95</sup> *Ibid.*, 517.

his theological thought against the background of Reformed orthodoxy is relevant because he was part of this context. Beeckman's *Journal* demonstrates continuity with Post-Reformation philosophy and theology. After all, he mentions typical Scholastic terms—like *contingency, necessity, the will of God, the divine decree and providence*—in some of his discussions on mechanical philosophy.<sup>96</sup> Richard Muller summarizes main themes in Reformed philosophy and theology by stating that these early modern scholars developed

a robust doctrine of creaturely contingency and human freedom built on a series of traditional scholastic distinctions, including those associated with what has come to be called “synchronic contingency,” and did so for the sake of respecting the underlying premise of Reformed thought that God eternally and freely decrees the entire order of the universe, past, present, and future, including all events and acts, whether necessary, contingent, or free.<sup>97</sup>

The term “synchronic contingency” was introduced by the theologian and philosopher Antoon Vos, who states in his dissertation that especially the medieval theologian John Duns Scotus (ca. 1265–1308) developed a philosophy that recognizes the free will of God and the concept of contingency.<sup>98</sup> Synchronic contingency is the idea that God

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<sup>96</sup> Beeckman, *Journal*, 1:138; 1:230, 1:228-229; 2:358; 1:261; 4:30-31. These are some key texts that mention some of these typical scholastic theological terms. All these texts are discussed separately in this or other chapters.

<sup>97</sup> Richard A. Muller, *Divine Will and Human Choice: Freedom, Contingency, and Necessity in Early Modern Reformed Thought* (Grand Rapids, MI: Baker Academic, 2017), 34.

<sup>98</sup> Antoon Vos, *Kennis en noodzakelijkheid: een kritische analyse van het absolute evidentialisme in wijsbegeerte en theologie*, *Dissertationes Neerlandica* 5 (Kampen: Kok, 1981).

could create whatever world, time and space He wanted. The divine will has real alternatives in a particular moment, so that His actions and creation are contingent. According to Vos, the synchronic contingency model was influential in the University of Leiden, where Beeckman studied. Beeckman does not provide us a systematic theological discussion on this topic, so that it is impossible to determine empirically if he embraced the notion of synchronic contingency. However, in *Journal 1:138*, Beeckman mentioned that ‘the past’ as well as ‘the future’ are changeable, “because for God nothing is impossible.”<sup>99</sup> He explains that things happen necessarily with respect to the divine decree but from a human viewpoint they happen contingently. From the perspective of God’s omnipotence, this is synchronic contingency, because the divine decree is not limited by necessity.

#### *The Doctrines of God, Creation and Providence*

The following chapters will demonstrate that Beeckman mentioned concepts in his *Journal* – such as ‘providence’, ‘predestination’, ‘necessity’ and ‘contingency’ – that reflect university theology of his time. In Post-Reformation theology, the doctrines of “God, creation and providence” were important *loci*, that “reflect a rich tradition of patristic and medieval thought and also express interesting developments in the wake

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<sup>99</sup> Beeckman, *Journal*, 1:138. “Want Gode is niet onmogelick.”



of the European Reformations.”<sup>100</sup> Concerning the *interrelatedness* of these three doctrines, Andreas J. Beck explains,

The doctrine of God is about the triune God and his eternal, *immanent* acts or works, which can be directed both to God himself (*ad intra*) or to what is outside of him (*ad extra*). The doctrines of creation and providence concern *external* acts or works of the triune God that are directed *ad extra* (Wollebius 1935, 14-15; Voetius 1648, 403). The divine works *ad extra*, and thus creation and providence are free and contingent, whereas those immanent acts that are directed *ad intra*, such as “knowing himself,” are necessary.<sup>101</sup>

In the time of Reformed orthodoxy, Reformed theologians generally accepted the idea that ‘the contingent order’ was created by the divine free will. This means that God has real alternatives concerning the creation of space and time. Muller clarifies that this contingent order contains “actions and events that are necessary, contingent, and free.”<sup>102</sup> Muller emphasizes that this contingency does not “rule out causal necessities within the temporal order.”<sup>103</sup> Post-Reformation theologians believed that God—as the First Cause—does not violate the free will of humans or the contingency of the secondary causes. For Beeckman (and for medieval natural philosophers) nature’s

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<sup>100</sup> Andreas Beck, “God, Creation, and Providence in Post-Reformation Reformed Theology,” in *The Oxford Handbook of Early Modern Theology, 1600-1800*, ed. Ulrich L Lehner and A. Richard Muller (Oxford: Oxford University Press, 2016), 195.

<sup>101</sup> *Ibid.*, 196.

<sup>102</sup> Muller, *Divine Will and Human Choice*, 212.

<sup>103</sup> *Ibid.*

working was considered as a product of God's ordained power. Reformed philosophers, like Beeckman, considered everything that God created, wanted and decreed was and is contingent. Beeckman's mechanical philosophy should be interpreted within this theological framework. Everything that God decrees is necessary, as Beeckman says.<sup>104</sup> This does not mean that God depends on necessity. Beeckman certainly believed that God's decree itself is contingent because it is a product of God's free will. Causal necessity as well as free decisions of humans and the results of secondary causes are contingent themselves, because God's providence and divine decree guaranties their contingent state and freedom.<sup>105</sup> That is the intellectual context of Beeckman's thought, from the perspective of Post-Reformation university theology of Leiden.

An important nuance is that Reformed theologians avoided considering God as the establisher of sin. Therefore, they adapted the medieval distinction between God's effective will and His permissive will concerning evil.<sup>106</sup> God only allows evil, they believed, but He does not cause it in the sense that He would desire to create evil. In this context, Beeckman quoted pastor Cornelis Hanecop who stated in a sermon that

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<sup>104</sup> Beeckman, *Journal*, 1:138. "Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt."

<sup>105</sup> Muller, *Divine Will and Human Choice*, 211–214.

<sup>106</sup> Beck, "God, Creation, and Providence," 203.

a thief lies if he says that God foreordained him to do evil. The thief wrongly thinks, Beeckman explained, that he is innocent by this evil act because of God's decree.<sup>107</sup> Beeckman said that the predestination doctrine may not be used as an argument for doing bad things, like stealing. He warned that predestination and God's decree are not an excuse for doing evil. This demonstrates that Beeckman, as a seventeenth century scholar of the Reformed tradition, did not believe that the doctrine of predestination ruled out human responsibility or free will. Just like other Reformed theologians of his time, Beeckman saw 'predestination' as a kind of divine providence and not as a deterministic principle.<sup>108</sup>

### Summary

Isaac Beeckman was born in a family of traders and craftsmen, who fled from the Southern part to the Northern part of the Low Countries because of the persecution of Protestants. Beeckman combined his artisanal knowledge with his education in theology (in Leiden and Saumur), mathematics (through self-study and the courses of Snellius) and medicine (in Caen). As a Protestant in the Reformed tradition, Beeckman was influenced by the reforming movement of Teellinck. For Beeckman, piety and a

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<sup>107</sup> Beeckman, *Journal*, 1:261. Between November 23 and December, 1618 Beeckman says, "Alsoo als eenen dief segt: 'God heeft my daertoe gepredestineert', hy liecht, omdat hy sichselven wys maect, dat hy door dit besluyt Gods niet schuldich en is in die dieverie."

<sup>108</sup> Beeckman, *Journal*, 1:230. "...de praedestinatie, welcke niet anders is dan een bysonder specie van de providentie."

convicted faith were important. His personal library demonstrates his interest in religion and theology. Ramist pedagogical principles, such as simplicity in argumentation, were attractive for Beeckman, who was both a teacher and a rector of a Latin school. Another chapter will mention Beeckman's use of *Ockham's Razor* in his mechanical philosophy. Beeckman learned theological concepts, that he mentioned in his *Journal*, from his university education. We should interpret Beeckman's theological thought from the perspective of early and high orthodoxy, in which the doctrines of God, creation and providence were important. Scholastic theology is an important source for Beeckman's mechanical philosophy.

## CHAPTER 2. GOD'S BOOK OF NATURE AND ITS MECHANICAL WORKING

### Introduction

Beeckman connected *mechanics* to natural philosophy and, in addition, *mathematics* to mechanics.<sup>109</sup> These are big steps in the history of philosophy and science. Beeckman developed a coherent mechanical philosophy that integrated mathematics, mechanics and physics to each other. The fields of 'mechanics' and 'mathematics' were in his days different fields than that of 'natural philosophy,' but Beeckman crossed the lines between them.<sup>110</sup> Moreover, Beeckman is one of the first natural philosophers who consequently described the mechanism of nature in words and pictures on paper. This radical new way of doing science needs a closer discussion in its historical, philosophical and religious context.<sup>111</sup> Therefore, this chapter will argue that the influential concept of the *book of nature* in the Low Countries was conducive to a (mechanical) philosophy that describes nature's mechanism. The 'hermeneutical' consequences of a worldview that considers nature as a 'text' will be explored. Beeckman explicitly called both God and humans "authors" of nature.

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<sup>109</sup> Ibid., 3:51-52.

<sup>110</sup> Berkel, *Beeckman on Matter and Motion*, 136; Beeckman, *Journal*, 3:51-52.

<sup>111</sup> Some of the following chapters will explain similarities between medieval physics and Beeckman's way of thinking. We will argue that Beeckman's thought should be interpreted within the context of university thought, medieval physics and theology.

However, the meaning of the word ‘author’ in the seventeenth century will be discussed because this word had more meanings than ‘writer of a book.’ The chapter will explore whether the concept of ‘the book of nature’ was prevalent in Beeckman’s thought. It will be argued that his *Journal* demonstrates that he considered natural science as an act of authorship (describing nature’s mechanism) and that from his perspective, faith in God’s sovereignty and divine providence was not in conflict with mechanical philosophy.

#### The Author, the Book of Nature and Its Readers

##### *The Source Text (Journal 1:228-229)*

In the following selection of Beeckman’s note, he calls humans as well as God “authors.” Beeckman says,

Because God governs both: that what we know as well as that what we don’t know. But that what we have zealously experienced and know for sure, it pleases him that we are called its author; but that what we do not yet know for sure or can’t do without mistakes, it pleases him to be called the maintainer of it, until we are able to understand...God is author of nature itself. And for that reason, we must ascribe to him all good and weighty matters, whether people can predict them or not.<sup>112</sup>

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<sup>112</sup> Beeckman, *Journal*, 1:229. Beeckman’s Dutch source text is consultable in Appendix A. The term ‘author’ can be translated as: ‘author,’ ‘creator,’ ‘establisher,’ ‘finder’ or ‘maker.’

*The Meaning of 'Author'*<sup>113</sup>

Before we analyse this note, it is necessary to discuss the meaning of 'author' in Beeckman's time. Beeckman uses the Old-Dutch word "auteur" two times. He says that it pleases God that humans are called the 'author' of "that what we have zealously experienced and know for sure."<sup>114</sup> Moreover, he mentions that "God is the author of nature itself." Although we will argue that there are good reasons to assume that Beeckman had the activity of authorship (in the modern sense) in mind for both humans and God, it is relevant to remark that in his time 'author' was also used in other contexts. The Dutch word "auteur" was adapted from the French word "auteur" and the Latin word "auctor."<sup>115</sup> The term 'author' could mean 'author of a book,' but also 'creator,' 'establisher,' 'finder' or 'maker.'<sup>116</sup> Since the concept of *the book of nature* was influential in Beeckman's time (as will be explained further), this raises the question whether Beeckman meant that God is the writer (author) of His book of nature. Beside the interpretation of 'writer' it is possible that he understood 'auteur' as the creator, maker or establisher of nature. On the other hand, there is the

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<sup>113</sup> Ibid., 1:228-229.

<sup>114</sup> Ibid.

<sup>115</sup> Instituut voor Nederlandse Lexicologie, "Historische Woordenboeken op Internet," Geïntegreerde Taalbank, *Instituut voor de Nederlandse Taal*, s.v. auteur, last modified 2010, accessed November 25, 2017, <http://gtb.ivdnt.org/>.

<sup>116</sup> Ibid., auteur.

question why Beeckman called humans also the ‘authors.’ Concerning God, the interpretation of author as the creator of nature would be understandable, but for humans this meaning is less obvious. In the following analysis of Beeckman’s note, the possible meanings will be discussed more closely. We will argue that the concept of authorship is prevalent in Beeckman’s philosophy.

*An Analysis of Beeckman’s Note (Journal 1:228-229)*

The quoted text is part of a larger whole that now will be explored. Beeckman starts his note with a reflection on the question of whether humans can understand natural phenomena. He uses the example of the profession that he learned from his father – candle making. As a professional candle maker, Beeckman knows that with some experience one can become an expert in *candle making*.<sup>117</sup> Beeckman explains that one can always repeat the same procedure in making candles because the natural elements (the fire and the candle grease) remain of the same nature, so that the result (the candles) of this craft is always the same.

Beeckman realizes that his other specialization – the profession of physician – is not that simple. He graduated in 1618 in medical sciences at the University of Caen. He says that if someone would predict, “I will not be sick once this year, if I will do

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<sup>117</sup> Beeckman, *Journal*, 1:228. See *Appendix A* for the source text.



my best, then that will be blamed, even if the person who said this was an experienced doctor.”<sup>118</sup> Then he mentions that although physicians don’t understand the cause of diseases yet, there is still a *physical explanation* for every disease. His contemporaries sometimes explained natural phenomena as the result of magic or spiritual forces, but Beeckman refuses these non-physical explanations.<sup>119</sup> In what follows, Beeckman’s coherent mechanical philosophy becomes clear. He does not try to speculate about the natural mechanism behind diseases, but instead he focusses on the relationship between ‘knowledge’ and ‘faith in God.’ Here, his metaphysical and theological framework behind his mechanical philosophy becomes visible. Immediately after his conclusion that physicians don’t know the cause of diseases, he calls humans “authors” of the things that we “have zealously experienced and know for certain” and he says that God is pleased to be called “the maintainer” of the things that we do not yet know for sure until we are able to understand.”<sup>120</sup>

At the end of the note, he says that God is the “author of nature itself.” Since Beeckman already stated that God is the maintainer of nature, it is possible that he understood ‘author’ as ‘creator’ or ‘maintainer’ of nature. However, another possibility is that he regarded nature as a book that was written by God because the

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<sup>118</sup> Ibid.

<sup>119</sup> Ibid., 2:242.

<sup>120</sup> Ibid., 1:228-229. The source text is mentioned in Appendix A.

concept of 'the book of nature' was used in his time. Further, it will also be argued that in Beeckman's time and place, God's role as Creator was seen as an act of authorship. An interpretation of 'author' as both 'creator,' 'maintainer' and 'writer' do not exclude each other in a seventeenth century theological context.

It is remarkable that Beeckman not only calls God an author, but also humans. This raises the question what Beeckman means when he says that humans are 'authors.' Beeckman mentions that God calls humans "authors" of the things that we have "zealously experienced" and "know for sure" and that it pleases God to be called the "maintainer" of the things that we do not yet know for sure.<sup>121</sup> It is unlikely that Beeckman, as a Protestant, would believe that humans are 'maintainers' or 'creators' of nature's working (a characteristic that Christians attribute to God). We suggest that Beeckman understood 'author' in the sense of the 'describer' or 'discoverer' of nature's working. Humans have the capacity to understand and explain the working of nature and write it down like authors. This meaning is close to the interpretation of 'authorship,' since that is what Beeckman does in his *Journal*: he describes the working of nature as an author. Further, this concept of science as an act of authorship will be

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<sup>121</sup> Beeckman, *Journal*, 1:228-229. "Maar hetgeene wy door neerstcheyt ondervonden hebben en seecker weeten, daer laet hy geern ons den autheur van genoempt worden; maer hetgeene, dat wy noch niet seecker ende sonder foute doen en connen, daer wilt hy noch den beschicker van genoempt worden, tot dat wy oock eens seecker comen te weten."

explored more extensively as well as the theological concept of ‘the book of nature’ in the Low Countries.

For Beeckman, there is no contradiction between his faith in the existence of God and his perspective that nature works as an *understandable* mechanism. Beeckman believes that the working of nature is in God’s hand. He uses the example of an eclipse. “Before one could predict an eclipse,” as Beeckman explains, “one had to say that God established it to move the people to respect for him, or to let the enemy losing the battle – and thank him that the eclipse was ordained to our advantage.”<sup>122</sup> Beeckman explains that God is pleased that humans now understand the working of an eclipse. Moreover, people are allowed to take the prediction of an eclipse into account for their decisions and actions (he mentions a *war* as an example), just like they already do by predicting day and night. God allows us to take this knowledge into account in decisions and actions. Moreover, although people are now able to explain the cause of natural phenomena by studying nature, they still can attribute its mechanism to God and one may still thank Him for phenomena like day and night. The imagery of the book of nature and science as an act of authorship will be discussed now.

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<sup>122</sup> Beeckman, *Journal*, 1:229. “Eer dat men de eclipsen seeckerlick conde voorseggen, soo moest men seggen, dat se God tewegen brocht om tvolck tot hemwaerts tot vreesse te brengen ofte om den vyant den stryt doen te verliessen en hem dancken, dat den eclips tot ons voordeel alsoo hadde beschict.”

## Reading the Book of Nature

*Physics on Paper: the 'Picturability' of Nature*

Van Berkel mentions the role of – what he calls – “picturability” in Beeckman’s philosophy. Here is an image of Beeckman’s visual presentation of the pressure of water in a vessel.

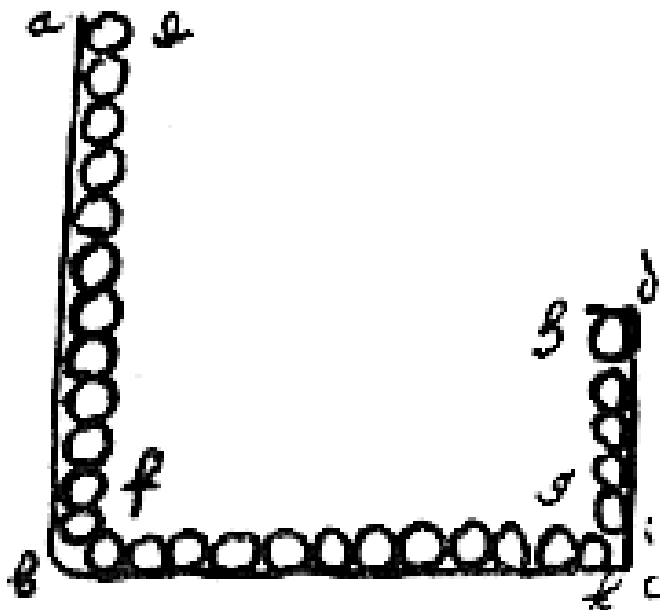


Figure 1. *Pressure of water particles (Journal 2:236)*

In another image, Beeckman draws the refraction of light by the representation of light atoms, something that was new in his time.

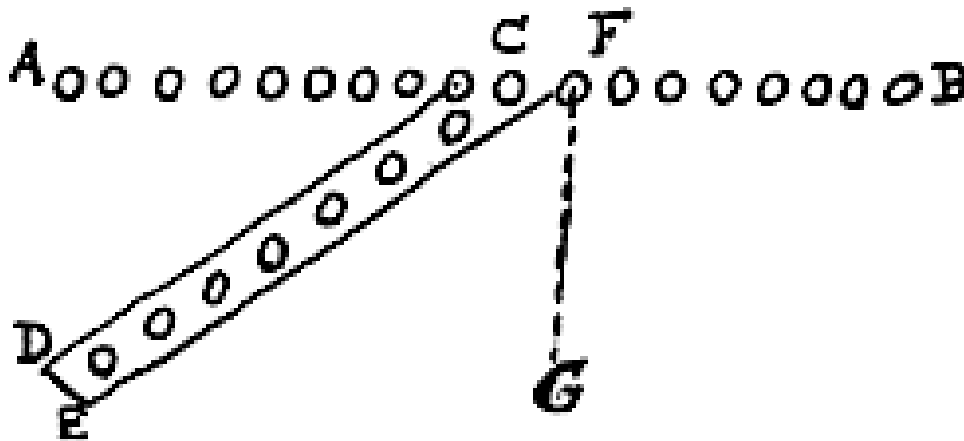


Figure 2. *Beeckman's visualising of the refraction of light (Journal 1:211)*

One should not underestimate the importance of Beeckman's new way of looking at reality in the history of philosophy. While Dijksterhuis regarded 'picturability' as irrelevant in the rise of a mechanical worldview, Van Berkel reacts on Dijksterhuis that it was "a cornerstone of Beeckman's physical-mathematical philosophy."<sup>123</sup> Also Beeckman's pupil René Descartes used illustrations in his mechanical philosophy.<sup>124</sup> This famous French philosopher might have been influenced by Beeckman's

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<sup>123</sup> Berkel, *Beeckman on Matter and Motion*, 177–178.

<sup>124</sup> *Ibid.*, 174, 178. Van Berkel mentions a famous picture of Descartes' theory on magnetism.

'picturability' of nature, because both philosophers cooperated in the first years of their friendship.

Perhaps one of the biggest changes in the history of science and philosophy is Beekman's recognition of reality itself, that can be explained mechanically by drawing pictures on paper.<sup>125</sup> This means a remarkable hermeneutical change: from the abstract to the concrete; from the physical world to paper and ink.<sup>126</sup> After all, Beekman explains physical reality by describing its logical working, with the support of drawing pictures on a physical medium (paper). Aristotelianism explained physics from first principles instead of explaining its concrete mechanism. Platonism interpreted physical reality from the perspective of the higher world of ideas. For Beekman, natural science was an act of *describing* nature's mechanism: the work of an author.<sup>127</sup> His natural science was not built on eternal principles, *Forms* or *Ideas* (as in Aristotelian physics), but on mechanics and mathematics. These became important building stones for mechanical philosophy.

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<sup>125</sup> Ibid., 173–185.

<sup>126</sup> What we mean here is that Aristotelian physics interpreted the physical world from first principles. Platonism interpreted it from the higher world of Ideas. Beekman interpreted the physical reality from its own mechanical working.

<sup>127</sup> Beekman, *Journal*, 1:228-229. Beekman says that God as well as humans are "authors" of nature.

What motivated Beeckman to describe nature's mechanism, by drawing pictures and writing words? We suggest that the imagery of nature as *God's book* is an important philosophical concept for Beeckman's mechanical philosophy and 'picturability.'<sup>128</sup> Although Beeckman does not mention the phrase 'book of nature,' he certainly knew this imagery, as will be explained further. The imagery of humans as 'authors' of nature or nature as a 'book' was certainly supportive for the hermeneutical shift from Aristotelian physics to mechanical philosophy. We will argue that the viewpoint of nature as a 'text' opened the philosophical way for the scientific methods of *analysing* and *describing* nature's mechanism (the 'text') on paper. The use of the imagery of the 'book of nature' in the Low Countries will now be explored.

#### *Exploring the 'Book of Nature' in a Dutch Context*

It is sometimes stated that Dutch natural science of the seventeenth century was more *practical* and *non-philosophical* in comparison with, for example, France.<sup>129</sup> While French natural philosophers, like René Descartes, packed their natural scientific theories in a clear metaphysical framework, scientific works of the Low Countries were less philosophical (according to this standard view). However, Van Berkel, as a Dutch

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<sup>128</sup> Beeckman, *Journal*, 1:228-229.

<sup>129</sup> Klaas van Berkel, *Citaten uit het boek der natuur: opstellen over nederlandse wetenschapsgeschiedenis* (Amsterdam: Bert Bakker, 1998), 21-23.

historian of science, mentions a clear philosophical concept that was influential in the Low Countries: the concept of the 'Book of Nature.'<sup>130</sup> Especially in the Low Countries, the concept that nature can be 'read' as a book was an important theological concept. Beekman knew this imagery because he belonged to the Dutch Reformed church and the *Confessio Belgica* was part of his library.<sup>131</sup> The *Confessio Belgica* (1561) mentions in *article II* explicit that nature is 'a book':

We know [God] by two means: First, by the creation, preservation, and government of the universe; which is before our eyes as a most elegant book ...Second...by His holy and divine Word.<sup>132</sup>

This is an important reference because the *Confessio Belgica* was influential in the Reformed churches of the Low Countries. The 'two-book' theology (*Scripture* and the *Book of Nature*) is visible in this article. In the Dutch Republic the ideology of nature as God's book was generally accepted.<sup>133</sup> Some decades after Beekman, the Dutch natural scientist Jan Swammerdam (1637-1680) called the wonders of nature an "open

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<sup>130</sup> Ibid., 8, 267-270.

<sup>131</sup> Canone, "Il Catalogus librorum di Isaac Beekmann."

<sup>132</sup> *Confessio Belgica*, art. II, quoted in *Historic Creeds and Confessions*. Electronic ed. Oak Harbor: Lexham Press, 1997.

<sup>133</sup> Berkel, *Citaten uit het boek der natuur*, 269.



Bible.”<sup>134</sup> Swammerdam is famous because of his accurate observation and description of red blood cells in 1658.<sup>135</sup> In his work on microscopic observation, he wrote that natural science is like seeking God “in the bible of nature.”<sup>136</sup> The fact that a leading modern scientist as Swammerdam referred to nature as an ‘open Bible’ demonstrates the widespread use of the ‘two books’ theology in the seventeenth century. The imagery of nature as a book even occurred in the eighteenth century in a secular variant.

Other areas in which the imagery of nature as a book is visible in the Low Countries, are the natural collections and the botanic gardens of the seventeenth century. The ‘natural history cabinet’ was as important for seventeenth century natural history as the laboratory is for modern biology, Van Berkel explains.<sup>137</sup> As a historian of Dutch science, Van Berkel noticed that in the apparent chaos of the natural cabinets, one can observe that the researchers saw their collections as creative quotations from

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<sup>134</sup> Ibid., 270.

<sup>135</sup> Encyclopædia Britannica: Noet Edition (Chicago, IL: Encyclopædia Britannica, 2016), s.v. Swammerdam, Jan.

<sup>136</sup> Jan Swammerdam’s letter to Melchisedec Thévenot (January 1678), cited in Berkel, *Citaten uit het boek der natuur*, 270. Swammerdam’s phrase is “inde bybel der natuur.”

<sup>137</sup> Ibid., 85.

nature's book.<sup>138</sup> To understand the purpose of these collections, one should know that the collectors regarded nature as "a manifestation of God's will."<sup>139</sup> Just like God reveals himself through the Bible, Dutch natural scientists believed that He also demonstrates His will through nature. They saw nature as 'a text' with meaningful words and sentences: the natural history cabinet was a quotation from nature's 'text.'<sup>140</sup> According to Van Berkel, the seventeenth century people regarded nature as "the art of God." In the Toledo Museum of Arts, a painting from 1647 is exhibited that refers to this religious idea. This museum has an image of an exotic plant, with next to it the phrase "every crop attests to God's presence."<sup>141</sup> The cabinets of curiosity and natural history were apparently built up randomly, but its owners regarded these cabinets as quotes from the *book of nature* that refer to its Creator.<sup>142</sup> Just like pastors use various texts from God's Scripture in their sermons, the collectors saw their collections as references to His other book (nature). Beeckman was part of this Dutch context, in which natural science was seen as an act of 'quoting' from God's book of

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<sup>138</sup> Ibid., 7-9.

<sup>139</sup> Ibid., 109.

<sup>140</sup> Ibid.

<sup>141</sup> Ibid., 116. "Praesentem monstrat, quaeliset herba deum."

<sup>142</sup> Ibid., 110.

nature. Moreover, also his contemporary Galileo used the imagery as well as other natural philosophers outside the Dutch Republic, but their views will be discussed in the final chapter.<sup>143</sup> It is worth noting that the imagery was already mentioned explicitly by many church fathers. As Giuseppe Tanzella-Nitti noticed,

Among the Fathers of the Church, explicit references to the book of nature can be found in St. Basil, St. Gregory of Nyssa, St. Augustine, John Cassian, St. John Chrysostom, St. Ephrem the Syrian, and Maximus the Confessor.<sup>144</sup>

This demonstrates how widespread the two-book imagery was in church history and in the seventeenth century, when a Scientific Revolution took place.

#### *Science as an Act of Authorship*

It is no coincidence that the ‘picturability’ of nature was established in *The Low Countries*. After all, Beeckman developed his mechanical philosophy in this historical context where the imagery of “God’s book of nature” was an important doctrine. When Beeckman says that God calls humans the authors, it is not inconceivable that Beeckman thought about *his own activity* as an author: he writes nature’s working down on paper, in words and pictures. This is an act of ‘authorship.’ This means that

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<sup>143</sup> Kenneth J Howell, *God’s Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science* (Notre Dame, Ind: Univ. of Notre Dame Press, 2002), 2.

<sup>144</sup> Giuseppe Tanzella-Nitti, “The Two Books Prior to the Scientific Revolution,” *Perspectives on Science and Christian Faith* 57, no. 3 (September 2005): 237.

in *Journal* 1:228-229, there is evidence for the statement that Beeckman had religious reasons for his work as “an author” of nature.<sup>145</sup> His faith in God allowed him to describe nature’s mechanism and to draw pictures of this mechanism on paper. We suggest that the concept of the ‘book of nature’ was supportive for his activity as ‘an author’ of nature.

The combination of Beeckman’s mechanical philosophy with the metaphor of God’s book of nature demonstrates that natural science was an ‘hermeneutical’ activity. As a theologian, Beeckman learned to interpret the Bible and as a natural philosopher he developed his method to interpret the book of nature by writing and drawing its working on paper. As an elder in the Reformed tradition, Beeckman knew the imagery of God’s two book—Scripture and the book of nature—because it was mentioned in the *Confessio Belgica* that he owned in his personal bookcase.<sup>146</sup> As a Protestant, he believed that the Bible was written by human inspired authors. As a natural philosopher, he believed that humans can analyse and describe the working of the book of nature.

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<sup>145</sup> Beeckman, *Journal*, 1:228-229. Beeckman says, “Maar hetgeene wy door neersticheyt ondervonden hebben en seecker weeten, daer laet hy geern ons den autheur van genoempt worden.”

<sup>146</sup> Canone, “Il Catalogus librorum di Isaac Beeckmann.”

### Summary

Beeckman stated that the divine author of nature was a very wise architect of the universe. He believed that the mechanical working of nature was not a limitation of God's sovereignty and divine providence. Beeckman's *Journal* demonstrates a hermeneutical change from Aristotelian physics to his method to describe and draw nature's mechanical working on paper. The imagery of nature as a book made it possible to translate nature's mechanical working into text on paper. Indeed, Beeckman called natural philosophers "authors." In the seventeenth century, science was an act of authorship. The following chapter will explore the difference between Aristotelian physics and Beeckman's mechanical philosophy.

## CHAPTER 3. CREATION THEOLOGY BASED PHYSICS VERSUS ARISTOTELIAN PHYSICS

### Introduction

Beeckman's physics demonstrates a new approach of the physical world. His rejection of Aristotelian physics is remarkable because these ideas were still influential in his time. In this third chapter we will argue that Aristotelian physics was built on religious assumption, such as the divine '*law of necessity.*' A central argument is that Beeckman's modern physics replaced the religious assumptions of ancient physics by a creation theology-based physics. Therefore, the first part will analyse some of Beeckman's notes in which he mentioned God's role as creator and architect of the physical world. After a historical overview of 'the law of necessity' and its influence on ancient physics, we will uphold the statement that Beeckman's creation theology stands in a long theological tradition that already started in the sixth century, with John Philoponos who (like Beeckman) integrated biblical creation theology with physics.

### God as the Creator of Perpetual Motion

#### *Ancient Authors in Beeckman's Journal and the Auction Catalogue*

Beeckman had access to the complete work of Aristotle in Greek and Latin, but also to other ancient authors like Galen and the Roman poet and philosopher Titus

Lucretius Carus (first century B.C.).<sup>147</sup> Lucretius' atomism had especially caught Beeckman's interest, as we will explain further on. It is worth mentioning that although Beeckman commented on books of ancient philosophers, the notes of his journal demonstrate less interest in Aristotelian physics.<sup>148</sup> Although Aristotelian physics was still popular in his days, there was a growing opposition to it, occurring mostly within the social circles of Beeckman. He maintained contacts with scholars who distanced themselves from Aristotelian (meta)physics and the *Journal* shows his interest in authors who disagreed with Aristotle. Typical critics of Aristotelianism that caught Beeckman's attention were the scholars Lucretius and Philip van Lansbergen.<sup>149</sup> Beeckman had contacts with scientists and inventors of perpetuum mobile machines, who often built their theories on Aristotelian thought, but he consistently rejected their physical explanations, as we shall discover in the following paragraphs.

*Only God Makes Perpetual Motion*

In the early seventeenth century, artisans took the challenge to invent a machine that works uninterruptedly. Beeckman discussed the inventions of his contemporaries

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<sup>147</sup> "Catalogus librorum di Isaac Beeckman"; Berkel, *Beeckman on Matter and Motion*, 74.

<sup>148</sup> Berkel, *Beeckman on Matter and Motion*, 130–131. According to Van Berkel, "Beeckman does not seem to have read widely in Aristotle."

<sup>149</sup> *Ibid.*, 130–131; 149–151.

in many notes. He realized, however, that both on religious and mechanical grounds a perpetuum mobile is impossible unless it exists in a vacuum.<sup>150</sup> After all, there is no air pressure present in the vacuum, which means that movement can last forever. In the Aristotelian cosmological order “a constant force leads to a constant motion,” but in Beeckman’s physics, a constant force leads to “a constant acceleration.”<sup>151</sup> Air resistance and friction prevent perpetual motion. When burgomaster Puyck funded an invention based on a “perpetuum mobile machine,” Beeckman warned him that such a machine would never work, by saying, “only God makes living wheels or perpetual motion.”<sup>152</sup> This is one of the few scientific subjects in which Beeckman explains a *physical* statement with a *religious* argument. It seems that the burgomaster needed a religious argument to be convinced by his respected natural philosopher. In most cases – as in his reaction to the inventors of the machine – Beeckman limited himself to purely *physical* arguments about why a perpetuum mobile is impossible. In the short religious reference that only God makes ‘living wheels’ or ‘perpetual motion,’ one can discover at least two theological assumptions. The first assumption is that for God nothing is impossible, because He is not bound by mechanical principles. The second

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<sup>150</sup> Ibid., 141.

<sup>151</sup> Ibid., 107.

<sup>152</sup> Beeckman, *Journal*, 2:358; Berkel, *Beeckman on Matter and Motion*, 141. “Want Godt maeckt alleen levende raders of perpetuum motum.”



assumption in this note is that humans are bound by the mechanical working of nature and by the mechanical boundaries of machines. Humans cannot build a machine with perpetual motion because this is physically impossible. After all, Beeckman realized that motion is hindered by air resistance and friction.<sup>153</sup> Further on, we will explain that in Aristotelian cosmology, motion is caused by the natural tendency of things to reach its destiny (in their eternal cosmological order). However, in Beeckman's physics—which is based on 'creation theology' and the affirmation of 'creatio ex nihilo'—motion has a purely mechanical cause because God created matter passive.

### Creation Theology and Mechanical Philosophy

#### *God as the Creator of Atoms*

In this part, the influence of creation theology on Beeckman's use of ancient atomism will be discussed. Beeckman gave Europe a "Christianized version of ancient atomism," which was important for the importation of ancient atomism in scientific explanations in a seventeenth century Christian environment.<sup>154</sup> After all, he integrated ancient atomism with creation theology by stating that God gave *primordia*

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<sup>153</sup> Berkel, *Beeckman on Matter and Motion*, 107.

<sup>154</sup> Beeckman, *Journal*, 1:23; 2:57; Kubbinga, "The First 'Molecular' Theory," 213; Berkel, *Beeckman on Matter and Motion*, 166–167.

("fundamental parts") to each individual being. He uses the analogies of King Salomo's temple and the architect.<sup>155</sup> Just like the architect first prepares the parts (the doors, stones, window, etc.) before building the temple, also God first created the primordia, what we today call 'molecules,' of all things in nature. Beeckman states that "these [parts] once created by God, could not but form a specific being."<sup>156</sup> He believed that atoms were created *ex nihilo* and that their form and movement reflect God's providence.<sup>157</sup> Beeckman rightly explained natural phenomena, such as air pressure or fire, as the working of particles.<sup>158</sup> God created nature well-structured and he produced atoms with the capacity "to form more complex structures according to rules also laid down by God."<sup>159</sup> Beeckman believed that God gave these atoms limitations in what they could produce. Nature and atoms work totally passive and according to the rules the Creator had imposed at creation.

In the seventeenth century, it was common to reintroduce a kind of "vitalism" in theories on the movement of matter, in the form of "active principles" or "life-giving

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<sup>155</sup> Beeckman, *Journal*, 1:23.

<sup>156</sup> Beeckman, *Journal*, 2:57. "Deum vero ejusmodi principia creasse in principio, quae sibi mutuo juncta, non possint non hoc facere."

<sup>157</sup> Kubbinga, "The First 'Molecular' Theory," 213.

<sup>158</sup> Berkel, *Beeckman on Matter and Motion*, 92–97.

<sup>159</sup> *Ibid.*, 143.

'seeds' (semina)."<sup>160</sup> These kinds of explanations were considered as essential in explaining motion. Beeckman opposed all explanations that attribute intelligence (or a soul) to matter. He was radical in the formulation of his atomistic theory in the context of matter and motion, which was quite remarkable so early in the seventeenth century, as Van Berkel noticed.<sup>161</sup> For many atomists of his time, atomism was only a mental construction, but Beeckman considered the existence of atoms as something real. He sketched atoms visually in his journal. The world exists of "concrete, almost tangible" things that are comprehensible to the human mind.<sup>162</sup>

Beeckman's confident faith in God reassured scientists of his days that his natural philosophy is compatible with Christian faith. After all, Beeckman gave three scholars access to his *Journal*: the natural philosopher and mathematician Marin Mersenne (1588-1648), René Descartes (1596-1650) and the Dutch mathematician and astronomer Martinus Hortensius (1605-1639), who was Beeckman's favorite pupil. Both Mersenne and Descartes were influential scientists, mathematicians and natural philosophers, who used ideas from Beeckman's *Journal* in their scientific theories. Moreover, he gave the priest, astronomer and mathematician Pierre Gassendi (1592-

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<sup>160</sup> Ibid., 87.

<sup>161</sup> Ibid., 84-87.

<sup>162</sup> Ibid., 105-106.

1655) a copy of his dissertation and a detailed summary of his mechanical philosophy, including a description of his inertia principle and atom theory.<sup>163</sup> They made Beeckman's mechanical philosophy, with the integration of mathematics and mechanics, available for the scientific world of the early seventeenth century. It is important to note that Gassendi learned from Beeckman that atomism and Christianity are compatible.<sup>164</sup>

*Ancient Atomism Versus a Christianized Version of Atomism*

According to Van Berkel, ancient atomism and modern mechanics were two important sources (yet not the only sources) for Beeckman's natural philosophy.<sup>165</sup> Beeckman studied some manuscripts on mechanics of the Flemish mathematician and engineer Simon Stevin, who was born in 1548 in Bruges and died in 1620 in The Hague or Leiden.<sup>166</sup> Just like Beeckman's father, Stevin emigrated from the Southern provinces (Flanders) to the northern part of the low countries (the Netherlands) because of his faith as a Protestant. Stevin criticized Aristotle's physics, such as the

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<sup>163</sup> Beeckman, *Journal*, 3:123; 4:189; Berkel, *Beeckman on Matter and Motion*, 58.

<sup>164</sup> Cohen, *How Modern Science Came into the World*, 226.

<sup>165</sup> Berkel, *Beeckman on Matter and Motion*, 130–136.

<sup>166</sup> Between June 16-24, 1624, Beeckman mentions in *Journal* 2:291 all the manuscripts of Simon Stevin that he could consult. He mentions that he studied these manuscripts carefully (*Journal* 2:305).

Aristotelian doctrine about the fall of bodies.<sup>167</sup> Although Beeckman mentioned that Stevin was focused too much on mathematics and too little on physics, he was interested in Stevin's view on mechanics.<sup>168</sup> Beeckman went even further than Stevin by connecting a mechanical understanding of reality to atomism. He showed interest in ancient atomism of the Roman philosopher Titus Lucretius Carus (first century B.C).<sup>169</sup> Aristotle and Galen made atomism accessible for a wider public because of their discussions with atomists. Beeckman shared with Lucretius the rejection of Aristotelian thought in physical explanations. Beeckman was interested in Lucretius' atomism, but he applied atomism from a whole new framework: his mechanical philosophy. Beeckman's theories on matter and motion, with its focus on the *mechanical* working of matter and atoms, demonstrate his rejection of ancient physics that assumed that matter has intelligence or a soul. These theories were still influential in his time.

Ancient atomism was different from Beeckman's mechanical use of atoms and, of course, much different from contemporary scientific theories on atoms. A difference between Beeckman's atomism and ancient atomism is the theoretical framework and

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<sup>167</sup> *Encyclopedia Britannica* (Chicago, IL: Noet Edition, 2016), s.v. "Stevin, Simon."

<sup>168</sup> Beeckman, *Journal*, 3:52. "Simon Stevin vero meo iudicio nimis addictus fuit mathematicae, ac rarius physicam ei adjunxit."

<sup>169</sup> Berkel, *Beeckman on Matter and Motion*, 131-133; "Catalogus librorum di Isaac Beeckman."

methodology that is used to explain the working of atoms. Ancient atomism was rationalistic: the atomists from ancient Greece underestimated the role of the senses in gaining knowledge about nature. They believed that only the mind has a role in the formulation of a theory on atoms. They followed the tradition of Parmenides in their approach of deducing “what the world must be like” by using reason alone.<sup>170</sup> The ancient atomists followed the tradition of the natural philosophers in their deification of nature.<sup>171</sup> The atoms bear *divine* properties, such as *unchangeability* and *eternity*. This means that the atomic world of ancient Greece was an extension of the divine world and that the atomic working followed the divine “law of necessity.”<sup>172</sup> This view is much different from Beeckman’s who believed, as a seventeenth century Protestant in the Reformed tradition, that matter was created by the will of God (and not by the essence of a divine being) and that the working of matter was, therefore, purely passive and mechanical.<sup>173</sup> This reveals a radical change in thought, from the ancient perspective on physics that is based on the *law of necessity*, to a physics that recognizes the *contingent* structure of reality. After all, Beeckman believed that God could create

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<sup>170</sup> Peter Adamson, *Atomism: Democritus and Leucippus*, Online Audio Lectures, vol. 9, History of Philosophy Without Any Gaps (King’s College, London, 2011), 16:40-55, accessed October 11, 2018, <https://historyofphilosophy.net/democritus-and-leucippus>.

<sup>171</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 2–3.

<sup>172</sup> Ibid.

<sup>173</sup> Berkel, *Beeckman on Matter and Motion*, 85; Beeckman, *Journal*, 4:30-31.

another, different world if he wanted to, because of His free will. Therefore, a scientist should explore how nature's mechanisms work in order to understand the way in which God made it contingent.

*A Very Wise Architect*

The Author of nature was, from Beeckman's perspective, a 'very wise architect.'<sup>174</sup> As a wise architect, God made the earth as a sphere so that it contains more space than if God had used another form.<sup>175</sup> Moreover, from Beeckman's perspective, God was not only the architect of nature but also the upholder of the natural processes. After all, Beeckman believed that the course of nature was guided by divine providence.<sup>176</sup> Beeckman might have learned these views from his Scholastic theological training, because Augustine, as well as Thomas Aquinas, already described God as the author of nature who guides nature's working.<sup>177</sup>

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<sup>174</sup> Beeckman, *Journal*, 4:122. "Hinc patet ratio cur sapientissimus Architectus universi hunc mundum circularem aut potiùs globosum fecerit..."

<sup>175</sup> *Ibid.*; Berkel, *Beeckman on Matter and Motion*, 78.

<sup>176</sup> Beeckman, *Journal*, 1:261, 1:138.

<sup>177</sup> John D. Caputo, *Philosophy and Theology* (Nashville, Tenn.: Abingdon, 2007), 22; Berkel, *Citaten uit het boek der natuur*, 267. Van Berkel says that the imagery of nature as God's book started with Augustine. Caputo refers to Thomas Aquinas who regarded God as the author of nature's working.

### Beeckman's View on Matter and Motion

Beeckman took radical distance from the Aristotelian concept of motion. His principle of inertia was his motivation to release himself from the Aristotelian framework.<sup>178</sup> Van Berkel noticed two stages in this process: in a first stage, Beeckman applied his law of inertia only to the particular case of the movement of heavenly spheres, but in a second stage, he went even further than Galilei by applying the principle to all motion: natural as well as non-natural; celestial as well as terrestrial.<sup>179</sup> Beeckman's new view on motion had consequences for his perspective on the cosmos. Aristotelian cosmology regarded the cosmos as an hierarchical ordered whole, in which every object has a natural place and stops moving when it has reached its natural resting place.<sup>180</sup> Beeckman left Aristotelian cosmology once he realized that 'movement' is as natural as 'rest,' as he explains in a letter to Mersenne.<sup>181</sup> Beeckman realized that he only had to explain *change in motion* and not *change* itself. Aristotle regarded motion as a 'process' (to the final destination of rest), but Beeckman ignores Aristotelian physics by considering motion as a 'state.'<sup>182</sup> This raises the question why

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<sup>178</sup> Berkel, *Beeckman on Matter and Motion*, 109.

<sup>179</sup> Ibid.

<sup>180</sup> Ibid., 107.

<sup>181</sup> Beeckman, *Journal*, 4:186.

<sup>182</sup> Ibid., 4:186; Berkel, *Beeckman on Matter and Motion*, 106.



Beeckman could distance himself from the enormous influence of ancient physics and how he could develop a whole new perspective on matter and motion. In the following parts, we will argue that creation theology inspired Christian philosophers to consider the cosmos as a 'contingent' creation instead as a 'closed system' that is ruled by the law of necessity.

### Necessity in Ancient Physics

#### *Necessitarianism of Ancient Philosophy*

Beeckman opposed the common Aristotelian explanations of his days, because his mechanical philosophy was built on a creation theology-based physics. Since this thesis regularly refers to Aristotle's physics, a more detailed discussion of ancient physics is crucial. Of course, ancient Greek philosophy offered the Western world important 'ingredients' for science, such as mathematics, logical reasoning and the attitude to explore nature rationally.<sup>183</sup> Therefore, the Scientific Revolution is often regarded as the 'renaissance' of ancient Greek thought. After all, it was Thales of Milete (6<sup>th</sup> century BCE) who bridged the world of mythological explanations to explanations of natural phenomena by reason alone. However, modern natural science and mechanical philosophy did not develop in the ancient world. Modern science is a

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<sup>183</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 85.

method that intends to gain knowledge by doing experiments (or other kinds of empirical research) in combination with hypothetical-deductive reasoning. This method is a product of the seventeenth century – the time of Isaac Beeckman.<sup>184</sup> The philosophy of ancient Greek philosophers like Parmenides, Socrates, Plato or Aristotle was simply incompatible with the philosophical requirements for modern natural science. Vos explains the reason for this incompatibility, by saying,

the nature and structure of modern science are excluded by the type of thought embodied in the Greek way of doing philosophy. The hypothetical-deductive structure of scientific explanations asks for acknowledging contingency and not an absolutely closed system of physicist phenomena.<sup>185</sup>

The medieval universities played an important role in the development of this modern way of thinking. The Christian concept of a creator who created contingently challenged ancient physics – that was often based on the law of necessity. Creation theology, as Lydia Jaeger explains, “considers that what is contingent – as contingent – is intelligible, and this makes it possible to ground the empirical approach of modern science.”<sup>186</sup> Beeckman’s mechanical philosophy is based on a philosophy

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<sup>184</sup> In the following chapters, we will state that the Scientific Revolution built further on medieval physics and theology. Especially in the thirteenth and fourteenth century, theologians developed remarkable ‘modern’ insights in physics. Those ideas were used by Beeckman, Galilei, Kepler, Descartes and Newton in the seventeenth century.

<sup>185</sup> Vos, “Scholasticism and Reformation,” 104.

<sup>186</sup> Lydia Jaeger, *What the Heavens Declare: Science in the Light of Creation* (Eugene, Or: Cascade Books, 2012), 67. Jaeger uses the term ‘creationism’ for what we call ‘creation theology.’ In the preface

that acknowledges the contingent structure of reality and therefore not on a philosophy that interprets natural phenomena a-priori (i.e. from Aristotle's first principles). And so, Beeckman was able to distance himself from the enormous influence of Aristotelian physics, in favour of his mechanical philosophy.

The following part will explain that ancient philosophy was 'religious' philosophy and that it was Christian theology of creation that challenged the religious assumptions of ancient philosophy and physics. The discussion starts in the Pre-Socratic era – the roots of Aristotle's philosophy.

#### *The Pre-Socratic Period*

Ancient polytheism contributed to the idea that 'the divine' manifests itself.<sup>187</sup> The result is that the ancient philosophers believed that nature has divine properties. This idea influenced both Plato and Aristotle. In the pre-Socratic period, the world was "a living organism, the divine source of all living beings, the gods included."<sup>188</sup> The myths about the gods were depersonalized in the time of the Ionic natural philosophers, but the religious ideas continued to form their view on reality. Ancient

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(xv), Jaeger mentions that this term points to "the worldview based on the belief that the world is created without specifying the manner of creation."

<sup>187</sup> Vos, *Kennis en noodzakelijkheid*, xv.

<sup>188</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 1. Hooykaas explains that "cosmogony and theogony were closely connected" in ancient Greek religion and philosophy.

Greek philosophy was 'religious philosophy,' like Vos states, as one can see in religious inspired terms of pre-Socratic philosophy, such as "*fate, destiny, law, reason, knowledge, god, cosmos.*"<sup>189</sup> The divine Being worked in matter itself.<sup>190</sup> The Eleatic philosophers believed that this divine Being was absolute and unchangeable. Western philosophy first had to free itself from these religious presuppositions of ancient Greek philosophy before modern science became possible. The following paragraphs will explain that 'the divine' was subordinated to the 'law of necessity.' For the ancient philosophers, 'knowledge' was the understanding of the 'law of necessity.' We will explain that even Aristotle deduced his *first principles* from the law of necessity in his physics. Many of Beeckman's contemporaries still followed the arguments of Aristotelian philosophers that were based on these necessary principles.

Beeckman's new mechanical philosophy was built on another religious fundament than that of the Aristotelian natural philosophers of his time. He rejected arguments that were based on necessary principles or speculation. The connection between 'knowledge' and 'necessity' has a long tradition that begins with Parmenides (born c. 515 BCE). For Parmenides, the actual world is necessarily the way it is.<sup>191</sup> The

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<sup>189</sup> Vos, *Kennis en noodzakelijkheid*, 4. The English words are my translation of the Dutch words: "*Lot, bestemming, wet, rede, kennis, god, kosmos.*"

<sup>190</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 1-2.

<sup>191</sup> Vos, *Kennis en noodzakelijkheid*, 8-9.

ability of 'knowing' is part of the whole reality, because everything in nature was considered as divinely inspired. There is no alternative world possible. Parmenides' view that logic, knowledge and being are connected to each other ('onto-logic') became influential after him.<sup>192</sup> Reality and reason are absolute: in this absolute, one and only possible world, necessity is equal to being.<sup>193</sup> This means that in ancient philosophy, natural phenomena are not contingent creations (as in Beeckman's Christian worldview), but necessary states of being. The idea that humans can only know the essence of reality through their (divine) human mind, was a logical result of the ancient religious worldview, in which nature bears the divine essence and properties. In such a worldview, the 'divine' human mind contains all truth and knowledge a-priori, so that modern empirical science could not develop in this ancient world. Ancient science was 'deducing first principles' from the law of necessity—an idea that Beeckman opposed with his mechanical philosophy.

#### *Aristotle's Principle of Necessity*

The Post-Socratic period was built on the foundations laid by natural philosophers like Parmenides. In Aristotle's scientific theory, a few principles stood

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<sup>192</sup> Ibid., 10.

<sup>193</sup> Ibid., 10–13.

central. One of them is that knowledge should be understandable and provable (deducible from theses and axioms) and another fundamental principle is that these theses and axioms are necessarily true.<sup>194</sup> This 'principle of necessity' means that something that is evidentially true is also necessarily true, in Aristotle's deductive epistemology.<sup>195</sup> Therefore, he never questioned his physics that was based on his first principles and not on empirical research. His theories were deduced from his principles, based on the divine 'law of necessity.'

Aristotle rejects Parmenides' view that change is impossible. He believed that *change in time* is possible (which Vos calls "diachronic contingency").<sup>196</sup> Change, motion and time are connected to each other: without motion, there is no time and without time there would be neither change nor motion.<sup>197</sup> In his analysis of Aristotle's philosophy, Vos concludes that Aristotle's view on contingency is only a diachronic change (in time), but not a synchronic change. On a point in time (t), a specific event (p) cannot simultaneously be another event (summarized:  $t^1 \rightarrow p^1$ ;  $t^2 \rightarrow p^2$  etc.). Everything that is necessary and everything that is contingent is both subject to

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<sup>194</sup> Ibid., 22–25.

<sup>195</sup> Ibid., 24.

<sup>196</sup> Ibid., 27–28.

<sup>197</sup> Anthony Kenny, *Ancient Philosophy*, A new history of Western philosophy 1 (Oxford: Oxford University Press, 2006), 186–187.

necessity, because there are no real alternatives for past and present.<sup>198</sup> Generally speaking, the ancient philosophers had difficulty with understanding change from the perspective of eternity and the divine law of necessity. However, a mechanical worldview requires a philosophy that accepts the idea that God could make the laws of nature in another way than he did. This theology is unacceptable for an Aristotelian philosopher who starts reasoning from the divine law of necessity.

*Aristotle's Physics Based on the Law of Necessity*

Before an exploration of Aristotle's determinism in the context of cosmology and physics, it is important to note that Aristotle's biology demonstrates a remarkable empirical approach, based on dissection, observation and categorisation of animals.<sup>199</sup> The distinctions he made between actuality and potentiality had an empirical outcome in the domain of biology: for instance, the observation that an acorn is 'potentially' an *oak tree* (and 'actually' after becoming one) is a clear example.<sup>200</sup> However, in biology, Aristotle could observe more easily, of course, than in the domain of cosmology. Aristotle's necessitarian framework becomes clear in his physics and cosmology.

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<sup>198</sup> Vos, *Kennis en noodzakelijkheid*, 28–29.

<sup>199</sup> David C Lindberg, *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, Prehistory to A.D. 1450* (Chicago, London: The University of Chicago Press, 2007), 60–65.

<sup>200</sup> *Ibid.*, 49–50.

Although Aristotle's focus moved to the natural world itself, he still integrated the 'world of ideas' of his master Plato in his natural philosophy. The world of ideas coincided with the visible, natural world.<sup>201</sup> Aristotle called these ideas the 'Forms.' For Aristotle, physics was the study of the *Form* of individual things in the natural world.<sup>202</sup> Aristotle's physics and cosmology were teleological: form and matter stand in a "teleological relation in which 'form' is the goal and matter is the means to it."<sup>203</sup> Unlike Beeckman's mechanical philosophy, Aristotle's physics was based on a "deduction from first principles."<sup>204</sup>

#### *Current Debate Concerning Aristotle's View on Necessity and Contingency*

In *Chapter 4*, we will explain that the universities played a central role in the development of a theology that took distance from ancient (religious inspired) necessity thought. However, the opinion that medieval university thought radically

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<sup>201</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 5.

<sup>202</sup> *Ibid.*, 6.

<sup>203</sup> Diana Quarantotto, ed., *Aristotle's Physics, Book I: A Systematic Exploration* (Cambridge, U.K.; New York: Cambridge University Press, 2018), 4.

<sup>204</sup> C.H. Lohr, "The Medieval Interpretation of Aristotle," in *The Cambridge History of Later Medieval Philosophy: From the Rediscovery of Aristotle to the Disintegration of Scholasticism, 1100-1600*, ed. Norman Kretzmann, Anthony Kenny, and Jan Pinborg (Cambridge; New York: Cambridge University Press, 1982), 93-94.



opposed Aristotelian thought is recently challenged by Richard A. Muller. According to Muller,

Aristotle bestowed on the Western philosophical tradition a clear and functional understanding of contingency and the basis for philosophical discussion of human freedom.<sup>205</sup>

Although many authors, as discussed above, point to Aristotle's 'necessity thought,' Muller explains that Aristotle's works also demonstrate texts on real synchronic contingency (the viewpoint that in a particular moment there are real alternatives possible). He points to texts in Aristotle's writings which, according to him, demonstrate that this philosopher provided the Western theologians an understanding of 'synchronic contingency' (in the world order) and of 'human freedom.'<sup>206</sup> He argues that Aristotle established "an understanding of contingency in the world order."<sup>207</sup> However, although Muller is right that some of Aristotle's works demonstrate contingency thought, Aristotle's physics and cosmology reveal that for Aristotle the divine *First Mover(s)* were depend on the law of necessity: there is only this necessary world that has a teleological purpose.

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<sup>205</sup> Muller, *Divine Will and Human Choice*, 102.

<sup>206</sup> *Ibid.*, 83-103.

<sup>207</sup> *Ibid.*, 137.

The confusion about whether Aristotle believed in real (synchronic) contingency or not is, as also Muller observed, a result of Aristotle's ambivalent perspective on the issue of necessity and contingency.<sup>208</sup> Some of Aristotle's texts give the impression that the philosopher believed in real possibilities and contingencies.<sup>209</sup> The difference between the ancient philosopher and Beekman is that the last one had a notion of God's *potentia absoluta* and Aristotle not. Although Aristotle had a notion of the existence of a divine being, he did not connect his views on contingency to the 'divine will' or to 'human freedom,' as also Muller remarks.<sup>210</sup> Muller rightly notes that Aristotle did not solve the "Judaeo-Christian issue of contingency and freedom in the context of an overarching divine willing."<sup>211</sup> This is a merit of medieval Scholastic theology, as the next chapter will explain. Beekman had to distance himself from the idea that God would depend on one necessary way to create the world. God could make the world according to whatever principles he wanted, so 'mechanical philosophy' is essential. Beekman learned the idea of God's free will to create the physical world contingently from his theological education in Leiden and Saumur.

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<sup>208</sup> Ibid., 90–91; 101.

<sup>209</sup> Ibid., 90–91. Muller refers to Arthur O. Lovejoy's analysis of Aristotle, *Metaphysics*, III.6 (1003 a1-4). Muller also mentions that Jaakko Hintikka regards, against Lovejoy, Aristotle's thought as "ambiguous."

<sup>210</sup> Ibid., 102–103.

<sup>211</sup> Ibid.

Creation theology played a fundamental role in this change from ancient religious thought—the law of necessity—to a theology that recognizes nature as a contingent mechanism.

### The Rise of a Creation Theology-Based Physics and Its Influence on Beeckman

#### *Early Christian Doctrine of Creation*

A central argument of the thesis is that Beeckman’s natural philosophy was built on creation theology. The following part will argue that he stood in a long theological tradition. One of the clearest evidences that Christian thought challenges Aristotelian physics can be discovered in the early sixth century C.E., in the work of John Philoponos, who lived on the border between Late Antiquity and the Medieval Era. Philoponos developed the important concept of ‘impetus’ that paved the way for the modern physical law of inertia, that Beeckman developed independently from Galileo.<sup>212</sup> Before an exploration of Philoponos’ thought, it is relevant to examine the influence of patristic creation theology on physics.

The Christian doctrine—as articulated in the early Christian creeds—that the cosmos was created ‘out of nothing’ and that it therefore has a beginning is “in

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<sup>212</sup> Thomas F. Torrance, *Theological and Natural Science* (Eugene, Ore.: Wipf & Stock Publishers, 2002), 15.

contradiction [with] almost every cosmology that the world has known,” as Colin Gunton states.<sup>213</sup> Gunton explains that the interaction between early Christianity and the Greek world was therefore “very complex.”<sup>214</sup> The Christian doctrine that creation is a product of God’s will and love means that creation was not necessary and thus contingent. This new doctrine challenged the ancient philosophical and physical assumptions, such as the Aristotelian notion of the eternity of the universe.

In his reaction against Gnosticism, the early Christian theologian Irenaeus (c. 130–c. 200) developed a positive view on the created order (both material and spiritual). His view on *creatio ex nihilo* was a unique achievement in the Greek-Roman world of his days. The Cappadocian father Basil the Great (c. 330–c. 379) took distance from the Aristotelian idea that the heavenly bodies were eternal and divine. For Basil, everything was created ‘ex nihilo’ and contingent.<sup>215</sup> Beeckman’s note that God is a “very wise architect” reflects Basil’s theology that God is the Creator of heaven and earth and that He is the “Master Craftsman” of the cosmos, who created “wisely and

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<sup>213</sup> Colin E. Gunton, *The Cambridge Companion to Christian Doctrine* (Cambridge University Press, 1997), 142.

<sup>214</sup> *Ibid.*, 145.

<sup>215</sup> *Ibid.*, 148.

skillfully.”<sup>216</sup> This is a theological concept that also Beeckman mentioned in his Journal, as we explained in the previous chapter. Augustine of Hippo (354–430) already built his theology on the foundation of the Christian doctrine of creation. Vos explains that the Augustinian tradition preserved ideas on contingency and freedom and delivered it to medieval theologians, like Anselm of Canterbury (c. 1033–1109).<sup>217</sup> The early church fathers were skeptical about ancient astronomy. In this regard, Augustine warned that the natural philosophers of his time were, in their astronomical predictions, not conscious of the transcendent origin of the universe and the contingent nature of creation.<sup>218</sup> It is interesting to discover that Christian theology not only had an impact on Beeckman’s mechanical philosophy, but that it had already an influence on Philoponos’ creation theology-based physics in the sixth century.

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<sup>216</sup> Basil of Caesarea Hexaemeron I, 11, quoted in Daniel Špelda, “The Importance of the Church Fathers for Early Modern Astronomy,” *Science & Christian Belief* 26, no. 1 (April 2014): 32.

<sup>217</sup> Vos, *Kennis en noodzakelijkheid*, 41.

<sup>218</sup> Špelda, “The Importance of the Church Fathers for Early Modern Astronomy,” 36.

*The Heritage of John Philoponos (c. 490–c. 570)*

For the Scientific Revolution, the achievements of John Philoponos, who was influenced by Basil, are important to mention.<sup>219</sup> It is remarkable that already in the sixth century, Philoponos distanced himself from Aristotelian physics, through his light theory and impetus theory.<sup>220</sup> According to Thomas F. Torrance, Christian theology of creation inspired Philoponos to move his focus from biblical theology to science (incl. the domains of physics, dynamics and meteorology).<sup>221</sup> Philoponos denied the existence of void, but he explained that theoretically speaking, motion of matter would work better in a void than in cases where it moves in mediums that offers resistance. Philoponos said that God gives every object a power to move. His ‘new’ physics is a direct result of his view on *creatio ex nihilo*. Philoponos laid the foundation for a modern understanding of ‘space’ and ‘time’.

It is important to note that, according to Torrance, the Genevan library of John Calvin contained two of Philoponos’ works, *De opificio mundi*, and *In animam Aristotelis*, which means that the thought of this ancient scholar was accessible for Reformed

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<sup>219</sup> F. L. Cross and Elizabeth A. Livingstone, eds., *The Oxford Dictionary of the Christian Church* (Oxford, New York: Oxford University Press, 2005), s.v. “John Philoponos”; Torrance, *Theological and Natural Science*, chaps. 1, 6.

<sup>220</sup> Torrance, *Theological and Natural Science*, 15.

<sup>221</sup> *Ibid.*, 7.

theologians.<sup>222</sup> For our study of Beeckman, the influence of Philoponos on the Roman-Catholic scientist Galileo Galilei – who was Beeckman’s contemporary – is important to mention.<sup>223</sup> In an explanation of Beeckman’s molecular theory, Henk Kubbinga says that Beeckman’s atom theory refers back in time to Philoponos’ rejection of Aristotle’s physics, by developing a notion of ‘particles,’ that both Beeckman and Philoponos regarded as contingent creations by God.<sup>224</sup> About the important role of Philoponos in the development of (modern) physics, Gunton says,

Not only did his belief in God make possible his anticipation of later discoveries in natural science, but he also reinforced the teaching of creation out of nothing by exposing contradictions in Greek views of the infinity of the universe.<sup>225</sup>

This means that Philoponos’ achievements in the sixth century were important in the introduction of ‘contingency’ in the context of physics. His creation theology motivated him to challenge Aristotle’s physics that was based on belief in necessary principle’s, such as the eternity of the universe and the circular movements of the celestial bodies. Philoponos’ merit is that he transformed mathematic-scientific

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<sup>222</sup> Ibid., 11.

<sup>223</sup> Gunton, *The Cambridge Companion to Christian Doctrine*, 148.

<sup>224</sup> Henk Kubbinga, *De molecularisering van het wereldbeeld* (Uitgeverij Verloren, 2003), 58–59.

<sup>225</sup> Gunton, *The Cambridge Companion to Christian Doctrine*, 148.

thought from an understanding of nature as a closed system of natural phenomena to an understanding of the universe as an “*open-structured and contingent*” creation.<sup>226</sup> Creation theology and Philoponos’ thought are the bridge between ancient Christian thought and medieval (and even early modern) physics. Now, we will explore how creation theology made a difference in how Beeckman and Aristotle both approached the divine *First Mover*.

#### Beeckman’s Versus Aristotle’s View on God as the ‘First Mover’

Finally, it is interesting to compare Aristotle’s view and Beeckman’s view on God as the first mover of eternal motion of the heavenly bodies. In this theology, one can observe the influence of Christian doctrine of creation on Beeckman’s theory of motion. This comparison is relevant because it demonstrates how the theological tradition challenged the ancient religious concept of the ‘law of necessity’ in the context of physics. Both Aristotle and Beeckman believed in a divine *First Mover* who set in motion the eternal movement of the universe. However, there is a difference between the omnipotence of Aristotle’s First Mover(s) and Beeckman’s view on God. Aristotle believed that eternal motion is necessarily circular and continuous and that it has a divine origin.<sup>227</sup> The motion of the heavens has a prime cause that is *unmoving*,

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<sup>226</sup> Torrance, *Theological and Natural Science*, 45.

<sup>227</sup> Aristotle, “*Metaphysics*,” book XII and “*Physics*,” book VIII; Jonathan Gingerich, “A Study of the Necessity of the Unmoved Mover in Aristotle’s *Metaphysics*,” *Eudaimonia: the Georgetown*



*eternal, substance, and actuality (not potentiality).*<sup>228</sup> Just like Beeckman, Aristotle believed that the *Unmoved Mover* is necessary for the movement of the heavens. However, Aristotle's *First Mover* is not only necessary for motion, but this being *exists* of necessity, as Jonathan Gingerich clearly demonstrates by analysing Aristotle's work on the *Unmoved Mover*.<sup>229</sup> This First Mover *produces* necessarily "motion in space...and motion in a circle."<sup>230</sup> This is different from Beeckman who rejected the idea that God would depend on a higher 'law of necessity.' After all, Beeckman believed that God *creates* 'necessity' by His decree, but He does not depend on it.<sup>231</sup> Moreover, unlike Aristotle's First Mover, God doesn't produce 'necessarily.' Beeckman's divine Architect creates 'contingently,' from His free will. We conclude that both Aristotle and Beeckman believed that accepting the existence of a 'First Mover' is necessary for

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*Philosophical Review; Washington* 3, no. 1 (Spring 2006): 88; David Stewart, "Aristotle's Doctrine of the Unmoved Mover," *Thomist: a Speculative Quarterly Review; Washington, etc.* 37, no. 3 (July 1, 1973): 523–524.

<sup>228</sup> Gingerich, "A Study of the Necessity of the Unmoved Mover in Aristotle's Metaphysics," 89–90.

<sup>229</sup> *Ibid.*, 90–91. These works are: Aristotle, "Metaphysics," book XII, § 1072b11–2 and "Physics," book VIII.

<sup>230</sup> *Ibid.*, 91.

<sup>231</sup> Beeckman, *Journal*, 1:138. Beeckman said: "Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt."

the motion of the heavenly bodies, but Beeckman rejected Aristotle's idea that this being, God, depends on necessity. God's decree *produces* necessity and contingency.

Aristotle's cosmology flows from his necessary principles. According to him, the earth was the centre of the universe, while Beeckman accepted heliocentrism, as the final chapter will explain. Aristotle believed that the heavenly bodies have a soul, a supernatural intellect, that was the source of their journey through the cosmos.<sup>232</sup> This differed from Beeckman's view, who believed that all matter is passive. An "unchanging, eternal mover" caused the perfect circular motion of the heavenly bodies.<sup>233</sup> It is important to note that this mover was not the creator of the cosmos, because Aristotle regarded *matter* and *the Form* as eternal.<sup>234</sup> In this respect, too, Beeckman's vision is different. Beeckman accepted the Christian doctrine of creation *out-of-nothing*. He said that God in the beginning had created the atoms and "their nature," so that they "*could not but produce [things according to their nature].*"<sup>235</sup> This means that for Beeckman, *matter* and *Form* are not eternal, but rather created *ex nihilo*.

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<sup>232</sup> Kenny, *Ancient Philosophy*, 88.

<sup>233</sup> *Ibid.*, 88.

<sup>234</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 5.

<sup>235</sup> Isaac Beeckman, "Journal 2:57," quoted in Berkel, *Beeckman on Matter and Motion*, 143.

## Summary

Beeckman refused to accept (Aristotelian) 'first principles' or religious inspired assumptions in physics. His philosophy only accepted mechanical explanations of how nature works. Humans are not able to create a machine with perpetual motion because this is physically impossible due to air resistance and friction. Only God creates perpetual motion, he explained. Creation theology was Beeckman's theological fundament. He saw God as the "very wise architect" and the creator of eternal motion of the planets. God is not dependent on necessity, like the ancient 'law of necessity' that was a characteristic of Aristotelian physics. Ancient physics was built on a religious worldview, but creation theology offered a new religious framework. The assumption of an omnipotent creator who created 'ex nihilo' from His free will, was a challenge for Aristotelian physics of his days. An external proof that creation theology has the potency to challenge Aristotelian physics and cosmology comes from John Philoponos, who in the sixth century already challenged 'necessary' elements in Aristotle's physics. Philoponos' use of creation theology in the context of physics was known in the Middle Ages. His writings were available in Calvin's Genevan library and Beeckman's contemporary Galileo referred to Philoponos. Beeckman was not the first who built a creation theology-based physics, but his natural philosophy was radical in explaining nature as a 'mechanism.' Although Beeckman believed, just like Aristotle, in a divine First Mover, he believed that God is the creator of necessity, while Aristotle's First Mover(s) depend on the law of necessity. The following chapters will

explain that also in medieval physics, creation theology challenged natural philosophers to take distance from 'necessity thought' in the context of physics.

## CHAPTER 4. GOD'S ABSOLUTE AND ORDAINED POWER OVER NATURE

### Introduction

The medieval distinction between Gods 'absolute' and His 'ordained' power as well as 'primary' and 'secondary causality' was an important step in the process that led to the rise of modern science. Beeckman was also aware of the distinction between the mechanical working of nature and God's omnipotence to intervene in this mechanism. In this chapter, we will argue that Beeckman built his physics on the philosophical foundation that was laid by medieval theologians. The chapter will explore Beeckman's distinction between 'theology' and 'philosophy'; something that reminds to the influence of medieval scholars like Thomas Aquinas. Another influence of medieval philosophy is Beeckman's use of *Ockham's Razor* in his scientific explanations. The standard view of the Middle Ages as a period of stagnation is at odds with the interesting and influential debates in theology and philosophy in this era. Medieval theology is the background of Beeckman's conceptual world and mechanical philosophy. The rise of the universities as medieval Christian institutions will be discussed. Attention will be paid to three important medieval theologians: Thomas Aquinas, John Duns Scotus and William of Ockham. The role of Nominalism and Scotism in the rise of modern science is a point of interest.

### Natural Phenomena Have a Natural Explanation

In *Journal* 2:242, Beeckman explained that people often wrongfully seek refuge in supernatural explanations for diseases or natural phenomena they cannot explain. He writes,

If their experience is contrary to their reasoning, they take refuge in that which cannot be experienced. Thus, they seek the extraordinary in illnesses, as if these had come and were continuing by magic, etc. Thus people also speak of rain, snow, lightning, thunder, etc... There is no reason for us to seek any miracle in rain, snow, etc., any more than in the path of the sun or moon, whose course is known to us.<sup>236</sup>

This quote demonstrates Beeckman's rejection of supernatural explanations, such as magic, for natural phenomena and illnesses. Beeckman mentioned the following example, "We do not consider it a miracle, if someone whose wallet we do not know, unexpectedly makes large expenditures."<sup>237</sup> In the same way, Beeckman believed that natural phenomena have natural explanations. From other notes we know that Beeckman believed that God is the creator of this contingent, mechanical working of nature.<sup>238</sup> This raises the question how Beeckman regarded the relationship between 'mechanical philosophy' and 'God.' Beeckman believed in the existence of

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<sup>236</sup> Beeckman, "*Journal*," 2:242, quoted in *Ibid.*, 145.

<sup>237</sup> Beeckman, *Journal*, 2:242. See Appendix D.

<sup>238</sup> *Ibid.*, 1:228-229, 1:138, 2:375, 1:261.

supernatural powers (like angels and devils), but according to him, the devil had no power to cause natural phenomena.<sup>239</sup> This argument ensured the mechanical operation of nature, under God's control.<sup>240</sup> This distinction between God's omnipotence and creation's natural working requires an explanation in the following two parts.

### The Distinction between Philosophy and Theology

#### *Nature's Mechanism as a Wonderful Creation*

Beeckman made a clear distinction between 'philosophy' and 'theology'. Concerning the relationship between philosophy, theology and faith in God, he wrote in 1626,

In philosophy, one must always proceed from wonder to no wonder, that is, one should continue one's investigation until that which we thought strange no longer seems strange to us; but in theology, one must proceed from no wonder to wonder, that is, one must study the Scriptures until that which does not seem strange to us, does seem strange, and that all is wonderful. Just like it was with the philosopher, the longer he thought about God, the more wonderful He

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<sup>239</sup> Ibid., 2:242; Berkel, *Beeckman on Matter and Motion*, 145.

<sup>240</sup> Berkel, *Beeckman on Matter and Motion*, 142.

seemed to him; so we should say about His government, the better we understand it, the more glorious and wonderful it is.<sup>241</sup>

This quote makes clear that Beeckman considered philosophy and theology as two independent domains that both serve faith in God. Natural philosophy and theology have different methodologies and subjects.<sup>242</sup> Philosophy has the task to make that which seems strange understandable and theology helps people to praise God for His wonderful creation.<sup>243</sup>

Beeckman explored how the mechanical working of nature is related to the divine providence.<sup>244</sup> Hooykaas quotes Beeckman's note as an example of a Reformed scholar who saw the *order* of nature as miraculous: the good working of nature coincided, from Beeckman's perspective, with God's providence and free will.<sup>245</sup> Moreover, Van Berkel noticed that in this note, Beeckman referred to Simon Stevin's motto "Wonder is no wonder."<sup>246</sup> This Flemish mathematician was also a Protestant

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<sup>241</sup> Beeckman, "Journal," 2:375-376, quoted in Berkel, *Beeckman on Matter and Motion*, 144-145. The source text is consultable in Appendix C. Only the last sentence is our own translation.

<sup>242</sup> Howell, *God's Two Books*, 139.

<sup>243</sup> *Ibid.*, 139-140.

<sup>244</sup> Beeckman, *Journal*, 1:228-229; 1:138; 2:242; 1:261.

<sup>245</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 108.

<sup>246</sup> Berkel, *Beeckman on Matter and Motion*, 144.



in the Reformed tradition, just like Beeckman. Both scholars shared their mechanical view (“wonder is no wonder”) because nature’s working can be explained by reason. As the quote demonstrates, Beeckman adds to Stevin’s motto that the mechanism behind nature is still a wonderful creation of God. There was no discrepancy between Beeckman’s mechanical philosophy and his faith in God.

It is interesting to observe that in another note, Beeckman adds a new field of study to the typical medieval domains of ‘logic’ and ‘grammar’: the domains of ‘physics’ and ‘handicraft.’ He mentions these four domains in the same note. He says that ‘logic’ compares the relationship between things, that ‘grammar’ names things, that ‘physics’ attributes ‘time’ to all things and that the ‘craftsman’ disposes things.<sup>247</sup> The ancient philosophers would never mention ‘handicraft’ in a philosophical note, but Beeckman regarded his experience as a craftsman as something helpful. The positive appreciation of manual labour (something ancient philosophers despised) in seventeenth century Reformed circles was an important development in the rise of *experimental* science. ‘Manual skills’ and ‘methodical thinking’ were connected to each other in the seventeenth century, something that opened the way for experimental science.<sup>248</sup> Beeckman preferred doing manual labour because this gave him the

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<sup>247</sup> Beeckman, *Journal*, Journal 1:131-132.

<sup>248</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 92-96.

opportunity to observe physical phenomena and doing physical experiments, as Hooykaas noticed.<sup>249</sup> There was a long process to go from ancient philosophy to the connection of handicraft to the domains of natural philosophy and physics. This reveals a paradigm change from a-priori knowledge to a philosophy that recognizes the contingent state of natural phenomena and handicraft as a means to understand its mechanical working. As already explained, the medieval universities were the stage in which this paradigm change could flourish.

The distinction between philosophy and theology as two independent domains has a long tradition, that goes back to the medieval theologians. One should not interpret the distinction as a separation between religion and philosophy. In this context it is important to remind that also ancient Greek philosophy was in essence 'religious philosophy.'<sup>250</sup> In the Middle Ages, Christian theologians established both theology and philosophy as two independent domains, both in the field of *religion*. Philosophy was 'religious philosophy' and theology was seen as 'the queen of all sciences.' In the aforementioned quote, Beekman explains that the purpose of theology is to demonstrate the glorious and wonderful government of God through

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<sup>249</sup> Ibid., 93.

<sup>250</sup> Vos, *Kennis en noodzakelijkheid*, 3. The pre-Socratic built their theories on religious thought. Greek philosophy integrated these religious inspired concepts.

nature's working. Philosophy offers him the tools to investigate this 'wonderful' creation.

*Thomas Aquinas on Theology as the Queen of the Sciences*

Since Beeckman studied theology in the University of Leiden, he knew the medieval distinction between philosophy and theology. A clear example is the medieval theologian and philosopher Thomas Aquinas. Beeckman had books of Aquinas in his library.<sup>251</sup> Aquinas merit is that he settled both theology and philosophy as two independent domains, but he regarded theology as the Queen of all sciences. He regarded (Aristotelian) philosophy and Christian theology as two "compatible roads to truth," but methodologically distinct.<sup>252</sup> Some scholars even characterized Aquinas as an 'Aristotelian philosopher' instead of a 'Christian theologian.' However, the label *aristotelico-thomistic* is a questionable characteristic for Aquinas' philosophy. Although Aquinas integrated Aristotelian vocabulary and concepts, his works demonstrate, as Joseph Owen explains, that this medieval thinker sometimes interpreted Aristotelian philosophy in a radical different way.<sup>253</sup> The context of both

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<sup>251</sup> Canone, "Il Catalogus librorum di Isaac Beeckmann."

<sup>252</sup> Lindberg, *The Beginnings of Western Science*, 241.

<sup>253</sup> Joseph Owens, "Aristotle and Aquinas," in *Aquinas*, ed. Norman Kretzmann and Eleonore Stump, The Cambridge Companion (Cambridge; New York, NY, USA: Cambridge University Press, 1993), 38–39. Pope Leo XIII promoted in 1879 this kind of *aristotelico-thomistic* philosophy in the encyclical "*Aeterni Patris* (...)."

philosophers was different. Aquinas developed his thought in the thirteenth century, in a time when Aristotelian works (these include the works of Aristotle, Averroes, Maimonides and Avicenna) were highly debated. The openness of Aquinas to the philosophy of ancient and foreign thinkers demonstrates the tolerant attitude of the church and Christian culture of his days. It is insufficient to call Aquinas a 'philosopher' instead of a 'theologian.'<sup>254</sup> Aquinas studied Aristotelian philosophy as a *Christian theologian*, so that he developed different views than Aristotle.<sup>255</sup> However, it is also important to recognize the influence of Aristotelian thought on Aquinas' philosophy. This is an important difference between Aquinas and Beekman's thought. Although Aquinas took distance from Aristotle's non-biblical view on the divine *Unmoved Mover* (as a non-personal power), Aquinas still limited God's power by making creation dependent on God's character. He believed that God is "perfectly powerful," which means that God can (only) do "whatever agrees with his own nature."<sup>256</sup>

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<sup>254</sup> Lambertus Marie de Rijk, *Middeleeuwse Wijsbegeerte: Traditie En Vernieuwing*, 2nd ed. (Assen: Van Gorcum, 1981), 186.

<sup>255</sup> Owens, "Aristotle and Aquinas," 40, 52. An example is Aquinas' view that *existence* is the highest being and not Aristotle's *finite Forms*.

<sup>256</sup> Muller, *Divine Will and Human Choice*, 122.

*The Medieval Institutional and Methodical Revolutions*

The universities played an important role in the development and transmission of natural philosophy and theology between the Middle Ages and Beeckman's time. Since Beeckman adapted theological concepts from his education in the University of Leiden (and Saumur), it is relevant to discuss the institutional and methodological revolution that paved the way for mechanical philosophy. James Hannam states that early modern scientists like Galilei and Kepler (contemporaries of Beeckman) further built on *medieval* physics.<sup>257</sup> As a historian of science, Hannam even states that,

the myth that Christianity held back science was invented during the 19<sup>th</sup> century... In reality, the medieval church demanded that every student should study maths and science in the new universities.<sup>258</sup>

A historical view on the Middle Ages demonstrates that Hannam is right that in many ways, Christian institutions contributed to the development and transmission of knowledge from ancient times, through the Middle Ages, to the modern era. Also David C. Lindberg criticizes the typical eighteenth and nineteenth century assumption

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<sup>257</sup> James Hannam, *The Genesis of Science: How the Christian Middle Ages Launched the Scientific Revolution* (Washington, D.C.: Regnery Publishing, 2011), 345–351; Vos, "Scholasticism and Reformation," 100–103. Hannam states that the Middle Ages laid important foundations for natural philosophy and physics. Vos states that the modern scientists built on university philosophy that was developed between ca.1200-1800.

<sup>258</sup> James Hannam, "Lost Pioneers of Science," *History Today* 60, no. 1 (January 2010): 5–6.

that the Christian church was “a serious obstacle” for the development of science.<sup>259</sup> He points to the central role of the church in educating medieval people, by organizing education. Although the motivation of the church was to teach the Bible and Christian doctrine, Lindberg emphasizes that this “mission, interestingly, did not include the suppression of scientific investigations and ideas.”<sup>260</sup> The monastic tradition built libraries—with books of many philosophical and theological subjects—and monks copied ancient and medieval works so that knowledge could be transmitted through the ages. The church organized education so that many people learned reading and writing.

Moreover, the perception of the Middle Ages as ‘dark’ and the medieval church as a suppressor of science at least ignores the immense impact of one of the medieval Christian institutions on the modern era: the rise of the universities around 1200. Vos explains that these universities were not founded by the church, but rather spontaneously developed from medieval Christian institutions: the monastic schools (i.e. the school of Cluny, Le Bec of Lanfranc and Anselm) and the cathedral schools (i.e. of Chartres and Paris).<sup>261</sup> These institutional revolutions invented the “academic

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<sup>259</sup> Lindberg, *The Beginnings of Western Science*, 148–150.

<sup>260</sup> *Ibid.*, 149.

<sup>261</sup> Vos, “Scholasticism and Reformation,” 101–102.

patterns of team formation and specialization,” as Vos explains.<sup>262</sup> The rise of the universities of Bologna, Paris and Oxford can be seen as a second institutional revolution that came after the establishment of the cathedral schools. Modern scholarship is not always aware of the history before the Scientific Revolution. It is important to mention that the Scientific Revolution of the seventeenth century was preceded by a philosophical and methodical revolution, in which the European universities played an important role.<sup>263</sup> The developments of logic, analytic methods and philosophy of language – with the “relationship between thought and language” as a “focal point” – were important achievements of the medieval universities.<sup>264</sup> The Scholastic method of *questio* forced scholars to ask questions to a text and to interact with opposing viewpoints. It was first applied in canon law, but Abelard is the first who applied it to theology.<sup>265</sup>

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<sup>262</sup> Ibid., 102.

<sup>263</sup> Ibid., 101–104.

<sup>264</sup> Lambertus Marie de Rijk, “The Origins of the Theory of the Properties of Terms,” in *The Cambridge History of Later Medieval Philosophy: From the Rediscovery of Aristotle to the Disintegration of Scholasticism, 1100-1600*, ed. Norman Kretzmann, Anthony Kenny, and Jan Pinborg (Cambridge; New York: Cambridge University Press, 1982), 161; Vos, “Scholasticism and Reformation,” 103.

<sup>265</sup> Pieter L. Rouwendal, “The Method of the Schools: Medieval Scholasticism,” in *Introduction to Reformed Scholasticism*, ed. Willem J. van Asselt et al., trans. Albert Gootjes (Grand Rapids, MI: Reformation Heritage Books, 2011), 61–62.

## Primary and Secondary Causes

### *Nature's Mechanical Working and Divine Providence*

In a note, Beeckman said that—as the controversial pastor Hendrick Boxhorn (1545-1631) stated in a sermon—like an eclipse in ancient Greek predicted disaster, natural phenomena can still today be signs of God, even if we can explain the mechanism behind these phenomena.<sup>266</sup> Beeckman emphasized that the ability to understand the mechanical workings of natural phenomena is not in contradiction with faith in God's providence. He says,

God is so wonderful in His providence, that He makes the natural things correspond to those that exist in human action.<sup>267</sup>

This note demonstrates that Beeckman believed that natural processes are in God's control and that they are a means of His divine providence. This thought is an application of the medieval Scholastic distinction between God's absolute and His ordained power.

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<sup>266</sup> Beeckman, *Journal*, Journal 1:261. "Ist dat—gelyc Boxhoren preecte—een eclips ten tyden Xerxis een teecken was van syn toecomende ongeluck in Grieckenlant, soo kunnen dan de dingen, die natuerlick geschieden en die men voorseggen can, teeckenen syn."

<sup>267</sup> *Ibid.*, 1:261. "Want soo wonderlick is Godt in syn voorsienicheyt, dat hy de natuerlicke dingen doet overeenkommen met die in der menschen actie bestaen."



*God's Absolute and Ordained Power*

The distinction that the medieval European theologians made between God's 'absolute' and 'ordained' power and between 'primary' and 'secondary' causes was an important step towards the development of modern science and Beekman's mechanical philosophy.<sup>268</sup> Medieval theologians like Alexander of Hales, Albertus Magnus, Thomas Aquinas and John Duns Scotus believed that God has absolute power over nature, but that He also gave material objects the power to cause (secondary causality).<sup>269</sup> They believed that God can, at will, directly intervene in this mechanical system. Beekman was clearly influenced by this medieval distinction. Nature's working was in his opinion not caused by chance or miracles, but by God's ordained power.<sup>270</sup> The mechanical working of nature was for Beekman not in conflict with his faith in divine providence and absolute power over nature's working.<sup>271</sup> Beekman does not use the terms 'ordained' and 'absolute power' or 'primary' and

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<sup>268</sup> P. E. Hodgson, *Theology and Modern Physics*, Ashgate science and religion series (Aldershot, Hants, England ; Burlington, VT: Ashgate Pub, 2005), 13-18; Berkel, *Beekman on Matter and Motion*, 142-143.

<sup>269</sup> Hodgson, *Theology and Modern Physics*, 14.

<sup>270</sup> Berkel, *Beekman on Matter and Motion*, 143.

<sup>271</sup> Beekman, *Journal*, 1:228-229; 1:138; 1:230, 1:261; 2:242. Beekman believed that although nature is an understandable mechanism, God still has the authority over it.

‘secondary causality,’ but he clearly applied these distinctions in his mechanical philosophy.<sup>272</sup>

In another note, Beeckman made a distinction between “the course of nature” and “God’s decree and all things that happen necessarily with respect to it.”<sup>273</sup> In this note, he also emphasized God’s absolute power to intervene in the natural working of nature.<sup>274</sup> God is the “author of nature” and humans are able to understand the mechanical working of nature.<sup>275</sup> Beeckman rejected all theories of his time that assign the working of nature to continuous divine intervention (natural phenomena as continuous miracles).

#### *Thomas Aquinas’s (1225–1274) View on Philosophy and Nature*

One medieval theologian who already regarded God as the author of the physical processes in nature was Aquinas.<sup>276</sup> Just like Aquinas, Beeckman believed that God is the Author of nature, who upholds the natural processes. Beeckman is the first

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<sup>272</sup> Ibid., 1:228-229; 1:138, 2:375.

<sup>273</sup> Ibid., 1:138. “Certus est quidem naturae cursus...Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt.”

<sup>274</sup> Ibid. “Waeruyt volcht, dat men hetgene ten onsen aensien onseker oft onbekend is, altyt voor veranderlick achten mach, want Gode is niet onmogelick.”

<sup>275</sup> Ibid., 1:228-229.

<sup>276</sup> Caputo, *Philosophy and Theology*, 22.

Christian who worked this idea out in a coherent mechanical philosophy of nature. An exploration of Aquinas' view is interesting because Beeckman owned books of Aquinas in his personal library, as the Auction Catalogue demonstrates.<sup>277</sup> This means that Beeckman knew Aquinas' natural philosophy.

Important for the rise of natural science and Beeckman's natural philosophy is that Aquinas defended the dogma of *secondary causes* as a valid way of explaining the working of nature.<sup>278</sup> According to Muller, Aquinas encountered the Aristotelian philosophers – Averroes, Avicenna and Maimonides – who believed that God “cannot do otherwise,” or that God “acts from natural necessity” or that He is “constrained by the order of his justice and wisdom.”<sup>279</sup> The Aristotelian philosophers placed God's relationship with nature in the context of His absolute power, but Aquinas reasoned from the Western concept of God's ordained powers, which was an important step in the development of modern natural science.

An important contribution to the development of natural science is that Aquinas regarded observation of natural phenomena, with the purpose to determine natural

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<sup>277</sup> “Catalogus librorum di Isaac Beeckman.”

<sup>278</sup> Hannam, *The Genesis of Science*, 93.

<sup>279</sup> Muller, *Divine Will and Human Choice*, 122–123.

laws, as something positive.<sup>280</sup> This is due to his acceptance of *secondary causes*, caused by God's ordained power, through which God delegates the governance of the world. However, Aquinas still interpreted natural phenomena in an Aristotelian way (from first principles). In the context of astronomy, Aquinas formulated a principle of verification. In response to the defenders of Ptolemy's mathematical astronomy – who argued that experience (mathematical calculations) contradicted Aristotle's astronomy – Aquinas answered,

The [mathematical] hypotheses which [some astronomers] invented are not necessarily true. For even though such hypotheses should save the phenomena, it is not right to say that they are true, because the astronomical phenomena can perhaps be saved in some other way not yet understood by men.<sup>281</sup>

It is important to note that Aquinas used this principle of verification to defend Aristotle's astronomy and not to defend the natural phenomena itself.<sup>282</sup> He hoped that someday Aristotle's physics can be demonstrated by experience (which, in his time, did not mean 'experimentation' in the modern sense). His statement shows that Aquinas believed that somewhere in the future, experience should demonstrate the

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<sup>280</sup> Thomas Aquinas, *Summa Theologiae*, Pt 2.2, Q 95, art 5, quoted in Hannam, *The Genesis of Science*, 117–118. Aquinas stated that astronomical observation may be used to predict weather phenomena.

<sup>281</sup> Thomas Aquinas, II lect.17, quoted in *The Cambridge History of Later Medieval Philosophy: From the Rediscovery of Aristotle to the Disintegration of Scholasticism, 1100-1600*, ed. Norman Kretzmann, Anthony Kenny, and Jan Pinborg (Cambridge; New York: Cambridge University Press, 1982), 161.

<sup>282</sup> Lohr, "The Medieval Interpretation of Aristotle," 93–94.

reliability of Aristotelian physics.<sup>283</sup> Beeckman could certainly agree with this principle of verification, but his natural science was much different from Aquinas' view. Just like Aristotle, Aquinas believed that theories concerning 'nature' should be deduced from first principles. One has to wait until the seventeenth century before someone – Isaac Beeckman – would make the shift from necessary 'first principles' (to explain natural phenomena) to an explanation of the 'mechanical working' of natural phenomena itself. His use of the *Principle of Parsimony* was an important step in this development.

#### 'Ockham's Razor': The Principle of Parsimony

Frédéric de Buzon rightly notes that Beeckman often used the "principle of parsimony" – known as *Ockham's Razor* – in his scientific explanations.<sup>284</sup> Beeckman rejected unnecessary concepts like 'impetus' and 'intelligentia' because he believed that a combination of geometry and mechanics were sufficient to explain natural phenomena. He rejected the widely accepted theory that the motion of the heavenly

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<sup>283</sup> Ibid., 94.

<sup>284</sup> Frédéric de Buzon, "Beeckman, Descartes and Physico-Mathematics," in *The Mechanization of Natural Philosophy*, ed. Sophie Roux and Garber Daniel, Boston Studies in the Philosophy of Science 282 (New Jersey, Grenoble: Springer Science & Business Media, 2013), 146; Beeckman, *Journal*, 1:10; 1:51; 4:122.

bodies was caused by “heavenly intelligences.”<sup>285</sup> His own explanation was based on his inertia principle, in which he appealed to the Parsimony Principle, “What can be done with a few means is said to have been done badly with many.”<sup>286</sup>

De Buzon calls this principle the “epistemological background” of Beeckman’s physical law of inertia that a body in motion will not come into rest unless it is hindered by an external cause.<sup>287</sup> Beeckman’s reference to this principle means that he rejected speculative theories in cases where ‘simpler’ explanations are possible (with which he means ‘mechanical’ explanations).<sup>288</sup> It is important to note that Beeckman does not mention the source of the principle of parsimony (i.e. the name of William of Ockham is not mentioned in the *Journal*). The principle is often associated with Ockham, because he mentioned the principle in various ways. However, the principle was already formulated by others before Ockham and also by others in his time. The Principle of Parsimony was named as “Ockham’s Razor” in the nineteenth century. For instance, an opponent of Ockham, who was a follower of Duns Scotus, called the

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<sup>285</sup> Berkel, *Beeckman on Matter and Motion*, 148.

<sup>286</sup> Beeckman, *Journal*, 1:10; Berkel, *Beeckman on Matter and Motion*, 148. “Quod ergo fieri potest per pauca, male dicitur fieri per plura.”

<sup>287</sup> Buzon, “Beeckman, Descartes and Physico-Mathematics,” 146.

<sup>288</sup> Beeckman, *Journal*, 1:10; 1:51; 4:122.

principle of parsimony the “Scotus’ rule.”<sup>289</sup> According to Paul Vincent Spade, the phrase “Beings are not to be multiplied beyond necessity” is often ascribed to Ockham as the *Ockham’s Razor*, but Ockham never used the expression in this way.<sup>290</sup> Ockham said the following equivalent phrases:

Plurality is not to be posited without necessity;  
 What can happen through fewer [principles] happens in vain through more;  
 When a proposition is verified of things, more [things] are superfluous if fewer suffice.<sup>291</sup>

Moreover, in an explanation of ‘matter in the heavens’, Ockham himself explicitly says that others already mentioned the parsimony principle. Ockham says,

It appears to me...that the matter in the heavens is of the same kind as the matter here below. And this is because plurality should never be posited without necessity, as has often been said. Now, however, there appears no necessity to posit matter of a different kind...since everything that can be saved by [positing] diversity in matter can just as well or better be saved by [positing matter] identical in kind.<sup>292</sup>

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<sup>289</sup> Peter Adamson, *Full of Potential: Thirteenth Century Physics*, Online Audio Lectures, vol. 226, History of Philosophy Without Any Gaps (King’s College, London, 2015), 2:10-2:20, accessed September 26, 2018, <https://historyofphilosophy.net/thirteenth-century-physics>.

<sup>290</sup> Paul Vincent Spade, *The Cambridge Companion to Ockham* (Cambridge: Cambridge University Press, 1999), 101.

<sup>291</sup> Ibid.; Adamson, *Thirteenth Century Physics*, vol. 226, secs. 1.00-2.00.

<sup>292</sup> William of Ockham, *Reportatio* II, q. 18, quoted in Sober, *Ockham’s Razors*, 11.

As this quote demonstrates, Ockham used the *Principle of Parsimony*, that he learned from others, to demonstrate that there is no reason to say that matter in the heavens would be different than matter on earth. There is no need for speculations if a simpler explanation is possible. Ockham's rejection of 'first principles' and 'universals' or other speculations, in favour of a more empirical approach, was an important step in the process that led to the rise of modern science.<sup>293</sup> Also Elliott Sober mentions, the principle was before Ockham already used by Thomas Aquinas and Duns Scotus.<sup>294</sup> Aquinas' formulated the principle as follows,

If a thing can be done adequately by means of one, it is superfluous to do it by means of several; for we observe that nature does not employ two instruments where one suffices.<sup>295</sup>

After Aquinas and before Ockham, Duns Scotus formulated the *Principle of Parsimony* in these words,

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<sup>293</sup> Hannam, *The Genesis of Science*, 165.

<sup>294</sup> Elliott Sober, *Ockham's Razors: A User's Manual* (Cambridge: Cambridge University Press, 2015), 5.

<sup>295</sup> Thomas Aquinas, *Basic Writings of St. Thomas Aquinas*, ed. Anton C. Pegis, vol. 2 (Indianapolis, Cambridge: Hackett Publishing Company, 1997), 129; Sober, *Ockham's Razors*, 5.



We should always posit fewer things when the appearances can be saved thereby...therefore in positing more things we should always indicate the manifest necessity on account of which so many things are posited.<sup>296</sup>

The consequent use of the *Principle of Parsimony* in Beeckman's *Journal* demonstrates the influence of medieval philosophy as well as Ramism. Especially medieval Nominalism and Scotism offered the seventeenth century a philosophy that allowed 'simple' explanations of natural phenomena that went behind the boundaries of Aristotelian physics. The word 'simple' means that unnecessary speculation were avoided in explanations. This new philosophy allowed medieval natural philosophers to critically challenge widely accepted Aristotelian physics.

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<sup>296</sup> Duns Scotus, *Questions on the Book of Metaphysics of Aristotle*, Book VIII, Q.1, n.22, quoted in Sober, *Ockham's Razors*, 5.

## Nature as a Contingent Creation

### *God's Absolute Power*

Chapter 3 already explained that Aristotelian physics was built on the religiously inspired 'law of necessity.' This means that this world – with the possibility of change in time – is a product of divine necessity.<sup>297</sup> Ancient physics started therefore from a deduction of first principles. However, Beeckman's mechanical philosophy is built on another religious foundation than that of Aristotle. Both Aristotle and Beeckman believed in a divine First Mover, but the difference is that Aristotle's First Mover was dependent on the law of necessity, while Beeckman said that everything happens necessarily with respect to God's decree.<sup>298</sup> For him, God is not dependent on necessity, but rather the all-powerful cause of it.<sup>299</sup> God's providence guides the natural working of nature.<sup>300</sup> As one can observe in the theological, religious and philosophical notes of Beeckman's *Journal*, his natural science was built on a philosophy that recognizes physical objects as contingent creations – we already

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<sup>297</sup> Vos, *Kennis en noodzakelijkheid*, 29.

<sup>298</sup> Beeckman, *Journal*, 1:138. "Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt; nostro vero respectu multa fiunt contingenter..."

<sup>299</sup> Ibid.

<sup>300</sup> Ibid., 1:261; 1:138. "Want soo wonderlick is Godt in syn voorsienicheyt, dat hy de natuerlicke dingen doet overeenkommen met die in der menschen actie bestaen."

referred to Beeckman's "picturability" of nature, in Chapter 2. From this perspective, Beeckman's natural philosophy was the harvest of medieval contingency thought in the context of physics. We will explain these important developments in the following paragraphs.

Beeckman's religious foundation is part of a longer theological tradition. After all, creation theology of early Christianity had an immense impact on the development of medieval philosophy as well as on physics. The process of rethinking ancient philosophy from the new perspective of Christian thought was intensified in the Middle Ages. Moreover, new philosophical modalities—such as Nominalism and Scotism—not only influenced Enlightenment philosophers, it also opened the philosophical way for Beeckman's mechanical philosophy and the rise of modern natural science.<sup>301</sup> A central argument in our thesis is that Beeckman's academic education in Leiden and Saumur was an important background for his theological thought behind his natural philosophy. After all, the University of Leiden and the academy of Saumur, where Beeckman was educated, was the bridge between developments in medieval Christian theology and Beeckman's theological and natural philosophical thought. John Duns Scotus and William of Ockham are two important key figures that opened the way for a coherent philosophy that recognizes the world as a contingent creation. Our focus will now be on the rise of a theology that

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<sup>301</sup> Vos, "Scholasticism and Reformation," 99–101; Vos, "Isaac Beeckman."

consequently accepts ‘the free will of God’ and the universe as His ‘contingent’ creation. This is an important background of Scholastic philosophy that was taught in Leiden and of Beeckman’s mechanical philosophy.

*John Duns Scotus (c. 1265–1308) and His View on Contingency*

Early Christian theology already replaced the cosmology of ancient Greek philosophy by a “creation based theology.”<sup>302</sup> In the Middle Ages, Anselm of Canterbury (c.1033–1109) introduced the topic of the ‘divine will’ and the idea that God’s will and knowledge are ‘contingent.’<sup>303</sup> Duns Scotus completed this process by developing his theory of—what Vos calls—“*synchronic contingency*,” that replaced necessitarian models by a creational model that takes real freedom of will as the starting point.<sup>304</sup> Duns Scotus radically considered the present and the future as contingent, as demonstrated in Scotus’ *Lectura I*, 39. This passage is the key to understand his other works (i.e. the *Ordinatio* and *Quodlibet*).<sup>305</sup> Also Calvin G.

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<sup>302</sup> Antoon Vos, *The theology of John Duns Scotus*, Studies in Reformed Theology (Leiden: Brill, 2018), 13.

<sup>303</sup> Antoon Vos, *Johannes Duns Scotus*, Kerkhistorische monografieën (Leiden: Uitgeverij J.J. Groen En Zoon, 1994), 9.

<sup>304</sup> Vos, *The theology of John Duns Scotus*, 13.

<sup>305</sup> A. Vos et al., “Inleiding: *Lectura I*, 39,” in *Contingentie en vrijheid: Lectura I*, 39 (Zoetermeer, Netherlands: Meinema, 1992), 20.

Normore mentions contemporary interest in Duns Scotus' development of a "modal theory," in which he employed "a synchronic conception of modality, one that allowed for alternative possibilities at a given time."<sup>306</sup> Normore points to the suggestion that Duns Scotus was the first philosopher in history who used this concept of synchronic contingency.<sup>307</sup> This was an important philosophical step away from ancient 'law of necessity,' towards modern natural science—that presumes contingency. After all, Beekman believed that humans should look at nature's mechanism because we cannot know the will of God and the way in which He created it.<sup>308</sup> While from Aquinas' perspective the world was created by the divine ideas—that are part of the divine essence, which means that creation is essentially perfect and necessary—Duns Scotus saw the world as the result of God's *will* and not of God's *essence*.<sup>309</sup> For God, real alternatives—synchronic contingency—are possible. This is an important philosophical conclusion for the rise of modern empirical science. Duns Scotus' *will-*

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<sup>306</sup> Calvin G. Normore, "Duns Scotus's Modal Theory," in *The Cambridge Companion to Duns Scotus*, ed. Thomas Williams (Cambridge: Cambridge University Press, 2006), 129.

<sup>307</sup> *Ibid.*, 129.

<sup>308</sup> Beekman, *Journal*, 4:30-31.

<sup>309</sup> Alessandro D. Conti, "Divine Ideas and Exemplar Causality in Auriol," *Vivarium* 38, no. 1 (March 2000): 103–104. Conti refers to Tomas Aquinas, *STh. I, q. 14, a. 2* to demonstrate that Aquinas saw creation as perfect and intelligible because it is the result of God's intelligence and essence. He refers to Duns Scotus' *Ordinatio I, d. 30-36* and *Lectura I, d. 35-36* to demonstrate that Duns Scotus rejected this point of view by pointing to God's free will as the origin of creation.

*theology* opened the philosophical way for accepting other theories and speculations than those of Aristotelianism.<sup>310</sup>

Of course, in some perspectives, even Duns Scotus was influenced by ancient necessity thought. One clear example is that he considered the past (when something already happened) as necessary.<sup>311</sup> He did not realize that an omnipotent Creator of the universe and time is not bound by His own creation of past, present and future because they are all contingent and changeable. However, Scotus' theology (Scotism) became an influential movement that influenced Ockham and his Nominalism.

*William of Ockham (c.1285–1347) and the Rise of Nominalism*

The rise of nominalism was another important historical event for the development of modern physics. The philosophical position of nominalism rejected generalisations (the existence of 'universals'), so that the philosophical way to modern science – that requires observation and mechanical explanation of natural phenomena themselves – was open.<sup>312</sup> Lindberg nuances that the recognition of the impossibility to know the contingent world from first principles did not immediately lead to

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<sup>310</sup> Hannam, *The Genesis of Science*, 162.

<sup>311</sup> Normore, "Duns Scotus's Modal Theory," 131; Vos et al., "Contingentie en vrijheid: Lectura I,39," 42. In paragraph 69 of Lectura I, 39, Duns Scotus agrees with Aristotle that the past is true and necessary.

<sup>312</sup> Hannam, *The Genesis of Science*, 165.

*experimental* science.<sup>313</sup> One had to wait until the seventeenth century before the development of experimental science would take place. However, the medieval dogmas of the divine free will and the contingency of the cosmos caused a more empirical approach of nature.<sup>314</sup> William of Ockham is an important key figure in the development of nominalism. He believed that human reason is not able to discover truths about God or nature.<sup>315</sup> Ockham rejected speculations in cases where simpler explanations are sufficient, a principle that also Beeckman applied—known as *The Principle of Parsimony* or *Ockham's Razor*.<sup>316</sup>

Ockham is loyal to Duns Scotus' emphasis on God's free will and the contingency of creation, but he also followed the logical-metaphysical tradition of Aristotle.<sup>317</sup> Ockham is from the same philosophical-theological 'family' as Duns Scotus.<sup>318</sup> Both are part of the same Augustinian-Franciscan tradition. Ockham accepted God's necessarily existence, but he abandoned the "*foundation of synchronic contingency,*"

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<sup>313</sup> Lindberg, *The Beginnings of Western Science*, 253.

<sup>314</sup> *Ibid.*, 252–253.

<sup>315</sup> Hannam, *The Genesis of Science*, 164–166.

<sup>316</sup> Beeckman, *Journal*, 1:10; 1:51; 4:122.

<sup>317</sup> Vos, *Kennis en noodzakelijkheid*, 94.

<sup>318</sup> Antoon Vos, "The Systematic Place of Reformed Scholasticism: Reflections Concerning the Reception of Calvin's Thought," *Church History & Religious Culture* 91, no. 1/2 (April 2011): 39.

as Vos explains.<sup>319</sup> Ockham developed a radical notion of contingency, in which he rejected everything that limited God's omnipotence and freedom. Nominalism rejects "the dimension of necessity," so that only contingency remains. Vos nuances that Ockham accepted that God has "some necessary properties" and that His existence is also necessary.<sup>320</sup> Ockham rejected the ancient and medieval theory of the *universals* by making the concrete reality and the characteristics of individuals more important than universals—these are nothing more than *names*.<sup>321</sup> The new movement of Nominalism, that is associated with Ockham, is therefore linked to the new philosophy that Ockham's master Duns Scotus already started, with his emphasis on 'synchronic contingency' and the focus on unique characteristics of 'individuals.' The following chapter will explain that Beeckman studied theology in the University of Leiden where *will-theology* was influential. His mechanical philosophy takes the free will of God as a starting point, so that not Aristotelian 'first principles' but only 'mechanical explanations' of reality itself are valid.

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<sup>319</sup> Ibid., 40.

<sup>320</sup> Ibid.

<sup>321</sup> Rouwendal, "The Method of the Schools," 66.



### Summary

Beeckman believed that the purpose of theology was to explain nature's working as a 'wonderful' creation, while the task of philosophy was to explain its mechanism. Natural phenomena require a natural, mechanical explanation. The distinction between philosophy and theology was established by medieval theologians of the universities. The universities were important medieval institutions that flourished from Christian Cathedral schools. The distinction between God's absolute power and His ordained power, as well as between primary and secondary causality, was influential on Beeckman's mechanical philosophy. The emphasis of Duns Scotus, Ockham and Nominalism on the free will of God and the contingent nature of God's creation opened the philosophical way for experimental science and mechanical philosophy. Beeckman distanced himself from the ancient 'law of necessity' by stating that everything happens necessarily with respect to God's decree. After all, he believed in the omnipotence of God. Moreover, Beeckman applied the medieval *Principle of Parsimony* in his mechanical philosophy. Next two chapters will further explore Beeckman's use of will-theology; the divine decree; necessity and contingency in his mechanical philosophy.

## CHAPTER 5. THE DIVINE WILL AND THE RISE OF MODERN PHYSICS

### Introduction

In the previous chapters, we explained that in Beeckman's time, natural philosophers often applied first principles, religious arguments or even magic in theories on matter and motion. Our discussion will start with a short note of Beeckman's *Journal* in which he refers to the will of God in the context of physics. Thereafter, publications of the University of Leiden will be explored with the purpose to demonstrate that Beeckman stood in a philosophical tradition in which will-theology was an important concept. Moreover, attention will be paid to a note of Beeckman's *Journal* in which he says that nature's working is a necessary result of God's decree and that natural events in history, present and future are contingent. A central argument is that already in medieval Scholastic theology, the concepts of the divine free will and contingency had influence on cosmology (the possible world debate). This chapter will conclude that Beeckman built his mechanical philosophy on the medieval legacy that he learned from his theological education in Leiden.

### God's Will and the Mechanical Working of Nature

Our statement that Beeckman had religious reasons for his scientific work and natural philosophy is, at first sight, in conflict with the observation that Beeckman hardly appealed to religious arguments in his scientific explanations of nature's mechanical working. The vast majority of Beeckman's notes in his *Journal* are purely

mechanical descriptions and theories on all kinds of natural phenomena. This lack of religious arguments in his scientific theories requires an explanation. However, Beeckman had *religious* reasons for his scientific method to explain nature's mechanism without religious arguments. A first observation is that Beeckman believed that God made nature comprehensible so that supernatural or theological arguments are unnecessary.<sup>322</sup> This becomes visible in a discussion between Beeckman and Jeremias van Laren about the structure of matter and the existence of vacuum. Beeckman believed that vacuum exists (in the universe or within particles itself) simply because without the existence of vacuum, one cannot explain the movement of matter in the air.<sup>323</sup> As an Aristotelian scholar, Van Laren stated in 1613, that God gave matter the capacity to change its structure so that movement of matter is possible. Beeckman disagreed and responded that "humans should not invoke the will of God in such cases because they know nothing about His will."<sup>324</sup> Beeckman considered Van Laren's theory as unlikely because if Van Laren is right (in his claim that God gave air the capacity to change its structure) then this mechanism would be

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<sup>322</sup> Beeckman, *Journal*, 3:34; Berkel, *Beeckman on Matter and Motion*, 144.

<sup>323</sup> Berkel, *Beeckman on Matter and Motion*, 84–85.

<sup>324</sup> Beeckman, *Journal*, 4:31; Berkel, *Beeckman on Matter and Motion*, 85. "Et malè dicitur Deum aeri potentiam rarescendi aut densandi indidisse absque necessitate, praestatque philosophia intellectui objecta, quum quae nudaе voluntati divinae innititur cujusque modus inexplicabilis est menti humanae."

“incomprehensible” for humans.<sup>325</sup> Beeckman denied the speculation that matter has intelligence, because he believed that the working of matter is the product of God’s will and not of His intelligent nature.<sup>326</sup> The result of this theological position is that Beeckman believed in the *total passivity* of matter.<sup>327</sup> He believed, therefore, that natural phenomena have a physical, mechanical explanation.

From a philosophical perspective, we should not underestimate the importance of Beeckman’s theological statement that one should not invoke the will of God in physical explanations. It means that Beeckman refused to argue from speculations or supposed divine principles (as Aristotelian scholars like Van Laren did). One cannot know the will of God, so a natural philosopher should *observe* how God made nature’s mechanism. Beeckman argued for the existence of ‘vacuum’ simply because this assumption is the best explanation for movement of matter in the air. There are religious arguments behind both Beeckman’s mechanical philosophy and Van Laren’s philosophical assumptions. Van Laren’s perspective was influenced by the Aristotelian tradition, that led to the belief in ‘first principles’ of how the divine

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<sup>325</sup> Berkel, *Beeckman on Matter and Motion*, 144; Beeckman, *Journal*, 3:30-31.

<sup>326</sup> If matter was a product of God’s nature, then it would have God’s intelligence. Beeckman took distance from this kind of reasoning. He believed that matter is passive, because it is only created by God’s will. He believed that creation is not an extension of the divine essence, but of the divine free will.

<sup>327</sup> Berkel, *Beeckman on Matter and Motion*, 143.

worked.<sup>328</sup> Unlike Van Laren, Beeckman applied the argument that one cannot know the will of God in the context of physics. Why did Beeckman use this argument? Since Beeckman studied theology in Leiden and in Saumur, it is likely that his university education is the background of his emphasis on the ‘will of God’ in his physics. After all, next parts will mention publications from Leiden about the divine and human free will.

#### The Legacy of Medieval Will-Theology in the University of Leiden

On January 21 in 1595 Jacobus of Miggrode (1573-1645) defended his remarkable disputation on *Theses Theologicae de Providentia Dei*.<sup>329</sup> He studied at the University of Leiden in the time of Franciscus Junius (1545–1602) and Franciscus Gomarus (1563-1641); just before Isaac and Jacob Beeckman. In the time that Gomarus was professor in Leiden, the Beeckman brothers studied theology in this city. According to Vos, Miggrode’s disputation is of historical importance because it demonstrates the influence of early Christian and medieval ‘contingency thought’ that was further developed by the Franciscan school and proponents of the Oxford University.<sup>330</sup> The

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<sup>328</sup> Ibid., 85. Aristotelian physics and philosophy will be discussed in chapter 3.

<sup>329</sup> Vos, “Isaac Beeckman,” 19.

<sup>330</sup> Vos, “Scholasticism and Reformation,” 113–114.

will-tradition, which was built on the “contingency model,” was influential in the Scholastic Reformed tradition, especially in the University of Leiden where also Beekman studied theology.<sup>331</sup>

Moreover, the *Synopsis Purioris Theologiae* (1625)—a collection of disputations that were presented in the University of Leiden—is an important document that also demonstrates continuity between Post-Reformation theology and medieval Scholasticism. The *Synopsis* mentions the topic of necessity and God’s free will.<sup>332</sup> Concerning the doctrine of God, the *Synopsis* also discusses Christology, providence and predestination,<sup>333</sup> topics that are related to Beekman’s natural philosophy. It is important to emphasize that Beekman’s thought on the divine free will and contingency is grounded in the typical Post-Reformation doctrines of God, creation and divine providence of the time of early and high orthodoxy. Beekman lived between these two eras.

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<sup>331</sup> *Ibid.*, 111–112.

<sup>332</sup> Dolf te Velde et al., eds., *Synopsis Purioris Theologiae Synopsis of a Purer Theology Latin Text and English Translation Volume 1 / Disputations 1-23*, trans. Riemer A. Faber, *Studies in Medieval and Reformation Traditions* (Leiden: Brill, 2014), 37. “Quia est notitia rerum necessariorum, vel absolute, ut Dei et attributorum ejus; vel ex hypothesi voluntatis Dei, ut cultus et operum ipsius.”

<sup>333</sup> Donald Sinnema and Henk van den Belt, “The *Synopsis Purioris Theologiae* (1625) as a Disputation Cycle,” *Church History & Religious Culture* 92, no. 4 (December 2012): 510.

As already mentioned before, the emphasis on the divine will was a central doctrine in post-Reformation in the seventeenth century. In the second half of the sixteenth century, theologians of the Reformed tradition made great efforts to rediscover their theological heritage of medieval Scholastic theology.<sup>334</sup> “In the course of this reorientation,” as Vos states, “Scotus’ legacy became a major influence.”<sup>335</sup> Duns Scotus (c. 1265–1308) developed a theology that placed the free will of God central, as well as the idea that God’s creation is contingent: God is not bound by necessity, which means that He could have created a world that is (completely) different from the world we live in. Muller agrees with Vos that Duns Scotus developed the notion of synchronic contingency and that medieval Scholasticism is the background of Reformation theology, but he states that also other medieval theologians, like Thomas Aquinas, already had a notion of synchronic contingency.<sup>336</sup> Muller argues that Reformed theology concerning the divine free will and contingency integrated many traditions – like Scotism, Thomism and Augustinianism.<sup>337</sup>

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<sup>334</sup> Vos, “Scholasticism and Reformation,” 117.

<sup>335</sup> *Ibid.*

<sup>336</sup> Muller, *Divine Will and Human Choice*, 137–138.

<sup>337</sup> *Ibid.*, 73.

### Reformed Thought on the Divine Free Will and Human Choice

In a publication, *Reformed Thought on Freedom*, researchers of Post-Reformation theology translated and discussed primary sources of sixteenth and seventeenth century Reformed theologians, like Girolamo Zanchi (1516-1590), Franciscus Junius (1545 -1602), Gisbertus Voetius (1589-1676) and Francesco Turretini (1623-1687) that demonstrate their affirmation of human and divine freedom of will. These are notable texts because they clearly demonstrate that the Reformed theologians of Beeckman's time understood 'sin' and 'salvation' from the perspective of God's free will and human's free choice.<sup>338</sup> They believed that the divine grace did not exclude human freedom, but that it rather *requires* freedom of will and choice.<sup>339</sup> From a modern perspective, this is remarkable for theologians who belonged to the Reformed tradition (that includes Calvinism) of the sixteenth and seventeenth century. The researchers argue, as Muller in a review noticed, that the Reformed Scholastic theology of that time was "not a form of determinism or compatibilism, nor...a form of libertarianism."<sup>340</sup> The Reformed theologians connected the necessity of the divine decrees to a theology

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<sup>338</sup> Willem J. van Asselt, J. Martin Bac, and Roelf T. te Velde, eds., *Reformed Thought on Freedom: The Concept of Free Choice in the History of Early-Modern Reformed Theology* (Grand Rapids: Baker Academic, 2010), 18.

<sup>339</sup> Ibid.

<sup>340</sup> Muller, *Divine Will and Human Choice*, 27.



of contingency and free will that relies on God's grace.<sup>341</sup> It is therefore interesting to explore one of Beeckman's notes in which he used the typical Scholastic concepts of 'contingency' and 'necessity.'

*Beeckman's Note on Creation's Contingency and the Necessity of the Divine Decree*

As the following analysis will demonstrate, Beeckman believes that God made nature as a contingent mechanism that is ruled by the divine decree. Beeckman's note starts with his remark that people often pray to God for everyday things that will happen or that already happened.<sup>342</sup> Beeckman mentions the examples of a prayer to find something in a dictionary or for a safe journey for acquaintances. People even pray for change concerning the past. Beeckman says,

When one sees a ship of acquaintances colliding, then they say, 'May God provide that these people had a safe journey.'<sup>343</sup>

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<sup>341</sup> Asselt, Bac, and Velde, *Reformed Thought on Freedom*, 238.

<sup>342</sup> Beeckman, *Journal*, 1:138. The source text is consultable in Appendix B.

<sup>343</sup> *Ibid.*, 1:138. "Soo oock van dingen, die gesciet syn: als men een scip van kennisse siet thuis komen varen, men secht: 'Godt geve, dat hi behouden reise mach gedaen hebben.'"

From a human perspective, there are uncertainties about “the future things, that certainly will happen in nature,” for which people pray.<sup>344</sup> Beeckman gives the examples of a prayer for the ‘wind direction’ or a ‘good harvest.’ From the fact that people pray for the ‘uncertain’ future, he concludes that the uncertain or unknown things are changeable, “because for God nothing is impossible.”<sup>345</sup> This is an important observation, because it means that Beeckman believes in the *contingent* state of nature. After all, a prayer can change “the things that already happened” and future things “that will happen in nature.”<sup>346</sup> Beeckman clearly believes in the sovereignty of God over natural forces, in past, present and future.

Beeckman now changes the language of his note from Dutch to Latin. In what follows, Beeckman discusses God’s sovereignty over nature in the context of anthropology. He says that through the course of nature, the sinner is punished, and the upright is blessed.<sup>347</sup> This means that the mechanical working of nature is not an obstacle for God’s omnipotence and sovereignty. He deals with the question whether

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<sup>344</sup> Ibid., 1:138. “Soo oock van toekomende, die vast gaen in die nature: ‘Ick bidde, dat de wint morgen Oost wesen mach’, oft: ‘dat het koren wel groeien mach’, etc.”

<sup>345</sup> Ibid. “Want Gode is niet onmogelick.”

<sup>346</sup> Ibid. “Soo oock van dingen, die gesciet syn...Soo oock van toekomende, die vast gaen in die nature.”

<sup>347</sup> Ibid., 1:138. “Certus est quidem naturae cursus; attamen eo punitur peccator et benedicitur probus.”

one can still see the hand of God in human life, if one realizes that natural phenomena have a *natural* cause. All things happen necessarily with respect to the divine decree, Beeckman explains.<sup>348</sup> Although there is “the course of nature,” God is still Lord over it because He punishes the sinner and blesses the upright through the natural course.<sup>349</sup> With respect to humans, “many things happen contingently” and the “unjust is justly punished,” Beeckman explains.<sup>350</sup> The final sentence of the note makes Beeckman’s focus clear: all good things are given by God, so that no one can say that he or she earns these things.<sup>351</sup>

Beeckman’s main concern was how to approach nature as a natural mechanism, without denying the teachings of the divine providence and predestination (that both suppose *divine intervention* in nature). Beeckman says that God’s decree rules the working of nature, so that He still does justice to the sinner and the righteous one.<sup>352</sup> Beeckman believes that God takes care of humans by divine providence and

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<sup>348</sup> Ibid. “Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt.”

<sup>349</sup> Ibid., 1:138. “Certus est quidem naturae cursus; attamen eo punitur peccator et benedicatur probus.” The Latin word ‘eo’ (‘it’) gives space for a translation as both ‘by it’ or ‘through it’.

<sup>350</sup> Ibid. “Nostro verò respectu multa fiunt contingenter et justè punitur injustus.”

<sup>351</sup> Ibid. “...de probis tamen docet nos Scriptura loqui respectu Dei. Ideòque nihil mereri dicendus est.”

<sup>352</sup> Ibid. “Certus est quidem naturae cursus; attamen eo punitur peccator et benedicatur probus. Ita quoque certum est decretum Dei.”

predestination. From his perspective, nature is ruled by the divine decree to perform the acts of God's providence and predestination. In this context, Beeckman uses typical Scholastic concepts of 'necessity' and 'contingency.' From a human perspective, the working of nature is *contingent*, but it is also a *necessary* result of the divine decree.<sup>353</sup> This does not mean that Beeckman believes that God was bound by necessity (as Aristotelianism did). Beeckman is aware of the distinction between 'necessity' and 'contingency,' as the note demonstrates. Beeckman considers the things that happen in nature as results of the *divine decree*, but he also mentions the *contingent nature* of these things *with respect to us*.<sup>354</sup> This means that the mechanism of nature is not a product of necessity, but of God's will (as ordered by His decree). Beeckman clearly uses concepts that he learned from his theological education. Indeed, the subject of logical necessity and contingency was already discussed in medieval logic, philosophy and theology, as Vos explains.<sup>355</sup> The following part will explain that 'free will theology' challenged ancient physics.

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<sup>353</sup> Ibid. "Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt; nostro vero respectu multa fiunt contingenter et juste punitur injustus."

<sup>354</sup> Ibid. "Ita quoque certum est decretum Dei, omniaque ipsius respectu necessario fiunt; nostro vero respectu multa fiunt contingenter."

<sup>355</sup> Antoon Vos, "Logical Necessity: Necessity of the Consequence and Necessity of the Consequent" (Leuven: Evangelical Theological Faculty, 2018), 1.

### The Condemnations against Aristotelian physics of 1277

In 1277, the bishop of Paris, Etienne Tempier, condemned several Aristotelian doctrines in the context of natural philosophy, especially those that limited God's free will and omnipotence. These condemnations inspired a specific kind of theology that placed emphasis on God's free will; a movement that is often called 'voluntarism.'<sup>356</sup> Lindberg explains that the condemnations "were motivated by concern over the element of necessity that Aristotle had attached to his natural philosophy – the claim that things cannot be otherwise than as they are."<sup>357</sup> Theologians realized that Aristotle's necessity thought in the context of physics was incompatible with Christian doctrine of divine omnipotence. Medieval theologians challenged Aristotelian cosmology – based on necessary first principles – such as the idea that a heavier object falls faster than a light object, that the universe is eternal, that nature absorbs a vacuum, that the earth is the centre of the cosmos or that the heavenly bodies move in perfect circles around a stationary and fixed earth. Progression in natural science was achieved in the thirteenth and fourteenth century (and of course in the centuries of the Scientific Revolution); a time when theologians realized that God has the power to act differently than Aristotle's necessary principles claimed. It is important to emphasize

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<sup>356</sup> Nancy Pearcey and Charles B. Thaxton, *The Soul of Science: Christian Faith and Natural Philosophy*, Turning Point Christian Worldview Serie (Wheaton, Ill: Crossway Books, 1994), 31.

<sup>357</sup> Lindberg, *The Beginnings of Western Science*, 249.

that Beeckman's physics was built on this theological foundation. Now, the medieval 'possible worlds debate' will be discussed because this debate shows the development of a contingency based cosmology.

### The 'Possible Worlds' Debate

In the discussions between Peter Abelard (1079-1142) and his contemporaries, like Hugh of St-Victor and Bernard of Clairvaux, the central position of God's freedom of will is remarkable. Behind this discussion, there was Abelard's question whether God could have created another world. Initially, he answered this question negatively because he believed that God chose the best option between these possibilities, but after the condemnation of his perspective on the synod of Sens (1140) Abelard saw that his position limited God's freedom of will (as articulated in his *Apology Sue Fidei Confessio*).<sup>358</sup> Concerning the possibility of other earths, Beeckman said,

"Besides, many Earths could have been naturally constituted by God in this world, with each one conserving any motion perpetually."<sup>359</sup>

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<sup>358</sup> Vos, *Johannes Duns Scotus*, 10.

<sup>359</sup> Beeckman, *Journal* 2:232, quoted in Richard Arthur, "Beeckman, Descartes and the Force of Motion," *Journal of the History of Philosophy* 45, no. 1 (January 17, 2007): 22. See Footnote 45. "Necnon plures Terrae potuissent naturaliter a Deo in hoc mundo constitui, unaquaque quemvis motum in perpetuum conservante."

Beeckman believed in God's free will to create other earths, but it is unclear whether he means 'alternative earths' or the possibility of 'other planets' in the universe. Now we examine the opinion of both Thomas Aquinas and John Duns Scotus in the 'possible world' debate.

*Thomas Aquinas' View on the Possible Worlds Debate.*

In his reflection on contingency, necessity and free will, Aquinas was aware of the perspective that God is outside time.<sup>360</sup> On the question whether God could have created the world better than He did, Aquinas reasoned that God uses the best methods, so that the result is always the wisest and best possible creation.<sup>361</sup> This means that Aquinas believed that if God had created another world, this world and its creatures would not be better or worse than our world. Aquinas did not believe in a "best of all possible worlds," as Anthony Kenny explains.<sup>362</sup> Aquinas saw the current world as the result of God's wisdom.

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<sup>360</sup> Anthony Kenny, *Medieval Philosophy*, vol. 2 (Oxford; New York: Clarendon Press; Oxford University Press, 2005), 301.

<sup>361</sup> *Ibid.*, 2:302.

<sup>362</sup> *Ibid.*

*The Franciscan Tradition on Possible Worlds.*

The theologians of the Franciscan school realized that Aquinas' way of thinking limited God's omnipotence. Especially John Duns Scotus placed emphasis on God's potency to create another world. Vos calls Duns Scotus' theory "revolutionary" because Scotus considered real alternatives as a norm in his philosophy.<sup>363</sup> The possibility of real alternatives is an important step in the development of a philosophy that recognizes real contingency. In the thirteenth century, theologians stated that Aristotelianism claimed worldviews that were incompatible with Christian view on God's omnipotence.<sup>364</sup> After all, Aristotle thought that true knowledge is necessary knowledge; the highest being (God) cannot know the contingent.<sup>365</sup> The debate of possible worlds should be interpreted as a criticism on Aristotelian necessity thought. We recall that Duns Scotus realized that taking the free will of God as a starting point means the acceptance that in the same moment, real alternatives for the actual world and the metaphysical state of something is possible.<sup>366</sup> Accepting contingency is an important starting point for modern physics and Beeckman's mechanical philosophy.

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<sup>363</sup> Vos, *Kennis en noodzakelijkheid*, 271–272.

<sup>364</sup> Neil Lewis, "Space and Time," in *The Cambridge Companion to Duns Scotus*, ed. Thomas Williams (Cambridge: Cambridge University Press, 2006), 69.

<sup>365</sup> Vos et al., "Contingentie en vrijheid: Lectura I,39," 27.

<sup>366</sup> Vos, *Kennis en noodzakelijkheid*, 269–270.



After all, Beeckman's physics recognizes nature as a free and contingent creation of the divine will.

### Conclusion

Beeckman stated that one should not invoke the will of God in physical explanations, because one cannot know the will of God. His scientific method of describing nature's mechanism was built on this theological concept of the divine will. Humans should explain nature's working mechanically, because creation is contingent: God could have made another world if he had wanted to. Will-theology prompted him to distance himself from Aristotelian explanations. The condemnations of 1277 already challenged Aristotelian theories in the context of cosmology. The possible world discussion demonstrates that medieval theologians provided medieval as well as seventeenth century physicists, like Beeckman, a theology that recognizes nature as a contingent creation by the divine will. The next chapter will focus on the influence of creation theology on Beeckman's law of inertia and on some remarkable 'modern' theories of medieval natural philosophers.

## CHAPTER 6. DOES GOD MOVE MATTER? BEECKMAN'S LAW OF INERTIA

### Introduction

Aristotelian philosophers believed that matter moves because the medium (air) pushes it or because matter has an intelligent soul. According to them, matter stops moving because this is its natural tendency (a state of rest). We will argue that creation theology influenced medieval natural philosophers as well as Beeckman to rethink ancient physical explanations in the context of matter and motion. A central argument will be that his theology and mechanical philosophy is part of the larger tradition of the universities. Medieval scholars already criticized ancient physics from the perspective of creation theology. This chapter will point to the influence of free will theology on medieval natural philosophers, who often were clerics, bishops or devoted Christians. In addition, we will point to similarities between the theological foundation of medieval physics and Beeckman's view on God as the omnipotent creator of perpetual motion of the heavenly bodies.

### God and the Motion of the Heavenly Bodies

It is no coincidence that Beeckman first formulated his physical formula that matter cannot come to rest on its own in the context of *cosmology*. The idea that the planets move perpetually unless another force stops them was already proposed by fourteenth century natural philosophers. Especially John Buridan believed that God gave the heavenly bodies their perpetual motion at creation. Religious concepts played

an important role in the rise of modern physics in the context of matter and motion. Creation theology was also Beeckman's starting point in his physics. He believed that God created everything with its weight, time and measure.<sup>367</sup> Kubbinga explains that for Beeckman, as a Protestant Christian, "theology and cosmology are discretely related."<sup>368</sup> In his dissertation, Beeckman described God as the intelligent author, mover and governor of the universe.<sup>369</sup> His view on matter and motion as contingent creations of God's free will had an impact on his physics.<sup>370</sup> In the following note, Beeckman discussed celestial motion in terms of 'possibility', by saying,

Besides, many Earths could have been naturally constituted by God in this world, with each one conserving any motion perpetually.<sup>371</sup>

Beeckman's merit is that he applied his inertia principle to all kinds of motion (planetary as well as earthly motion). Between 1616 and 1618 Beeckman applied his law of inertia to the motion of atomic bodies. Here, the influence of his creation

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<sup>367</sup> Beeckman, *Journal*, 2:246. "Bene igitur Veteres: Deus omnia creavit pondere, tempore et mensurâ."

<sup>368</sup> Kubbinga, "The First 'Molecular' Theory," 213.

<sup>369</sup> Beeckman, *Journal*, 4:40.

<sup>370</sup> Beeckman, *Journal*, 2:358; 4:31; 2:232.

<sup>371</sup> Beeckman, "Journal," 2:232, quoted in Richard Arthur, "Beeckman, Descartes and the Force of Motion," *Journal of the History of Philosophy* 45, no. 1 (January 2007): 22. See footnote 45.

theology on how he regarded the motion of matter becomes obvious. Beeckman explained that God gave atomic bodies their continuous motion at creation,

God first moved atomic bodies no less than he created them; once moved, they never came to rest, unless by colliding with one another.<sup>372</sup>

With a reference to the Parsimony principle (*'Ockham's Razor'*) Beeckman argued (in another note) that the world is not moved by divine intelligence nor by God's continuous will, but by its own urgent, natural motion and that it can never come to rest on its own.<sup>373</sup> Beeckman believed that matter, such as the heavenly bodies were created passive. God gave the planetary and atomic bodies their motion at creation and therefore the inertia principle is applicable to these passive bodies. Corpuscular motion is thus not a continuous intervention of God nor does matter have intelligence (as the ancient philosophers often believed). The motion of matter is a result of God's creational work and providence. The heavenly bodies as well as matter on earth work mechanically. Since the cosmos is a contingent creation of God's free will, humans should not invoke God's will in scientific explanations, because they cannot know His

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<sup>372</sup> Ibid. Arthur's translation is mentioned in footnote 45. "Deus corpora atoma primò movit non minus quàm creavit; motis semel nunquam quiescebant, nisi ab invicem impeditis."

<sup>373</sup> Beeckman, *Journal*, 1:10. "Censendum videtur coelum nec ab intelligentijs moveri, nec continuo Dei nutu, sed suâ et sitûs naturâ semel motum, nunquam per se posse quiescere. Quod ergo fieri potest per pauca, male dicitur fieri per plura."

will.<sup>374</sup> In Beeckman's discussion on perpetual mobiles, his belief in God's omnipotence is evident. Humans are not able to make a perpetuum mobile because they depend on the mechanical boundaries of matter and motion. Beeckman realized that all machines will stop moving because of air resistance. However, God can make "living wheels or perpetual motion."<sup>375</sup>

#### The Omnipotence of God: Medieval Theories on Motion, Impetus and Inertia

What causes the motion of bodies? In ancient times, Aristotle had argued that "Unmoved Movers" caused the motion of the planetary spheres.<sup>376</sup> However, assigning a role to divine powers other than God was unacceptable for Beeckman as well as for the medieval Christian philosophers.<sup>377</sup> After all, Aristotle believed in the existence of many Unmoved Movers, that were subordinate to eternal principles and the law of necessity. Christians sometimes identified these powers as 'angels' or 'minds,' but influential fourteenth century natural philosophers take another position that is remarkably similar to Beeckman's mechanical explanation of motion. From a

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<sup>374</sup> Ibid., 4:31; Berkel, *Beeckman on Matter and Motion*, 85. "Et malè dicitur Deum aeri potentiam rarescendi aut densandi indidisse absque necessitate, praestatque philosophia intellectui objecta, quum quae nuda voluntati divinae innititur cujusque modus inexplicabilis est menti humanae."

<sup>375</sup> Beeckman, *Journal*, 2:358; Berkel, *Beeckman on Matter and Motion*, 141. "Want Godt maeckt alleen levende raders of perpetuum motum."

<sup>376</sup> Lindberg, *The Beginnings of Western Science*, 259–260.

<sup>377</sup> Ibid., 259–260; Beeckman, *Journal*, 1:228–229; 1:138.

historical perspective, an important development in physics was that Beecman transformed the impetus theory (first formulated by Philoponos and later also by Buridan and others) into the modern concept of inertia. The following part will argue that creation theology played an important role in this development. We will place Beecman in a wider tradition of natural philosophers that paved the way for his mechanical philosophy on motion. It is remarkable that these scholars were often followers of Duns Scotus or Ockham's nominalism. The discussion will start with explaining that the affirmation of 'creatio ex nihilo' in combination with the acceptance of both 'free will theology' and the 'contingent state of creation' was conducive to the development of modern physics.

*The Affirmation of God's Free Will in Medieval Physics*

The condemnations of Aristotle's necessitarian arguments in 1277, that emphasized God's omnipotence and free will, had a direct impact on the development of medieval and modern physics. The condemnations encouraged natural philosophers to question some of the Aristotelian doctrines, such as Aristotle's claims about the eternity of the cosmos and the denial of space, place or vacuum outside the world.<sup>378</sup> The articles of 1277 affirmed explicitly that God has the power to move the

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<sup>378</sup> Lindberg, *The Beginnings of Western Science*, 257.

universe in a straight line, if he so wished.<sup>379</sup> Beeckman's mechanical philosophy was built on the same theological tradition that accepts the idea that God could create another mechanism if He wanted to. He explained that speculative or supernatural explanations are, therefore, useless.<sup>380</sup>

*The Debate Concerning the Existence of Vacuum*

The Christian doctrine of creation not only motivated Beeckman, but also his ancient and medieval predecessors like Philoponos, Buridan and Oresme to break with Aristotelian physics, like the idea that celestial matter is divine.<sup>381</sup> Renaissance scientists—and especially Galileo—recognized their debt to Philoponos' physics.<sup>382</sup> The modern insight that bodies with different weight fall with the same speed in vacuum—due to the absence of air resistance—and that matter is not moved by the movement of air but by an 'impetus' are often attributed to Galileo, but go back to Philoponos (a thousand years earlier).<sup>383</sup>

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<sup>379</sup> Ibid., 298.

<sup>380</sup> Beeckman, *Journal*, 2:242; 1:228-229; 1:138.

<sup>381</sup> Hodgson, *Theology and Modern Physics*, 27–28.

<sup>382</sup> Torrance, *Theological and Natural Science*, 98. In the Renaissance, there was interest in Philoponos' writings.

<sup>383</sup> Hodgson, *Theology and Modern Physics*, 27.

Since the condemnation of 1277, scholars speculated about what would happen if God would have designed ‘vacuum.’ In the sixth century, Philoponos already formulated a ‘modern’ view on falling bodies, by stating,

If you let fall from the same height two weights, one of which is many times heavier than the other, you will see that the relative times required for their drop does not depend on their relative weights, but that the difference in the time taken is very small.<sup>384</sup>

It seems that Philoponos gained this knowledge experimentally. In the margin we note that a thousand years later, Galilei—who referred to Philoponos in his writings—formulated a similar theory. In the thirteenth century, Thomas Bradwardine (c. 1295–1349), a theologian who became the archbishop of Canterbury, formulated a similar theory on falling objects, but the difference between both scholars is that Bradwardine made a distinction between ideal circumstances in which the objects will move with the same speed and the current situation in which air resistance will have effect on the objects.<sup>385</sup> This fourteenth century idea of air resistance foreshadows Beekman’s inertia principle. The debates concerning the existence of vacuum and what would happen with matter and motion was intensified in the Middle Ages and the discussion

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<sup>384</sup> John Philoponos on falling object, quoted in Hannam, *The Genesis of Science*, 172.

<sup>385</sup> *Ibid.*, 172–173. Bradwardine and the Merton Calculators will be explored further in this chapter.



was still current in Beeckman's time. Beeckman believed that matter was created passive, which resulted in his radical mechanical explanation of motion.

*Richard Rufus' Theory on Motion*

Although Aristotelian physics will be influential until the early seventeenth century, medieval scholars further challenged Aristotelian theories on matter and motion. In the thirteenth century, commentators on Aristotle explored the nature of time, motion and space. It is important to note that their theories were not proposed by themselves as new innovations, but often as explanations of Aristotle's thought.<sup>386</sup> In their efforts to demonstrate that Aristotle's thought was right, they sometimes developed other theories than Aristotle's. In the fourteenth century, theologians will challenge Aristotelian physics more directly.

One of the Aristotelian commentators was the thirteenth century Franciscan Richard Rufus of Cornwall (d. 1260), who taught in the universities of Paris and Oxford. He was influenced by Philoponos. Later, Duns Scotus cited Rufus, i.e. Rufus' statements on individuation.<sup>387</sup> A question in physics was why matter still can move when it leaves someone's hand. Aristotle believed that the medium caused matter to

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<sup>386</sup> Adamson, *Thirteenth Century Physics*, vol. 226, sec. 2:00 to 4:00.

<sup>387</sup> Stanford University, "The Life of Richard Rufus," *The Richard Rufus of Cornwall Project*, last modified 2018, accessed December 26, 2018, <http://rrp.stanford.edu/life.shtml>.

move (i.e. motion of the air), but Rufus—as a commentator of Aristotle’s physics—formulated an opposite theory on *projectile motion*. Rufus stated that when someone throws an object, that person (instead of the air) gives it an “impression” so that the object can move; an idea that was already formulated by Philoponos.<sup>388</sup> Rufus still worked with the Aristotelian idea that the natural state of matter is ‘rest’ (so that an object would fall immediately on the ground), but due to the ‘impression’, given by someone’s hand, the projectile will move through the air. Adamson clarifies that this idea of ‘impression’ is not the same as the later concept of ‘impetus,’ because Rufus did not realize that matter moves until something else stops it. This idea is the essence of Beeckman’s inertia principle.

*Nicholas Oresme (ca. 1320—1382)*

Oresme was a French bishop who studied at the College of Navarre at the University of Paris. He was probably a student of Buridan. After all, he built his theories (on mechanics and mathematics) on the thoughts of Buridan and the Oxford Calculators.<sup>389</sup> He was a theologian, mathematician, economist and natural philosopher who developed an important basis for modern mathematics (incl. analytic

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<sup>388</sup> Adamson, *Thirteenth Century Physics*, vol. 226, sec. 05:00 to 06:00.

<sup>389</sup> Hannam, *The Genesis of Science*, 183.

geometry) and science (i.e. the development of kinematics).<sup>390</sup> Influenced by creation theology and by the doctrine of the divine freedom, Oresme argued against some of Aristotle's doctrines by formulating arguments for the possibility of a daily spinning of the Earth on its axis.<sup>391</sup> His master Buridan still followed Aristotle's physics by stating that if the earth is really rotating, then a fired arrow "straight up into the air" would not fall back on top of the archer because he was moved with the earth rotation.<sup>392</sup> In contrast to Buridan, Oresme realized that if the earth was really rotating (something both Buridan and Oresme denied) then the arrow would share in its rotational motion. This is an important correction, because this viewpoint challenged Aristotle's physics.<sup>393</sup>

It is remarkable that although Buridan and Oresme formulated theories concerning the possibility of earth rotating (that were adopted by seventeenth century scientist like Galilei), they still believed in a stationary earth. The reason is that they realized the contingent possibility of earth rotating (because of God's free will), but they also realized that they could not give a definitive answer (because of their earthly

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<sup>390</sup> Stefan Kirschner, *Encyclopedia Britannica*, s.v. Oresme, Nicholas.

<sup>391</sup> Cross and Livingstone, *The Oxford Dictionary*, s.v. Oresme, Nicholas; Hannam, *The Genesis of Science*, 182–183.

<sup>392</sup> Hannam, *The Genesis of Science*, 182.

<sup>393</sup> *Ibid.*, 183.

perspective). One had to wait until the seventeenth century before Galilei would provide empirical evidence for earth rotation. Based on Psalm 93:1, Oresme argued for a stationary earth.<sup>394</sup> By his theories of a rotating earth, he only wanted to demonstrate that reason can be misused to argue against Christian dogmas.<sup>395</sup> Notwithstanding his affirmation of Aristotelian cosmology of a stationary earth, Oresme paved the way for modern physics by theorizing the possibility of a moving earth.<sup>396</sup> His use of mathematics, his theory on time and his theory on the existence of void outside the earth are other domains in which Oresme argued outside an Aristotelian framework. It was Albert of Saxony (c. 1316-c. 1390) who made Oresme's and especially Buridan's thought more popular beyond Paris. Albert was a German Scholastic philosopher who contributed to logic and physics. His logic was influenced by Ockham, his physics by Buridan and his mathematics by Bradwardine.<sup>397</sup>

*John Buridan (1300-ca.1358) and his Impetus Theory*

Buridan formulated this principle of perpetual motion in the context of physics, but Beeckman (and Galileo, Descartes and later Newton) applied it to all kinds of

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<sup>394</sup> Ibid., 183–184.

<sup>395</sup> Cross and Livingstone, *The Oxford Dictionary*, s.v. Oresme, Nicholas.

<sup>396</sup> Hannam, *The Genesis of Science*, 184.

<sup>397</sup> *Encyclopedia Britannica*, s.v. Albert Of Saxony.

(heavenly and earthly) motion. He could make this step because he believed that the whole cosmos was created passive, so that mechanical explanations are necessary in cosmology as well as in physics. An exploration of the impetus theory of the fourteenth century philosopher John Buridan is therefore interesting because their theories share the same theological foundation. According to Lindberg, Buridan stated that

God, by his absolute power, could have endowed the cosmos as a whole with a rotational motion had he so wished.<sup>398</sup>

This quote demonstrates that the theological assumption of God's omnipotence, as articulated in 1277, opened the philosophical way for taking distance from the conventional, Aristotelian cosmology. The impetus theory is rooted in creation theology. Buridan believed that God, by His ordained power, impressed on the celestial bodies an impetus to move "without Him having to move them anymore."<sup>399</sup> Buridan's impetus theory needs more explanation. It is important to emphasize that Buridan was influenced by Nominalism.

As explained in *Chapter 3*, the concept of 'impetus' goes back to the sixth century scholar Philoponos and his monotheistic belief in a contingent *creatio ex nihilo*.<sup>400</sup> In the

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<sup>398</sup> Lindberg, *The Beginnings of Western Science*, 298.

<sup>399</sup> Hodgson, *Theology and Modern Physics*, 31.

<sup>400</sup> Torrance, *Theological and Natural Science*, chap. 6.

fourteenth century, Buridan and Oresme developed ideas that are similar to Philoponos' physics of motion (that was based on creation theology).<sup>401</sup> Pierre Duhem already mentioned the importance of these two physicians and their influence on early modern scientists, like Galilei.<sup>402</sup> Buridan studied philosophy under William of Ockham during his studies at the University of Paris, but when he was rector in Paris, he condemned some of Ockham's ideas.<sup>403</sup> His refusal to study theology and his rejection of Ockham is sometimes seen as theological scepticism. However, Buridan followed Ockham in his rejection of the universals. He rejected the Aristotelian ideas that did not correspond with his observation of the real world.<sup>404</sup>

Important for Beeckman's theory on motion is that Buridan revised Aristotle's physics by formulating a new theory on impetus. Buridan was familiar with Philoponos' concept of impetus and he combined it with Ockham's philosophy.<sup>405</sup> Buridan stated that a mover gives a power to an object that is "proportional to the

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<sup>401</sup> Hodgson, *Theology and Modern Physics*, 27.

<sup>402</sup> Edward Grant, "Jean Buridan and Nicole Oresme on Natural Knowledge," *Vivarium* 31, no. 1 (May 1993): 84.

<sup>403</sup> *Encyclopedia Britannica*, s.v. "Buridan, Jean,"

<sup>404</sup> Hannam, *The Genesis of Science*, 179.

<sup>405</sup> *Ibid.*

speed and mass, which keeps it moving.”<sup>406</sup> He foreshadowed Beeckman’s law of inertia by stating that resistance of air reduces the impetus that was given to matter and that weight also has an influence on the movement of an object. Another remarkable similarity between Buridan and Beeckman is that both natural philosophers rejected the idea that matter has intelligence. Buridan rejected the idea that the celestial bodies have intelligence,<sup>407</sup> just like Beeckman who argued against the Aristotelian philosophers of his time that matter is passive and thus has no intelligence.

Buridan rejected Aristotle’s view that the air pushes a ball (or another object) so that it moves through it. Buridan realized that nothing pushes an object. He stated that a ball moves because the hand gives it a quality—which he called ‘impetus’—to move.<sup>408</sup> Concerning the relationship between God and the movement of the heavenly spheres, Buridan says that God gave each sphere, at the creation, its velocity He wished; and by giving it a force (impetus), this movement will never stop.<sup>409</sup>

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<sup>406</sup> *Encyclopedia Britannica*, s.v. “Buridan, Jean”

<sup>407</sup> Lindberg, *The Beginnings of Western Science*, 260.

<sup>408</sup> Hannam, *The Genesis of Science*, 179.

<sup>409</sup> *Ibid.*, 180.

### Comparison between Beeckman's Inertia Principle and Buridan's Impetus Theory

In his dissertation of 1618, Beeckman formulated his principle of inertia as follows,

A stone that is thrown away by the hand does not remain in motion by some added force, or because of the fear of a vacuum, but because it is not able not to continue the motion that it had when it was still being moved by the hand.<sup>410</sup>

This formulation of inertia is a milestone in the history of physics. Van Berkel admittedly explains that Beeckman's inertia principle differs from the Cartesian and Newtonian formulation, because Beeckman applied it wrongly to rectilinear as well as to circular motion.<sup>411</sup> Beeckman realized that matter on a "horizontally rotating wheel would fly off that wheel," as Van Berkel clarifies, but he thought this was caused by "the effect of the medium."<sup>412</sup> Nevertheless, we agree with Van Berkel that Beeckman's formulation is "essentially modern" and that he dismantled Aristotelian cosmology by explaining *change* in motion and not *motion* itself – Beeckman's new insight is that matter in 'change' is a natural state, just like the state of matter in 'rest'.<sup>413</sup>

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<sup>410</sup> Beeckman, *Journal 4:44*, quoted in Berkel, *Beeckman on Matter and Motion*, 106. "Lapis ex manu emissus pergit moveri non propter vim aliquam ipsi accedentem, nec ob fugam vacui, sed quia non potest non perseverare in eo motu, quo in ipsa manu existens movebatur."

<sup>411</sup> *Ibid.*, 108.

<sup>412</sup> *Ibid.*

<sup>413</sup> *Ibid.*, 108–109.



Beeckman's formulation is the oldest written source of the modern law of inertia, but Buridan formulated the idea behind inertia already in the fourteenth century. Buridan says,

Impetus would last forever if it were not diminished and corrupted by an opposing resistance or a tendency to contrary motion.<sup>414</sup>

While Buridan formulated his impetus theory in the context of cosmology, Beeckman formulated his inertia principle as a general law of nature for all kinds of matter, on earth as well as in space. Hannam clarifies that Buridan's description is not the 'modern' formula, because "the modern principle of inertia states that a moving object will keep going at the same speed in a straight line until it is subjected to another force."<sup>415</sup> Buridan applied his principle to the circular movements of the heavenly spheres, but he never applied it to the rectilinear movements of earthly objects.<sup>416</sup> Beeckman's achievement is that he applied inertia to all kinds of matter that moves in straight lines. Hannam refers to Isaac Newton (1642-1727) as the formulator of the modern principle of inertia but he does not mention Beeckman's name, who already described the law of inertia between July 1613 and April 1614.

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<sup>414</sup> Hannam, *The Genesis of Science*, 179.

<sup>415</sup> *Ibid.*, 181.

<sup>416</sup> *Ibid.*

With a reference to the *principle of Parsimony*, Beeckman rejected the Aristotelian idea that the heavenly spheres have intelligence or the idea that the spheres are moved by the continuous intervention of God's will.<sup>417</sup> Buridan already regarded the cosmos as a machine that God set in motion at creation,<sup>418</sup> an idea that Beeckman shared with him. However, although Beeckman used the word 'impetus' (that was used by Buridan and other medieval physicists), he gave it another meaning. Van Berkel noticed that Beeckman no longer used 'impetus' as "the *cause* of the continuous motion," but as "the force that is the *effect* of motion."<sup>419</sup> Buridan regarded impetus as the *cause* of eternal movement, while Beeckman realized that it is rather *a force* that has an *effect* on the rectilinear motion of all kinds of matter, so that its speed delays or accelerates. Just like Buridan, Beeckman first applied inertia to the movements of the heavenly bodies,<sup>420</sup> but Beeckman took the revolutionary step by applying it to all kinds of motion, as Van Berkel discovered.<sup>421</sup> Creation theology inspired the medieval physicians as well as Beeckman to observe nature's mechanism as a way of how God

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<sup>417</sup> Beeckman, *Journal*, 1:10. "Censendum videtur coelum nec ab intelligentijs moveri, nec continuo Dei nutu, sed suâ et sitûs naturâ semel motum, nunquam per se posse quiescere. Quod ergo fieri potest per pauca, male dicitur fieri per plura."

<sup>418</sup> Hannam, *The Genesis of Science*, 180–181.

<sup>419</sup> Berkel, *Beeckman on Matter and Motion*, 106.

<sup>420</sup> Beeckman, *Journal*, 1:10.

<sup>421</sup> Berkel, *Beeckman on Matter and Motion*, 109.

made it. The following medieval natural philosophers demonstrate that Buridan and Beeckman are not exceptions in applying creation theology in the context of physics.

### Summary

Beeckman was radical in his affirmation that God made all kinds of matter passive, so that inertia is applicable to the motion of the heavenly bodies as well as matter on earth. It is important to notice that many of the medieval natural philosophers and physicists were theologians, bishops, clerics or monks, which is at odds with the popular viewpoint that the church stopped scientific progress. After the condemnations of 1277, natural philosophers developed theories that went behind Aristotelian physics. Moreover, the pioneers of the new physics all studied in the universities and can often be linked to the Franciscan scholarly movements of Duns Scotus, Ockham and nominalism. Will-theology was often their source of inspiration to accept contingency – and thus the possibility to doubt Aristotelian physics that was based on necessity. Beeckman's religious references show that his physics is part of the same theological tradition.

## CHAPTER 7. HOW CAN HUMANS UNDERSTAND NATURE? SCIENCE IN BEECKMAN'S RELIGIOUS CONTEXT

### Introduction

The focus of this final chapter will be on the question how humans can understand nature. We will explain that Beeckman mentioned the 'Fall' of Adam, which supports the thesis that the Reformed doctrine of the Fall and the total depravity of humanity (which includes the loss of intellectual capacity) was conducive to the rise of experimental science. Moreover, the chapter will discuss how biblical hermeneutics and scientific insights challenged each other in a seventeenth century context. On the one hand, there is the hypothesis that the Protestant 'literal' hermeneutics of Scripture influenced 'hermeneutics' of God's other book, nature. We will explain that Galileo as well as Kepler believed that God wrote the 'book of nature' in the language of mathematics and geometry. On the other hand, there was the rise of Copernicanism that challenged biblical hermeneutics. We will mention Philipp Lansbergen's view on science and biblical hermeneutics, because he was an acquaintance of Beeckman and both were advocates of heliocentrism. The differences between Descartes and Beeckman's thought is relevant to discuss because it sheds light on Beeckman's place in the Scientific Revolution. The conflict between Descartes and Voetius is necessary to explore because the rise of Cartesianism caused an aversion to mechanical philosophy and Heliocentrism in some Reformed circles.

### Pitfalls in Interpreting the Scientific Revolution

There are at least two pitfalls in interpreting the history of modern science. The first one is to view early modern scientists like Nicholas Copernicus (1473–1543), Galileo Galilei (1564–1642) and René Descartes (1596–1650)—all contemporaries of Beeckman—as exceptions who established new theories, without recognizing their (medieval) sources. The previous chapters already explained that modern physics built further on the foundation of medieval physics and theology. Of course, it is important to nuance that in the Renaissance, these scholars made progression in making medieval theories on motion more precise with mathematical calculations and experimental measurements.<sup>422</sup> Another pitfall is related to the first one. There is, after all, a tendency to focus on the conflict between Galileo and the church concerning the heliocentric worldview as proof for a battle between science and religion. From a modern perspective, it would be tempting to consider the seventeenth century Scientific Revolution as a movement that started as a reaction against the influence of religion. An example is the opinion of the Israeli historian Yuval Noah Harari who says in his book *Sapiens* that religious traditions like Christendom stimulated ignorance. He mentions the example of a thirteenth century farmer who only trusted

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<sup>422</sup> Hodgson, *Theology and Modern Physics*, 55.

the priest and other religious sources for knowledge.<sup>423</sup> He states that the Scientific Revolution was a revolution that distanced themselves from the ‘ignorance’ that was fed by religion.<sup>424</sup> However, Harari ‘ignores’ the fact that in the same thirteenth century, there was an institutional revolution: Christian cathedral schools developed into the universities. International students came to these Christian centers of knowledge to study philosophy, theology, medicine or law.<sup>425</sup> Moreover, Beeckman’s religious notes demonstrate that his mechanical philosophy was compatible with his Christian faith.

#### The Fall of Human Knowledge and the Need of Empirical Science

##### *The Loss of Human Intellectual Capacity*

Lindberg points to the Protestant dogmas of “the ‘fall’ of humankind” and the “drastic loss of human intellectual capacity” as the reason why experimental science could flourish in Europe.<sup>426</sup> John Calvin’s emphasis on the consequences of ‘the Fall’

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<sup>423</sup> Yuval Noah Harari, *Sapiens: een kleine geschiedenis van de mensheid*, trans. Inge Pieters (Amsterdam: Uitgeverij Thomas Rap, 2014), 272.

<sup>424</sup> *Ibid.*, 271.

<sup>425</sup> Vos, “Scholasticism and Reformation,” 99–104.

<sup>426</sup> Lindberg, *The Beginnings of Western Science*, 253.

of men led to the hypothesis that the Fall caused a “serious reduction in the ability to know nature,” which paved the way for experimental science.<sup>427</sup> After all, Calvin emphasized the impossibility of humans to have natural knowledge of God, because of the corruption by sin.<sup>428</sup> Humans depend on observation of the world, due to the effect of the Fall, a-priori knowledge about nature’s working is impossible. Empirical research is the only way to gain knowledge.

Van Berkel explains that Beeckman knew this doctrine, but that “Adam and Eve and their Fall from grace are not mentioned in the *Journal*.”<sup>429</sup> However, Van Berkel must have overlooked *Journal 1:230*, in which Beeckman explicitly refers to the Fall. Beeckman mentions the Fall of Adam and the necessity of divine grace. Although he does not say that human intellect was corrupted by the Fall, this note demonstrates that he at least knew the doctrine of the 'total depravity' of man. Moreover, Beeckman lived in a context where Reformed theologians affirmed the doctrine of the 'Fall' and its disastrous effects on human capabilities: he knew Calvin's works, some of Bacon's

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<sup>427</sup> Berkel, *Beeckman on Matter and Motion*, 141.

<sup>428</sup> John Calvin, *Inst.* 1.2.1.

<sup>429</sup> Berkel, *Beeckman on Matter and Motion*, 142.

works, as well as the Reformed Confessions on this topic.<sup>430</sup> In the following paragraph, the notes of Beeckman on this topic will be analysed.

*Beeckman's Note on the Fall (Journal 1:230)*

In this note, written between October 16-28, 1618, Beeckman says that before Adam had sinned, he had “a free will to do good and evil, just like we still have to eat and to fast, to go and to stand.”<sup>431</sup> After the Fall of sin, “we no longer have the power to do genuine good,” as Beeckman explained, “but only outward things we can do...like drinking, eating and attending church, reading God’s word, praying, etc., but not with a heart as it pleases Him.”<sup>432</sup> In the following part, Beeckman mentions two theological concepts. He says that we can still do these things like Adam, because of God’s “providence” and because of the “treatise of God’s decree.”<sup>433</sup> According to Beeckman, that which we lost and regain “actually belongs exclusively to the

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<sup>430</sup> Ibid., 142.

<sup>431</sup> Beeckman, *Journal*, 1:230. “Eer Adam gesondicht hadde, hadde hy eenen vryen wille om goet en quaet te doen, gelyck wy noch hebben om teten en te vasten, te gaen ende te staen.”

<sup>432</sup> Ibid. “Maer gevallen synde en hebben wy geen macht meer om oprecht goed te doen, twelc Gode alleen om Christi wille behaegelyck is; maer alleenlick alle uytterlycke dyngen kunnen wy noch doen so wel als eten en drincken, gelyck te kercke gaen, Godes woort lesen, hem bidden, etc., doch niet met sulck een hert als hem behaecht.”

<sup>433</sup> Ibid. “Hetgene Adam doen konde en wy noch doen kunnen, als eten ende vasten, worden alle drie verhandelt in de providentie ende int tractaet van het decreet Gods.”



predestination.”<sup>434</sup> From a modern perspective, it is remarkable that Beeckman calls predestination “nothing other than a special kind of providence.”<sup>435</sup> However, Muller clarifies that “the notion of the divine decree of predestination as the fundamental or material principle and central dogma” can only be found in writings of the Reformed tradition after 1844. As was usual in his days, Beeckman placed ‘predestination’ in the context of ‘providence.’ Beeckman believed that the regaining (with which he means living like ‘it pleases God’) is a result of God’s grace. God gives this grace by the act of predestination. From this exploration, we learn that Beeckman used the concepts of divine providence and God’s decree in the context of anthropology and salvation history (as was common in his days).

It is interesting to mention Beeckman’s use of Reformed anthropology. He discussed the doctrines of divine grace, predestination and providence against three different states of human being: before the Fall, after the Fall and after conversion. This way of presenting anthropology – from the perspective of salvation history – was typical in the early seventeenth century. For example, his contemporary Francis Gomarus (1563-1641) discussed the topic of free will from the perspective of four states

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<sup>434</sup> Beeckman, *Journal*, 1:230. Beeckman says: “...behoort eygentlick en particulariter tot de praedestinatie.”

<sup>435</sup> Beeckman, *Journal*, 1:230. “Maer tgene Adam verloren heeft en de wederkryginghe daervan door de genade Godts, behoort eygentlick en particulariter tot de praedestinatie, welcke niet anders is dan een bysonder specie van de providentie.”

of human being: before the Fall, after the Fall (but before conversion), in the moment of conversion and after conversion.<sup>436</sup> Beeckman did not mention the moment of conversion, as Gomarus did.

### *The Doctrine of Predestination*

The historian of science Reijer Hooykaas refers to the hypothesis that the Reformed doctrine of predestination contributed to the scientific idea of 'natural laws.'<sup>437</sup> Nothing in nature happens by chance because God established the order of nature by His free will and providence. Beeckman calls God the author of nature and the very wise architect of the cosmos, Who established nature's natural working.<sup>438</sup> The 'course of nature' is subordinate to God's decree, Beeckman said.<sup>439</sup> Hooykaas explains that Calvin regarded the order of nature as a kind of providence: the natural working is an act of divine love.<sup>440</sup> Beeckman, who had a lot of Calvin's works in his

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<sup>436</sup> Franciscus Gomarus, "Theological Disputation on Free Choice," in *Reformed Thought on Freedom: The Concept of Free Choice in the History of Early-Modern Reformed Theology*, ed. Willem J. Asselt, Roelf T. te Velde, and J. Martin Bac, trans. Willem J. van Asselt (Grand Rapids: Baker Academic, 2010), thesis X. Gomarus defended his thesis on free will on June, 28, 1602.

<sup>437</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 107–109.

<sup>438</sup> Beeckman, *Journal*, 1:228-229.

<sup>439</sup> *Ibid.*, 1:138.

<sup>440</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 107–108.

personal library, had a similar view. Beeckman discussed mechanical philosophy in the context of anthropology and the fact that God's decree is sovereign over nature's mechanical working.<sup>441</sup> Beeckman believed that all events in nature coincide with God's will and are caused by God's providence, as Hooykaas noticed.<sup>442</sup> Scientific study was seen as an investigation of God's works and for Reformed Christians even a Christian duty.<sup>443</sup>

The Synod of Dordrecht (1618-1619) was the culmination of the Arminian controversy. It is interesting that Isaac and his brother Jacob Beeckman studied in Leiden, between 1607- 1610, in the time when Franciscus Gomarus (1563–1641) and Jacob Arminius (1560 – 1609) were professors in theology in the University of Leiden. Gomarus was appointed as professor on January 25, 1594, and he ended his function in Leiden in 1611.<sup>444</sup> Arminius had been appointed on May 8, 1603, until his death in 1609. This means that the brothers were witnesses of the conflict between Arminius and Gomarus, concerning the doctrine of predestination. Isaac and Jacob Beeckman ended their studies in Leiden in 1610—the year in which the followers of Arminius

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<sup>441</sup> Beeckman, *Journal*, 1:138; 1:230.

<sup>442</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 108.

<sup>443</sup> *Ibid.*, 106.

<sup>444</sup> Universiteit Leiden, "Gomarus, Franciscus," *Leidse hoogleraren vanaf 1575*, accessed August 16, 2018, <https://hoogleraren.leidenuniv.nl/id/919>.

(who are called *the Remonstrants*) asked the States of Holland for tolerance of their perspective.<sup>445</sup> Moreover, Beeckman wrote two notes on the predestination doctrine in the year that the Synod of Dort started. The formal sessions of the Synod started on November 13, 1618, and ended on May 9, 1619, so it is possible that the current events inspired Beeckman to reflect on the topic of divine grace and predestination. The central topic of the Synod was God's sovereignty in the context of election.

#### *Background of the Predestination Debate*

Andreas Beck mentions the following two developments as the background of the predestination debate between Arminius and Gomarus. The first development was that some ministers of the Erastian movement – that emphasized the subjection of the church to the state – were afraid that the doctrine of predestination, as articulated in article 16 of the *Confession Belgica*, makes God the author of sin. The second development were the “Catholic controversies on grace”.<sup>446</sup> Research demonstrates that Arminius followed the positions of Jesuit theologians (Molinism), in his use of the

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<sup>445</sup> Berkel, *Beeckman on Matter and Motion*, 14. Van Berkel connects the ending of the studies of the Beeckman brothers in Leiden to the Arminian conflict. Although there is no direct evidence for this opinion, this difficult time in Leiden could, of course, play a role in their decision.

<sup>446</sup> Andreas Beck, “Reformed Confessions and Scholasticism. Diversity and Harmony,” *Perichoresis* 14, no. 3 (2016): 31.

concept of 'divine middle knowledge.'<sup>447</sup> The reason for the conflict between Arminius and Gomarus was, in the first place, a different starting point. Arminius saw God's foreknowledge as the basis for predestination, while Gomarus started from the divine decree. Gomarus believed that God's decree guaranteed real human freedom.<sup>448</sup> Although Beeckman did not provide a systematic theology, there are good reasons to assume that Beeckman's vision was more in line with Gomarus' perspective. Beeckman mentioned 'divine grace' and 'predestination,' but the concept of 'foreknowledge' is not present in the Dutch notes of the *Journal*.<sup>449</sup> The following part will argue that, beside the doctrines of the Fall and grace, also the 'two book theology' was supportive for the rise of modern science. After all, if humans do not have the capacity to have a-priori knowledge, then they need a philosophy that looks at nature as something that can be observed and analysed to understand its working.

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<sup>447</sup> Ibid.

<sup>448</sup> Ibid.

<sup>449</sup> Beeckman, *Journal*, 1:230; 2:35.

### Science as 'Reading' the Language of God's Book of Nature

Beeckman regarded God as the author, sustainer and architect of the universe.<sup>450</sup>

In the second chapter, we already argued that the imagery of nature as a book was influential in Beeckman's time. As an author, Beeckman translated the text of the book of nature in words and images on paper in his notebook. He writes that it pleases God that we are called "authors" of nature.<sup>451</sup> Mechanical philosophy was a translation process – a transmission of the text from one book (the book of nature) to another book (i.e. Beeckman's *Journal*). In the following part we will demonstrate that the imagery of 'the book of nature' was a common concept in Beeckman's time, even outside the Low Countries. After all, his contemporary Galileo Galilei mentioned in his *Assayer* the concept of the 'book of nature' by saying,

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about in a dark labyrinth.<sup>452</sup>

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<sup>450</sup> Ibid., 1:228-229; 1:138; 2:375; 1:261; 4:122.

<sup>451</sup> Ibid., 1:228-229.

<sup>452</sup> Galileo Galilei, "The Assayer," quoted in Hannam, *The Genesis of Science*, 324.

This quote demonstrates that this famous astronomer believed that the book of nature was written in the language of mathematics. He talks about comprehending the letters and the language of the book. This clearly shows that Galileo saw science as a hermeneutical, exegetical activity. Mathematics was the language of the book of nature and science was a method to analyse this language.

In his book *The Harmonies of the World*, John Kepler described his famous – what is called today – ‘third law of Kepler,’ concerning the orbit of planets. He ended his book with a prayer in which he thanked God for the “works of Thy hands.”<sup>453</sup> Kepler called this work of God’s hands a “wonderful beauty.” He saw the task of science as deciphering “the code God had employed in creating the world.”<sup>454</sup> This is an idea that goes back to Basil the Great’s Hexaemeron.<sup>455</sup> Kepler’s worldview was colored by his Lutheranism and he replaced Platonic views on ‘the divine’ and ‘geometry’ by a biblical theology, which he integrated with a Pythagorean cosmology. Concerning Kepler’s interaction with ancient philosophy and biblical creation models, Floris Cohen explains,

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<sup>453</sup> Kepler, *The Harmonies of the World*, 125.

<sup>454</sup> Cohen, *How Modern Science Came into the World*, 161.

<sup>455</sup> Peter Heltzel, “Interpreting the Book of Nature in the Protestant Tradition,” *The Journal of Faith and Science Exchange* 4 (2000): 225.

From his student days onward Kepler embraced a Pythagorean conception of the harmony of the world along with a *Timaios*-like account of Creation. However, he replaced Plato's demiurge, who *obeys* the geometric models of creation, with the biblical God as an absolutely sovereign *handler* of such models.<sup>456</sup>

It is important to emphasize that Beeckman called Kepler's notion of a "shaping nature in the universe" ridiculous because he rejected every attempt, including Kepler's, to ascribe intelligence to nature.<sup>457</sup>

For our study concerning Beeckman's theology it is interesting to conclude that both Galileo and Kepler believed that God wrote nature in the language of mathematics and that the task of science was to decipher the code that God used in His creation. It is important to note that the perspective of nature as a book is not supported in all religions and worldviews. It is a typical Western concept. Animistic and polytheistic religions regarded nature as "heterogenous" and "capricious," which makes the deduction of natural laws impossible.<sup>458</sup> These worldviews regard nature as sacred so that it should not be further analysed or dissected (because dissection is sacrilege). On the contrary, Christianity supports the idea of nature as a book and therefore also the scientific study of the book's content (natural science). The

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<sup>456</sup> Cohen, *How Modern Science Came into the World*, 161.

<sup>457</sup> Beeckman, "Journal," 3:34, quoted in Berkel, *Beeckman on Matter and Motion*, 146.

<sup>458</sup> Angus J L Menge, "Interpreting the Book of Nature," *Perspectives on Science and Christian Faith* 55, no. 2 (June 2003): 88.



worldview that nature reads as a text, written by a divine Author, is a more supportive environment for modern science. Angus J. L. Menuge rightly remarks that “the theological hermeneutic that insists the book of nature is the work of a single, coherent author has been very fruitful for science.”<sup>459</sup> Menuge concludes that science began when nature was considered as intelligible, “something one might read like a book.”<sup>460</sup>

The metaphor of God’s two books—the book of His Words and the book of nature—has a long historical tradition, that goes back to Augustine. This ancient theologian saw nature as a manifestation of God’s will.<sup>461</sup> Hugh of St Victor (1096 - 1141) already mentioned that “the whole sensible world is like a kind of book written by the finger of God...instituted by the divine will to manifest the invisible things of God’s wisdom.”<sup>462</sup> This quote demonstrates that St. Victor connected the book of nature to the finger of God and the divine will.

In Protestantism, the study of nature was seen as a religious duty.<sup>463</sup> After all, Protestants believed that God gave both Scripture and nature as books that should be

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<sup>459</sup> Ibid., 90.

<sup>460</sup> Ibid., 96.

<sup>461</sup> Berkel, *Citaten uit het boek der natuur*, 267.

<sup>462</sup> Hugh of St Victor ‘De tribus diebus’ 4, quoted in Harrison, “The Bible and the Emergence of Modern Science,” 119.

<sup>463</sup> Pearcey and Thaxton, *The Soul of Science*, 35–36; Berkel, *Citaten uit het boek der natuur*, 265.

studied.<sup>464</sup> According to Peter G. Heltzel, John Calvin's thought on nature was influenced by the Greek Patristic tradition of the Cappadocian fathers, who already used the imagery of the two books.<sup>465</sup> Especially Basil the Great's *Hexaemeron* regarded nature as a "species of language," Heltzel explains, which means that Basil views nature as a "code or language that may be deciphered."<sup>466</sup> Calvin developed this theology of nature as God's work further. He made a distinction between God as Creator and God as Redeemer. God's role as Creator can be seen in His creation and His role as Redeemer is revealed through the Bible. Calvin encouraged the practice of arts and science, such as investigations in biology and astronomy, because this promotes natural knowledge about God.<sup>467</sup> For Calvin, the Bible is the lens through which the book of nature should be interpreted. The influential Protestant natural philosopher Francis Bacon (1561–1626) turned the hermeneutic key around by saying,

God's two books are... first the Scripture, revealing the will of God, and then the creatures expressing his power; whereof the latter is a key unto the former.<sup>468</sup>

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<sup>464</sup> *Confessio Belgica*, art. II.

<sup>465</sup> Heltzel, "Interpreting the Book of Nature in the Protestant Tradition," 224–225.

<sup>466</sup> *Ibid.*, 225.

<sup>467</sup> *Ibid.*, 226.

<sup>468</sup> Francis Bacon, *The Advancement of Learning*, quoted in, *Ibid.*, 227.

The shift from ‘Scripture’ to ‘the book of nature’ as the hermeneutical key is remarkable. This quote demonstrates the prominent place that the ‘two books’ theology has in sixteenth and early seventeenth century philosophy.

*Biblical Hermeneutics and Science*

Various sociological studies demonstrate that in the sixteenth and seventeenth century (and even later) Protestant scientists—who were often a minority in their societies—outnumbered the Roman-Catholic scientists in scientific academies and institutions.<sup>469</sup> This means that there was (in that time) something in Protestant faith and practice that encouraged people to have interest in the scientific study of nature. However, the opposite statement is also possible: scientifically minded people opted for Protestantism. There is Peter Harrison’s controversial thesis that the Protestant emphasis on biblical hermeneutics was of “profound importance” for the development of new approaches of nature that contributed to the rise of modern science.<sup>470</sup> “Changing attitudes to the Bible,” Harrison says, resulted in changing attitudes to God’s other book—nature.<sup>471</sup> After all, Protestants (but sometimes also Catholic theologians) rejected the medieval symbolic reading of the Bible in favor of a

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<sup>469</sup> Reijer R. Hooykaas, *Religion and the Rise of Modern Science*, 98–99.

<sup>470</sup> Harrison, “The Bible and the Emergence of Modern Science,” 115.

<sup>471</sup> *Ibid.*, 116.

more literal or historical approach. Since the seventeenth century scientists often regarded science as the study of God's book of nature, it is reasonable to assume that a change in (biblical) hermeneutics led to a new approach in natural science: the study of the book of nature. Harrison's thesis is that the Protestant Reformers, by their new approach of the Bible, established a "hermeneutical revolution" that "brought in its wake a new approach to natural objects."<sup>472</sup> Of course, the opposite thesis is also true: new scientific insights challenged biblical hermeneutics, as one can see in the debate concerning Copernicanism.

### The Rise of A Heliocentric Worldview

#### *Beeckman Accepted a Heliocentric Worldview*

Some Reformed theologians, like Voetius, opposed the new heliocentric worldview, often as a reaction against Cartesianism.<sup>473</sup> However, Beeckman accepted Copernicus' heliocentrism after 1616, which makes a discussion of Copernicus and Galileo worthwhile. In this part, we will argue that early modern scientists, like Beeckman and Galileo, stood in a long tradition of medieval and seventeenth century natural philosophers. After all, the idea that Copernicus was a lonely genius who

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<sup>472</sup> Ibid.

<sup>473</sup> Hendrik van den Belt, "Sola Scriptura: An Inadequate Slogan for the Authority of Scripture," *Calvin Theological Journal* 51, no. 2 (November 2016): 215.

invented the heliocentric system does not match the historical facts. In the fourteenth century, Buridan and Oresme already formulated arguments for the spinning and rotating of the earth – although they still believed in a fixed earth as the centre of the universe. Hannam detected remarkable similarities in argumentation, used by Buridan and two centuries later by Copernicus, concerning the rotating of the earth around the sun.<sup>474</sup> The argument was that passengers on a moving ship, who think that their ship is at rest, might believe that another ship in rest is moving. With this argument, both Buridan and Copernicus realized that the earth might move, while humans mistakenly think that the earth is fixed as the centre of the universe. Hannam also mentions that the same argument of the ship is used by Nicholas of Cusa, who “studied at Padua in the century before Copernicus arrived there.”<sup>475</sup> Similarity in argumentation demonstrates that Copernicus was a talented scholar who built further on his medieval predecessors. Hannam concludes that Copernicus

was part of the long-running European school of natural philosophy that went back to William of Conchez and Adelard of Bath...[Copernicus’ book] *Revolutions of the Heavenly Spheres* is written in the language of medieval thinkers and uses their arguments.<sup>476</sup>

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<sup>474</sup> Hannam, *The Genesis of Science*, 277–278.

<sup>475</sup> *Ibid.*, 278.

<sup>476</sup> *Ibid.*, 279. Hannam also mentions the influence of the medieval Muslim Astronomers on Copernicus.

Just like Copernicus, also Galileo Galilei (1564–1642) is part of the medieval tradition of science. Galileo is often seen as an important key figure of the seventeenth century Scientific Revolution, but it is necessary to emphasize that many of his theories were already developed by ancient and medieval natural philosophers. Examples are Galileo’s references to Philoponos’ theory on falling bodies,<sup>477</sup> but also his generalisation of Buridan’s theory on the motion of heavenly bodies. Moreover, he used results of the Oxford Calculators and he demonstrated it “in the same way as Nicole Oresme had done.”<sup>478</sup> Galileo’s merit is that he empirically demonstrated the correctness of medieval and modern theories, such as Copernicus’ heliocentrism.<sup>479</sup> The medieval philosophers should be credited for the achievements that are often assigned to Copernicus, Galileo (and to Descartes and Beeckman).<sup>480</sup> As explained in the previous two chapters, medieval university theology and philosophy caused a methodical revolution and a “paradigm change of thought” that led to the Scientific Revolution.<sup>481</sup>

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<sup>477</sup> Gunton, *The Cambridge Companion to Christian Doctrine*, 148.

<sup>478</sup> Hannam, *The Genesis of Science*, 334–341.

<sup>479</sup> *Ibid.*, 341.

<sup>480</sup> Hannam, “Lost Pioneers of Science,” 6.

<sup>481</sup> Vos, “Scholasticism and Reformation,” 99–104.

*Heliocentrism Challenged Biblical Interpretation*

The new astronomy of Copernicus provoked debate on the question of how to interpret the Bible. Since Heliocentrism caused theological debates in the Low Countries, the printer of Amsterdam, Willem Blaeu, asked Philipp Lansbergen (1561-1632) to publish a book on the issue of the Earth's motion.<sup>482</sup> For several reasons it is interesting to discuss Lansbergen. First of all, Beeckman could be influenced by Lansbergen's view on science and theology because he received books (on mathematics) and advice from Lansbergen, who was a friend of Beeckman's father.<sup>483</sup> Van Berkel says that Beeckman accepted in 1616 heliocentrism "possibly under influence of Lansbergen."<sup>484</sup> He was a reformed pastor and astronomer who openly defended Copernicanism from a theological perspective. Important for the acceptance of heliocentrism in a Protestant environment was that Lansbergen placed heliocentric theory in a Christian worldview.<sup>485</sup> Religion played an important role in the life of this astronomer, who wrote "a collection of 52 sermons" on the Reformed "Heidelberg

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<sup>482</sup> Howell, *God's Two Books*, 148-149.

<sup>483</sup> Berkel, *Beeckman on Matter and Motion*, 20.

<sup>484</sup> *Ibid.*, 98.

<sup>485</sup> Rienk Vermij, *The Calvinist Copernicans: The Reception of the New Astronomy in the Dutch Republic, 1575-1750*, History of Science and Scholarship in the Netherlands (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2002), 73.

catechism.”<sup>486</sup> Later, he published books on mathematics and also manuals on astronomical instruments. Beeckman mentioned that he used Lansbergen’s manual for the quadrant to calculate the height of the sun.<sup>487</sup> Beeckman’s pupil, Martinus Hortensius, translated Lansbergen’s popular defense of Copernicanism, called *Bedenckingen*, into Latin. Hortensius became an advocate of the heliocentric worldview.

In 1580 Lansbergen became pastor in the Reformed church in Antwerp. After the Spanish Conquest of Antwerp (1585) and the persecution of Protestants, he moved to the Northern part of the Low Countries where he became a pastor in Goes (Zealand). He approached science as an instrument to praise the Creator, to support humans and to discover the truth about nature.<sup>488</sup> Lansbergen’s cosmology was not restricted to the Reformed doctrine, but was also influenced by “neo-Platonist philosophy and alchemical speculation.”<sup>489</sup> This influenced his theory that the cosmos is endowed with beauty and harmony. However, Lansbergen succeeded in integrating “the physical, moral and religious elements” in a Copernican framework, which brings Rienk Vermij

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<sup>486</sup> Ibid., 75.

<sup>487</sup> Beeckman, *Journal*, 1:106.

<sup>488</sup> Howell, *God’s Two Books*, 147.

<sup>489</sup> Vermij, *The Calvinist Copernicans*, 88.



to the conclusion that his Christian cosmology contributed to the acceptance of Heliocentrism in a Reformed, Christian environment.<sup>490</sup> This makes clear that Beeckman lived in an environment that encouraged him to accept Heliocentrism.

### *Science and Biblical Interpretation*

In a note of his *Journal*, Beeckman encourages students of the Bible to take notes and mark out striking words in the original biblical text.<sup>491</sup> The purpose is to discover the locations where the Holy Spirit used the same words. Beeckman described an inductive approach of Bible reading, by observing and taking notes. He used the same methodology in his mechanical philosophy. It is interesting to explore the interaction between biblical hermeneutics and natural science in Beeckman's context, from the perspective of his advisor. Lansbergen distinguished between "knowledge of mathematics" and "the purpose of Holy Scripture."<sup>492</sup> He says that questions in geometry and astronomy should not be answered from holy scripture, because the Holy Spirit "did not desire to hand down the foundations in either of these

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<sup>490</sup> Ibid.

<sup>491</sup> Beeckman, *Journal*, 1:1.

<sup>492</sup> Howell, *God's Two Books*, 149.

sciences.”<sup>493</sup> Lansbergen pointed to mathematical errors in 1 Kings 7:23 and 2 Chron. 4:2 to demonstrate that the language of the Bible has a nonscientific character because it was written in the “common speech of that day.”<sup>494</sup> Lansbergen believed that Christians who rejected Copernicanism on a biblical basis misinterpret some key texts; they wrongly read them too literally as ‘physics’.

### Beeckman’s Place in the Scientific Revolution

#### *An International Natural Philosopher*

For a long time, Beeckman’s place in the history of the Scientific Revolution is underestimated. We already mentioned Dijksterhuis who recognized Beeckman’s natural scientific talent, but he underestimated Beeckman’s importance in the Scientific Revolution. He compared Beeckman with Leonardo Da Vinci who failed in developing a coherent scientific theory and Dijksterhuis even says that both gifted scholars lacked concentration to publish their ideas in a book.<sup>495</sup> However, Beeckman died because of tuberculosis in the age of forty-eight, so that he could not publish his

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<sup>493</sup> Commentationes in Lansbergen’s *Opera Omnia* (1663), fol. 6, quoted in Howell, *God’s Two Books*, 149.

<sup>494</sup> Howell, *God’s Two Books*, 150.

<sup>495</sup> Dijksterhuis, *De mechanisering van het wereldbeeld*, 364.

insights in a book and, besides, he had a timid personality that hindered him to trust that his scientific theories were worth publishing in a book.<sup>496</sup> After all, his friend and pupil, the famous French philosopher René Descartes, assured Beeckman that some of his ideas were not unique, even “ridiculous” and not worth publishing them.<sup>497</sup> Beeckman developed his ideas in relative isolation before he met other scientists of his days. He already developed his mechanical philosophy before his contact with Descartes in 1618. Around 1630, Beeckman became an international player by becoming “a member of the international republic of letters.”<sup>498</sup> Beeckman did not publish his ideas in a book, but his letters to Mersenne can be seen as an equivalent of academic articles in a scholarly journal today.<sup>499</sup> His meetings with important scientists like Mersenne, Gassendi and Descartes are a witness of his international influence.

*Descartes' Plagiarized Version of Beeckman's Mechanical Philosophy*

Beeckman and Descartes met each other at the end of 1618. Together, they discussed “questions of mathematics, music and harmony, and the law of falling

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<sup>496</sup> Berkel, *Beeckman on Matter and Motion*, 65–68.

<sup>497</sup> *Ibid.*, 60–65.

<sup>498</sup> *Ibid.*, 55.

<sup>499</sup> *Ibid.*, 165.

bodies.”<sup>500</sup> There is agreement among contemporary scholars, like Richard Arthur and Van Berkel, that Descartes adapted several insights—mechanical philosophy included—from his friend Beeckman, without acknowledging his source.<sup>501</sup> Arthur explains that in 1618, Descartes learned Beeckman’s theory of motion, including the idea that God conserves a body’s motion (inertia principle).<sup>502</sup> Although Descartes praised Beeckman in a letter of April 23, 1619, as the one who stimulated his interest in mathematics and physics,<sup>503</sup> several scholars agree that Descartes psychologically crushed Beeckman in another letter, with success.<sup>504</sup> Descartes wanted to be seen as the father of mechanical philosophy. In this letter of October 17, 1630, Descartes wrote to Beeckman

I have never learned anything but idle fancies from your *Mathematical Physics*...Have I ever been convinced by your arguments? Well, you said, I believed and accepted some of your views as soon as I understood them. But, mark you, the fact that I believed them at once does not show that I learned them from you. I accept them, rather, because I had already arrived at the same views myself. You should not indulge your sickness by dwelling on the fact that I admit

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<sup>500</sup> Bunge et al., *The Dictionary of Seventeenth and Eighteenth-Century Dutch Philosophers*, s.v. Descartes, René.

<sup>501</sup> Berkel, *Beeckman on Matter and Motion*, 171–173.

<sup>502</sup> Arthur, “Beeckman, Descartes and the Force of Motion,” 3.

<sup>503</sup> John Cottingham, ed., *The Cambridge Companion to Descartes* (Cambridge: Cambridge University Press, 1998), 4, 288–289.

<sup>504</sup> Arthur, “Beeckman, Descartes and the Force of Motion,” 1.

I have sometimes accepted what you said, for it occasionally happens that even when the most incompetent person discusses philosophy, he says many things which by sheer chance coincide with the truth.<sup>505</sup>

Descartes succeeded in his intention: after receiving this letter, Beeckman gave up his intention to publish his mechanical philosophy in a book.<sup>506</sup> This changed the future: not the original mechanical philosophy of Beeckman, but the plagiarized version of Descartes became influential. This is an important development because Descartes promoted a whole new metaphysical framework that became highly influential in Europe as a ‘Cartesian philosophy.’ Indeed, the Cartesian worldview was incompatible with Aristotelian cosmology.<sup>507</sup>

#### The Rise of Cartesianism

According to Daniel Garber, there was no Cartesian revolution in 1637. Garber analysed the writings of one of the first readers of Descartes, Libert Froidmont and Jean-Baptiste Morin, and he concludes that these natural philosophers did not perceive

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<sup>505</sup> René Descartes, “Descartes to Beeckman (October 17, 1630),” in *The Philosophical Writings of Descartes: The Correspondence*, trans. John Cottingham et al., 1st ed., vol. 3 (Cambridge: Cambridge University Press., 1997), 27.

<sup>506</sup> Berkel, *Beeckman on Matter and Motion*, 172–173.

<sup>507</sup> Vermij, *The Calvinist Copernicans*, 140.

Descartes' theory as revolutionary.<sup>508</sup> The standard viewpoint of Descartes as "an innovator who founded a school of thought, an original philosopher who saw what no one else had seen, the father of modern philosophy, and the philosopher who closed the books of the schools" is only of later date.<sup>509</sup> According to Garber, there is no evidence that Cartesian philosophy had this impact in the first years after 1637. However, Descartes' excellent qualities as a mathematician should be emphasized. He developed a philosophical method that was based on mathematics. While Beeckman was a gifted natural philosopher who provided Descartes the basics of a mathematical-physical philosophy, Descartes' surpassed Beeckman with his mathematical skills.

#### *Differences Between Beeckman's Philosophy and Cartesianism*

An important difference between both is that Beeckman regarded mathematics only as a tool for physics,<sup>510</sup> while Descartes believed that his mathematical method was a fundament for all sciences.<sup>511</sup> Descartes is often called the 'father' of rationalism

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<sup>508</sup> Daniel Garber, "Descartes, The Aristotelians, and The Revolution That Did Not Happen In 1637," *The Monist* 71, no. 4 (1988): 471-486.

<sup>509</sup> *Ibid.*, 482.

<sup>510</sup> Beeckman, *Journal*, 4:41; Cohen, *How Modern Science Came into the World*, 225. "Est tamen ad physicam cognitionem consequendam tanta mathematicae necessitas ut aptissimè ejus manùs vocari possit, qua solâ quicquid physica continet, apprehenditur."

<sup>511</sup> Gijsbert Van den Brink, *Oriëntatie in de filosofie* (Zoetermeer: Boekencentrum, 2002), 169.

because his starting point in his philosophy was human reason.<sup>512</sup> His aim was to find a universal method to gain knowledge. This method should be grounded in the same certainties as mathematics. Part of this method was the ‘methodical doubt.’ One should doubt everything until one has found indisputable basic concepts. According to Gijsbert van den Brink, the success of Cartesianism should be seen against the background of skepticism of his time.<sup>513</sup> A critic of his time pointed to Descartes’ refusal to approach sense experience as an epistemological source,<sup>514</sup> while Beeckman saw both ‘reason’ and ‘sense experience’ as means for science.

A study of Blake D. Dutton demonstrates that both Descartes and Galileo “sought to restrict the domain of theology and keep philosophy strictly separated from it so as to ensure greater freedom for science.”<sup>515</sup> Although Beeckman also distinguished between theology and philosophy, there was no need for him to strictly separate both domains.<sup>516</sup> He referred to faith and reason as two sources of knowledge. For him, faith

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<sup>512</sup> Ibid., 169–170.

<sup>513</sup> Ibid., 168.

<sup>514</sup> Beck, *Gijsbertus Voetius*, 70–71.

<sup>515</sup> Blake D. Dutton, “Physics and Metaphysics in Descartes and Galileo,” *Journal of the History of Philosophy* 37, no. 1 (January 1999): 70.

<sup>516</sup> Beeckman, *Journal*, 2:375.

is the source of knowledge about divine things, soteriology and eschatology.<sup>517</sup> Beeckman's metaphysics is more holistic than that of Descartes. Descartes' philosophy was dualistic because reality exists of two domains: material reality and reason.<sup>518</sup> Reality can be explored by using logic and mathematics as tools. Also Beeckman talked about knowledge, reason and science, but unlike Descartes, he does not limit science to mathematics and reason alone. For Beeckman, there are different ways of gaining knowledge: craft work, grammar, logic, physics, mathematics and mechanics are all mentioned in the same note as sources of natural philosophy.<sup>519</sup> This means that for Beeckman, not only reason is a way of gaining knowledge. Also, through observation, mechanics and handiwork knowledge can be achieved. Descartes used the "mathematical method" in physics,<sup>520</sup> just like Galileo and Kepler both regarded mathematics as "the key to the real world of natural phenomena."<sup>521</sup> Unlike these

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<sup>517</sup> Beeckman, *Journal*, 1:131. "Omnia quae aliquo modo in nostram notitiam veniunt, sunt duplicia: alia enim fide credimus, alia ratione. Fides imperat conscientiae estque de rebus divinis, de poenis et gloriâ post hanc vitam, de immensitate et aeternitate."

<sup>518</sup> Van den Brink, *Oriëntatie in de filosofie*, 172.

<sup>519</sup> Beeckman, *Journal*, 1:131-132. The source text was already mentioned in the fourth chapter.

<sup>520</sup> Dutton, "Physics and Metaphysics in Descartes and Galileo," 51.

<sup>521</sup> Cohen, *How Modern Science Came into the World*, 225.



scientists, Beeckman wrote that mathematics “serves as the hands of physics.”<sup>522</sup> This means that Beeckman regarded mathematics not as an all-embracing method, but as ‘a tool’ for mechanical philosophy.

Van Berkel as well as Kubbinga state that Beeckman provided Gassendi as well as Descartes a “Christianized version of ancient atomism.”<sup>523</sup> Gassendi and Descartes adapted their method to use atomism and mathematics in physical explanations from Beeckman.<sup>524</sup> Gassendi was convinced by Beeckman (in 1629) that atomism is compatible with Christian faith,<sup>525</sup> while Descartes met Beeckman in 1618 in Breda. There, Descartes learned Beeckman’s mechanical philosophy. However, not Beeckman’s version of mechanical philosophy was known in the Low Countries, but only the Cartesian version of Beeckman’s ideas.

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<sup>522</sup> Beeckman, *Journal*, 4:41; Cohen, *How Modern Science Came into the World*, 225. “Est tamen ad physicam cognitionem consequendam tanta mathematicae necessitas ut aptissimè ejus manús vocari possit, qua solà quicquid physica continet, apprehenditur.”

<sup>523</sup> Kubbinga, “The First ‘Molecular’ Theory,” 213; Berkel, *Beeckman on Matter and Motion*, 166–167.

<sup>524</sup> Cohen, *How Modern Science Came into the World*, 225.

<sup>525</sup> *Ibid.*, 226.

*The Clash between Voetius and Descartes*

In the first chapter, several similarities between Beeckman and Voetius were mentioned. Nevertheless, there is a remarkable difference between them: it is often stated that Voetius was conservative regarding his view on science. This can be seen in his rejection of heliocentrism and even of Descartes' mechanical worldview. It is important to nuance that the conflict between Voetius and Descartes was not between 'natural science' and 'faith,' as is often stated. According to Beck, different views on epistemology and metaphysics was the reason for the clash between both scholars.<sup>526</sup> Voetius feared the influence of Cartesian philosophy on theology.<sup>527</sup> One of his concerns was that Descartes' mechanical philosophy and radical nominalism – with its rejection of substantial forms – made it difficult to describe how God interacts with His creation and human beings.<sup>528</sup> Descartes held an extreme nominalist position,<sup>529</sup> that was rejected by Voetius. It is important to note that Descartes shared with Beeckman the foundation of mechanical philosophy in the theology of the divine free will, but there are no signs in Beeckman's *Journal* that he would have accepted an extreme nominalist position like Descartes.

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<sup>526</sup> Beck, *Gisbertus Voetius*, 87.

<sup>527</sup> *Ibid.*, 79.

<sup>528</sup> *Ibid.*, 68. This Utrecht debate is therefore called a "crisis of causality."

<sup>529</sup> Vos, "The Systematic Place of Reformed Scholasticism," 40.

### Summary

The Fall of Adam was mentioned in Beeckman's *Journal*. He described the typical Reformed anthropological states of humanity before the Fall, after the Fall and conversion. He said that because of the Fall humans are only able to do 'outward things' (like eating, praying or attending church) but not with a heart as it pleases God. Since they are not able to do genuine good, humans depend on God's grace. There is the hypothesis that the dogma of the Fall opened the philosophical way for experimental science. After all, Reformed theology taught that humans lost intellectual capacity to know nature and God. Therefore, empirical science is necessary to gain knowledge. Although Beeckman's note does not mention 'the loss of intellectual capacity' explicitly, his note demonstrates that he knew the doctrine of the 'total depravity' of humans.

In Beeckman's time, scientists like Galileo and Kepler believed that God wrote the book of nature in the language of mathematics and geometry. Beeckman called God the author of nature and he said that God allows humans to be authors of nature too. In the seventeenth century, science was 'reading' the book of nature. Therefore, it is reasonable to assume that a change in biblical hermeneutics to a more literal interpretation was conducive to empirical research of the book of nature. Of course, also the opposite hypothesis is true: new scientific insights challenged biblical hermeneutics, as one can see in the debate concerning Copernicanism. Beeckman accepted the heliocentric worldview, just like his advisor Lansbergen and his pupils

Hortensius and Descartes. The rise of Cartesianism was the reason why some Reformed theologians, like Voetius, were critical about mechanical philosophy and Heliocentrism. There was the concern that Descartes' metaphysics and epistemology –including the acceptance of an extreme nominalist position in his mechanical philosophy –leads to theological difficulties.

## CONCLUSION

Van Berkel mentions that religion was one of Beeckman's sources for mechanical philosophy, but he warns that "there is no inevitable link between being a strict Calvinist and being a mechanical philosopher."<sup>530</sup> However, based on our exploration of Beeckman's theological concepts, this statement can be refined. In the seventeenth century, there was a variant of Christian faith that not only was compatible with, but even conducive to the development of Beeckman's mechanical philosophy. After all, mechanical philosophy requires a philosophy that regards nature as a contingent and intelligible mechanism. Beeckman had to get away from a natural philosophy that accepts supernatural explanations (i.e. magic) or necessary (Aristotelian) first principles. Therefore, we propose a modified formulation of Van Berkel's phrasing, which is an interesting topic for new research. Our new formulation is that there is an "inevitable link" between being a mechanical philosopher and accepting nature as a contingent mechanism that can be observed and understood; a philosophical concept which is compatible with—and even provided by—Reformed Scholastic theology. Reformed Scholastic theology, as taught in the Leiden University, offered Beeckman a philosophy that meets several requirements of mechanical philosophy.

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<sup>530</sup> Berkel, *Beeckman on Matter and Motion*, 146.

Van Berkel calls Beeckman a ‘Calvinist,’ but we would rather call Beeckman’s thought ‘Reformed.’ His conceptual thought was based on Reformed theology – which was not exclusively Calvinistic. Beeckman mentioned several theological concepts that demonstrate continuity with a theology that was developed by theologians of Leiden University. After all, publications of the University of Leiden demonstrate that Reformed theologians like Gomarus, Voetius and Jacobus of Miggrode emphasized the divine freedom of will, God’s omnipotence and His contingent decisions and creation. Beeckman built his mechanical philosophy on this theological foundation. The following table gives an overview of all Beeckman’s theological concepts, in the context of mechanical philosophy, that were explored in this thesis.

**Table 1. Beeckman’s theological concepts**

Beeckman’s Journal	Theological concept
1:228-229	God is the author of nature God allows humans to be authors of their (scientific) discoveries Nature is a mechanism God’s omnipotence
4:122	God is a very wise architect of the world
1:138	God is sovereign over nature God can change past, present and future Everything happens necessarily with respect to God’s decree Many things happen contingently The course of nature is not a limitation for God’s acts of justice
2:242	Natural phenomena have a natural, mechanical explanation (no magic)

- 2:375            Philosophy reasons from 'wonder' to 'no wonder'  
Theology reasons from 'no wonder' to 'wonder'
- 2:358            Only God makes perpetual motion; humans can't because this is  
physically impossible
- 1:230            The Fall of Adam  
God's decree  
Predestination is a specific kind of providence
- 1:261            Natural phenomena have a natural explanation  
God's providence matches natural phenomena with the actions of  
humans
- 2:232            God could constitute many earths, each one with perpetual motion
- 1:131-132        God moved the first atoms (inertia principle)  
Sources of knowledge: logic, grammar, craftsman's work and  
physics
- 1:10; 1:51; 4:122    Ockham's razor (principle of parsimony)
- 4:30-31            The divine will shouldn't be invoked in physical explanations

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*Source:* Data from Beekman, "Journal," vol. 1-4.

The religious concept of 'the book of nature' was conducive to mechanical philosophy, because it supported the hermeneutical shift from a-priori explanations (first principles) to mechanical explanations. After all, science in the seventeenth century was an act of 'reading' the book of nature. The worldview of nature as a 'text' was supportive for the method of observing and explaining this book. For Beekman, mechanical philosophy was an act of authorship: he described the working of nature

in his notebook. The 'two book' imagery was widely accepted in the Low Countries and by other famous scientists of his time. Galileo and Kepler believed that God wrote His book of nature in the language of mathematics and geometry. This concept was not exclusively Reformed, but both Calvin as well as Reformed documents like the *Confessio Belgica* mentioned the two-book imagery. As a Reformed theologian, Beeckman called God the "author of nature" and he said that God allows humans to be authors (of nature's mechanism) too.

The medieval distinctions between God's absolute and His ordained power as well as primary and secondary causality is, on the one hand, visible in Beeckman's view on God as "a very wise architect" and "the author of nature" who made, on the other hand, the world as a natural mechanism that works in an understandable and logical way. Beeckman explicitly said that the will of God cannot be invoked in natural explanations because one cannot know God's will. Will-theology encouraged Beeckman to reject every attempt to apply eternal first principles or a divine law of necessity in physics. After all, he believed that an omnipotent God did not depend on necessary first principles. God could make whatever kind of world with any physical laws He preferred, so empirical science is the only way to gain scientific knowledge. Beeckman applied Reformed concepts in his descriptions of mechanical philosophy. He emphasized that the mechanical working of nature is no limitation for God's power. The past, present and future are contingent because everything (in nature)



happens necessarily with respect to the divine decree. The divine providence sustains the working of nature so that it corresponds to God's plan with humanity.<sup>531</sup>

Beeckman's application of inertia to all kinds of motion was revolutionary. Creation theology provided him a framework to develop his new insights in the context of matter and motion. Beeckman stood in a long tradition of ancient and medieval natural philosophers who challenged Aristotelian explanations by applying creation theology in the context of cosmology and physics. This tradition started with Philoponos (sixth century) and was further developed by medieval natural philosophers like Buridan, Oresme, Rufus and the Oxford Calculators. Many of these theologians were part of the Franciscan movement and stood in the tradition of Duns Scotus and Ockham, who developed a theology that took the will of God and His contingent actions as a starting point. Beeckman learned will theology and creation theology during his education in Leiden.

For further research it is interesting to notice that in the 1600 pages of the *Journal*, there are more Latin notes on theological subjects that would be interesting to analyse. This thesis focussed on Beeckman's Dutch religious notes (and only some Latin notes). Moreover, further research can examine the question whether there is evidence that Beeckman and the Leiden University knew medieval physics, like Buridan's theories on motion. Unfortunately, the library of the University of Leiden has no list available

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<sup>531</sup> Beeckman, *Journal*, 1:138. See Appendix B.

of books that students in Beeckman's time should study for the curriculum of theology. Studying the theological sources that Beeckman could have read will be helpful to further examine the continuity between Beeckman's thought and Scholastic theology.

Finally, teachers of physics in high schools notice that teenagers with a Muslim or Evangelical background sometimes have resistance to science because of their religion. However, in the context of pedagogy it is interesting to study how Beeckman's theological concepts can provide teachers with tools to engage in dialogue with their religious students about the relationship between faith and science. After all, the seventeenth century offered the modern world a variant of religion that is compatible with—and even conducive to—a scientific attitude, which is interesting information for today's scientific education. In addition to school communities, churches and religious institutions can also benefit from the results of this research, in order to give young people a positive appreciation for natural sciences.

## APPENDIX A

### Journal 1:228-229: God as the Author of Nature

Beeckman described his view on faith in God as the Author of nature and the mechanical working of nature.

Als iemand segt van die haer ambacht wel connen, verbi gratiâ roetsmelten: 'Ic en sal binnen het jaer niet ééns faute hebben in eenich smeltsel', niemand en sal dat qualick nemen, noch antwoorden: 'Soot God gelyft', want ygelick weet, dat het vier en het roet altyd van één nature blyft ende dat het derhalven eeveneens gesmolten wort, als ment eeveneens bearbeyt. Maer soo ymant seyde: 'Ic en sal dit jaer niet ééns sieck syn, soo ic myn beste wil doen', dat sal qualick genomen worden, al waer ooc diet seyde een seer expert medicyn. En waerom doch? En is smenschen lichaem, spys en dranck ende de actien niet van éénder nature, gelyck tvier en troet? alsoo dat de uytcomste altyt éénderley is, als men spys en dranc, gaen en staen etc. op éénen maniere doet? en sichselven bewaert voor de veranderinge des lochts en influentie der sterren? Ja, het is wel so, maer dewyl geen medicyn so expert can syn als een ambachtman int smelten (niet omdat int een meer onsekerheyt is als int ander, maer omdat de medicyne moyelicker <is> om te leeren en verstaen), soo schryft men met recht Gode toe, hetgeene de medicyns door haer cleen verstant niet seecker weten en connen. Want God beschiet beyde: hetgeen dat wy weten, en hetgeene dat wy niet en weten. Maar hetgeene wy door neerstcheyt ondervonden hebben en seecker weeten, daer laet hy gern ons den autheur van genoempt worden; maer hetgeene, dat wy noch niet seecker ende sonder foute doen en connen, daer wilt hy noch den beschicker van genoempt worden, tot dat wyt oock eens seecker comen te weten.

Verbi gratiâ: eer dat men de eclipsen seeckerlick conde voorseggen, soo moest men seggen, dat se God tewegen brocht om tvolck tot hemwaerts tot vreesse te brengen ofte om den vyant den stryt doen te verliessen en hem dancken, dat den eclips tot ons voordeel alsoo hadde beschiet. Maer nu wy door studie de voorsegginge gevonden hebben, so is hy tevreden, dat wy daarmede handelen, gelyck met den dach en nacht, Somer en Winter, die men altyt heeft connen voorseggen. Alsoo dat men den stryt daerna schicken kan datse snachts geschiede en alsoo den viant overwonnen worden, waerover men God wel dancken sal, maer niet ten aensien, dat hyt nacht heeft laten worden.

Dan nochtans groote en gewichtige saken worden <hem> noch dickwils met recht toegeschreven, al synse geschiet door een oorsaecke, die wy wisten, dat

seeckerlick gebeuren soude, gelyc men mach God wel dancken, dat hy op die ure den nacht liet comen, daerdoor wy de victorie gekregen hebben. Want God is autheur van de nature selve. Ende ten dien aensien moet men hem alle goede ende gewichtighe saecken toeschryven, tsy dat mense voorseggen konde oft niet, tsy dat mense selve doet oft niet.<sup>532</sup>

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<sup>532</sup> Ibid., 1:228-229.

## APPENDIX B

### Journal 1:138: Natural Events Match with God's Decree and Human Actions

In the following note, Beeckman mentions contingency, necessity and the divine decree. He starts this note in Dutch, but he ends in Latin.

Als men iet in een dictionaris etc. gaet soecken, dat men soo gerene weten soude, dat men der nae haect, men secht dickwyls al soeckende: 'och offer in stonde!' ende: 'Godt geve, dat het daer in staen mach'. Soo oock van dingen, die gesciet syn: als men een scip van kennisse siet thuis komen varen, men secht: 'Godt geve, dat hi behouden reise mach gedaen hebben'. Soo oock van toekomende, die vast gaen in die nature: 'Ick bidde, dat de wint morgen Oost wesen mach', oft: 'dat het koren wel groeien mach', etc. Waeruyt volcht, dat men hetgene ten onsen aensien onseker oft onbekend is, altyt voor veranderlick achten mach, want Gode is niet onmogelick. Certus est quidem naturae cursus; attamen eo punitur peccator et benedicitur probus. Ita quoque certum est decretum Dei, omniaque ipsius respectu necessariò fiunt; nostro verò respectu multa fiunt contingenter et justè punitur injustus. Deque eo loquitur Scriptura respectu nostri; de probis tamen docet nos Scriptura loqui respectu Dei. Ideòque nihil mereri dicendus est.<sup>533</sup>

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<sup>533</sup> Ibid., 1:138.

**APPENDIX C**

## Journal 2:375: Difference between Philosophy and Theology

Beeckman explains his view on philosophy and theology. He clarifies the differences between these domains.

In de philosophie moetmen altyt procederen van wonder tot gheen wonder, dat is te segghen, men moet so langhe ondersoecken totdat hetgene ons vreempt dunket, ons niet meer vreempt en schyndt; maer in de theologie moet men procederen van gheen wonder tot wonder, dat is te segghen, men moet de Schrifture so langhe ondersoecken totdat hetgene ons niet vreempt en scheen, vreempt schynt, ende dat alles wonderlick sy. Gelyck het met den filosooph ghinck, die hoe langher hy op God docht, hoe wonderlicker hy hem scheen, so moeten wy oock segghen van syn regeringhe, hoe beter wy die verstaen hoe heerlicker ende wonderlicker sy is.<sup>534</sup>

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<sup>534</sup> Ibid., 2:375.

## APPENDIX D

*Journal 2:242: Natural phenomena have a natural explanation.*

Beeckman explains that natural phenomena and diseases are not the result of magic or supernatural events.

Dan dit is by den mensche gebruyckelick: als de experientie haer redeninghe teghen is, so nemen sy haren uytvlucht tot hetgene daer men gheen experientie van nemen en kan. Also soeckt men oock het extraordinaris in sieckten als door tooverye etc. aengekommen ende gecontinueert synde. Also spreekt men oock van reghen, sneuw, blixem, donder etc., daer de oorsaken door de ongelegentheyte van de omstandigheden verborghen syn, de menschen daerom niet konnende voorsegghen dattet dan, of so seer, blixemen sal etc. Niet dat de oorsaken onbekent syn, maer omdat de particulariteyten in dese saken verde van ons gesicht geleghen syn, niet wetende hoe de lucht ende aertryck in alle plaetsen gestelt syn, niet meer dan wy weten wat gelt in een ander mans burse is, voor geen mirakel nochtans houdende, als yemant diens burse wy niet en kennen, subitelick eenighe groote onkosten doet; want dan segghen wy: die man hadde meer gelt dan ick docht. Ten is dan gheen reden dat men eenich mirakel soeckt in reghen sneuw etc., meer dan in den loop der Sonne of Mane, diens cours ons bekent is, tensy dat wy oock snachs met de kinders verveert willen worden, omdat ons yet voorkomt, dat wy niet en vermoeden om de duysterheyte wille, daert ons gheen wonder en soude schynen, waert dat wy sien konden.<sup>535</sup>

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<sup>535</sup> Ibid., 2:242.

**APPENDIX E***Journal 1:230: The Fall of Adam, Predestination and Divine Providence*

In the following note, Beeckman mentions the Fall of Adam and the necessity of divine grace, providence and predestination.

Eer Adam gesondicht hadde, hadde hy eenen vryen wille om goet en quaet te doen, gelyck wy noch hebben om teten en te vasten, te gaen ende te staen. Maer gevallen synde en hebben wy geen macht meer om oprecht goed te doen, twelc Gode alleen om Christi wille behaegelyck is; maer alleenlick alle uytterlycke dyngen kunnen wy noch doen so wel als eten en drincken, gelyck te kercke gaen, Godes woort lesen, hem bidden, etc., doch niet met sulck een hert als hem behaecht. Hetgene Adam doen konde en wy noch doen kunnen, als eten ende vasten, worden alle drie verhandelt in de providentie ende int tractaet van het decreet Gods. Maer tgene Adam verloren heeft en de wederkryginghe daervan door de genade Godts, behoort eygentlick en particulariter tot de praedestinatie, welcke niet anders is dan een bysonder specie van de providentie.<sup>536</sup>

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<sup>536</sup> Ibid., 1:230.



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