The Philosophical Image: Rethinking Philosophical Understanding in the Early Modern Dutch Republic

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Introduction

Images in early modern philosophical thinking might appear as, at least, an odd combination for a master thesis topic. At first glance, the topic might seem more well-suited for another type of inquiry, such as an art historical one. Or, if that is not the case, then the topic might appear as concerning itself not with particular, material, concrete images, but rather with the understanding of images in early modern philosophy. This later impression is not entirely wrong but it isn't a good description of this investigation either. The present thesis investigates the role that printed images within an early modern philosophical publication have for thinking and understanding. The underlying claim of the investigation is that images don't act as *just* mnemonic or decorating devices for the text but are instead an integral part of the philosophical knowledge disseminated through the text. By denying the auxiliary or even decorative role of images and viewing them as an integral part of a philosophical system, the thesis challenges the common-sensical view that image doesn't have a place within the philosophical text which is seen as closer and more connected to thinking. To add to this, the topic also satisfies the requirements of this specific research master which asks for the philosophical treatment of a topic related to any field of the humanities. Images end up being this flexible thing that, over the centuries, played important roles in the developments of both humanities and science, although they are sometimes erroneously only associated with classic art.

To investigate what images do for philosophical understanding and thinking, the thesis is divided into three chapters which all relate to the main research question. The first chapter gives an outline of the historical and philosophical context of the elements at play. As this inquiry focuses on the Dutch Republic, a region of philosophical developments during the seventeenth century, it is mandatory to give a short historical outline of the Republic. The next very important element of the analysis is that of books and the book market. Historical context is also offered on how printing and the book system worked in early modern Europe, emphasizing the change that the printing press created. Lastly, the philosophical context of early modern Europe and the Dutch Republic is outlined to understand the philosophical changes that were at play. The second chapter of the thesis takes a closer look at the examples of images selected based on popularity, influence, and diversity of material. The examples number a frontispiece, in-text woodcuts, and pasted prints and drawings from a seventeenth-century philosophy student's notebook. The images are described, and their

context is connected to the author's philosophical conception of seeing and images. Lastly, the third chapter moves into the last stage of the analysis where the examples given are discussed from the perspective of reading comprehension, theories and experiments with images, the theory of embodiment, Husserl's account of images, and Merleau-Ponty's analysis of art and images.

As it can be noticed, the investigation relies on a historical account, an analysis of seventeenth-century accounts on the conception and role of images in thinking, followed by a contemporary phenomenological and embodied analysis, informed by neuroscientific finds, to give an answer to the main research question. Namely, what is the role that printed images have within an early modern philosophical publication for thinking and understanding? The methods employed in the thesis are literature research, historical investigation of primary sources, and philosophical interpretation based on the mentioned theories.

The relevance of this research lies in it counteracting the contemporary tendency to think of early modern texts outside of their historical and material context. When we read Descartes, we don't look at the images that were designed to be part of the text. Instead, these images just disappear completely from editions and their existence is almost forgotten by readers who don't specialize in this topic. As there is a growing interest in reconsidering the role that images played in early modern anatomical research, through projects such as those for the Leeuwenhoek Year (2023), early modern philosophy, which was so intertwined with what we see today as science, can also take the time to reassess the position that images had in its historical development.

Chapter 1. A new way of visualizing philosophy?

The seventeenth century is generally regarded as a century that saw both innovations and crises in all aspects of life, science, and society. The Dutch Republic was one of the countries that positioned itself at the forefront of these innovations, while also partaking in some of the greatest crises of the time. Relevant to this research are the developments that philosophy saw within the Dutch Republic. This chapter aims to provide a general survey of the main factors that might have had a traceable influence on these changes. The historical setting and the philosophical background presented here will be used to support the analysis of the research.

The historical setting

The early modern period, spanning between the fifteenth and the beginning of the eighteenth century[1], is generally considered by various historians and philosophers as being one of the cornerstones of our history and knowledge. This perception is generated through the major religious, political, social, and economic events that unfolded during these centuries (Israel 1995). If we want to think about the impact of major events on philosophy, the case of Thomas Hobbes (1588-1679) is illustrative enough, as his flight from war marked the creation of the Leviathan (Sorell 2022).[2] The following section will give a short summary of the major events that impacted early modern Netherlands, and implicitly, its seventeenth century.

The Dutch Revolt (1566-1648), the liberation of Leiden (1574), the capitulation of Antwerp (1585), but also the founding *Acte van Verlatinghe* (1581) are marking factors that led to the formation of the Dutch Republic in 1609 (Pettegree, Der Weduwen 2019, 29-32). Spain, the main catalyst of these events, recognized the new Republic during the peace treaty of Westphalia, in 1648. The treaty came as an effect of the Thirty Years War (1618-1648) that engulfed most of Europe in a fight which combined religion and politics. At the same time, the Dutch struggle was part of the Eighty Years War (1568-1648) against Spain which affected the newly formed Republic and Europe (Israel 1995, 313-314; Price 1998, 19). Without trying to go into further historical details, what is roughly sketched here is that the late sixteenth and first half of the seventeenth centuries are marked by long confrontations and a degree of political instability.

[1] Although this chronology is not something upon which all historians agree upon.

[2] He fled the English Civil War (1642-51), this influencing the writing of *Leviathan* (1651) and his political philosophy. For an overview of this see Tom Sorell. "Thomas Hobbes. English philosopher." *Encyclopedia Britannica, April 1, 2022.* Accessed 20.03.2022. https://www.britannica.com/biography/Thomas-Hobbes.

The religious undertone of these confrontations had to do with the Reformation, as Calvinism gained support from the Dutch, culminating with an event of iconoclasm in 1566. The *Beeldenstorm* triggered both religious and political animosity against Spain and marked the start of the Dutch Revolt against Spain. After the Republic was formed, a greater degree of religious freedom functioned than in most European states, becoming a hub of greater intellectual freedom and a refuge for persecuted intellectuals (Price 1998, 25-45). As one can imagine, philosophy benefited considerably from this.

The socio-economic aspect is also worth considering. The economic growth is visible in the population number that doubles between 1600 and 1700 when compared to the European average and can be explained through the many refugees that flee the South towards the independent North (Janseen 2017, 235-236). One of the industries that are of interest to this research is the book and publishing industry. After the fall of Antwerp, around 168 booksellers together with printers migrated North, contributing to the establishment of Amsterdam as a centre for book production and publishing. The printing industry grew so much that, in the seventeenth century, the Republic was the main book producer in Northern Europe. Furthermore, the publishing activity of the Dutch printing firms amounts to both internal and external production. The Dutch presence at the annual European book fair from Frankfurt is proof of this, as the fair was dominated in the seventeenth century by Amsterdam-based publishers and printers Pettegree, Der Weduwen 2019, 30-32). Given this, it is visible why the Republic was one of the attractive places for publishing and developing the "new" philosophies. It offered material opportunities for philosophers to publish and sell their books. Of course, the economic situation underwent a positive development in other sectors as well.

The formation of the Dutch Republic, the Reformation, and the economic growth that affected the book and printing business but also the intellectual development impacted the philosophic production and the emergence of new theories (Hellinga et al 1966, 27-30). The Republic and the Reformation provided a different approach towards the world that could harbour experiments, innovations, and a way of thinking.

But why are printed books and, implicitly printing, so celebrated and essential? As Eisenstein shows in a classic work on printing, this was an invention that can be seen as one of the revolutions of the early modern age. Printing presses spread extremely fast in Europe, as they can

be found in most parts of the continent by 1500, functioning alongside manuscripts. It is only by the late sixteenth century that printing makes its revolution felt (Einsenstein 1983, 12-15). Eisenstein notes how when paper was introduced in Europe, it didn't create such a big change. It facilitated correspondence and book production, but it did not change (at least not noticeably) how people related to the world. The number of copies that could be produced was unprecedented and this unlocked in the minds of people new views on what a book was and how they can relate to it. Printing impacted images as well, as the final products - the books, created new ways for images and text to function and interact. The mnemonic function of books is no longer required from text and images because of the possibility of replication. One didn't need to remember information because it could just be stored in this collective archive that intensified with the printing press (Einsenstein 1983, 20-27; 39-40). The revolutionary aspects with which we are concerned stem thus from the printing presses' ability to shake the functions and relations of us and books.[3] Ultimately, from a philosophical perspective, the printing press is crucial to understanding how knowledge was produced and disseminated in this period.

Replicating and disseminating text and images in a short amount of time is referred to as a 'revolution' because of the sheer number of products that increase drastically compared to the previous techniques (Veldman, Hoyle 2006, 9-11). The time spent on a drawing or manuscript to create one object is now used to create hundreds and thousands of engravings[4], the most popular technique for creating prints. From a single engraved plate, one could print 2,000 impressions out of which 1,000 would be of good quality. By repairing the copper plate used for printing, another 2,000 could be printed, and so on, although the process was laborious and oftentimes required a team to operate the printing press. These prints could be bound in books or sold separately for a small price, making them common and affordable visual commodities (Griffiths 2016, 50-62). Their accessibility is also proved by cases of notebooks, such as those of Johannes Knotter, that have various thematic prints bound with the student's notes (see Chapter 2). Buying a page with the portraits of various philosophers in medallions or an emblem that illustrates an idea would be affordable for an early modern philosophy student (see figs. 13,15). Moreover, students would

[3] Books is here used to include text, images, and virtually anything that can be printed and included in a book.
[4] Engraving is a printmaking process where lines are cut in a copper plate in order to create an impression of an image on a medium, usually paper. The cuts from the copper plate have the role of holding the ink, allowing for the impression to be created. For more on this, a short summary can be seen here: Engraving | The Metropolitan Museum of Art (metmuseum.org).

often commission artists to make an engraving for the first page of their thesis that would give a visual summary of the contents (Iacob 2022, 15).[5] This would normally be done by artists, using allegories that would allow them to convey abstract ideas in a very limited space (normally a page or half of it). Prints infiltrated every corner of early modern life and philosophy was no exception from students to seniors.

The beginning of a different relationship between readers and text culminates in the early modern period. Olson (1994, 181-187) argues quite convincingly that the function of memory of text begins to change somewhere after the twelfth century when the text transitions towards a representation. Before this, the text plays the role of a reminder of what was said, where the reader has no access to the author and his intentions. The text simply reminds of what was said but doesn't represent or stand for the meaning. This changes, from Olson's perspective, when during the medieval period verbal vows come to be represented by written documents that stand for the vows themselves instead of just reminding of the event. The widespread character of printed books in the seventeenth century, the pinnacle of the early modern period, testifies to this change because books stand now as full-fledged representations of meaning and the author's intention. They guide, together with images, how things are to be read and understood. This results from a mental shift that has to do with how we agree to represent and interact with knowledge and the subsequent collective 'archive' that printing books enable.

Guiding also means organizing. Going with the assumption that books indeed go beyond their mnemonic functions and interact with the reader as a proxy for the author's intention, then this change can also be viewed as a new way to organize knowledge and understanding. Books follow thus the modern tendency towards standardization. The refinement of map technology, the use of mathematics and geometry to derive general laws, the consensus that is created in natural sciences regarding what to be illustrated/communicated when describing a phenomenon, plant, or animal, define this desire for organizing. In this sense, what becomes visible in the seventeenth century is indeed a new way of viewing the world, a way that becomes the basis for what we can loosely now deem as 'scientific' (Olson 1994, 220-232; Eisenstein 1983, 55-62). This is not to say that this novelty sprung out of nowhere miraculously, as the previous centuries already started building towards this culmination in a process that is bigger than the scope of this research and has

[5] Such as the case of the philosophy thesis first-page engraving commissioned to Bernard Picart.

to be left out. Together with the printing press, information is viewed, organized, represented, and transmitted in a way which focuses more and more on understanding Nature. This enabled knowledge to be collected and thought of differently than before. Is philosophy affected by the same shifts and consequently represented in a different way than before (textually and/or visually via printed images) or is it unaffected in its ivory tower? The seventeenth century and the start of the eighteenth see an influx of philosophy books from various Dutch publishers (Iacob 2022, 35-40). This gives various artists the opportunity to illustrate and find ways to visualize philosophy. The next section will deal with how and where images fit in early modern philosophy books.

The philosophical setting

The philosophical setting must be prefaced first. The early modern philosopher was generally male and would pursue a career in university or outside of it. In the latter case, one would have to find a way to fund their activity, either through patronage (individual or institutional) or through business (Rutherford 2006, 4-5). René Descartes (1596-1650) and Thomas Hobbes are illustrative figures of the philosopher outside the university relying on patronage. The philosopher's situation was similar to the current one. The early modern intellectual environment wasn't a complete rupture with Aristotle and Scholasticism (Rutherford 2006, 15-16), as they survived in universities throughout the century (Menn 1998, 69). However, there was a strong sentiment for change, summed up perfectly by Francis Bacon (1561-1626): "It is futile to expect a great advancement in the sciences from overlaying and implanting new things on the old; a new beginning has to be made from the lowest foundations" (Bacon, Jardine, Silverthorne 2000, 31). Despite this ethos that desired change, it is more realistic to understand that the old mingled with the modern, making it hard at times to trace a clear division. Keeping the philosopher's possibilities in mind, it was more common for philosophers within a university to sustain some of the Scholastic views, whereas those outside of it were likely to explore other avenues.

The persistence of Aristotle can be seen in the university curriculum and the reintroduction of metaphysics by Protestant universities in the early seventeenth century. Despite Metaphysics being rejected in the Leipzig statutes, it was introduced again in Leiden in 1604 with the main concern being that of having appropriate secondary literature on Aristotle that isn't inherently Catholic (Menn 1998, 20). Another telling example comes from Marin Mersenne (1588-1648), friend of Descartes, who sees Aristotle as the best option available. The universities rejected Aristotelian principles only when they went against Christian teachings (Rutherford 2006, 20). At

the same time, the Renaissance and the discovery of other ancient philosophies, such as Stoicism, Atomism, Platonism, and so on, fuelled the development of natural philosophy, which was active in the seventeenth century. 'Natural philosophy' is associated with the interest in the workings of Nature that peaked around the sixteenth century but also with the philosophers that use Nature as the main principle in their works. This interest is reflected in Nicolaus Copernicus's (1473-1543) heliocentrism. Technically, natural philosophy is seen as encompassing most of the early modern theories in one way or the other. This is possible because of the vague nature of the term that makes it unable to identify with a specific philosopher or small group of philosophers (Rutherford 2006, 63-66). Due to this, this section won't insist too much on the topic of natural philosophy as up until Newtonianism most theories can be seen as part of natural philosophy.

Like natural philosophy, mechanical philosophy also fosters several philosophies. To quote Helen Hattab, "self-described proponents of the mechanical philosophy include figures as diverse as Descartes, More, the young Leibniz, Boyle, and Hooke" (Hattab 2011, 71). This theory sees matter as acting according to mathematic laws, implying that these movements can be understood once the laws are deduced. However, within this philosophy, one can be a mechanist to different degrees. For example, Descartes and Hobbes stick to the strict view of matter as defined by extension, lacking mysterious forces, and are some of the most emblematic mechanists. Mechanical philosophy can also take the form of physico-mathematics by formulating mathematical laws to explain the physicical phenomena. Mathematics offered philosophers the hope of explaining everything in the world as a rational mechanism that works in geometric harmony (Hattab 2011, 73). For this current undertaking, it must be noted that natural philosophy and mechanical philosophy indicate the main points of focus of the seventeenth century: Nature and universal laws, illustrating a concern towards the world and standardization.

Out of the theories that early modernity offered, Cartesianism is one of those that probably had the most lasting influence throughout the ages. After all, it is Descartes' dualism that haunts the history of philosophy still, and its *Meditations* to which Edmund Husserl (1858-1938) feels compelled to reply. Descartes combines the mechanistic approach with the dualism he envisioned, offering a general theory that explains the physical processes by mechanistic means. Moreover, it considers the human being as a thinking substance through *cogito ergo sum*. Therefore, a metaphysical dualism is achieved via the creation of matter and mind as two sides to the human

being (Strazzoni 2019, 12-16; Cotthingham 1992, 114-116). What defines the human being as such is its ability to think, reaching a situation where the terms 'mind' and 'soul' are used interchangeably (Descartes 2006, 2008; Rutherford 2006, 27). By demolishing and questioning the foundations of our prior knowledge, aided by mathematics, one can attempt to judge appearances and acquire reliable knowledge. Descartes's method aims to set the foundations for a philosophy that doesn't blindly rely on old authorities but scrutinizes and questions everything using reason. One of the reasons for the appeal of Cartesianism is that it provided a justification for its foundation and tried to prove its reliability (Strazzoni 2019, 17). The rise of Cartesianism in the Dutch Republic is also connected to foundationalism, as the latter prioritizes an inquiry into philosophy as a discipline, providing an alternative to Scholasticism in an institutional setting. Within the university, the shift towards Cartesianism can be seen in the Leiden and Utrecht Crises (1641-42, and 1647), fueled by Henricus Regius' (1598-1679) denial of substantial forms, going against university Aristotelianism. Moreover, as a professor of medicine, he used Cartesian theses to teach medicine, a choice that created friction between him and Utrecht University (Douglas 2019, 21-23). In the dispute that was now joined by Gisbertus Voetius (1589-1676), an influential religious figure, even Descartes chose to distance himself from Regius, leading to the latter being qualified as a radical Cartesian (Strazzoni 2019, 29-30). The problem of Cartesianism in universities was thus a complex matter.

Johannes Clauberg (1622-1665) and Johannes de Raey (1622-1702) were part of a common effort from both the Netherlands and Germany to defend Cartesianism. The main complaint against Cartesianism was that it studied natural phenomena without actively looking to demonstrate or observe God's role in them, thus being criticized as impious (Strazzoni 2019, 29-30). Nevertheless, what is to be taken from here is that through the efforts of various Cartesians, Cartesianism enters the curriculum of students via logic, metaphysics, or medicine.

By the end of the seventeenth century, Isaac Newton (1643-1727) slowly attracts the attention of enthusiasts from the Dutch Republic. Newtonianism gains some public interest in 1688 when an anonymous review, written by John Locke (1632-1704), from the *Bibliothèque universelle* was praising Newton's *Principia* (first published in 1687). Newton's theory truly gains popularity in the Republic with his second edition of *Principia* that gets printed in a pirated version in Amsterdam. He was quickly liked because he was seen as a Christian solution to the study of

Nature (Jorink, Zuidervaart 2012, 63-68). This pirated version is also in sync with an effort made by the likes of Jean Le Clerc (1657-1736), Herman Boerhaave (1668-1738), and Bernard Nieuwentijt (1654-1718) to support Newton and popularize him. In the university, Boerhaave argues that Newton's method is of interest to Christians, implying that Descartes' method is Godless and should be left behind. Physics is now seen as a way to study God (Jorink, Zuidervaart 2012, 70-75). From this premise, it is visible that with Newtonianism the tendency to focus on natural phenomena and objects without a theological interest (as implied by Cartesianism) is rejected. Newton is seen as a way of finding the Creator through the study of physics and the world. In a sense, the Scholastic creed of studying God and the world comes full circle in Newtonianism which retains some part of this ideal.

Images and philosophy

The previous brief historical account was needed to provide first and foremost context for the discussion to come, but also to stress that, essentially, what occurs is a new way of seeing philosophy and, implicitly, the world. This new way is not a smooth process, but follows organically as a domino of reactions; mechanicism as a reaction to late Scholasticism and a result of the other ancient philosophies discovered in the Renaissance, Cartesianism as a need to reject the Scholastic interest in God, questioning old foundations, Newtonianism as a change of heart from the desire to make a Scholastic Cartesianism towards Newton's theory that leaves enough space for God to fit in. In this new making of philosophical knowledge, images played their own role. As Berger notes in her study,

> "in early modern Europe the viewing and creation of imagery functioned as important instruments of philosophical thoughts and teaching. Visual representations acted as essential tools for the generation of knowledge. Philosophers understood the viewing and making of visual representations as cognitive processes, and images often articulated ideas that could not be communicated in verbal language" (Berger 2017, 2).

Berger's main thesis illustrates very well some of the roles that visual representation, here strictly in the sense of an image, plays for philosophy. Moreover, this thesis aligns itself with the view shared here; that of images being part of the process of understanding and acquiring philosophical knowledge.

A discussion on the topic of visual representations and philosophy can also be found in Ong's *Method and the Decay of Dialogue*, although his analysis focuses on medieval and Renaissance logic, culminating with Petrus Ramus (1515-1572). He posits that medieval logic has a "high mechanistic or mathematical value, adapted to diagrammatic manipulation" (Ong 1958, 62). This, coupled with the logicians' emphasis on the problem of *loci* prompt Ong to say that it is in this period of transition from medieval to Renaissance that the developments of logic show a growing interest in space and 'scientific' method. Logic builds certainty and places information in a well-located and known place that becomes accessible for others through its spatial virtue. The interest in space is crucial as it is responsible for an effort to organize knowledge and think about how knowledge functions in spatial terms. This idea is closely tied by the author to the age of printing because the printing press prompts everyone to think in space (i.e., how to arrange the information on page). The interest in space is also visible in the works of Peter of Spain, Jacques Lefèvre d'Étaples, Thomas Murner, Juan de Celaya, and Petrus Ramus. They devise ways to aid and simplify understanding and remembering by tables, cards, emblems, or wordplay. This process implies a schematization and placement that work together to facilitate the comprehension of young students. Ultimately, as Ong observes, these devices have pronounced algebraic or geometric displays that generally deal with space as a critical tool for intellectual development (Ong 1958, 65-83).

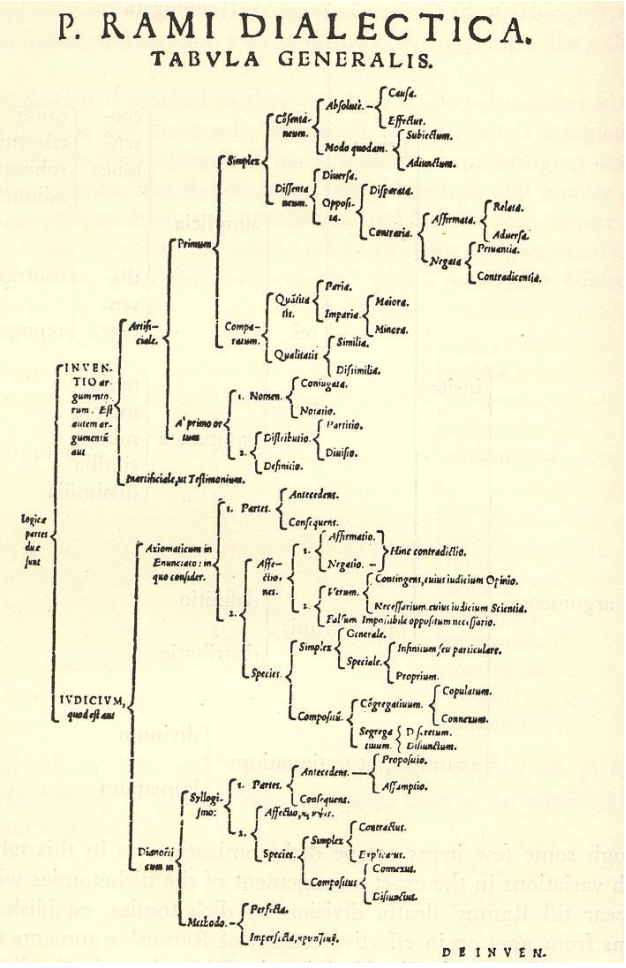


Figure 1. Example of a table in Ramus' *Dialectical Method*, from Walter Ong Ramus 1958. Image via: method2.jpg (300×462) (kelty.org)

This shift culminates with Ramus who gains popularity because of his successful pedagogical method which relied on diagrams or table (fig. 1, 2). This method of condensing complicated information in a visual manner also implies making visible this very structure that

may appear otherwise hidden in the text and inaccessible, especially for inexperienced readers (see Chapter 3 for more on this). Ramus also envisioned his diagrams and tables to be organized from general to particular to reflect the natural order of things as much as possible, showing thus an interest for the connection with the object of study, namely the natural world (Ong 1958, 100-120; Sellberg 2006; Dassonville 1964). The Ramist aim was thus to "transmute sounds into manipulable units like 'things'" (Ong 1958, 90) Ramus' dichotomies illustrate that knowledge is based on both intellectual and sensory knowing, with the former being in an analogy relation with the latter. In Ong's interpretation, the act of conceptualizing is always referenced to a sensory element, thus never being purely intellectual. Although 'scientific' explanations aim to limit as much as possible the sensory reference, this stops at vision which seems to be preferred as the *maxime cognoscitivus* of the senses. After all, vision has the most permanence as visual impressions are retained longer than other impressions (Ong 1958, 100-110). Overall, Ong's arguments and analysis are plausible as the printing press and the philosophy authors that work in this period of transition lay the basis for the mathematical organization of knowledge in the printed space. Needless to say, the likes of Peter of Spain, Agricola, and Ramus were influential in the Netherlands where their methods were employed both in university and outside of it.

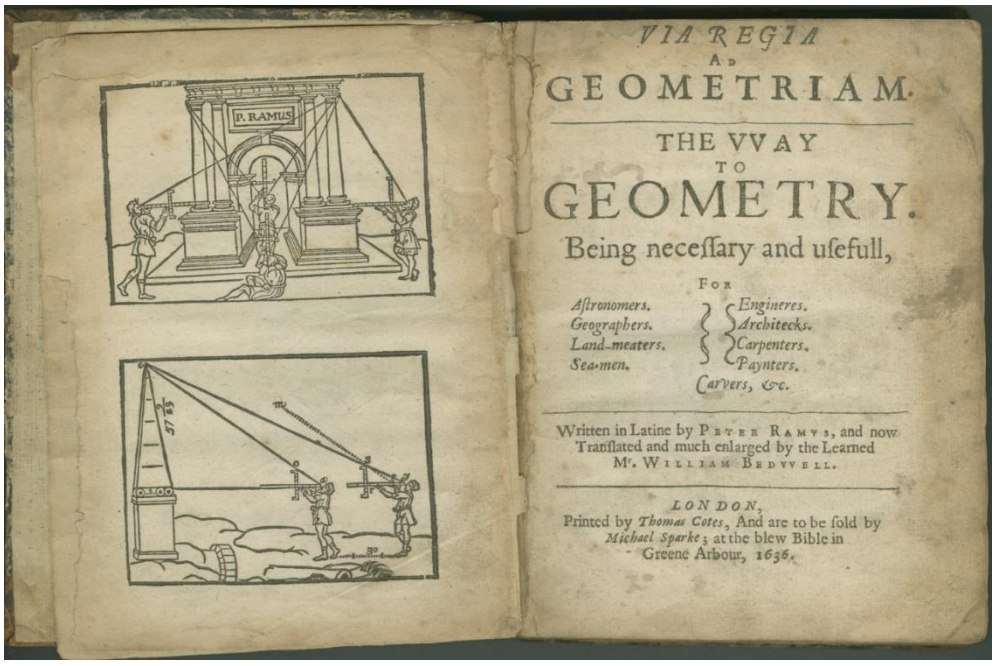


Figure 2. Title Page from Peter Ramus, *'The Way of Geometry'* (1569; English Translation, 1636) Imgage via Kalantzis and Cope on Petrus Ramus - New Learning Online

At this point, it's worth mentioning a classical, yet relevant account which relates to the discussion so far and the connection between images and thinking. Rudolf Arnheim posits that images are not just input that is passively received. Instead, they are processed and used in shaping thinking and presenting. To be more precise, images are

organized in memories which are then used to relate and compare to other experiences, but also to shape experience, imagination, and very broadly speaking, thought. He exemplifies to the reader that, when the subjects are faced with the task of presenting an abstract concept in a visual manner, they produce unique results that shed some light on the understanding of the said concept the subject has (Arnheim 1969, 297-312). This, if indeed true, shows that the subject needs a certain grasping of the concept that allows them to organize it in a format that is fit for a visual representation, and to communicate it in a physical manner via, for example, the act of drawing. One might be tempted to take for granted the organizing step but choosing the lines and shapes to present something that otherwise doesn't necessarily have a visual character (for example, freedom) is a very personal process that is entangled in one's thinking. At the same time, seeing and cognition are not one and the same because, as Pylyshyn argues, they follow different principles (Pylyshyn 2003, 7). He posits that even the principles of perception respond differently to visual information. If proven true (see Chapter 3 for an analysis on this), it would strengthen the previous assumption that images might do something that the text alone cannot, as it would open the possibility of them offering a specific response that cannot be obtained in another way. To quote, "it appears that we think about different things when we visualize a situation than when we do not; and so perhaps the thoughts that arise under these conditions are helpful in solving certain kinds of problems" (Pylyshyn 2003, 462). One's understanding will ultimately influence the visual representation and the process of thinking.

Continuing the survey, what Bacon calls 'natural and experimental history' develops new ways of doing research, thinking philosophy, and organising knowledge, providing another piece of the puzzle. Bacon wished to reform knowledge and provide a new philosophy meant to guide this new path. Parts of Bacon's projects are picked up in the seventeenth century in the model used to study Nature, but also more particularly in the works of scientists like Boyle who refer directly to natural and experimental history as a source of inspiration. In Bacon's Tree of Knowledge (fig. 3), natural history is one of the first disciplines within the process of learning, having thus mnemonic functions. It is also connected to knowledge, as experience can generate knowledge via the senses (Jalobeanu 2015, 202-206). Without going into further details, what ought to be picked up from this is that the model that was functioning during the seventeenth century, that of turning towards the study of Nature through experience was present in Bacon's writing. Consequently, the view of philosophy changes as it becomes a discipline that also investigates and studies in what

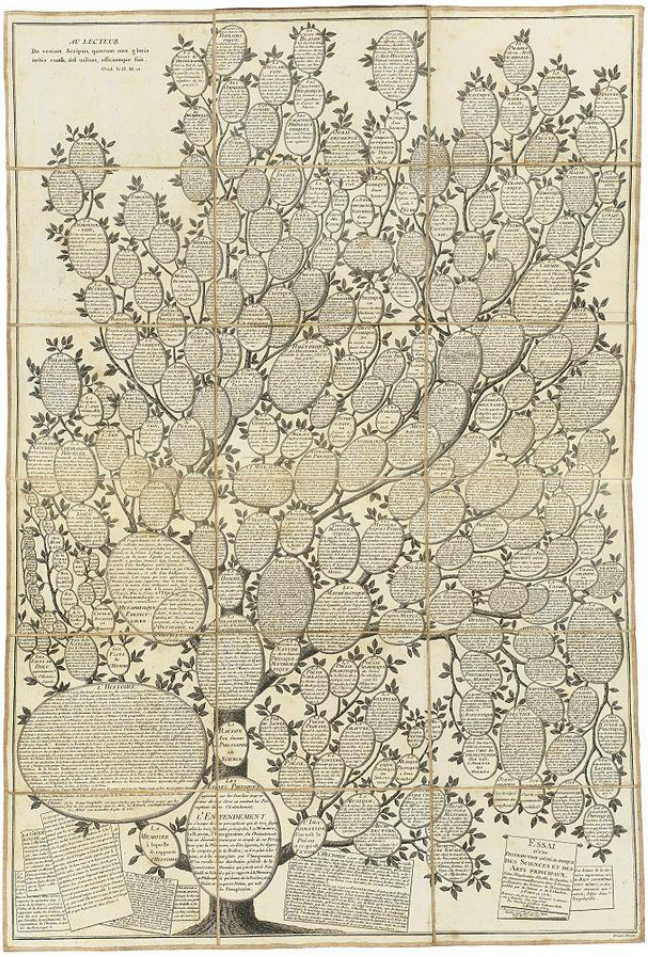


Figure 3. Chrétien Frederic Guillaume Roth. "Tree of knowledge" Frontispiece of the 1780 edition of Diderot's *Encyclopédie*. The left, middle, and right branches are influenced by the threefold classification in Francis Bacon's "Advancement of Learning" (1605). Image via: File:Encyclopédie - Tree of knowledge.jpg - Wikipedia.

we'd call a 'scientific' way. Knowledge is gathered in standard ways and is communicated via specially intended channels such as journals or books, and this makes up a new way of organizing and viewing these practices. Agricola's and Ramus' interest in quantification find another expression in Bacon and what comes after.

Another influence is that of English experimentalists like Boyle or Hooke. During his experiments with the air pump which are minutely described, Boyle devises a set of standard points that are meant to both legitimize and illustrate to the reader that the experiment indeed happened as was described. Because experience was so valued, it was stressed that the description should convince the reader is in the same room with Boyle, becoming a witness (see fig. 4). The textual descriptions coupled with illustrations are meant to create an experience beyond that of the thought experiments but also give the possibility to replicate the same process. Boyle's experiments provide a model of how knowledge that has minimal to no human agency and mirrors nature can be secured by his insistence on 'the matter of fact'. A matter of fact shares the objectivity we normally associate with science and opposes theories and interpretations which are subjective and thus subject to change. Opinions are no longer acceptable because what the knowledge desired can be supported by logic and geometry, i.e., general laws, which can vouch and inspire approval in the witnesses (Shapin, Schaffer 1989, 20-24; 58-63). The model of

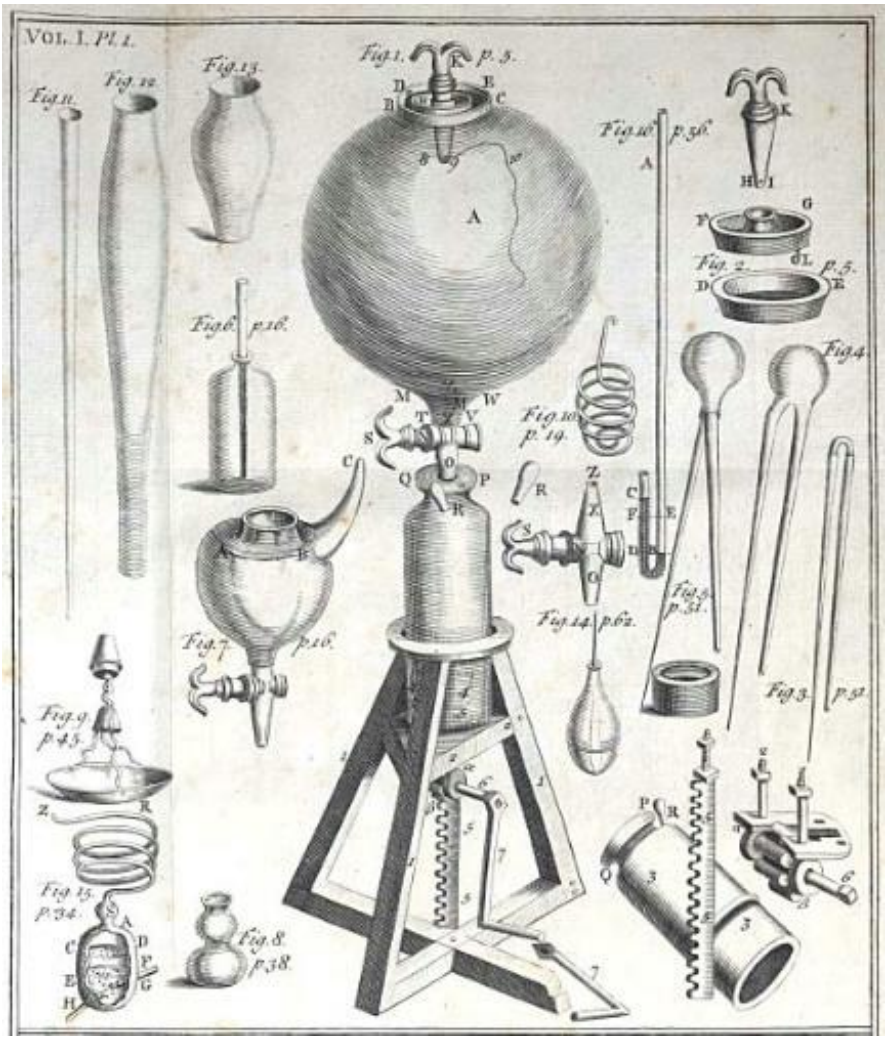


Figure 4. Boyle's air pump as depicted in *The works of the Honourable Robert Boyle*. London: printed for A. Millar, 1744 [Rare Books Collection FOL. QC3 BOY]. Image via: King's Collections : Exhibitions & Conferences : Boyle's air-pump (kingscollections.org).

opinions, on the other hand, could be backed by authority alone and, therefore, didn't have the solid foundation that was so desired for this new philosophy.

Following Shapin and Schaffer, Cunningham notices that what Boyle promoted can be deemed as "virtual witnessing- the use of linguistic resources to produce a vicarious experience enabling a reader to confer agreement as though she had actually been present" (Cunningham 2001, 208). The immediate impact of virtual witnessing is that it changes experience itself by adding this option. This allowed people everywhere to make visible the invisible in a double sense: the hidden workings of nature but also complicated experiments that were difficult to witness or replicate by the common man. As Cunningham suggests, the wide acceptance of modern science as the new paradigm of the time probably had to do with this increase in visibility that made everything more believable. Additionally, the natural philosopher also gained a bigger number of direct and indirect witnesses to vouch for the experiment's validity (Cunningham 2001, 209-214). By participating virtually, the reader assumes the belief that indeed there are general laws. If this wouldn't be the case, then the witnessing and the experiment and results wouldn't be repeatable. Needless to say, this has important consequences for illustrating philosophical works.

This first chapter traced the early modern coordinates that are of importance for this current research. It sketched the political and religious situation in early modern Europe and the formation of the Dutch Republic, then focused on the impact of the printing press. The printing press shifts the dynamics between people and books. Then, the focus shifts towards the complex philosophical climate of the period, with Scholasticism still looming in the eve of mechanism and Cartesianism, with a note on Newtonianism and the study of Nature and God. After some necessary context was given, the matter of a new way of viewing and thinking knowledge is addressed through the increasing interest towards space and organizing knowledge visually. This is seen via Renaissance Logicians like Ramus, but also Bacon and Boyle's contribution to a new model of acquiring knowledge. This same model is picked up in Descartes who shapes a new conception regarding what certain knowledge should look like, but also the idea that knowledge must be verified through explicit experiment. As the problem of visual representations in philosophy was merely introduced here, the next chapter will delve further into how visualizing philosophical knowledge changes and what role images play in this.

Chapter 2. Thinking images in early modern philosophy

As the previous chapter gave an introduction and outlined the topic for the discussion, this chapter moves towards selected examples of images in early modern philosophical texts, with a focus on the Dutch Republic as a hotbed for 'scientific' and philosophical thinking during the seventeenth century. This chapter will look at how illustrations worked in conjunction with text from an epistemological perspective in a few selected philosophical works. Hobbes' frontispiece for the Leviathan, the woodcuts used by Descartes, the notebook of a philosophy student, but also Newton's use of images will be investigated to form an idea of how the use of images in a philosophical context evolved during this period. While at first glance this selection might appear ad hoc, the selection followed a few criteria. To effectively cover the different ways in which printed images were used in a philosophical context, the selection includes frontispieces, in-text prints, but also a personal use of prints such as that of a student. Another criterion of selection was the influence of the author/works in the Dutch Republic. As the research looks to formulate a rather general conclusion, it was mandatory to look for authors that generated trends (Hobbesianism, Cartesianism, Newtonianism), with the only exception being the notebook mentioned because it's a personal item instead of a public one. Even so, the notebook is a great addition to this selection

because it can exemplify how the influences of philosophical theories like Cartesianism were reflected in how a student organized his philosophical knowledge.

Images in philosophical text?

To look at the epistemological role of images in philosophy, a brief context for early modern philosophy is needed before diving any further. Modern science as we know it was very much in the making in the early modern period, and the umbrella term of 'natural philosophy' encompassed more than is currently directly associated with philosophy, as briefly shown in the previous chapter. The matter of images must be considered in this context. Because the printing culture was still booming and authors were experimenting with printed images in relation to book publishing, the ways in which images were used in the context of knowledge were, too, in the making (Menn 1998, 63-68). The printing press offered more options; it allowed for bigger and more complex images to be made on the title page and throughout the text. To develop this point a bit further, in our current understanding it may come as a natural consequence to use a visual presentation that would accompany a lecture, and even the ways in which we organize the visual material are more or less standardized according to our general visual expectations that are, in part, cultural and historical. This point is stressed because it can offer some perspective on why the early modern use of images in natural philosophy texts was in development and, thus, experimental. Although the printing press was around for circa one century and it has been used in conjunction with text since the beginning, there's something different and 'modern' in how the conception of organizing a page shifts. Francis Bacon's *New Organon* envisioned a new method of research, a new 'science', effectively placing himself at the forefront of an ongoing intellectual attitude which concerned itself with a new way of finding knowledge (Bacon, Jardine, Silverthorne 2000, 31). This new vision reflected itself in the ways philosophers conceived of their own texts and used tools such as printed images to disseminate knowledge or exhibit their arguments.

The underlying assumption of this thesis is that visual representations in the form of figurative printed images don't have a purely decorative role in a philosophical work, but on the contrary, they have an epistemic and philosophical role just as valid as the text's. In other words, they don't act as an auxiliary with which one can do without, but rather as a part of a whole that constitutes the philosophical theory or system. This assumption of visual representations implies that the visual can offer some philosophical knowledge that either cannot be transmitted in words

or would be difficult to do so. By exploring this possibility, one can better assess why this issue is worth discussing in a philosophical context.

Hobbes' frontispiece for Leviathan: decor or more

Before stepping into an analysis of the *Leviathan*'s frontispiece (fig. 5), a few mentions ought to be made regarding the editions and translations of the text. *Leviathan* was published for the first time in 1651 in English, and in 1668, a Latin translation of the text was published under Hobbes (Nauta, Lodi 2005, 702), whereas a Dutch translation complete with the frontispiece was available in 1667, published in Amsterdam (Bredekamp, Clegg 2020, 13). Besides these first editions in Latin and Dutch, the *Leviathan* was printed and published several times in the Netherlands. Two Dutch editions are published in 1667 by Jacobus Wagenaar in Amsterdam, followed by a Latin edition published in Amsterdam by Joan I Blaeu in 1670, then another Dutch edition in 1672 by the same Wagenaar. Of notice is also the fact that in 1680, Gisbertus Cocquius (1630-1708) publishes in Utrecht a commentary on Hobbes' work where the *Leviathan* is discussed, attesting to the interest in the work. The editions mentioned here are only the ones published in the second half of the century in the Republic, but Hobbes was published way into the eighteenth and nineteenth centuries, with the 1750 and the 1839 editions

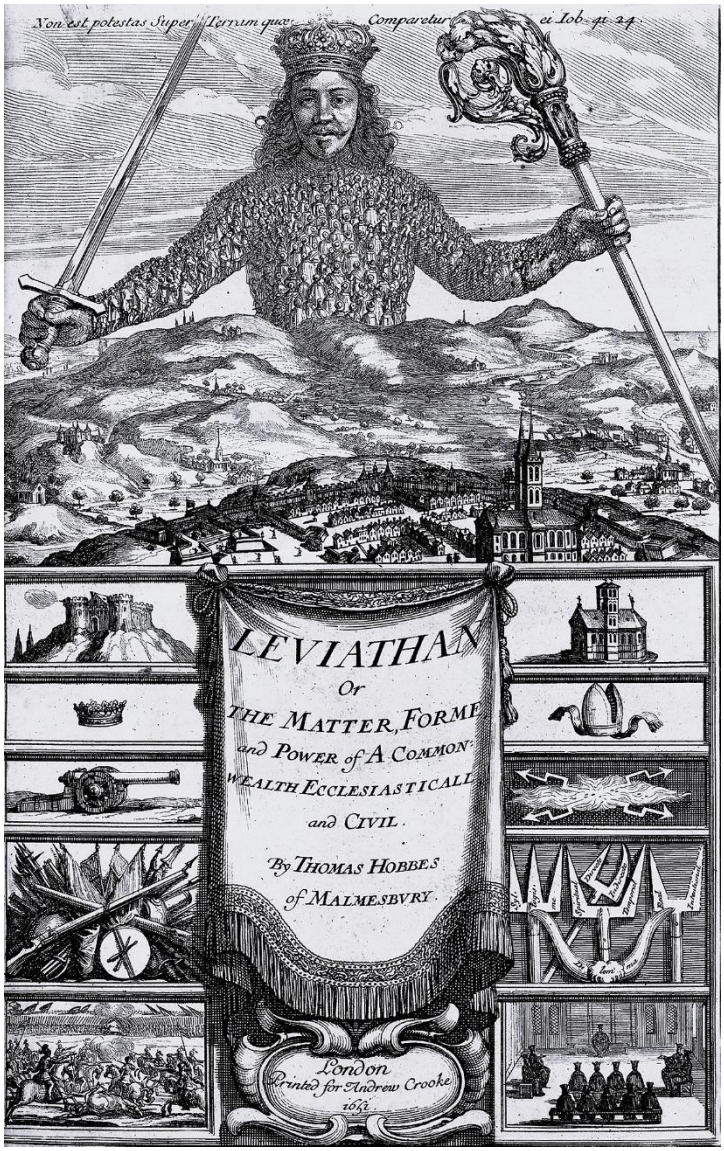


Figure 5. Abraham Bosse, frontispiece from Thomas Hobbes' *Leviathan*, 1651. Image via: Leviathan by Thomas Hobbes - Abraham Bosse - Wikipedia

(Nauta, Lodi 2005, 702). It is therefore fair to assert that the *Leviathan* was a popular publication, and that its text and frontispiece were known among the philosophical community.

The frontispiece, generally attributed to artist Abraham Bosse (1604-1676), is divided in two principal registers. The upper register features the well-known figure of the Leviathan with a sword in its right hand and a crosier in the left one, symbolizing the power of monarchs and clerics. The body is composed of dozens of human figures, in varied costumes and with different attributes, all looking towards the head of Leviathan. Only the head and the palms of his hands are not made of other humans. Around his torso, a landscape can be noticed with a town at the forefront. The placement of the Leviathan in a landscape, beyond the hills, makes it easy for the viewer to picture its gigantic scale, as the town looks considerably small in comparison to the hand of this creature (Vieira 2018, 93-100; Bredekamp, Clegg 2020, 362-365). As Kristiansson and Tralau have argued (2014, 299-305), behind the hills where the Leviathan is located there are signs that indicate how the rest of his body can be found in the sea (fig. 6). The second register of the frontispiece keeps the division of the two types of power, the monarchical and the ecclesiastical. The title, placed in the middle together with the name of the author divides ten frames with different images in five to the left, corresponding to the monarchical power, and five to the right for the ecclesiastical. This division is easy to spot through the symbols featured. Hobbes intended to portray most manifestations of power and did

Figure 6. A later, 18th century depiction of the Sea Monk from the Artis Library Collection, Amsterdam. This creature is part of the Sea Men that the Leviathan is believed to be, as the tail of the two indicates. Image taken by author from Artis Library Collection.

so through this complex composition that features a variety of elements related to this topic. How this participates in his philosophy, remains to be seen.

Because the aim of this section is to analyze the epistemic value of the frontispiece and see what its relation to the philosophical text is, Hobbes' account of images and their function will be given first. An account of seeing is found in the first part of *Leviathan* in the chapter dedicated to the senses (Hobbes 1997, 10-12). Hobbes starts by defining imagination and fancy, where the former is a retaining of an impression, "a decaying sense" (Hobbes 1997, 10), whereas the latter is an appearance of something. Imagination can be simple or compounded, where the simple one means only retention and the compounded is the joining of two things, such as a man and a fish to create a mermaid. Imagination is always limited as it works with finite elements. From this, Hobbes asserts, we conceive of God in relation to something existent and finite (such as him as a human being) because we cannot comprehend Him otherwise through our faculties. The philosopher also gives a thorough analysis of the role and influence images have in a religious context (Hobbes 1997, 70-80; 225-246), proving that he was well aware of the potency that images held.

Hobbes manifested interest in images, as he even distinguishes different types of images in Chapter 45 of *Leviathan.* He defines 'image' as something that resembles a visible object and distinguishes between image as the resemblance of something, image as imitation, (where imitation is either after a mental representation, imagination, or a combination of them), but also image as substitution of another thing. He explains the formation of images through reflection or refraction, where impressions of objects are formed on the organs of sight. Thus, an imagination of the object is produced. This is a mechanistic approach as there is an emphasis on motion and contact of light, eyes, and mind. Imagination, memory, and even dream can be explained by a mechanical process such as the pressing of the eye, the movement of the body (or parts of it), and the light (Hobbes 1997, 399-405). From this perspective, the senses are deceiving because an image is always a representation as it cannot achieve absolute likeness. Based on this classification, one can assume that the frontispiece can be seen as either imitation or substitution (in this case of a concept). Hobbes goes against theories that see images as perfect mirrors of the real world, replicated and retained mentally without any differences from the 'original'.[6] He understands that

[6] This can, in part, explain his preference for illustrations, but not as replicas that depict reality because this is not possible.

an image is not a perception of how things are, but rather our perception of them as appearances. Through this, the philosopher is aware of the 'volatility' of images as they can both uncover a truth or deceive a viewer via a flawed perception.

Furthermore, this connects with Hobbes' vision of the senses being inherently biased and thus, deceptive. However, this character of images serves as their forte too because they can appear in various ways and produce a variety of effects, some of them beneficial. The *mimesis* scheme is no longer valid for Hobbes because the representations rule over the represented object, constructing whatever we experience as reality (Vieira 2018, 95). This latter idea obviously relates to his political philosophy. The senses can deceive us, but this doesn't exclude the possibility of them deceiving us into seeing a 'good' representation. The points and lines that make up an engraving 'deceive' our eyes into seeing the Leviathan, making the engraving accessible to us.

Figure 7. Detail from *Totentanz* at St. Nicholas' Church, Taillinn, end of 15th century, now in the Art Museum of Estonia. EKM Digitaalkogu.

What is the role that the frontispiece plays in the *Leviathan*? Picking up on the last idea from the previous paragraph, if Hobbes applied the same inverted *mimesis* scheme when he devised the frontispiece, then some of his intentions may be deduced. If this is the case, then the frontispiece is beyond décor. It represents the Commonwealth, as Hobbes declares, but because it takes precedence in front of the object it represents, it shapes our perception. The direct effect is that it shapes the world as we experience it because reality is constituted from our perceptions of appearances, not from the things as they are (Vieira 2018, 95-98). This reading of Hobbes' passage

makes him sound similar to a phenomenological account of experience, perception, and reality. The reader will envision the Commonwealth as the artificial man that the Leviathan is presented to be and the envisioning will be affected by the frontispiece, as the latter directs this process. The mechanistic aspect of the Leviathan is emphasized by its portrayal. It is an artificial man, a Frankenstein, because he is made up of several bodies which are not his *par excellence* but become as such, as a result of their contractual relationship. This indiscriminative owning that the Leviathan has over everyone is reminiscent of a very popular visual motif, that of *Danse macabre* where Death dances with popes, kings, and peasants alike, expressing a similar message of universal ownership (fig. 7) (Kinch 2002, 165-167). From this, one can comment that the viewer will see that the Commonwealth is as inescapable as death is. Back to the main question of this example, that of the epistemic value of the image, we must ask again: what does this image do for the philosophical text? It is a complementary part of Hobbes' philosophy as it directs the reader in thinking the theories. The frontispiece offers epistemic insights by showing how the monster is while the text informs that the monster is. Can't a reader do without it? The ideal answer would be, no, because to understand the theory of the *Leviathan* one has to see the Leviathan, its scale, appearance, unnaturalness, and power. By seeing this appearance of the represented object one can properly grasp the reality of the Commonwealth, as presented by Hobbes. The close relationship between seeing and thinking only strengthens the assumption that the frontispiece has epistemic value and can be seen as an inherent part of Hobbes' theory, as a whole instead of a negligible addition.

Descartes and his 'antipathy' for images

Rene Descartes' extended stay in the Dutch Republic, from 1628 to 1649, offered him the opportunity to work with two Dutch publishers. For his first edition of *Meditations* printed in the Republic, Descartes worked with Leiden-based publisher Jan Maire (1575-1666) but then switched to a long-term collaboration with the Elsevier publishing house. This collaboration lasted postmortem, until 1712, when the publishing house closed. The Elseviers published his works both separately and as a part of *Opera philosophica*, a collection of Descartes' main publications (Iacob 2022, 8). Nevertheless, when looking at the publishing of Descartes, it is hard to contest his popularity.

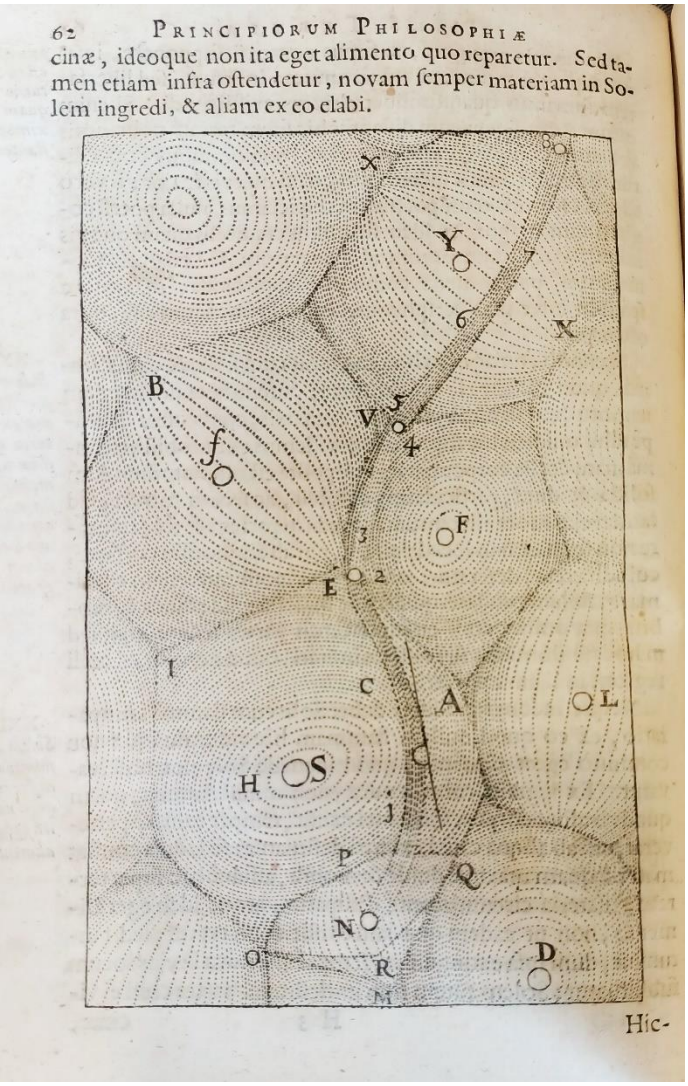


Figure 8. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

As it was mentioned before, of interest here are the woodcuts that are featured in his texts, especially in their relation to his philosophy and their possible quality as epistemic images. Descartes' *Essais*[7] are filled with woodcuts that are either integrated into a page together with the text or, in some cases, take up a full page by themselves. An image occupying an entire page (fig. 8) points to a shift from images as decorations, as they were mainly used in medieval manuscripts. They cannot be viewed as auxiliaries anymore but as constitutive of the whole. The woodcuts were devised by Descartes together with mathematician Frans van Schooten the Younger (1615-1660), an enthusiast of philosophy. Frans van Schooten was probably fit to work together with Descartes for these images due to his philosophical knowledge that facilitated the process (Slive 1970, 166; Iacob 2022, 11-14). Besides this, Van Schooten also did an engraving with the first known portrait of Descartes that was then used in most Elsevier publications of the philosopher. Just as in Hobbes' case, Descartes was involved in the creation of the images (Slive 1970, 166-168), leading us to assert that they are more or less how he envisioned them to work with the text.

When discussing the woodcuts of Descartes, Brian Baigrie (1996, 86) signaled quite early on that this can appear as problematic because of the apparent contradiction between the

[7] Including *Meteore* and *Dioptrice* as part of it.

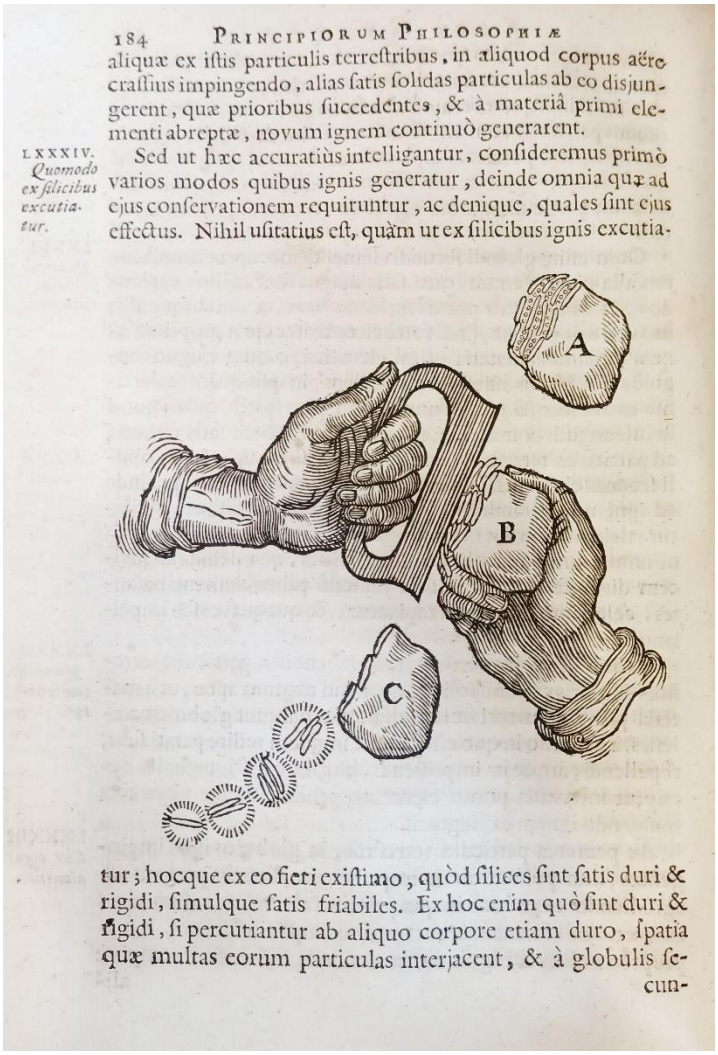


Figure 9. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

philosopher's use of images and him doubting the reliability of the senses. So then, how can we hope to qualify these woodcuts as epistemic images if visualization works with perception and thus has the risk of error? Before moving any further and looking at the woodcuts themselves, it's imperative to take a closer look at what Descartes makes out of this.

The main perceived antipathy between Descartes and images has its roots in the *Meditations* where it is stated how the senses deceive us (Descartes 2008, 14). While at first glance this might make Descartes appear as a sceptic that rejects anything that has to do with the senses, this is not the impression that his body of texts offers. When looked at beyond the emblematic *Meditations*, the picture appears more complex. A hint of this position can be found early on, in the *Discourse*. When discussing the perception of things we can and cannot access (God, for instance), Descartes makes an interesting remark saying that our imagination or senses cannot offer any assurance without the mediation of our intellect (Descartes 2006, 129). This point alone raises a few questions. If the senses are always deceitful, why should we need this sort of relationship where the mind mediates the senses? Moreover, what does the existence of this implied relationship mean? It implies that there is a sort of collaboration between the senses and the intellect where the parts need each other. The senses can't achieve knowledge without the intellect and the intellect can't perceive the world without the senses. This makes the rejection of senses at least a bit problematic.

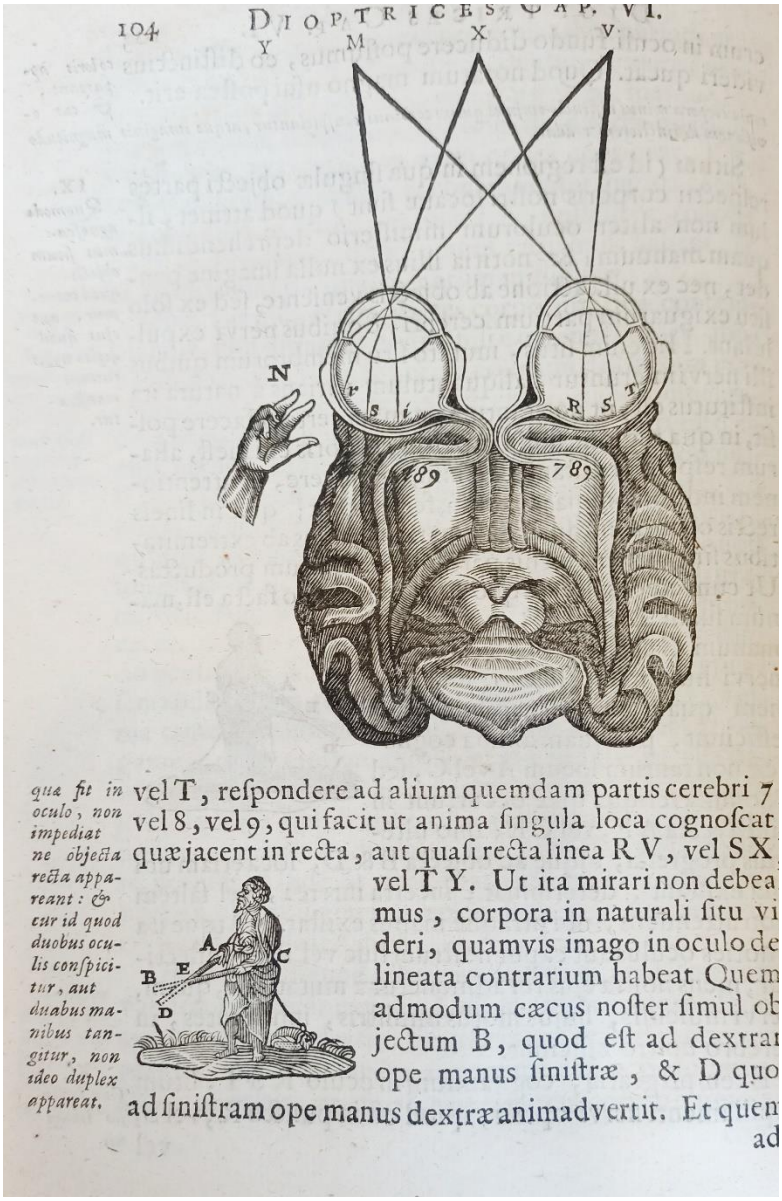
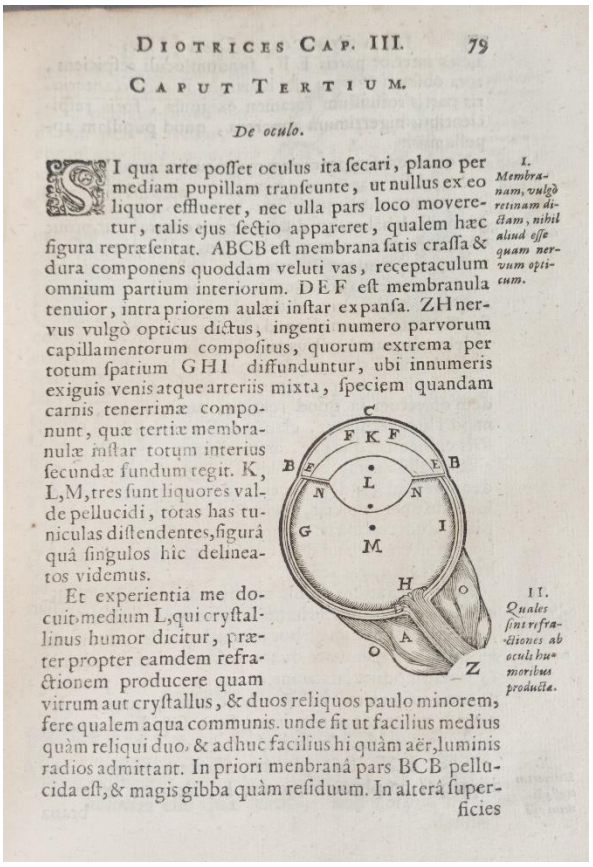


Figure 10. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, "Dioptrice", Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

The most extensive account of images and seeing is given in *Optics*, where Descartes qualifies seeing as the most comprehensive of the senses. Of interest here is also that his delayed and hindered work, *Traité du monde et de la lumière*, is a treaty that explains the world from a mechanistic standpoint where the phenomena of light play an important role, as indicated in the title. This implies that light in all its variations has a more foundational role with philosophical implications, beyond its physical aspect (Paterson 2017, 23-25). In 'Discourse four', the Aristotelian theory of seeing is alluded to, where the objects we perceive can be found in our eyes. Descartes states instead that "it is through the nerves that the impressions formed by objects in the external parts of the body reach the soul in the brain" (Descartes 1998, 164). Seeing is a transmission or communication, but also a processing between the senses and the brain, via the nerves. 'Discourse five' explains with examples how light refracts in the human eye to form inverted images on the retina. He notes that the transmitted images shouldn't be seen as the kind of images that can allow their contemplation but proposes to conceive of these mental images in a novel manner. Going against the Aristotelian, Descartes concludes in 'Discourse six' that mental images don't have to resemble their real counterparts (see fig. 10). On the contrary, and here he uses the example of draughtsmanship and



DIOTRICES CAP. III. 79

CAPUT TERTIUM.

De oculo.

SI qua arte posset oculus ita secari, plano per mediam pupillam transeunte, ut nullus ex eo liquor effluereret, nec ulla pars loco moveretur, talis ejus sectio appareret, qualem hæc figura repræsentat. ABCB est membrana satis crassa & dura componens quoddam veluti vas, receptaculum omnium partium interiorum. DEF est membranula tenuior, intra priorem aulæi instar expansa. ZH nervus vulgò opticus dictus, ingenti numero parvorum capillamentorum compositus, quorum extrema per totum spatium GHI diffunduntur, ubi innumeris exiguis venis atque arteriis mixta, speciem quandam carnis tenerrimæ componunt, quæ tertiæ membranulæ instar totum interius secundæ fundum tegit. K, L, M, tres sunt liquores valde pellucidi, totas has tuniculas distendentes, figurâ quâ singulos hic delineatos videmus.

I. *Membranam, vulgò retinam dictam, nihil aliud esse quam nervum opticum.*

Et experientia me docuit medium L, qui crystallinus humor dicitur, præter propter eamdem refractionem producere quam vitrum aut crystallus, & duos reliquos paulo minorem, fere qualem aqua communis. unde fit ut facilius medius quàm reliqui duo, & adhuc facilius hi quàm aër, luminis radios admittant. In priori menbranâ pars BCB pellucida est, & magis gibba quàm residuum. In alterâ superficies

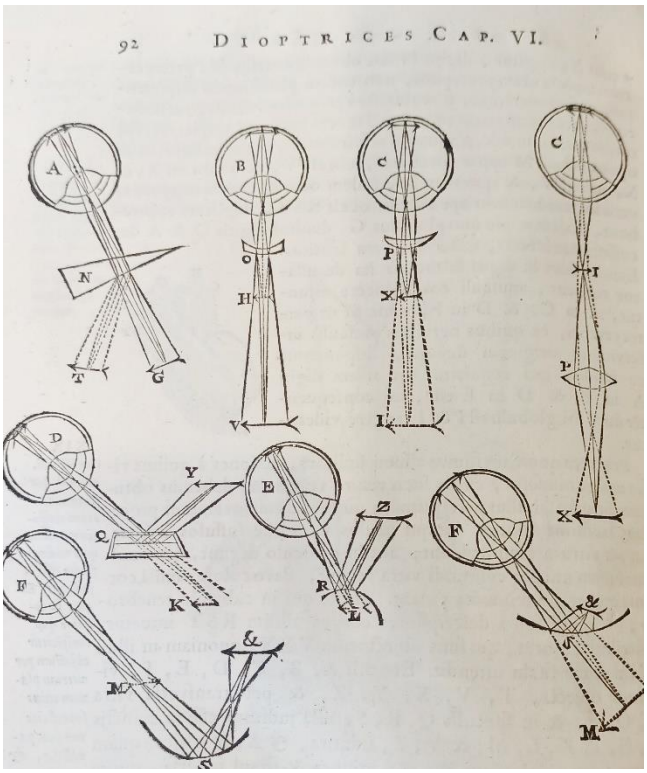
II. *Quales sint refractiones ab oculi humoribus productæ.*

Figure 12. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, "Dioptrice", Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

one can observe through the hole (once the eye is positioned properly in front of it) how images are seen through the eye. He also stresses that images are not formed in the eye, but rather this experiment shows how images can be perceived by the eye, whereas the images are transmitted to the brain via the nerves (figs. 11, 12). It must be stressed that there is something very 'scientific' about his strategy here with the sectioned eye experiment. It's a great example of one of the roles of experiments: they allow the subject to exit, temporarily and artificially his

engraving, an image oftentimes needs not to resemble its true counterpart in order to allow us to perceive the intended image. Small points and lines, and imperfect shapes, when put together manage to evoke to us a complete and faithful image of something (Descartes 1998, 154-165). The ensuing dilemma is the following. How can imperfect images confer to us perfect representations?

Trying to shed some light on this, he gives the example of an experiment with the eye of a newly dead large animal or human which is placed in an obscure room with a hole. By sectioning the eye and covering the sectioned portion with a slightly transparent material such as thin paper,



92 DIOPTRICES CAP. VI.

Figure 11. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, "Dioptrice", Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

subjective position where the world is experienced through the subjective body and its organs and enter an artificial state of objectivity. This state creates distance between the observer and the observed, allowing for a quasi-objective judgement to be made, i.e. if images are seen through this other eye, then it seems that indeed the eye is responsible for receiving them. The main implication, and also Descartes' conclusion from *Optics*, is that the knowledge we derive from images isn't primarily dependent on the images that we perceive, nor on how these images enact on us. Knowing via seeing is conditioned primarily by the position and proper working of those parts of the brain where the nerves responsible for seeing are located. Through them, we can know all the things in front of us but also those beyond them. He notes how in the case of damage in the brain area responsible for a certain function, one loses the ability connected to that part of the brain (Descartes 1998, 165-169). Given his practical experience, it is only fair to assert that Descartes was aware of the main limitations and possibilities our human construction offered in the context of images.

From *The Passions of the Soul*, throughout Articles 17 to 25, Descartes sketches the workings of thoughts, imagination, images, and the body. Without going into greater details, what is interesting to note here is that the passions of the soul, here understood as perceptions are either caused by the body or the soul (the latter covering the perception of volition). Descartes does not explain how the perceptions caused by the soul happens in great technical detail, but he does so with those coming from the body. He states that bodily perceptions can be neural and non-neural (called imaginings). The neural ones are further divided into three, those having a reference to objects, a reference to the body, and to the soul (Descartes 1985, 335-337). What is interesting here is that the neural aspect has a reference to all that constitutes life: the world made up of everything that is not me, but also the body and the soul which make up all subjects, including myself. In the mentioned articles, Descartes spends the most time developing and detailing those aspects that relate more so to the body and to the anatomically observable aspects instead of focusing on the intellect, as one might expect. This connection between perceptions as passions, even if called 'of the soul', is strongly linked to the body but also to its mental aspect via the brain. Moreover, the neural passions have references to objects, bodies, and souls. Ultimately, *The Passions* make one doubt whether Descartes' position against the senses is as strong as it may seem in *Meditations*.

Put further in the context of the correspondence with Elisabeth the Palatinate where Descartes is clearly faced with the problem of the union between the body and the soul, *The Passions* seem an attempt at solving the issue. What their correspondence reveals is that Descartes was made acutely aware of the problems dualism raises, especially when Elisabeth questioned the unity between the body and soul and how it can work within his theory. Besides this, there aren't sufficient reasons to believe that Descartes was an extreme dualist that rejected the body as a virtually inferior element that we can do without, as the history of philosophy sometimes makes him appear (Shapiro, Descartes 2007, 65). With this, his stance on the use of images can also be slightly nuanced. Apart from his philosophical work, his opinion of drawings and images can also be deduced from his correspondence. A telling example comes from the 24th of January 1619 when Descartes writes to Beeckman to inform him that he took up drawing and other artisanal activities that were opposed to the transcendental thinking that's traditionally associated with a philosopher (De Waarts, n.d.; Lo 2017, 376). If Descartes rejected images as useless because of the senses, it is doubtful he would have studied drawing, seemingly praising it in this letter.

Looking at the woodcuts that can be found throughout the *Essais*, one can readily notice how they do not represent the world as it is observable via the senses or how it's readily available without human artifice. By having a tennis player lined with geometric lines which are meant to inform the reader about the movement of the tennis ball and, implicitly, of the natural laws that make the ball act as such, Descartes is not offering a simple image of reality. Even if all the elements that make up that image are themselves in reality, they are not directly perceptible via the senses, but only deductible. With this, the claim that Descartes might reject images because of the improbability of the senses becomes rather weak. On the contrary, they (ironically) manage to capture what the usual seeing cannot through another way of seeing. As Melissa Lo noticed, the woodcuts gain a mathematic aspect to them, as they explain the unseen using geometry. This, of course, challenges the Scholastic presumption of the essence of an object being a reflection of its appearance and constitution (Lo 2017, 370). Nonetheless, the woodcuts are still images that make use of the senses, and geometry is still dependent on visual representations to explain its theories, so it's hard to discredit the senses in a strong dualism. At the same time, by stressing the role of nerves that connect the brain to the eyes and make possible the transmission of images, Descartes places himself in a more complex position that strengthens this particular reading. By representing something beyond the readily visible, the woodcuts can be seen as epistemic images, as they

participate in the text and carry knowledge alongside it. This early qualification raises some problems, as Luthy and Smets observe (Luthy, Smets 2009, 435). Namely, what gives the epistemic image any power? What sort of power is that? How can it effectively carry any type of knowledge to the viewer? The problem that remains is showing whether these woodcuts are decorations, and the philosophical text can do without them, or if they have an active role in the philosophical process and its transmission.

A seventeenth-century student's notes. Johannes Knotter's notebook

The third example discussed in this chapter is the lecture notebook of Johannes Knotter, dated 1683-1684, found in two volumes in the Leiden Special Collections (Mine, Van Eynatten, Knotter 1683-1684). It is part of a series of notebooks from the second half of the seventeenth century that survived and show how the lectures from the Faculty of Arts, which courses were mandatory for all students no matter the track, looked like. Although coming from the University of Louvain in the Southern Netherlands, it provides a glimpse into how philosophy was taught in the late seventeenth century and how a student would organize his notes. Despite not being produced within the Dutch Republic per se, the notes contain various references to Cartesianism that make its investigation worthwhile. Secondly, by its nature is a personal object that is hand-written and contains the student's emphasis on certain topics, but also his choice in representing his knowledge with the use of inserted prints. Because of these aspects, the notebook offers a valuable picture of how philosophical knowledge was structured (and ultimately mapped) by a student, on paper. It is not, as in the case of Hobbes or Descartes, a publication intended to be sold in many copies. On the contrary, it is an object that intends to have a very limited number of readers, with the main reader in the person of its author.

The contents of the two volumes are dedicated mainly to the study of *physica*, enforcing the observations of authors like Ong and De Mûelenaere that the study of physics occupied around eighty per cent of the course, while metaphysics which we usually associate with philosophy now, only a small portion of the material. It should be noted, once again, that physics was perceived as part of philosophy, via Scholasticism (Ong 1958, 141; De Mûelenaere 2023, 5-6). Throughout the notebook, one can easily observe a heavy Aristotelian influence in the many chapters dedicated to causes which follow the Scholastic classification, but also the treatment of vegetative life, nutrition, generation and corruption, and some primary functions of the bodies. The element of natural philosophy mingles with this traditional approach via the treatment of natural phenomena

Figure 13. An example of a pasted that shows an allegory for the concept of motion from Knotter, Mine, Van Eynatten. *Collegedictaten Van Eynatten en La Mine*, 1683-1684, Leuven, inv. No. BPL 3017-3018. Image via personal archive.

and celestial bodies, with clear signs of Cartesianism in the chapters on meteors, seeing and the eye, but also more generally light. Moreover, the mechanistic approach makes itself felt through in the chapters on all types of movements found in Nature.

How does a student organize such a notebook?Most Louvain students from this period bought prints made especially for these lectures and pasted them throughout the notebook (fig. 14). This practice was not exclusive to Louvain, as this practice was common in the Republic as well. On the other hand, not all prints found in Knotter are made for the lecture: some are prints straight out of famous publications like Descartes' *Optics.* The prints selected are most of the time emblems that are used to convey or explain abstract notions. There are also several prints that explicate certain parts of the human body such as the bile, the heart[8], the nervous system, the eye, etc. In addition to these, several sketches and drawings are made in the text by the author himself, seemingly copying Descartes' woodcuts (figs. 16, 17). Even the in-text placement makes one wonder if, again, Knotter wanted to fashion his Cartesian chapters of the notebook as a Cartesian book by aspect and theme alone.

A few things stand out in the visual organisation of the notebook. Firstly, not all prints and drawings are employed to explain a difficult notion. Some emblems signify rather well-known and general notions such as morality. Seconly, there are cases where the same representation can be

Figure 14. Drawings and prints from Knotter, Mine, Van Eynatten. *Collegedictaten Van Eynatten en La Mine*, 1683-1684, Leuven, inv. No. BPL 3017-3018. Personal archive.

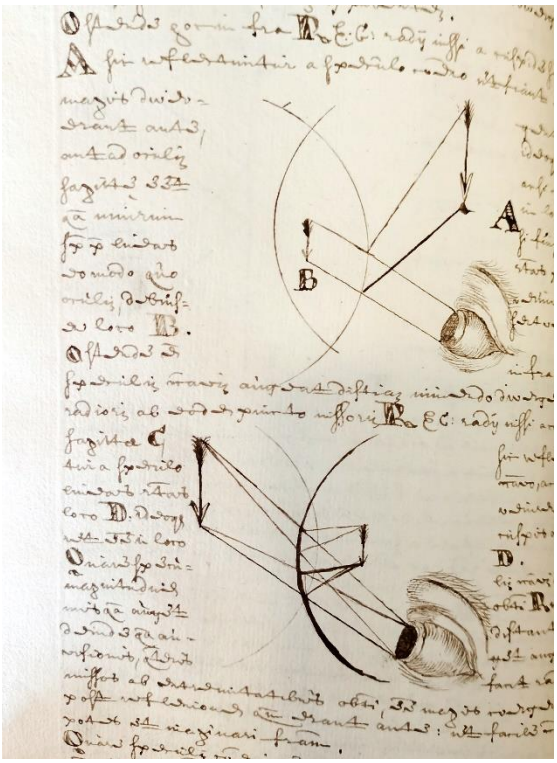
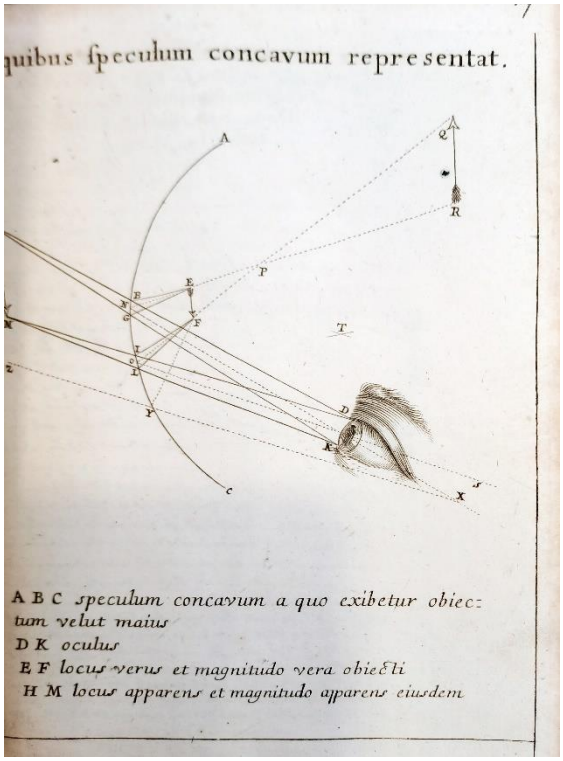


Figure 15. Drawings and prints from Knotter, Mine, Van Eynatten. *Collegedictaten Van Eynatten en La Mine*, 1683-1684, Leuven, inv. No. BPL 3017-3018. Personal archive.



found both in the form of print but also as a sketch (figs. 14, 15), either side by side or near each other. Thirdly, the possible assumption of having representations as decorum cannot be applied to all the images except for a few frontispieces for sections that only announce the title with a decorated frame. Apart from this, all images, drawn or printed, have other functions that relate them to the text. The first point mentioned here also raises the problem of necessity. If an image is used to illustrate an abstract concept that is already grasped by the user, is it a *necessary* image? If not, why go through the trouble of searching, buying, and pasting a print? Before giving a preliminary answer to this, let us also discuss the second point. This point appears as quite curious, as the possibility of the necessity of images seems to be discarded by default. Why would it be necessary to have one image, let alone two in different techniques? A preliminary answer can be sketched here. The images relate to seeing being the most comprehensive of the senses so, going with the ideas posited so far, it must offer a type of understanding that's different from that of the

text and probably relates to the general interest in spatiality on paper. They allow the reader to come to insights that probably would be hard to reach if it wouldn't be for these different types of thinking that allow for comparison and intersection. However, this embodied aspect in representation and the implications it holds for philosophical thinking will be treated in the third chapter.

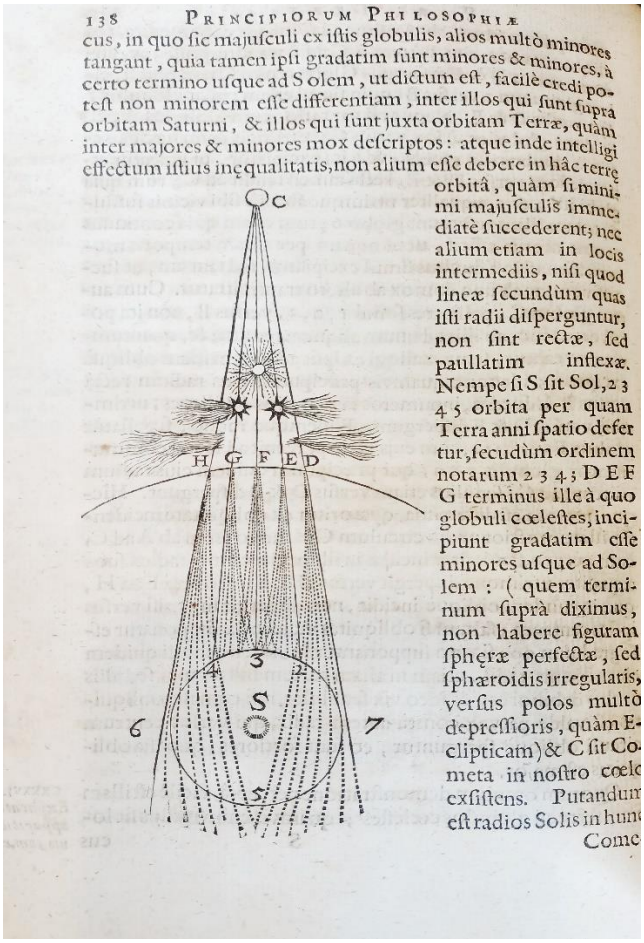


Figure 17. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

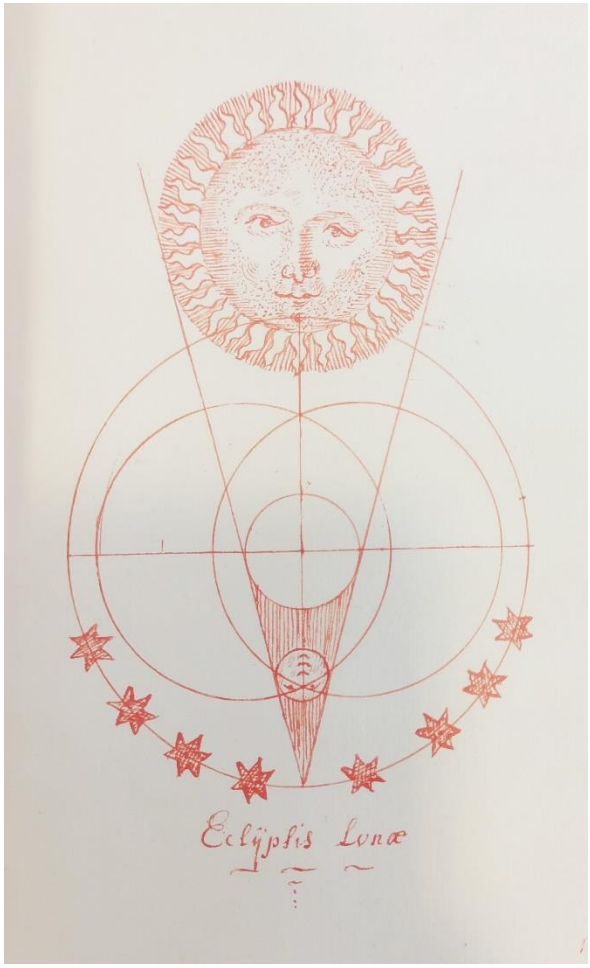
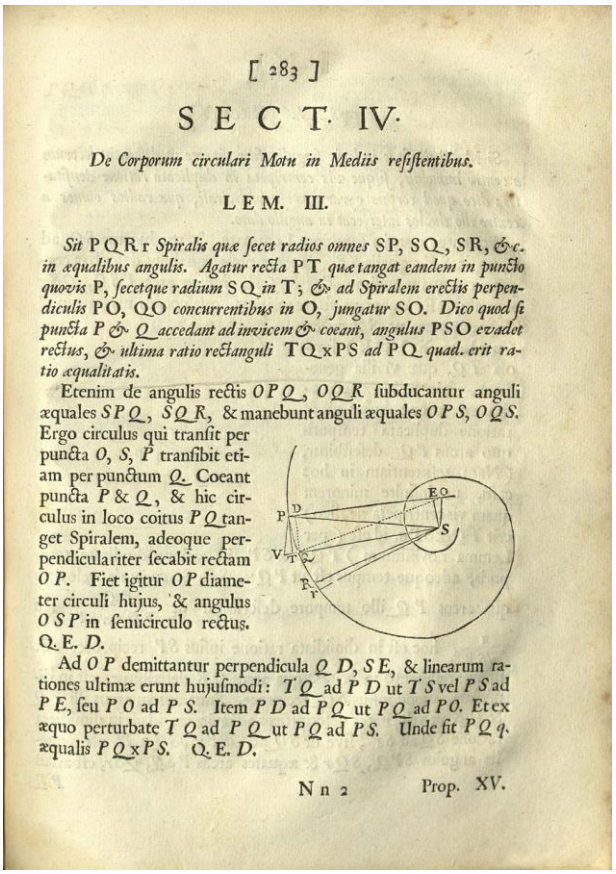


Figure 16. Drawing from Knotter, Mine, Van Eynatten. *Collegedictaten Van Eynatten en La Mine*, 1683-1684, Leuven, inv. No. BPL 3017-3018. Notice the visual similarities.Image via personal archive.

Newton, experimental philosophy, and images

Sir Isaac Newton is generally regarded as a science figure and not as much as a philosophical one, although his life and work were influenced by the fall of Aristotelianism, the rise and fall and Cartesianism, and the development of experimental philosophy. Although his writings deal mainly with what we regard today as science, he was regarded by his contemporaries

as a philosopher, a leading figure of experimental philosophy (Janiak 2006; Iliffe, Smith 2006, 7-19). Experimental philosophy is a term that emerged in the late 17th to early 18th century on the Continent and in England to describe a type of philosophical investigation that made use of experiments to test theories of natural philosophy such as causes of motion, nature of light and seeing, natural forces, etc (Iliffe, Smith 2006, 5-7). For example, Leiden University was the first university in Europe to provide instruments for experimental philosophy (Jorink, Maas 2012, 22). The movement is closely connected to natural philosophy and even overlaps with it at times as they have comparable aims that deal with what we'd call today the study of physics. Newton, together with Boyle, Locke, and Leibniz, is seen as an influential figure of the movement. To give a bit more context, it's necessary to consider that although authors identify his influence under the name of 'Newtonianism', Newton didn't put forward any coherent philosophical program like Descartes. Instead, his controversial conceptions of nature, the debates they sparked, and his emphasis on experiments and methodology are aspects that define the character of Newtonianism. The controversies his writings created contributed highly to engaging various top philosophers and intellectuals of his time, but also setting the philosophical development of later philosophers such as Immanuel Kant (Janiak 2006).



[283]

SECT. IV.

De Corporum circulari Motu in Mediis reſiſtentibus.

LEM. III.

Sit PQR *r Spiralis quæ ſecet radios omnes* SP, SQ, SR, *&c. in æqualibus angulis. Agatur recta* PT *quæ tangat eandem in puncto quovis* P, *ſecetque radium* SQ *in* T; *& ad Spiralem erectis perpendiculis* PO, QO *concurrentibus in* O, *jungatur* SO. *Dico quod ſi puncta* P *&* Q *accedant ad invicem & coeant, angulus* PSO *evadet rectus, & ultima ratio rectanguli* TQ x PS *ad* PQ *quad. erit ratio æqualitatis.*

Etenim de angulis rectis *OPQ*, *OQR* ſubducantur anguli æquales *SPQ*, *SQR*, & manebunt anguli æquales *OPS*, *OQS*. Ergo circulus qui tranſit per puncta *O*, *S*, *P* tranſibit etiam per punctum *Q*. Coeant puncta *P* & *Q*, & hic circulus in loco coitus *PQ* tanget Spiralem, adeoque perpendiculariter ſecabit rectam *OP*. Fiet igitur *OP* diameter circuli hujus, & angulus *OSP* in ſemicirculo rectus. Q. E. *D.*

Ad *OP* demittantur perpendicula *QD*, *SE*, & linearum rationes ultimæ erunt hujuſmodi: *TQ* ad *PD* ut *TS* vel *PS* ad *PE*, ſeu *PO* ad *PS*. Item *PD* ad *PQ* ut *PQ* ad *PO*. Et ex æquo perturbate *TQ* ad *PQ* ut *PQ* ad *PS*. Unde fit *PQq* æqualis *PQ* x *PS*. Q. E. *D.*

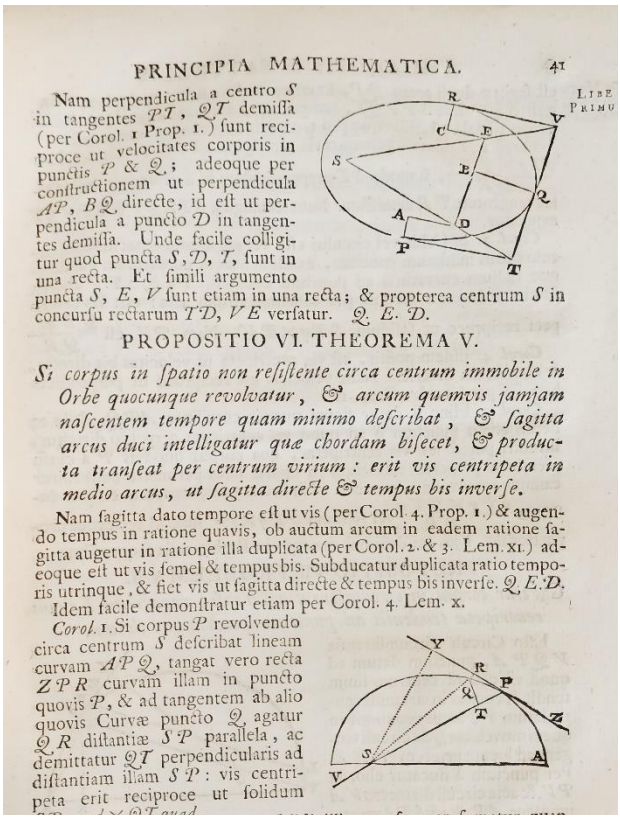
Nn 2 Prop. XV.

Figure 18. Page from Isaac Newton's *Philosophiae Naturalis Principia Mathematica*, 1687, London, J. Streater. Image via: Philosophiae Naturalis Principia Mathematica Marriott Library (utah.edu)

Newton's importance on philosophy is emphasized by recent authors who argue with historical and contemporary arguments to support this. To get an idea of how his contemporaries viewed him, Bruker's *Historia Critica Philosophiae* lists Newton as a central philosopher in what was seen as the modern development of philosophy (Bruker 1743, 639-655; Janiak 2006). From a contemporary view, Newton's conception of absolute space contributes to the development of the ontology of space and time and has implications for both philosophy and science. Absolute space,

for Newton, can be described as an unchanged framework of either space or time where all physical events take place. This framework is fixed and can therefore act as a reference, making all measurements possible and accurate. Similarly, his emphasis and insistence on methodology, but also his discussion on the role of hypotheses in formulating a valid conclusion has consequences for the evolution of philosophical reasoning. It is visible from this quick sketch that to reduce Newton to a physicist or mathematician is to lose sight of the philosophical debates of his time that he joined and in which he played important roles (DiSalle 2016, 38-45; Janiak 2006). The qualification of 'natural philosopher' is probably the most accurate and fitting and, therefore, it should dispel any questions on why he is included in this survey.

How important were images for Newton? What changed between Descartes and him? Were images used in the same way, as part of a philosophical argument which was built in conjunction with the text? To respond to this, a good hint lies in Newton's work on optics. His first published work was an essay/letter published by Oldenburg in the journal *Philosophical Transactions*, titled "A New Theory of Light and Colours". This first essay shapes Newton's future career and sparks an intense debate that shapes the following inquiries of this type. In the essay, Newton investigates light, creating a shift from the focus on vision towards that on light and color. The investigation on color wasn't new: Hooke and Huygens conducted similar research, but this essay created enough controversy to draw the focus towards the topic as never before. Newton went against Hooke and Huygens, who believed that light is composed from waves, arguing that light is formed from rays. He showed that although sunlight appears incolor, when directed through a prism, it actually contains a variety of colors that can then be separated. Color, was thus, seen as a property of light, meaning that all light contained the possibility to exhibit colors under specific circumstances (Newton 1993, 108-110;


PRINCIPIA MATHEMATICA. 41

Nam perpendicula a centro S in tangentes PT, QT demissa (per Corol. 1 Prop. 1.) sunt reciproce ut velocitates corporis in punctis P & Q; adeoque per constructionem ut perpendicula AP, BQ directe, id est ut perpendicula a puncto D in tangentes demissa. Unde facile colligitur quod puncta S, D, T, sunt in una recta. Et simili argumento puncta S, E, V sunt etiam in una recta; & propterea centrum S in concursu rectarum TD, VE versatur. Q. E. D.

PROPOSITIO VI. THEOREMA V.

Si corpus in spatio non resistente circa centrum immobile in Orbe quocunque revolvatur, & arcum quemvis jamjam nascentem tempore quam minimo describat, & sagitta arcus duci intelligatur quæ chordam bisecet, & producta transeat per centrum virium: erit vis centripeta in medio arcus, ut sagitta directe & tempus bis inverse.

Nam sagitta dato tempore est ut vis (per Corol. 4. Prop. 1.) & augendo tempus in ratione quavis, ob auctum arcum in eadem ratione sagitta augetur in ratione illa duplicata (per Corol. 2. & 3. Lem. XI.) adeoque est ut vis semel & tempus bis. Subducatur duplicata ratio temporis utrinque, & fiet vis ut sagitta directe & tempus bis inverse. Q. E. D.

Idem facile demonstratur etiam per Corol. 4. Lem. X.

Corol. 1. Si corpus P revolvendo circa centrum S describat lineam curvam APQ, tangat vero recta ZPR curvam illam in puncto quovis P, & ad tangentem ab alio quovis Curvæ puncto Q, agatur QR distantiæ SP parallela, ac demittatur QT perpendicularis ad distantiam illam SP: vis centripeta erit reciproce ut solidum

Figure 19. From I. Newton, *Philosophiae Naturalis Principia Mathematica,* 1714, edition ultima, Amsterdam, Sumptibus Societatis. Special Collections Leiden. Image from personal archive.

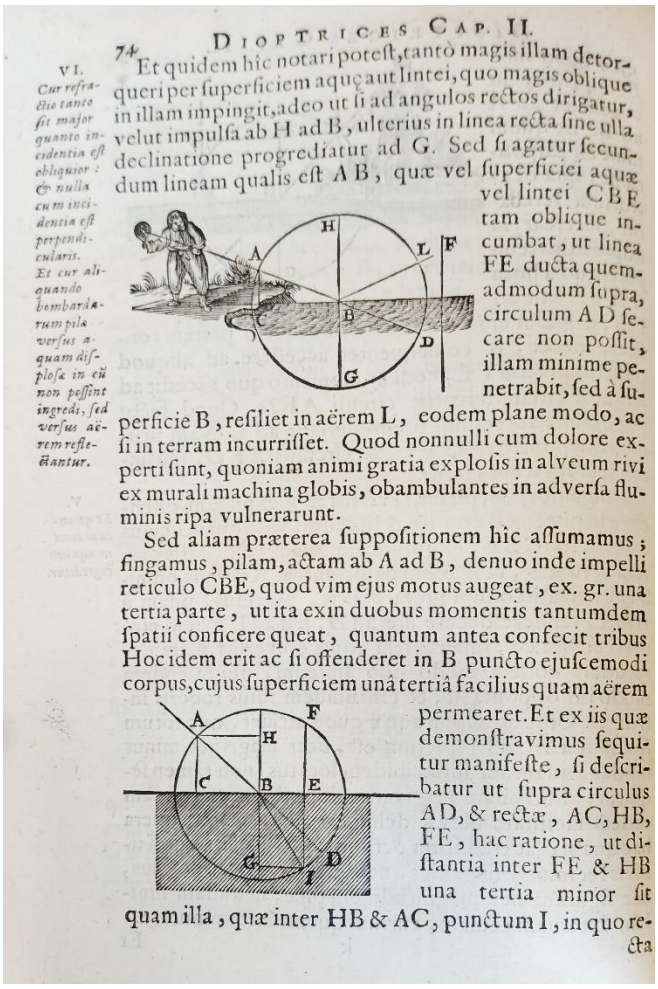
Janiak 2006). What I want to take and highlight from this short description of the essay is Newton's conception that can be derived from the matter. Going against the theories of the time and relying heavily on his experiments with the prism (which he describes in detail throughout the essay), he makes it clear that his belief is that experiments and instruments are necessary to aid the senses. Just as in the case of light, with the naked eye, there are no colors visible, and yet with a prism (the experimental device), the true nature of light is revealed, and the law of Nature is properly understood. This insistence on methodology, experiment, repeatability (the aim of describing an experiment in detail is none other but to make it repeatable), and disapproval for speculation set Newton against Cartesianism which relied in parts on meditation and thinking.

On the other hand, Newton's theories of light, color, and perception aren't too far away from the mechanistic approach, making thus a link with Descartes, for a few reasons. In the first seven definitions from the *Opticks*, sketches the conceptual framework for the theory of light and color, postulating that light is made up of rays and every single ray has one refrangibility (Newton 1721, 2-5). This postulation of singularity and refrangibility conditions Newton's framework, affecting the conclusions he draws. One has to accept, within this framework, that indeed the light is made out of rays as the observations wouldn't be visible and repeatable in the case of wave theory. As Steinle observes, the theory of light is mechanistic in character because of how its framework construction, the corpuscular hypothesis, but also his treatment of perception. Newton's approach to perception is even more evident in his color theory where he states that color is not a primary property of light but only a secondary one that can be perceived by us because it engages with a part of our brain called "sensorium" (Steinle 1993.571-573).[9] From Newton's point of view, the senses are not responsible from perceiving the primary qualities which should interest the philosopher but merely aid in pointing the limits between the visible and invisible; a border where instruments take over.

Let us go back to images and look at how Newton himself employed them in his most popular work, *Principia*. At a quick glance, it's visible that similarly to Descartes, Newton also uses in-text images with a geometric character (see figs. 18, 19). However, there is a notable difference as the tennis player, the hand, the human element that was represented or hinted at in most of Descartes' woodcuts disappears altogether. The images are pure geometric representations

[9] It's worth mentioning here that Leibniz attacks this theory.

as we know them, the type of representations that Descartes used in his personal correspondence with Elizabeth to debate a point among mathematicians. For example, someone with insufficient mathematical or philosophical training would have trouble understanding the lines and points and what they meant, whereas the tennis player and his ball intuitively inform the viewer that the image is probably about the flying ball and the power that propels it (as the accompanying line also suggests visually, see fig. 20). It's not far-fetched to posit that, by employing highly mathematical representations, Newton might've hoped that the images will serve as a type of simulated experiment that would align with his theory. On the other hand, this transition doesn't appear to be that abrupt from Descartes to Newton. By showing visually the force of motion or the speed of an object via mathematical means, would count not as speculation and hypothesis, but as an experiment, as proof verified through numbers. From this perspective, then, Descartes' employment of images doesn't appear too different in an epistemological context. Both Newton and Descartes use in-text woodcuts to illustrate a point of the text and to visually exemplify a physical phenomenon.



74 DIOPTRICES CAP. II.

VI. *Cur refractio tanto sit major quanto incidentia est obliquior: & nulla cum incidentia est perpendicularis. Et cur aliquando bombardæ tum pila versus aquam disploſa in eũ non poſſint ingredi, ſed versus aërem reflectantur.*

Et quidem hic notari poteſt, tantò magis illam detorqueri per ſuperficiem aquæ aut lintei, quo magis oblique in illam impingit, adeo ut ſi ad angulos rectos dirigatur, velut impulſa ab H ad B, ulterius in linea recta ſine ulla declinatione progrediatur ad G. Sed ſi agatur ſecundum lineam qualis eſt A B, quæ vel ſuperficiei aquæ vel lintei C B E tam oblique incumbat, ut linea FE ducta quemadmodum ſupra, circulum A D ſecare non poſſit, illam minime penetrabit, ſed à ſuperficie B, reſiliet in aërem L, eodem plane modo, ac ſi in terram incurriſſet. Quod nonnulli cum dolore experti ſunt, quoniam animi gratia exploſis in alveum rivi ex murali machina globis, obambulantes in adverſa fluminis ripa vulnerarunt.

Sed aliam præterea ſuppoſitionem hîc aſſumamus; fingamus, pilam, actam ab A ad B, denuo inde impelli reticulo CBE, quod vim ejus motus augeat, ex. gr. una tertia parte, ut ita exin duobus momentis tantumdem ſpatii conficere queat, quantum antea confecit tribus Hoc idem erit ac ſi offenderet in B puncto ejuſcemodi corpus, cujus ſuperficiem unâ tertiâ facilius quam aërem permearet. Et ex iis quæ demonſtravimus ſequitur manifeſte, ſi deſcribatur ut ſupra circulus AD, & rectæ, AC, HB, FE, hac ratione, ut diſtantia inter FE & HB una tertia minor ſit quam illa, quæ inter HB & AC, punctum I, in quo recta

Figure 20. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, "Dioptrice", Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

So, is there anything that changes during Newton's time regarding images in a philosophical text? In a way, the type of images employed by Newton circle back to those of Ramus. They are schematic, non-figurative, and minimal, a visual skeleton of a mental process. They are also more inaccessible, as the reader needs more basic knowledge and less common sense to understand their meaning. The type of information they display is different, less intuitive, more specialized. Their primary role is not to ease the understanding of the text by providing a different type of explanation and/or illustration

but hold the role of an abstract demonstration, a mathematical calculation displaced further away from reality and the tangible everyday realities. On the other hand, they are an attempt at placing all the laws and phenomena described in a visual space on paper.

In this chapter, the philosophical attitude towards images was investigated in the case of popular authors like Hobbes, Descartes, and Newton whose books were popular[10] in the second half of the seventeenth century in the Dutch Republic. This was done by looking at their mentions and theories on images and seeing, in connection to perception. As it was shown, they do not reject images despite their seeming rejection of the senses. The issue is more nuanced and Hobbes, Descartes, and even Newton showed interest and concern for the problem of images and seeing. Another aspect of this analysis looked at what images do or do not in the context of philosophy by making use of the three study cases that present different instances of material image usage in the 17th century. It has been posited that images trigger a different kind of response, one that in turn opens up a different kind of thinking, a visual one. In the context of philosophy, images don't seem to be decorative or exclusively explanatory. Rather, they appear to open in us another way of thinking philosophically that brings another type of insight than our textual-based thinking. This understanding isn't meant to replace or compete with the 'regular', but rather to run its course in a parallel that can, at any given time, become a comparison or an intersection of ways that can offer a vista of thinking. Ultimately, the interest the quest to explain vision indicates that images and seeing weren't seen as inferior and negligible.

Chapter 3. Body, images, and thinking in philosophy

The previous chapter introduced the main examples of images that were used in conjunction with influential philosophical works of the early modern period. While the introduction was more descriptive and aimed to give a solid idea about the context of these images, and connect them to the philosophical conceptions but also their context, this chapter will go a step further. It will take a closer look, from a perspective that focuses on understanding how those images might or might not function within the process of understanding a philosophical text. Theories of reading comprehension, phenomenology, and embodied cognition will be used to support this inquiry. The chapter will, therefore, test and ponder the use and functionality of these

[10] Descartes' *Opera Philosophica* was printed, for example, in at least six editions by the publisher Elsevier in the seventeenth century alone.

images in trying to answer whether philosophy today should reconsider its use of images as part of its argumentation and inquiry.

What images do for understanding

It is almost a common-sensical view that images help the reader understand a text, acting almost like a pair of training wheels. Out of this common-sensical view also stems a prejudice that views images in a text as a tool for those who struggle. From personal experience, some go as far as to view images in the text as affecting the intellectual character and purity of the text, because images would somehow go against the preferred abstract and rational character of the philosophical text. The first step is to see whether there's any basis for this common-sensical view that images are training wheels for the text.

Probably the earliest extensive accounts of images used to help the understanding of a text come from the work of psychologist Allan Paivio (1971;1975;1981). According to him, knowledge is represented both verbally and non-verbally in what he calls a 'dual-coded system'. Verbal knowledge is expressed via words, while non-verbal via something else, like images, that resemble to a degree the perceptions that cause them. This dual system assumes that both verbal and non-verbal elements are tightly connected and doesn't indicate that there is a type of hierarchy between the two. Rather, they ultimately work together to give rise to comprehended meaning. Swanson (1999), relating to Paivio's research, suggests that there is a connection between learning disabilities and the subject's failure to make verbal and non-verbal connections when engaging with new information. Nielsen Hibbing, and Rankin-Erickson, based on classical literature and their own surveys, suggest that creating mental images while engaging with text is a characteristic of proficient readers, supporting Swanson's claim. Moreover, they conclude that the failure to generate mental images in proficient readers is, for them, a telling sign that there is an issue in comprehension, prompting them to resort to strategies such as rereading, refocusing, or simply adjusting the pace (Nielsen Hibbing, Rankin Erickson 2003, 759-760). The benefits of mental imagery in relation to the text, as tested in children, are that they enhance memory, and the abilities to infer and make predictions. For struggling readers, a verbal description suffices to create the necessary mental imagery, while for others a picture is needed (Sadoski, 1983; 1985; Gambrell & Bales, 1986). Moreover, Hibbing and Rankin-Erickson noticed that the failure to generate a mental image is oftentimes connected directly to failing to understand "critical features in the setting or spatial relationships between characters or items discussed in a text." (Nielsen Hibbing, Rankin

Erickson 2003 ,761).1 From the results and observations of the mentioned authors, images appear to conform to the 'training wheels' perception, as they seem to resolve an incapacity to visualize information within the mentioned dual system. However, is that all there is to the relationship between images and text?

To go back to the images that were brought into question in the previous chapter, such as Hobbes' Leviathan, Descartes' woodcuts, or Knotter's drawings and pasted prints, this explanation of images, as just comprehension aids to the text, doesn't suffice. It is unlikely that these individuals, especially in the case of published works, aimed at a reader with learning difficulties. The people that bought and read Descartes' works were at least seasoned readers with an acquired taste for writings on natural philosophy. More recent opinions, such as that of Glenberg (2011, 5), argue that reading comprehension is an embodied process, indicating that the relationship between text and images should be understood in these terms as well. To this, the already-classic account of Lakoff and Johnson regarding understanding seen as affordances is also relevant (Lakoff, Johnson 2008). Understanding is shaped by how the information can be used in action with our body, as all of our interactions with the world are shaped by our embodiment and affordances. Meaning is also shaped in the image of our bodily constitution and our relating to information is primarily ordered and shaped in a human way because our bodies are such a big characteristic of our existence. In terms of experiencing knowledge as we understand it, Moulton & Kosslyn show that images relate to simulation when encountering and processing a text. If we read that 'X runs through a field of grass' we have the mental imagery of someone running through that field, but we also simulate being X and experience, to a degree, that running based on our experience (Moulton, Kossylyn 2009; Sadoski 2018, 333-334). To recall the comment from the previous chapter, when comparing Descartes' in-text woodcuts with Newton's, the embodied and experiential aspects of reading comprehension can be seen in favour of Descartes. His woodcuts are not complete abstract representations, as a bodily part or entire figure is placed in interaction with abstract elements such as axes and vectors. I don't only see Descartes' tennis player and his flying ball to understand his theory of motion, but I become the tennis player from the picture. Whereas, in Newton's case, one's mental imagery and experience recalling is challenged by the highly abstract woodcuts, making it difficult for my body to relate to the visual material provided. On the other hand, Sadoski, Lakoff and Johnson argue that even the most abstract things, like the language of mathematics, are rooted in metaphors which are rooted in bodily experiences (Sadoski

2018, 335; Lakoff, Johnson 2008) giving thus a new dimension to the mathematical aspect of Descartes' and Newton's woodcuts.

The works of Lakoff and Johnson on metaphors being rooted in embodied experience are already somewhat classic within the field of embodied cognition and the theory of embodiment. They posit that the ways in which we create, think, and understand metaphors are heavily conditioned and shaped by our bodily constitution and embodied experience. To be more specific, they argue that, when we create metaphors we use our body as a sort of reference point in creating metaphorical images. By having our head and vision field at the top of our body, we tend to perceive the head as the best part of the body, the centre of our being. As a result of this perception, we create metaphors where the highest part of something is associated with the most desirable part. Even the images of heaven being in the sky are also seen as a result of our bodily experience. If we had wings, then heaven wouldn't be placed in the sky. Similarly, as most people tend to be right-handed, this experience contributed to associating metaphorical the right path, the right part, the right hand with positive meanings, while the left one with negative ones, and so on and so forth. Lakoff and Johnson, supported by neuroscientific findings of how organisms relate to their environment based on their physical configuration, conclude that indeed metaphors are shaped by our body and experience within it. They also view abstract language as a type of metaphor, arguing that their principles are similar enough to indicate their relation, ultimately showing that how we map, organize, and codify information in an abstract language is not disconnected from our embodiment (Lakoff, Johnson 1999, 70-80). If we are to take this as valid, then there is a stable connection between text, figurative representations, and abstract elements as seen in Descartes' woodcuts which seem to be the best example for this case. Their connection is provided by the embodied subject that can access information and comprehend it via their body.

As contemporary theories of embodied cognition rely on findings from neuroscience, it is imperative that a short description of the most important mechanism that supports their claims is given. The mechanism in question is the brain's ability to mirror something, as part of the cognitive abilities, via the area F4 (ventral premotor) and area VIP (ventral intraparietal). These two areas make up the parietofrontal circuit which is in charge of the brain reacting to movements of the head and arm. Most of the neurons from this circuit are especially sensitive to visual and tactile stimuli, as they are responsible for encoding the space via reaching and grasping an object with

either head or arm. Moreover, besides reaching and grasping, the neurons are also sensitive to other ways of interacting with the perceived objects with the mentioned limbs, always looking for ways to place possible head/arm interactions with the exterior in a given space. This circuit is important because it is related to the functioning of mirror neurons (I'll refer to them as MN from now on), which enable a subject's ability to experience someone else's experience as theirs. They are oftentimes related in literature to the subject's capacity to experience empathy and/or sympathy towards another. MN fire upon encountering stimuli through the VIP-F4 area, if the head or arm is involved in the subject-object interaction (Gallagher 2012, 355-356; Iacob 2012, 5-6). A notable mention is also the fact that there doesn't seem to be a clear consensus on whether the MN and area VIP-F4 are responsible for empathy and/or simulation, as opinions are divided.[11] Regardless, the matter is outside the direct scope of this inquiry but is nonetheless worth keeping in mind. Relying on this data, it is posited that all sorts of material can activate the firing of MN. Interaction with a subject, an object, a text, an image, and so on can fire the mirroring process, enabling us to relate to what we're seeing as if we are the ones to experience it.

To connect everything discussed so far in this chapter with the matter of images and philosophical knowledge, from an embodied perspective it is visible that images go beyond the role of aid for less prepared readers. If we are to judge the illustrations invoked so far based on the connections with the MN and VIP-F4 area of the brain, then the matter is a bit more complex. As it was said, for the VIP-F4 area to be activated, there's a need for visual or tactile stimuli which, traditionally, cannot be given by text alone. Although the text might create mental images based on the information given, it's worth noting that most philosophical text is not so descriptive and full of imagery through its nature. Therefore, the activation of the area is not a given, just a possibility. On the other hand, the joining of text and image changes the matter altogether. It triggers the mirroring and gives rise to a slightly different type of understanding (oftentimes of the same or very similar information as the text), an understanding that's rooted in the body and in our experience. But why is there a need for this added dimension in philosophy, anyway? Why can't we, at most, stick with Newton's abstract illustrations (although Lakoff and Johnson would also see those as embodied)? Because it enables a layered type of understanding that engages with more than just our rationality, if we are to go with the traditional dualist perspective of looking at

[11] For a survey on this see Gallagher 2012.

ourselves. The other, more practical, obvious reason is the one invoked by authors of reading comprehension; it facilitates understanding to a greater degree. The next step is to see whether there's any philosophical advantage of adding a bodily dimension to our comprehension.

The value of lived experience. The body in the image

The theory of embodied experience has parts of its roots in phenomenology, mainly in the theories of Husserl and Merleau-Ponty. Husserl's phenomenological account of images distinguishes between two types of images: *Bildvorstellungen*, the reproductive images, and *Phantasiabilder*, the images related to *phantasia*. The first is connected to memory and perception, reproducing past experiences and objects, acting as mental images involved in the process of recalling something. On the other hand, the second involves imagination and oftentimes deals with abstract concepts or imaginary objects, events, and persons. This latter category of images is associated by Husserl with artistic creation and all types of creative thinking (Husserl, Brough 2005, 723). If we take Husserl's account and we try to apply it to Descartes' woodcuts, the favorite example of this research, we already run into troubles. How are we to qualify, for example, the image of an anatomical body part? Is it a reproduction of a *Phantasiabilder*? On one hand, it is a recalling of a past object: the dissected heart. On the other hand, it's not only that. The image is used to create concepts and launch theories regarding its functioning (as blood circulation, for example, was still under debate during Descartes' time). Isn't the abstract thinking that is done with the heart image part of the *Phantasiabilder?* Lacking the instruments to unravel or solve the problem of blood circulation, one is left to imagine and engage in creative thinking in trying to understand the mechanism behind it. That is to say, the nature of the woodcuts in question is already complex, making a clear-cut inclusion in Husserl's categories a bit difficult.

Looking at Merleau-Ponty's account of images offers a valuable perspective on what images *can* offer exclusively and why they shouldn't be dismissed so easily. The philosopher himself stated the common perception invoked earlier in this chapter, namely that images have a bad reputation (Perri 2003, 76), positing that they can be rehabilitated through a phenomenology of art. He argues that objects depicted in paintings are not present in the same way other things are, they aren't unreal nor are they absent. They have a complex and paradoxical nature where they are present and absent, real and unreal, visible and invisible. However, this is not a duality, nor a shifting from one end to the other. They are best described as ambiguous as the seemingly paradoxical characteristics are intrinsically connected and tied to each other. The visible has in

itself the opening needed to make the invisible visible, as one appears with the other. The objects of art, are therefore described by Merleau-Ponty as a "cvasi-presence and an imminent visibility" (Perri 2003, 82). Objects of art such as paintings aren't signs, as they don't stand for something, but are instead expression and not imitation, as it's commonly believed. His argument for art being expression lies in its very nature because expression doesn't pre-exist in the same way that, in the case of imitation, the object to be imitated is already existent before its imitation. At the same time, the paradox is created by expression not being pure creation. Expression expresses something, but the object expressed is not pre-existent in the same way it is in imitation (Merleau-Ponty 1993, 17-19; Perri 2003, 86). To say so, expression is not a replication, but more of an approximation in as much as expression is constrained by the possibilities of expression and reality.

However, expression can bring into being that something that is expressed and isn't found in the world as it is found in the expression, in art. Merleau-Ponty uses Cezanne to illustrate his point, arguing that the distortions visible in Cezanne's paintings are a capturing of our living, of our lived, moved, body in action. The distortion is an expression of the distortion of our visual field as we move about when we observe an object. This lived experience is also characterized by it being shaped by a perception which is synesthetic. The perception of our senses is not isolated per sense but is instead a collaboration and interaction between them. The moment, environment we are in, but also the movements of our own body participate in this synesthetic perception of the world. Due to this, our perceptions, even the visual ones, have a "motor, living significance for the perceiving subject" (Perri 2003, 87). The synesthetic character of perception has a direct consequence, namely that it implies the need for a synchronicity between the subject and the world for perception to happen. Merleau-Ponty argues that for perception to happen, the conditions and the working senses are not enough. We also need to orient and open ourselves towards the targeted object or event for our bodies to take the proper attitude, enabling us to anticipate and then receive the sensation. This anticipation stays at the root of the paradoxical overlap between the inside and the outside, the visible and the invisible (Merleau-Ponty 2005, 120-170) . To quote Perri, "rather than a negation of perception, paintings expand our natural perception by bringing into visibility the manner of appearing objects from the lived experience of my body" (Perri 2003, 88). In " Eye and Mind" (Merleau-Ponty 1964, 16-19), Merleau-Ponty explains that, in the case of images (*Bild*), we don't look at them as we would at any object, but our looking at them is conditioned

and directed by the image itself. The aim of this looking is nothing but explaining (and implicitly understanding) expression.

Although Merleau-Ponty's analysis of paintings (and images in this sense, together with vision) is a positive one, he is a bit critical when it comes to engraving. When discussing Descartes' *Optics* and his account of seeing in "Eye and Mind", he suggests that etching is less preferable to painting because it simplifies and represents two-dimensionally, failing in most cases to capture that something between the visible and invisible that paintings, for instance, do. This results in a further failure to speak through vision to our lived body, as it cannot awaken in us that in-between that human lived experience is characterized by. Regarding Descartes, he criticizes his account of seeing from *Optics* because Descartes equates, in the case of visually impaired persons, seeing with touching, failing thus to see the special character of vision. Additionally, he reads the *Optics* from a very Cartesian and mechanistic perspective where, he claims, Descartes equates thinking and mathematics with vision, when the latter is actually a very organic process that has to do with living and humanity.

On one hand, Merleau-Ponty's critique of Descartes and engravings is understandable. Cartesianism has been a constant concern in the history of philosophy up until now, whereas engravings are only recently reconsidered as something that is as valuable as a painting for example. It is fair to assume that the philosopher was operating under his own set of biases when commenting on this matter. On the other hand, if we go beyond his direct critique and simply look to apply his main ideas to the cases presented with the arguments thus far, the situation is less dire. For example, if we are to circle back to all the arguments of embodied cognition presented, there is a bit of overlap with Merleau-Ponty's main point. Namely, that images can appeal to our bodily lived experience in a way that other things cannot. The VIP-F4 area that gets triggered by stimuli containing at least a head and/or hand with the possibility of interacting with an object is a perfect example of a body function that is studied enough to know it's there and what it does. If we are to connect this information with Merleau-Ponty's account of images giving rise to something within our bodies that is not condition by rationality but acts on a different level, then we end up with the images of human figures (hand, head, full body) triggering in our bodies the possibility of action and movement. It is the possibility of 'how can I interact with my environment and things within it' (fig. 20). This is not a willed process in the rational sense. It is bodily, instinctive, wired. I see

someone holding hands and my body and mind act as one instantaneously. I become the persons holding hands, maybe a memory or sensation is trigger, or maybe I get a craving to hold something or someone. I'm neither them nor myself in that moment, I'm somewhere in between my own person who is a stranger to that happening and the strangers that make me react. It's as Merleau-Ponty puts it: the visible always has an invisible, both at the same time.

To circle back even further, to Hobbes, Descartes, the student notebook, and Newton, the prints featured in these publications speak to us on a bodily and experiential level as well. If up until Newton, the mentioned texts feature figurative images which respect the VIP-F4 condition for stimuli, what happens in cases when the abstraction is as big as it is in Newton's case? Is Merleau-Ponty right and there is no reaction because of the platitude of engravings? This might be a tricky problem, but a probable answer can be given. Although the figurative component is inexistent in the pages full of abstract geometry (see figs. 1, 18, 19), there is something which remains. Namely, space. Circling back to Peter of Spain, Agricola, and Ramus, whom all used abstract illustrations in the form of tables and diagrams, their main characteristic was an interest in space and placing phenomena and, ultimately, knowledge in space. This assessment is true for Newton as well because geometry, no matter how abstract, cannot be done in the absence of space. In this case, a double space: the geometrical one, but also the material space of the page. To invoke Merleau-Ponty once more, another characteristic of us as living embodied beings is the fact that we are moving beings (as the body's main characteristic is movement) and we think and live in an environment. The mind and body are not separated or parallel to the world. Our existence is one within and intimately tied to that of the world. Because of this, space is one of the coordinates that relates to our living. We always move in space, and, therefore, so does our thinking. Because of our bodily experience, our minds and thinking are also shaped in this likeness. Our thinking and understanding are impacted by our life within a body. The geometrical illustrations of Newton maybe won't trigger the VIP-F4 area and provoke any simulation, but they will speak to us intimately and relate to our spatial thinking. The text, as Ramus observed through his pedagogy, is harder to divide and arrange in space. It is a continuous, a flowing of ideas. Tables, figures, on the other hand, can be placed in space and allow us to think in that manner when encountering them. Geometry is not only making a simple figure to prove that a demonstration is correct. It is also a process of thinking and seeing.

Conclusion

The present investigation addressed the issue of the roles that images play in the context of a philosophical text, using examples from the early modern period when the printing press made printed images very accessible for authors, publishers, and readers. This greater access meant that philosophers who published in this period gained more possibilities in terms of thinking and formatting their text. The philosophical information shared but also their own particular way of thinking about philosophical issues could shape how images were created and employed in the context of a book. A philosophical theory didn't rely only on text to communicate its information, but images became part of this tool, effectively shaping how thinking and knowledge were made, transmitted, and understood.

By challenging the view that images can only have decorative and mnemonic roles for a philosophical text, acting as auxiliaries that can be left out, the thesis argued that images are an integral part of the philosophical text. Following the analysis of Merleau-Ponty of art and images, it was posited that the prints in question give rise to a type of knowledge that is not attainable via text alone. They engage with us on a bodily level that relates to our lived experience. Through the visual figurative stimulation of the brain area VIP-F4, when we look at an object or human figure, we mirror ourselves within that representation and this activates a recalling or simulation of a specific act. Just as in Descartes' tennis player, we don't just see a tennis player, but we become it. Our embodied experience relates to him (us) hitting the ball and we gain a lived understanding of the law of motion explained in the text.

The three chapters, therefore, covered the necessary aspects to show that images can be an integral part of a philosophical theory and not just an auxiliary. The first chapter showed that, as a result of the developments of the early modern period, such as the technological and philosophical advancements, created the right environment for images to be employed by philosophers in their published books which, in a way, experimented with how images can be used in a text. The historical context outlined functioned as the foundation for the analysis of the thesis, as it provides the basis for why such an investigation makes sense.

The second chapter picks up on that and gives a detailed look at Hobbes, Descartes, and Newton, the most influential figures that impacted philosophy in this part of Europe, discussing both images and how they fit into their philosophical conception. Hobbes' reliance on a heavy

allegorical frontispiece for the Leviathan, it is argued, shows that the frontispiece sums up and expresses whatever the text can't. In a sense, it gives reality to the monster, it makes it tangible. Descartes' woodcuts, done in close collaboration with the mathematician and artist Van Schooten, are proof that the senses are not all-deceiving, as *Meditations* seem to suggest. Instead, the problem of dualism and the rejection of the senses appears more nuanced, influenced by Descartes' own interest and conception of images and the working of vision. His later texts are meant to engage the reader beyond the words of the book. Images play an integral part in how the ideas are to be read and understood. The in-text image-use fashioned by Descartes are also employed by Newton, although he openly criticized Cartesianism for its reliance on hypotheses and not so much on experiments. Despite the higher degree of abstraction of the illustrations used by Newton, as they are made up of vectors and geometric shapes only, they still retain some of the features of their predecessors. Perhaps, images are too useful to be simply discarded, Cartesian or not. This infatuation with images and knowledge is also seen in the way the student Johannes Knotter employs them in his notebook. Drawings and prints are inserted or pasted into his notes, serving a multitude of purposes: mnemonic, decorative, and epistemological. Some of the same images are repeated in the notebook with great insistence, Knotter drawing them but also pasting them in print, although the object of the representation was the same. This further proves that the mentality of the time, even that of a philosophy student, was favorable towards images.

Lastly, the third chapter looks at the matter, from the prism of the given examples, through a contemporary point of view informed by reading comprehension studies, phenomenology, embodied cognition, and neuroscience. The conception of images supporting devices for readers is affirmed through the experiments conducted by the theorists of reading comprehension with children. They illustrate convincingly that images facilitate the understanding of a text by mediating the formation of mental imagery, which in turn helps the reader place in time and space the information but also remember it effectively. However, it is argued that this is not the sole role of images, especially in the case of images within a philosophical text. Following the assumptions of embodied cognition, namely that cognition happens in the body as well, the neuroscience behind this involvement is discussed through the parietofrontal brain area VIP-F4 and the activity of mirror neurons (MN). Even the fact that images are able to mediate our understanding shows that they engage, on a subtle level, our cognition and comprehension. This engagement, it is argued by embodied theories, also uses our embodied experience to make sense of things and, ultimately,

think. Images don't make sense to us just because they are some figures on a piece of paper. They speak to us because we can make sense of them via our bodies through processes like that of mirroring, believed to play a big role in empathy, sympathy, and simulation. The figurative images from the examples are especially relatable to us because of that. Merleau-Ponty's account of art and images complete this discussion by looking at *why* images are desirable when dealing with knowledge. By positing that indeed our perception and interaction with art and images are shaped and mediated by our lived and bodily experience, Merleau-Ponty sees images as an expression and not an imitation. They are as such because they can give rise to something that cannot be seen in any other way and speaks to us through a lived experience that's rooted in our bodies. In other words, whatever the image gives rise to, the same thing cannot be done by a text in the same way.

Images are not just decorum, or some training wheels. They are inherent and valuable elements that participate in the whole that a philosophical theory is. They have an active role in our knowledge acquisition and give rise to a different type of understanding, a bodily one. Although this thesis chose to look at the seventeenth century in a centre of book publishing, because this image boom facilitated some of the most illustrative examples, these same questions can be applied to any other period of the history of philosophy. The limitations of this research lie, of course, in its rather restricted scope and survey. By looking at just some of the examples available, it was possible only to show that images may be employed in such a way to take part in the philosophical thinking of an author. This result will, hopefully, make us reconsider the role that images may have within philosophy as a process of knowledge-making. The relevance of this study lies in its approach towards this aspect of philosophy, as there is a tendency to ignore Descartes' woodcuts when his work is discussed, although they are part of the work just as the text is. Moreover, it also poses a challenging question for philosophy and thinking itself, as Merleau-Ponty himself admitted the problem of images to be a difficult one. However, as we increasingly live in a world dominated by images that sometimes become knowledge-makers, it is imperative for philosophy to consider this aspect not only as a phenomenon outside its walls but also within them. Hopefully, this research will be a starting point for more inquiries into this topic of philosophy and science, either in the form of articles or even a PhD.

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Figure 35. Drawing from Knotter, Mine, Van Eynatten. *Collegedictaten Van Eynatten en La Mine*, 1683-1684, Leuven, inv. No. BPL 3017-3018. Notice the visual similarities.Image via personal archive.

Figure 36. F. van Schooten, in R. Descartes, *Principiorum Philosophiae*, Johannem Jansonium, 1666, Amsterdam, Special Collections Leiden University, image via personal archive.

Figure 37. Page from Isaac Newton's *Philosophiae Naturalis Principia Mathematica*, 1687, London, J. Streater. Image via: Philosophiae Naturalis Principia Mathematica Marriott Library (utah.edu)

Figure 38. From I. Newton, *Philosophiae Naturalis Principia Mathematica,* 1714, edition ultima, Amsterdam, Sumptibus Societatis. Special Collections Leiden. Image from personal archive.

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