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## Newton and the Netherlands

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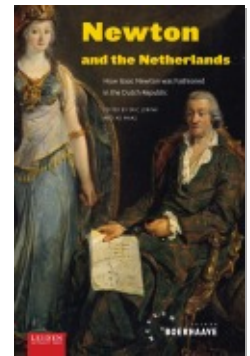
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# Introduction

ERIC JORINK AND AD MAAS

The Dutch Republic is known as an early adopter of Isaac Newton's natural philosophy. In fact, Newton's success on the Continent was largely effected by Dutch scholars who supported his work at an early stage. This volume, *Newton and the Netherlands*, is largely devoted to the perception of Newton's ideas in the Dutch Republic, as well as the fashioning of the man himself, from the publication of his magnum opus *Philosophiae naturalis principia mathematica* in 1687, until the end of the eighteenth century.

Despite the importance of the Dutch Republic in the history of Newtonianism, surprisingly little research has been done in this field. For most historians the sudden popularity of Newtonianism in the Dutch Republic has been a historical fact requiring no explanation. The introduction of Newtonianism to the Netherlands in 1715 is usually considered the logical next step towards modern science: from Aristotelianism, via Cartesianism towards Newtonianism. Seen from this perspective, the appearance of Newtonian physics in the academic curriculum in 1715–1717 was inevitable, as was the increasing popularity of the man himself. The eighteenth century in the Dutch Republic was, as in England, the age of Newton. Eulogies of 'this miracle of our age' are found not only in scientific texts, but also in sermons and poetry.

In this volume, which is the result of an international conference held in Museum Boerhaave, Leiden, 20–22 April 2010,<sup>1</sup> we would like to draw attention to certain conceptual and contextual problems, and to highlight a number of protagonists and underlying patterns rele-

vant to Newton's success. Drawing on the recent trend in the history of science for concepts such as the 'circulation of knowledge', and the focus on the processes of reception, adaptation and dissemination, we will argue that 'Newtonianism' in the Dutch context was not a stable, coherent system, originating in Britain and waiting to be implemented on the Continent, but a philosophical construction, adapted to local problems and circumstances. The dissemination of Newton was a many-sided and complex process, in which natural philosophy, religious and cultural factors, propaganda and practical concerns, and personal benefits, fears and preferences interacted in a fascinating manner.

As this book shows, the 'Newtonianism' constructed by Dutch natural philosophers appears to be anything but a fixed and clearly defined set of scientific concepts. Many scholars who have been labeled straightforwardly as 'Newtonians', in practice did not embrace Newton's natural philosophy completely. Actually, the Dutch 'Newtonians' mostly used Newton's ideas in a selective or even defective manner, and were far from dogmatic in their adherence to his work. Moreover, what was understood by 'Newtonianism' changed in the course of time. Studying Newtonianism, therefore, is like looking at Dutch fog: it is omnipresent, but intangible as well, it often conceals more than it reveals and at short distances it seems to disappear altogether. It is no surprise that many of the authors in this book are intrigued by the 'foggy', intangible character of Dutch Newtonianism.

In the first chapter Eric Jorink and Huib Zuidervaart present an overview of the colorful rise of Dutch 'Newtonianism', and the way the man himself was put on the map, as well as on the market. As they show, Dutch 'Newtonianism' was a label, an intellectual construction, to a large extent molded by an already existing tradition of empirical research and by a Protestant natural theology which gave the study of nature a strong religious connotation. Newton's natural philosophy was adopted to solve pressing religious and philosophical concerns of Dutch culture, particularly as an antidote to the 'blasphemous' ideas of Spinoza. In the second half of the eighteenth century an increasing terminological vagueness became apparent. 'Newtonianism' became interchangeable with experimental philosophy, 'physico-theology' and natural theology, all of which roughly described the same set of ideas, values and practices. As their research suggests, the sudden success of Newton in the Dutch Republic after the publication of the

second edition of the *Principia* in 1713, and the subsequent pirated Amsterdam edition, could be seen as the result of a conscious strategy of philosophers and publishers.

A particularly penetrating insight into the selective way in which Newton's ideas were adopted is provided by Fokko Jan Dijksterhuis in chapter 6. His study focusses on the *Opticks*, Newton's book about his optical experiments and views (first published in 1704). The reception in the United Provinces of this book, which, unlike the *Principia*, has little to say on worldviews and religion, provides a revealing look into the practical use of Newton's work. The polymath Lambert ten Kate and the instrument maker and lecturer Daniel Fahrenheit, two well-known 'Newtonians' who became familiar with the *Opticks*, largely ignored Newton's central claims and freely picked out the elements they could use. For Fahrenheit the *Opticks* proved useful for his pursuits in telescope making, while Ten Kate even aimed to correct some elements of Newton's optics with his own experiments, because they did not fit his own theories. Both were largely indifferent to Newton's natural philosophical system. How 'Newtonian', then, were these scholars actually? Dijksterhuis ends his article by calling into question the usefulness of the term 'Newtonianism', which he considers 'too ambiguous, to illuminate historical developments'. 'To put it briefly', he concludes, "Newtonianism" is not a fruitful category for doing history of science'.

Another chapter that discusses the nature of Dutch 'Newtonianism' is the analysis of its intellectual dimension by Rienk Vermij (chapter 7). While emphasizing the heterogeneous character of the Dutch Newtonians, Vermij identifies a common project, namely 'defining the relation between God and nature in a way which answered both scientific and religious demands'. This 'project' had an important impact on the interpretation and perception of Newton's ideas by Dutch scholars.

While in the seventeenth century nature was increasingly considered in terms and concepts adapted from natural philosophy and geometry, there was some unease about its consequences for traditional religious views. The presumption that the universe was directed by a set of eternal and immutable laws of nature could lead to a deterministic worldview in which God's role was marginalized. What was ultimately at stake, Vermij argues, were not philosophical matters as such, but the authority of the Bible. How could the supernatural events of the Scripture be brought in accordance with new scientific

developments? From Newton's natural philosophy a worldview could be derived in which the world depended directly on God's benevolence. Vermij argues that this worldview was instrumental in achieving a broad consensus that arose in the eighteenth-century Dutch Republic: the miracles and mysteries of the Bible remained outside the scope of scientific interpretations and, on the other hand, supernatural events were no longer considered credible in daily life.

Henri Krop establishes (chapter 9) that in the course of the eighteenth century a 'Newtonian' philosophical system was taught at the Dutch universities, which included not only natural philosophy, but also a logic and a metaphysics. The rise of such a comprehensive academic Newtonianism was unique to the Netherlands, and was distinct from the popular 'branch' of Newtonianism, which in particular found expression in physico-theological writings.

Krop focuses mainly on the late eighteenth-century writings of the then influential natural philosopher Jean Henri van Swinden, professor at Franeker and Amsterdam. Van Swinden employed in his metaphysics a Cartesian dualism of the bodily and the immaterial world. The latter should be investigated by mathematics and metaphysics, the former by observations. Thus, Van Swinden insisted on a sound combination of rationalism and empiricism for investigating nature, which according to him had a God-given, all-encompassing, teleological order. According to Van Swinden's interpretation, it was Newton who had managed to combine the deductive and the inductive method in a fruitful manner.

This book maintains that even the three Leiden professors who became the figureheads of Newtonianism throughout Europe – Herman Boerhaave, Willem Jacob 's Gravesande and Petrus van Muschenbroek – cannot simply be regarded as 'dogmatic' Newtonians. Rina Knoeff elaborates in chapter 3 that Herman Boerhaave – the first who openly supported Newton in an academic oration – hardly used Newton's mechanical philosophy at all in his medical work. At the beginning of his career, Boerhaave applied Newton rhetorically to criticize the method of Descartes, as an example of a sound use of mathematics in the study of nature. As he later in his career became increasingly skeptical about the usefulness of the mechanical method for medicine, he no longer referred to the 'mathematical' Newton, but rather to his chemistry, to the experimental approach of the *Opticks*. Knoeff concludes that although Boerhaave was inspired by Newtoni-

an methods, he was at the same time critical about Newton's results. Boerhaave's turn to chemistry, with its emphasis on non-mechanical powers in the body, even caused a decline of Newtonian medicine from the 1740s onwards.

Nor did Willem Jacob 's Gravesande, the most influential disseminator of Newton's ideas in the first decades of the eighteenth century, always follow in the steps of his master. As Ad Maas argues (chapter 4), 's Gravesande decided to spend his life on popularizing Newton's natural philosophy not only because of its supreme intellectual qualities but also because it coincided with 's Gravesande's personal preferences and furthered his career. Maas suggests that by dissociating Newton's natural philosophy from the metaphysical and theological concerns that had worried Newton's early Dutch followers, 's Gravesande paved the way for the introduction of Newton's natural philosophical system into the Dutch academic curriculum.

Kees de Pater suggests in chapter 5 that in the case of Petrus van Musschenbroek, too, there is a marked discrepancy between rhetoric and scientific practice. Although Van Musschenbroek portrays himself as a wholehearted follower of Newton, he deploys in his research a rather individual interpretation of what Newtonianism concerns, focusing especially on its empirical aspect. As De Pater concludes, the limits of this approach became clearly visible in Van Musschenbroek's research, which tended to result in a rather pointless piling up of experimental data. On the other hand, Van Musschenbroek was not always able to abstain from 'feigning hypotheses' when speculating about the nature of matter and forces.

Two of the contributions to this volume reach beyond the borders of the Dutch Republic. The tragic central figure of Jordy Geerling's article (chapter 8), Johann Konrad Franz von Hatzfeld, was a German lackey, who spent some years in England, but also stayed for a while in the Republic, the refuge for a number of European freethinkers. In The Hague, Hatzfeld published his *La découverte de la vérité* (1745), which contained a ferocious attack on Newton's natural philosophy. Hatzfeld was condemned for the opinions he expressed in his book, not for his attack on Newton, but for his radical religious and political views. His books were burnt and Hatzfeld was banished.

Hatzfeld's story is a case study in how personal and social factors could lead to radicalization. By following Hatzfeld's footsteps, Geerlings opens a fascinating panorama of marginal intellectuals who

built *perpetua mobilia* and considered fermentation to be the driving force of the universe, and of radical Wolfians, *Aletophilen*, Freemasons and – to be sure – anti-Newtonians.

In Rob Iliffe's article (chapter 2), the somewhat unfathomable figure of Nicolas Fatio de Duiller leads us over the border of the United Provinces. For a while Fatio held a unique position as a close collaborator of both Christiaan Huygens and Isaac Newton, and seemed to be on the brink of joining the ranks of the most prominent mathematicians and natural philosophers. For a brief period of time he seems even to have obtained Newton's assent for taking care of a revised, second edition of the *Principia*, in which Fatio would incorporate his own theory of gravity. However, the close association with Newton and Huygens also made it difficult for him to develop his own reputation in the community of natural philosophers, and after the first years of the 1690s, he gradually faded from view.

In contrast to the other articles in this volume, Iliffe's contribution addresses not the dissemination, but rather the genesis of Newton's ideas. His story describes the intriguing period directly after the publication of the *Principia*, in which its contents were widely discussed and its main conclusions had not yet taken shape as the indisputable laws of mechanics. This was also the period in which the controversy between Newton and Leibniz about differential calculus started. In both developments, Fatio and Huygens played a significant role. Also in contrast to the other contributions in this book, we see in Iliffe's chapter the 'real' Newton in action. It is here that we finally meet a person who can safely be considered as a Newtonian.

Between the English and the Dutch coast lies the North Sea. It is often from this direction that dense fog penetrates the Netherlands. Sometimes, in the patches of fog that move over the country, one can recognize, with a little imagination, the figure of Isaac Newton, chasing the ghost of Spinoza.

### Note

- 1 We would like to thank Pete Langman and Nadine Akkerman, who came up with the idea for this conference.