The Serious Naturalist and the Frivolous Collector: Convergent and Divergent Approaches to Nature in *D'Amboinsche Rariteitkamer*

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Abstract

The traditional literature on *D'Amboinsche Rariteitkamer* depicts a difference between the editor of the text and images, Simon Schijnvoet (1652-1727), and the original author, Georg Everhard Rumphius (1627-1702). Schijnvoet was seen as the 'frivolous collector' who did not understand the motives of the original author, whereas Rumphius was seen as the 'serious naturalist' and biologist *avant la lettre*, whose work predated Linnaeus. This paper re-evaluates these contrasting views by placing both men against a broader background of a 'scientific culture' and 'knowledge production', that was in part informed by the practice of collecting. By discussing their views on the classification of specimens, the formation of specific stones, and the locality of fossilised shells, questions emerge about Rumphius's modernity and Schijnvoet's alleged indifference. Even though their opinions often diverged, it will be shown that the motives and interests of the two men were not that different.

Keywords: natural history, history of collections, empiricism, astrology, taxonomy, conchology, mineralogy

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This issue of *Early Modern Low Countries* is in part dedicated to the work of Georg Everhard Rumphius (1627-1702). This article will not take his writings as a point of departure, but those of the annotator and editor of the *D'Amboinsche Rariteitkamer*, Simon Schijnvoet (1652-1727). By emphasising Schijnvoet's additions to Rumphius's text and images, I aim to revise the present historiography on the role and place of Schijnvoet, as well as that of Rumphius, and to adjust preconceived ideas of 'the naturalist' and 'the collector' in early modern knowledge creation. In the past, Schijnvoet's additions have been severely criticised by authors like Montague Beekman, Peter Dance, and Ernst Ullman. They depict two very different men, characterising Schijnvoet as a frivolous collector who did not understand the motives of the original author, and Rumphius as the sincere biologist *avant la lettre*, who paid significant attention to the biotopes of living animals, and whose classifying work predated Linnaeus. Beekman even apologises for including Schijnvoet's remarks in his lucid translation, stating that 'no matter how irritating or irrelevant', he had to include them because they had become an integral part of the text. Peter Dance, in his *History of Shell Collecting*, asserts that Schijnvoet, 'to his lasting discredit', added numerous irrelevant details and unnecessary figures. Similarly, Ernst Ullman, in his monograph on Maria Sibylla Merian, argues that the annotator misunderstood Rumphius's motives, who 'was not out to present collectors' pieces, as was Schynvoet, but to describe the fauna of a country'.[1]

These statements spring from a traditional attitude towards the history of science that is focused on proclaiming 'heroes of science', as well as an outmoded and superseded view on the practice of collecting. Rumphius is seen as playing a leading role: a herald who

1 Rumphius, *Ambonese Curiosity Cabinet*, xc, cxii; Dance, *Shell Collecting*, 31, 54; Ullmann, *Leningrader Aquarelle*, ii, 284. I previously made this point in Van de Roemer, 'Neat Nature', 70-73. For a more nuanced view, see Buijze, *Leven en werk van Georg Everhard Rumphius*. The current article can be seen as an elaboration of this statement. I would like to thank Kay Etheridge, Robin Schepers, and Dutton Hauhart for their help and valuable comments.

worked autonomously and independently his whole life.[2] In opposition, Schijnvoet is seen as someone in the wings, as the ignorant and deceitful collector. However, over the past few decades many studies have shown that early modern knowledge production was more complex. New developments in the history of science and other subdivisions like book history, art history, and the history of collections, contested these views. The autonomous development of the modern sciences is replaced by the idea of a broad movement comprising a diversity of cultural practices generating different sorts of knowledge. These practices were firmly imbedded in an intricate network of social, political, and economic endeavours and motives that were not only confined to lonely study rooms, but also took place in crowded workshops, markets, print shops, artist studios, and cabinets of curiosities.[3] How these cabinets of curiosities contributed to the development of the modern sciences is still a matter for debate, but most scholars agree that they formed important junctions for knowledge transfer and sociability.[4] Comparably, recent studies in book history see publications as not predominantly the voice of one author, but as the outcome of a complex web of motives, wishes, practices, and possibilities of authors, publishers, printers, artists, commissioners, benefactors, and audiences. The materialisation of *D'Amboinsche Rariteitkamer* serves as a good example.[5]

The book itself can be seen as a multifaceted aggregate of knowledge, where colonial cognition in the East coincides with European cultures of collecting and where old traditional knowledge alternates fluidly with local as well as European approaches to nature. Maria-Theresia Leuker has presented a more subtle and nuanced account of Rumphius's book to stress its complexity as a 'medium of knowledge transfer'. She emphasises that knowledge production was not solely localised in Europe, but also in a 'third space' formed by the circulation of knowledge between actors in the two continents, a space where hybrid forms of knowledge were shaped.[6] Leuker distinguishes three 'knowledge bases' used in Rumphius's text: empirical observation, Moluccan local knowledge, and European book wisdom. But maybe we can specify the 'empirical observation' more, and see – apart from observations in nature – the knowledge engendered in the cabinets of curiosities by handling and processing the *naturalia* also as a specific knowledge domain in its own. It presupposes an overlapping space that includes Rumphius's experiences in his cabinet in Ambon as well as those of Schijnvoet in his cabinet in Amsterdam. Sadly, little is known

2 Theunissen and Hakfoort (eds.), *Newtons God.*

3 For overviews of recent developments in the history of science, see Jardine and Spary, 'Natures of cultural history'; Jardine and Spary, 'Worlds of history'; Smith, 'Science on the Move'. For the relationship between the sciences and the arts in Dutch context, see Jorink and Ramakers, 'Undivided Territory'.

4 MacGregor, *Curiosity*; Te Heesen and Spary, *Sammeln als Wissen*; Marx and Rehberg (eds.), *Sammeln als Institution*; Daston and Park, *Wonders and the Order of Nature*, 265-276.

5 For an elaborate description of the book's publication history, see Rumphius, *Ambonese Curiosity Cabinet*, lxxxvii-civ; Buijze, *Leven en werk van Georg Everhard Rumphius*, 173-183. On book history in general, see Johns, *Nature of the Book*; Frasca Spada and Jardine, *Books and the Sciences*. The book's complex publication history is comparable with that of Maria Sibylla Merian's *Metamorphosis insectorum Surinamensium*, also published in 1705. In her letters, Merian compared the production of her own book with that of Rumphius: see Mulder and Van Delft (eds.), *Maria Sibylla Merian*, 40-48. Another important and slightly later publication is Alberta Seba's *Locupletissimi rerum naturalium thesauri*: see Margócsy, *Commercial Visions*, ch. 3.

6 Leuker, 'Wonder en Weten', 116.

about the actual cabinet of Rumphius, but that his collection was an important catalyst for his natural-historical research is evident.[7] The book title explicitly refers to a cabinet of curiosities, and in his preface Rumphius states that his book was written with an eye on the European enthusiasts and connoisseurs (*liefhebbers* and *kenneren*). He hopes that his work will help to resolve the confusion in naming among collectors in Europe and Asia.[8] He does not present the descriptions of the biotopes as an end in itself, but as places where the 'rarities' are 'found' and subsequently meticulously 'collected' and 'kept' with 'great effort and expense'. Collectors like Rumphius often stress the labour-intensive nature of keeping a cabinet, and how they gained knowledge of their *naturalia* through the continuous processing of their precious collectables. This is underlined by the chapter Rumphius added entitled 'How One Should Gather and Clean Shells', which Peter Dance incorrectly suggested was written by Schijnvoet because 'Rumphius was not a man to waste precious hours rubbing shells thill they shone'.[9] But it is Rumphius who advises the collector to catch shells at night and to kill the animal swiftly to prevent the shell from fading, which brushes to use to polish them, and how to send them to others. He emphasises it is a general misconception that shells are just gathered effortlessly. In their cabinets, the practices and interests of Schijnvoet and Rumphius certainly found a common ground, which enables us to get a more nuanced view of the constructed and exaggerated divide created in traditional historiography. Even in Leuker's subtle studies a dichotomy emerges between the 'scientific ambition' of the author and the interests of collectors, 'who generally preferred to behold rather than analyse their objects'.[10] This might be true in general, but in this article, I will follow another lead. Instead of pulling Rumphius and Schijnvoet apart, I will see them as different actors in a joint endeavour of 'knowledge production' operating in the same 'scientific culture' where collections formed a point of reference. This approach raises important questions about the modernity of Rumphius and the alleged indifference of Schijnvoet. I will show that their motives were not as divergent as previous historians have described.

Although some differences between Rumphius and Schijnvoet are certainly noticeable, they do not concern their presumed respective statuses as naturalist and collector. Rather, there were some distinct contextual differences between the two men, which helps to explain why their opinions did not entirely concur. First, the social and educational background of the men differed. Schijnvoet was a self-made man who started his career as a saddle maker in The Hague and eventually rose to the highest official strata of the city government of Amsterdam.[11] He probably did not read Latin, but educated himself in a variety of fields, like natural history and classicist garden architecture. Rumphius had some education – he went to the gymnasium in Hanau – and read Latin, and was certainly more

7 For Rumphius's cabinet, see Buijze, *Leven en werk van Georg Everhard Rumphius*, 112-113; for Schijnvoet's cabinet, see Van de Roemer, 'Neat Nature'.

8 Rumphius, *D'Amboinsche Rariteitkamer*, 'Den Edelen Achtbaren Heere, den Heere Hendrik D'Acquet'. See also Leuker, 'Knowledge Transfer', 163.

9 Rumphius, *D'Amboinsche Rariteitkamer*, 163-166; Dance, *Shell Collecting*, 54.

10 Leuker, 'Knowledge Transfer', 145, 162-163.

11 Van de Roemer, 'Neat Nature', 55.

familiar with classical texts and traditional knowledge.[12] His texts on natural history show a profound knowledge of Pliny and Aristotle.[13] Furthermore, both men evidently operated in different geographical and social contexts: Schijnvoet was active as a cultural figure in Amsterdam and operated at the centre of a vast network of collectors, naturalists, merchants, publishers, and magistrates, whereas Rumphius was a merchant and naturalist on a remote island in the East Indies inhabited by diverse ethnic groups and surrounded by fascinating nature. He had comparatively limited access to written information, and thus to those new insights that developed in Europe.[14] Third, it is important to note that Schijnvoet belonged to another generation than Rumphius: he was twenty-five years younger. In a century where different views on and approaches to nature followed each other rapidly and coexisted at the same time, this might be of some importance.[15] The changes that occurred in this period have been studied in a Dutch context by Eric Jorink: focusing on the metaphor of the Book of Nature, he shows how in the course of the seventeenth century older textual based knowledge gradually made way for a focus on the 'admiration for the order, structure and diversity of creation' and 'emphasis on the underlying structure of God's creation'.[16] This concurred with a growing emphasis on physico-theological discourse that coupled new findings and descriptions in natural history with awe and praise for the Creator.[17] In what follows, I will show that the above-mentioned differences become manifest in some places in *D'Amboinsche Rariteitkamer*. More systematic research is required, but I will confine myself here to three significant instances where a comparison between the two men is most applicable: the way they observed and classified their specimens, their opinions on how specific stones were formed, and their views on the locality of fossilised shells. I will argue that the constructed images of the 'serious naturalist' and 'frivolous collector' are in need of a re-evaluation and are indeed sometimes even interchangeable.

Classifying and Counting

Schijnvoet's involvement with the *Rariteitkamer* is often underestimated, misinterpreted, or even neglected. But it could be argued that without him the book would never have seen the light. After Rumphius's death, the manuscript of *D'Amboinsche Rariteitkamer* came into the possession of the Delft burgomaster Hendrik d'Acquet (1632-1706), who asked the Amsterdam publisher François Halma (1653-1722) to publish it. Halma then asked the civil servant Schijnvoet to edit the book and to retrospectively provide images where the manuscript explicitly lacked them. The versatile and cultured Schijnvoet had a reputation

12 Buijze, *Leven en werk van Georg Everhard Rumphius*, 1-20; Runmphius, *Ambonese Curiosity Cabinet*, xl-xliii.

13 Leuker, 'Buch der Natur'.

14 Rumphius tried to compile a library in Ambon and send orders to the Dutch Republic, but access was still limited compared to Amsterdam. For more on Rumphius's library, see Buijze, *Rumphius' bibliotheek*.

15 Compare Ogilvie, *Science of Describing*, 29.

16 Jorink, *Book of Nature*, 418-419.

17 Vermij, *Secularisering en natuurwetenschap*.

as a great connoisseur of *naturalia*, especially shells. He scrutinised the Dutch cabinets of curiosities, like those of Nicolaas Witsen, Frederik Ruysch, and Levinus Vincent, searching for specimens of crustacea, shells, stones, minerals, and fossils that corresponded with those described by Rumphius, and had illustrations made accordingly. In his own words, he added some three hundred objects from his own collection.[18] Sometimes he added illustrations of additional specimens not described by Rumphius to please the *liefhebber* (enthusiast), something that discredited him in the eyes of later authors.[19] Schijnvoet's contemporaries were much more enthusiastic about his editing work than later authors allow. The German patrician Zacharias Conrad von Uffenbach, who visited Schijnvoet in Amsterdam in 1711, considered his involvement with *D'Amboinsche Rariteitkamer* as proof of his great knowledge of natural history – especially of conchology – and he expressed nothing but praise for the systematic and elegant order of his collection.[20] Furthermore, Schijnvoet was not 'casting doubt on the authorship' of the book, as has recently been argued.[21] On the contrary, his operating procedure can be seen as meticulous and reliable, especially by early eighteenth-century standards. His textual additions were printed in another font, below the texts of Rumphius, leaving no doubt about what was written by whom. His comments consist mainly of dry enumerations of names and remarks about the provenance of the specimens depicted in the book, while on several occasions he voices his respect for the author.[22] Often he reports if Rumphius had sent drawings from Ambon, or whether he had found specimens in Dutch collections to depict; in the latter case, he specified the owner of the cabinet. In general, he makes a distinction in the prints between drawings sent by Rumphius and drawings he commissioned himself by indicating them with letters and numbers. This might well be seen as a reliable way of making things verifiable.

In their research concerning shells, Schijnvoet and Rumphius operate in a similar mode when examining their material: observing and classifying their specimens in families and groups based on the empirical analysis of their outer shapes and discerned similarities and differences in form, colour, and pattern. The conclusions they reach while following this procedure exhibit small differences.[23] For the most part, the editor follows the divisions laid down by the author, but in three instances he chooses not to follow Rumphius's taxonomical insights.[24] For instance, Rumphius counts the *Cassis pennata*

18 Uffenbach, *Merkwürdige Reisen*, III, 670. The word used is 'beschrieben' (to describe). Schijnvoet was probably talking about the illustrations, as he does not 'describe' the specimens.

19 See, for example, Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 160-161. Schijnvoet also added some shells depicted by the artist Wenceslas Hollar (1607-1677): Leonhard and Leuker, 'Hollar's Shells'; Moolenbeek and Pieters, 'Rare schelpen'.

20 Uffenbach, *Merkwürdige Reisen*, III, 670.

21 Margócsy, *Commercial Visions*, 3.

22 For example, Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 133, 160-161.

23 This mode of classification is more present in the book's section on shells, which according to Rumphius must be regarded as the primary part of the book: Rumphius, *D'Amboinsche Rariteitkamer*, 'Opdragt', fol. *4v.

24 Rumphius described 151 families and 339 species, of which only 20 families and 157 species had previously been reported. He divided the shells into three orders (univalves spiralled, univalves not spiralled, and bivalves) containing twelve, two, and eight families, respectively. On Rumphius's contribution to malacology, see Rumphius, *Ambonese Curiosity Cabinet*, XCVIII-XCIX; Dance, *Shell Collecting*, 27; Martens, 'Die Mollusken'. For more on early modern shell collections in general, see Spary, 'Scientific Symmetries'; Dietz, 'Mobile objects'.

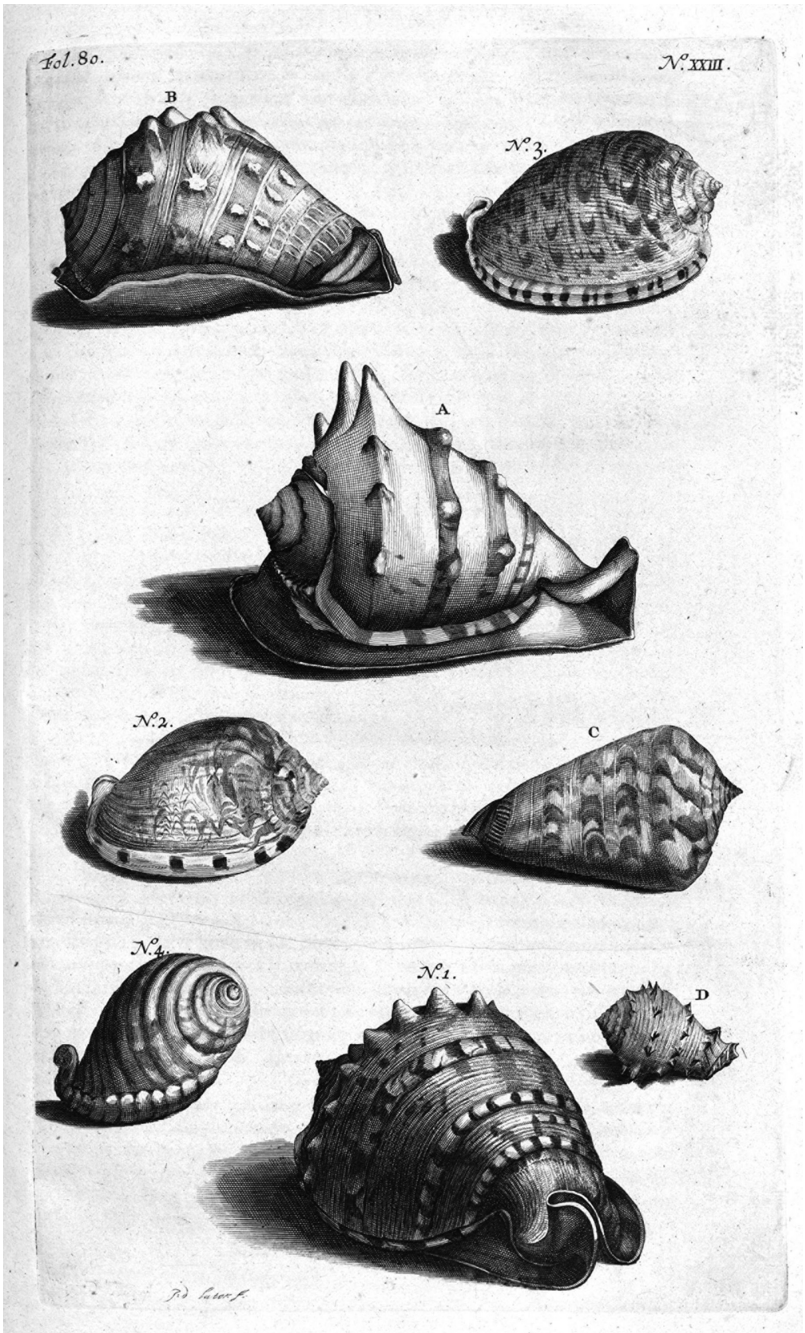

Fig. 1 Jacob de Later, Eight shells*, engraving, 3,17 × 1,92 cm, in: G.E. Rumphius,* D'Amboinsche Rariteitkamer, *Amsterdam 1705, opposite p. 80, Niedersächsische Staats- und Universitätsbibliothek Göttingen.*

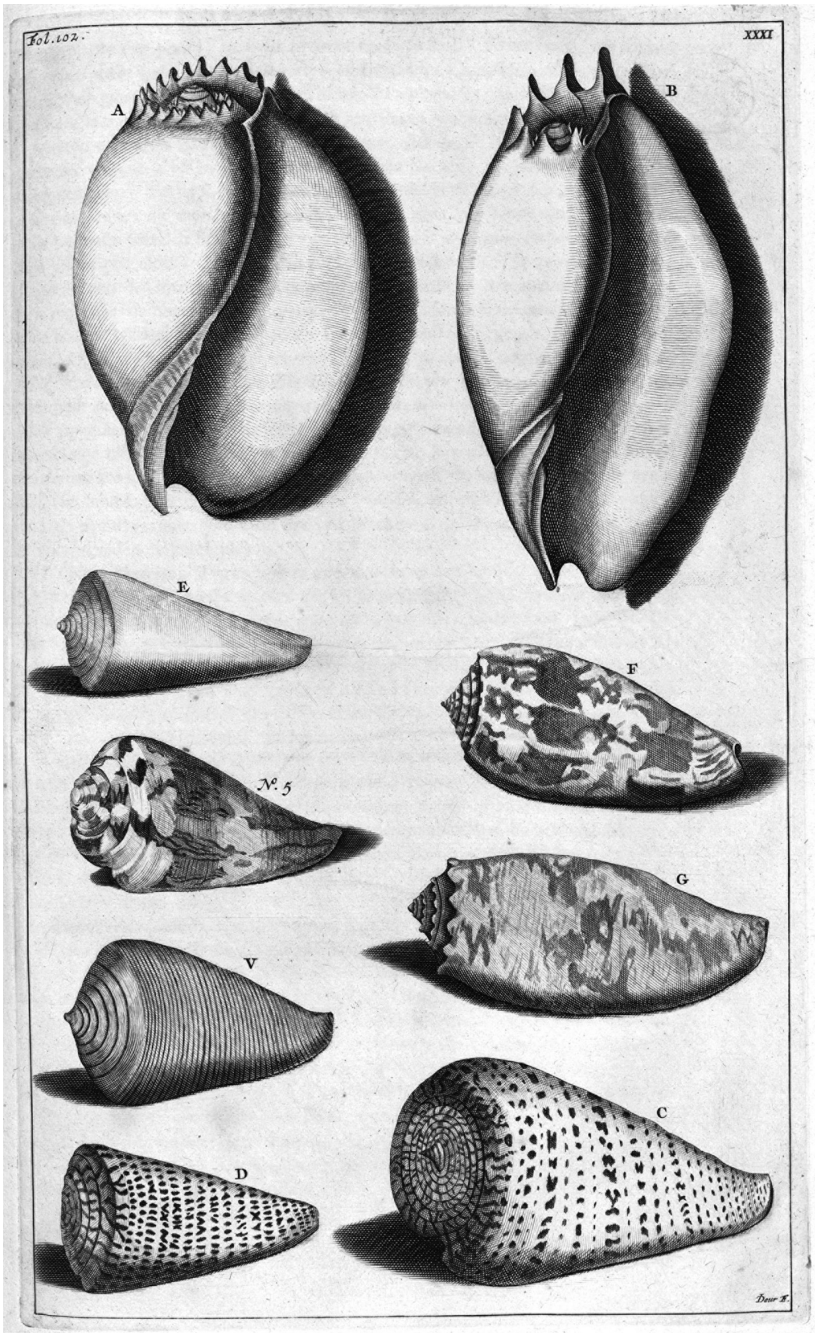

Fig. 2 Anonymous, Nine shells, *engraving, 3,17 × 1,91 cm, in: G.E. Rumphius,* D'Amboinsche Rariteitkamer, *Amsterdam 1705, opposite p. 102, Niedersächsische Staats- und Universitätsbibliothek Göttingen.*

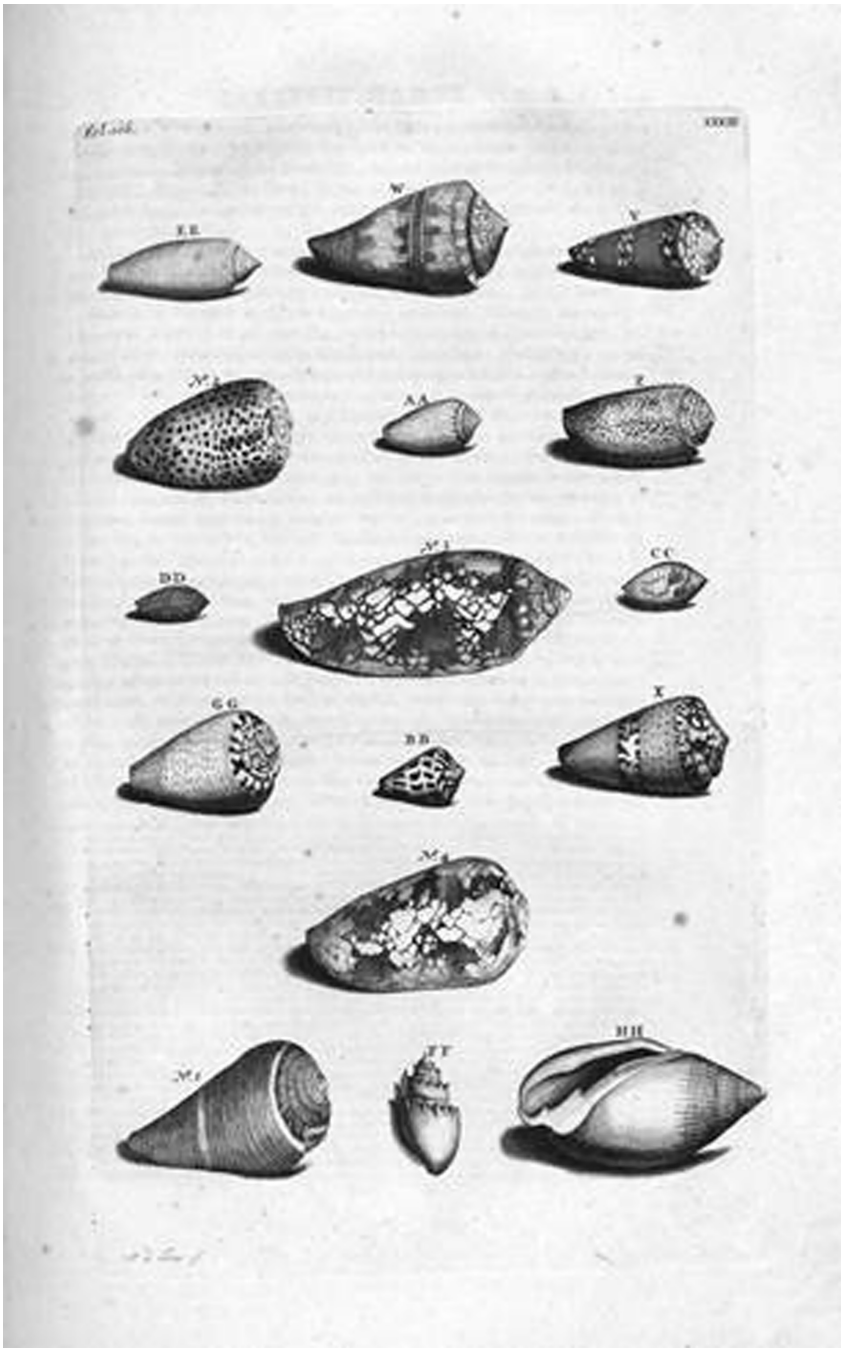

Fig. 3 Jacob de Later, Sixteen shells, *engraving, 3,20 × 1,94 cm, in: G.E. Rumphius,* D'Amboinsche Rariteitkamer, *Amsterdam 1705, opposite p. 106. Niedersächsische Staat- und Universitätsbibliothek Göttingen.*

among the fourth family of the first order, the *Cassidae*, or *Stormhoeden*, but in a footnote Schijnvoet declares that this specimen actually belongs to the eighth family of *Volutae*, or *Tooten*. However, he states that he will not depart from the author's classification and depicts them among the other *Cassidae* (fig. 1, letter C).[25] Also, in the chapter concerning *Volutae*, or *Tooten,* Schijnvoet airs a different opinion. The top of the first plate of several specimens of this genus shows the large *Kroontepelbak*, or *Kroonhoorn* (*Melo aethiopcia*; fig. 2, letters A and B).[26] Schijnvoet notices that this shell is too large and the mouth is too wide to be a *Toot*, and places it instead among the *Bakken*. Also, on a third print with *Tooten*, there are two species that do not belong there according to the annotator, the *Rivier Pausekroon* and the *Midas oor* (*Thiara amarula* and *Ellobium aurismidae*; fig. 3, letters FF and HH).[27]

Both men had a keen interest in the empirically discernible characteristics of the specimens, but in some passages in the book there seem to be differences in how these observations were framed. These differences can be related to the above-mentioned generation gap and a gradually stronger predisposition for the underlying order and structure in nature during the course of the seventeenth century. A first small indication of this is the discussion of the well-known chambered nautilus (*Nautilus pompilius*). Schijnvoet fully justifies his decision to replace the drawing sent by Rumphius with a better specimen from Holland, as he cut the shell into two halves to reveal its inner structure. Where Rumphius only mentions 'innumerable little chambers', Schijnvoet tried to count them, emphasising that it was a 'wondrous creation', and concluding that there might be fifty. There could be even more, he states, because the partitions are so small that you can hardly see them.[28] In an album kept at the Royal Library in The Hague, which contains the larger part of the original drawings from Ambon and the additional drawings made in Holland, the two drawings sent by Rumphius are combined with the drawing Schijnvoet had made (fig. 4, the larger drawing in the middle was commissioned by Schijnvoet). Indeed, the drawing of the outer shell on top does not correspond with the one reproduced in the printed book. In the middle we see the drawing of the cut shell, showing its chambers. Even though Schijnvoet stresses the difficulty of depicting its structure in a reliable way – 'as well as the engraver could get it' – his enumeration of fifty chambers seems plausible.

This urge to elucidate nature's structure becomes even more evident in Rumphius's chapter on crustacea and several echinoderms. The chapter deals with the *Caput medusa*, now known as the *Gorgonocephalus caput medusa*, a species of marine basket star. In line with the physico-theological discourse, Schijnvoet expresses his amazement regarding the structure of the creature and its Creator: 'Among all the Creatures I have encountered, this must be the most amazing; it is an animal that should amaze the careful observer and

25 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 81. Martens notes that the shell depicted here is a younger form of the one depicted by the letter B *Cassis rubra* (current name *Cassis rufa L.*), and that Rumphius was correct. This was confirmed by specialist Robin Schepers: see Martens, 'Die Molusken', 115.

26 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 107.

27 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 108.

28 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 61.

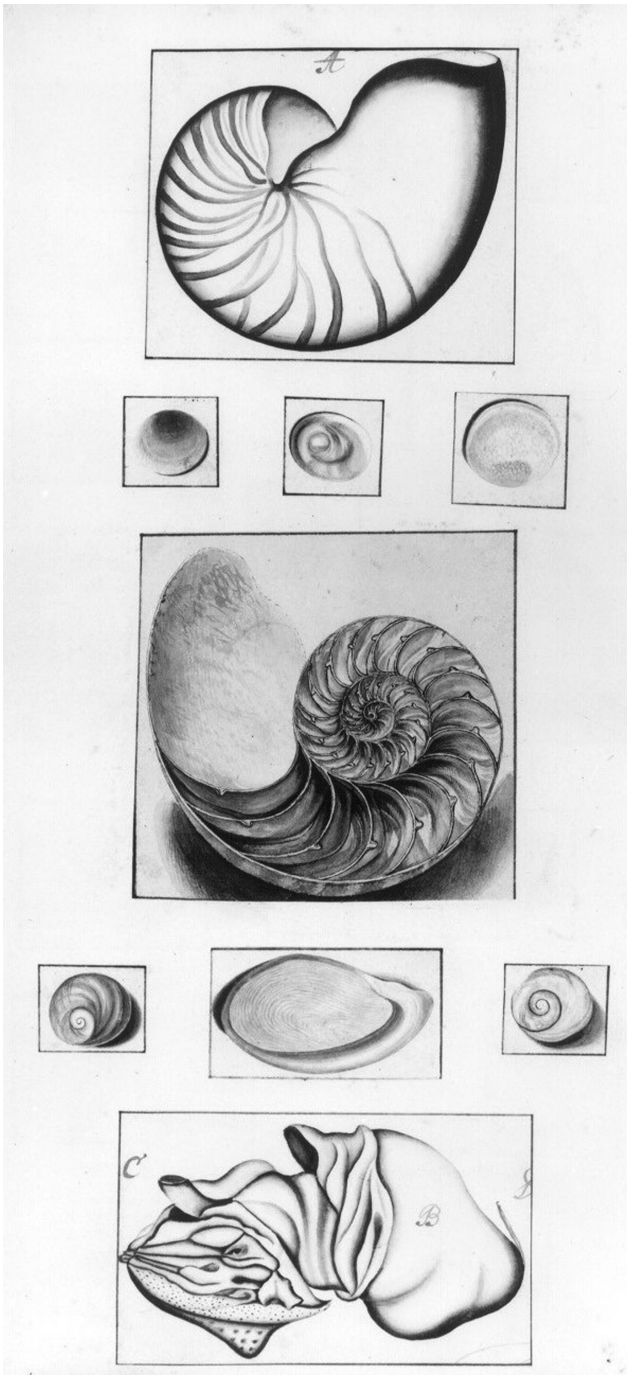

Fig. 4 Anonymous, Nautilus shell, cross-section nautilus shell, nautilus, and shells, *washed drawing, 39,5 × 24,5 cm, in:* Dessins originaux des raretés d'Amboine par G.E. Rumphius, *Koninklijke Bibliotheek, The Hague, MS 68 A 3, fol. 8.*

make him say: Lord, how wondrous is your creation!'[29] He explains that Rumphius did not send a drawing of the animal because it is very difficult to depict, but he received a specimen from the cabinet of the Delft burgomaster Hendrik d'Acquet and had it depicted 'as much as feasible' (fig. 5). To describe the animal properly, he starts counting again. The animal consists of five branches that each split into two new ones and so on, exponentially. He counted the far ends of one branch and came to a total of 512. This leads to a total of 2560 ends, meaning that the animal consists of 5115 branches. Each branch has between ten and twenty-four articulations, with an average number of sixteen. This means that the whole animal consists of 81840 articulations. 'And this is only the small *Caput medusa*', he adds with apparent surprise. In comparison, Rumphius's discussion of the animal is more imbedded in a classical and textual tradition, and in an emotional response of wonder that is connected to fear instead of amazement and veneration. He calls the starfish a 'monstrous Sea animal […] dreadful to behold', a remark that reflects its association with the mythological Medusa head after which it was named. He also recounts how seamen haul it up with their anchors but are afraid to remove the 'fearful animal' and how they are amazed if they see an old sailor who dares to do it, and 'watch it sling its branches around his hands'.[30] Where Schijnvoet analytically unfolds the animal in praise of creation, Rumphius starts his discussion from a framework of ancient mythology to evoke wonder and fright.

Apart from a general development of naturalist predilections for the structure of nature in the seventeenth century, Schijnvoet's more mathematical outlook on nature might have been informed by practical matters. Besides his function as a civil servant, Schijnvoet was also known as a renowned designer of formal gardens and garden ornaments. He had trained himself thoroughly in classicist architectural theory, in which accurate measurement and proportion are basic principles. His autodidactic knowledge of mathematics and geometry was praised by contemporaries, and his garden designs for country estates of rich citizens of Amsterdam were well appreciated. Here he ordered nature according to clear mathematical laws in well-structured proportions. Also, the way he displayed the *naturalia* in the prints for Rumphius's book shows an emphasis on a geometrical and symmetrical approach to the study of nature. As an image editor, he was without doubt responsible for the overall design of the prints. Each of the prints with shells and minerals displays strict geometrical composition and an almost compulsive use of bilateral symmetry. The same process can be observed in the way he ordered objects in his cabinet. Around 1700, a mathematical and geometrical presentation of objects focused on the overall structure, and it became customary to pay close attention to the relative proportions of objects when arranging cabinets of curiosities. Schijnvoet certainly followed this trend, if not set it.[31] No doubt his endeavours as garden designer, image editor, and collector interacted with his understanding of nature as a mathematically wrought construct.

29 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 42; translated in Rumphius, *Ambonese Curiosity Cabinet*, 71.

30 Rumphius, *D'Amboinsche Rariteitkamer*, 41-42; translated in Rumphius, *Ambonese Curiosity Cabinet*, 70.

31 Jorink, *Book of Nature*, ch. 5; Spary, 'Scientific Symmetries'; Van de Roemer, 'Neat Nature', 47-84.

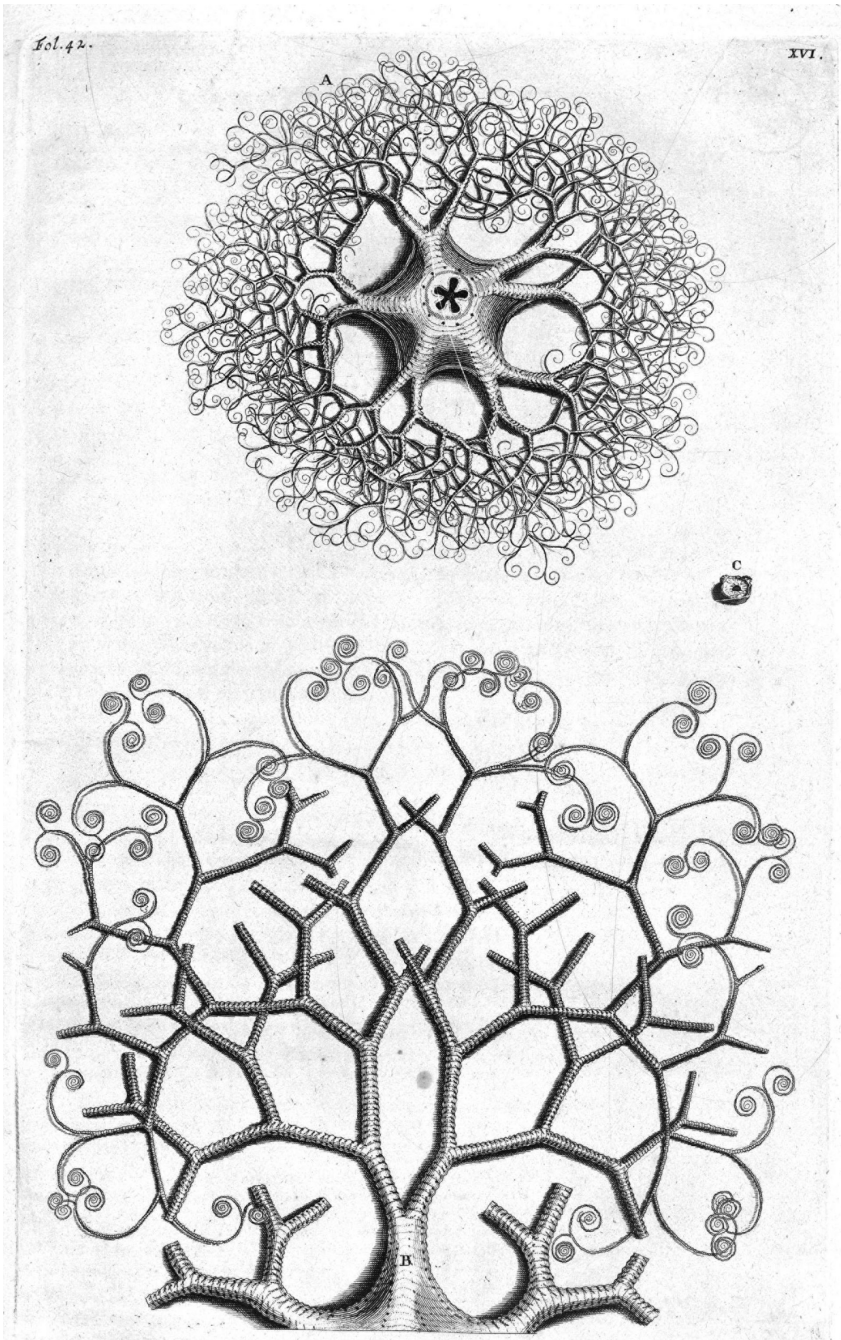

Fig. 5 Jacob de Later, A basket starfish with details, *engraving, 31,9 × 20,0 cm, in: G.E. Rumphius,* D'Amboinsche Rariteitkamer, *opposite p. 42, Amsterdam 1705, Niedersächsische Staats- und Universitätsbibliothek Göttingen.*

The Influence of the Planets

The opinions of Rumphius and Schijnvoet diverge further in their discussions of minerals, stones, and fossils. In chapters eight and nine of the third part of *D'Amboinsche Rariteitkamer*, Rumphius discusses the so-called thunderstones and thunder shovels.[32] The print compiled by Schijnvoet to accompany these chapters shows four objects provided by Rumphius and seven from Schijnvoet's own mineral cabinet (fig. 6). The editor took great care to clarify the origins of the depictions: Rumphius's stones were marked with letters, his own additions with numbers. We can recognise a combination of prehistoric weapons and tools and fossils (*belemnites* and *echinoids*). However, in the days of Schijnvoet and Rumphius these diverse groups of objects were considered by many to belong to one category: stones that were formed by lightning.[33] Rumphius divides them into two groups – thunderstones that consist of stony matter and thunder shovels that contain metal – and asserts that many of these are found in the Indies. He reports about twenty-four cases, some from his own experience, some from book knowledge, but the majority deriving from the unconfirmed reports of Moluccan, Chinese, and European informants. As Leuker argues, it is a list of disparate information that is neither Asian nor European, and could be seen as a hybrid form of knowledge production taking place in a third space between the two continents.[34]

In all its diversity, the list also illustrates Rumphius's inquisitive and experimental mind, because he conducted all kinds of tests to investigate the true nature of the stones, for example sprinkling them with vinegar, soaking them in water, and heating them wrapped in linen on hot coals. Likewise, Schijnvoet cut some stones in half to investigate their inner structure. He follows the account of the main author and extensively repeats this theory in his footnote, stating that it will remove the objections of those who have any doubts.[35] Both explain how tiny particles of earth or metal mingle with watery vapours in the ground and evaporate in the air. During a thunderstorm the powerful heat unleashed by lightning melts these particles together into a bigger lump. The stone thus formed is sent earthward with great force. But there is one minor deviation: Rumphius explicitly denies that thunderstones can also be produced when lightning strikes the earth, but according to Schijnvoet, this option is also possible. He explains that particles in the dirt melt together and form a more irregular and rougher stone, but still with the specific characteristics of thunderstones. He added an illustration of such a rougher, 'earthy' thunderstone to the print (fig. 6, no. 10).[36] When he split some of these stones crosswise and lengthwise, he noticed the radial organisation of the matter and attributed this to the swiftness of

32 Rumphius, *D'Amboinsche Rariteitkamer*, 207-217.

33 Some scholars in the seventeenth century, like Anselmus Boëtius de Boodt, Robert Plot, and Nehemiah Grew, suggested that thunderstones or *Ceraunia* were (petrified) tools from the past, but this was not yet generally accepted. See Goodrum, 'Thunderstones'; Blinkenberg, *Thunderweapon*.

34 Leuker, 'Wonder en Weten', 128-129.

35 Rumphius, *D'Amboinsche Rariteitkamer*, 210. Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 211. This passage is printed in a non-italic font while the rest of the long footnote appears in italics, which may suggest that Schijnvoet was quoting another source here.

36 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 212.

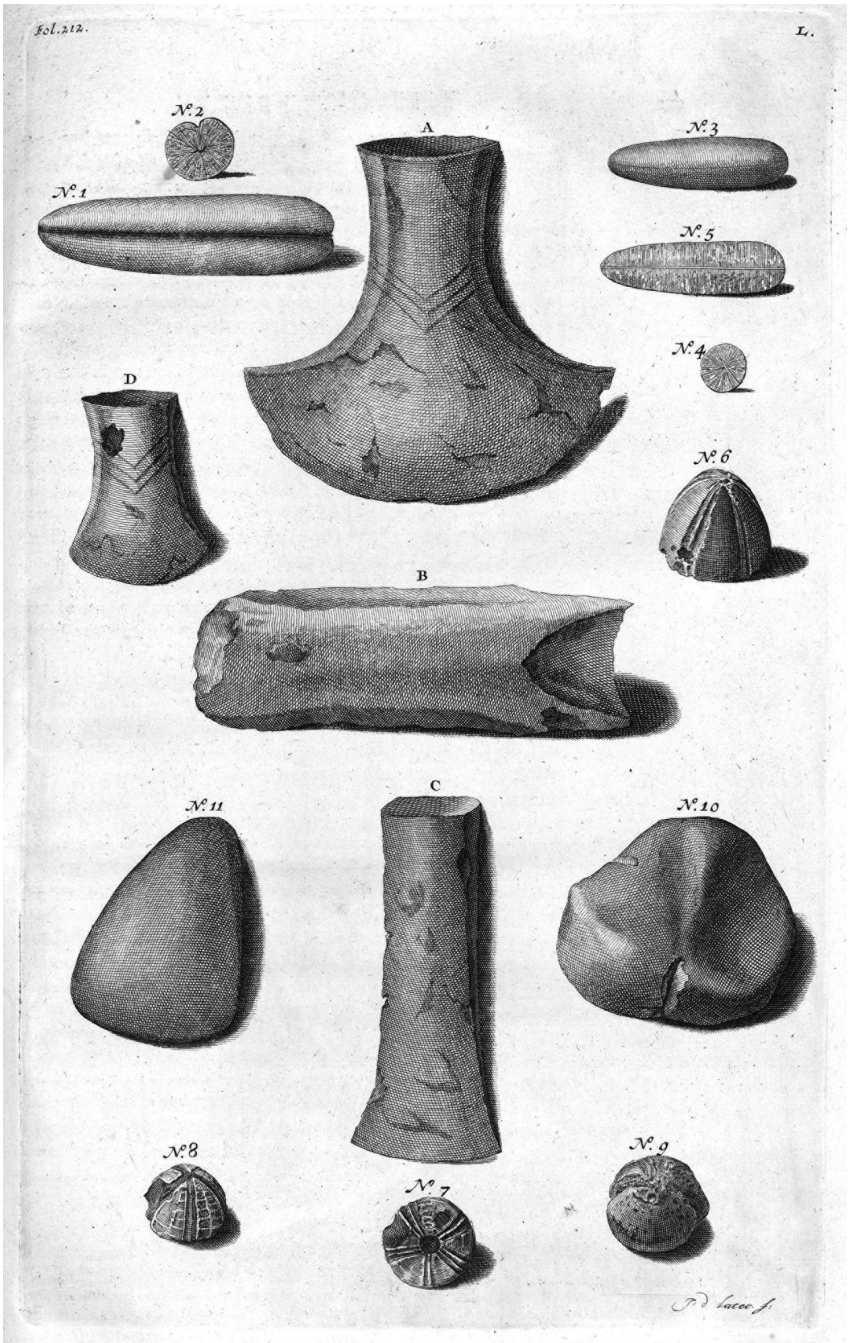

Fig. 6 Jacob de Later, Thunder stones, *engraving, 31,9 × 20,0 cm, in: G.E. Rumphius,* D'Amboinsche Rariteitkamer, *opposite p. 212, Amsterdam 1705, Niedersächsische Staats- und Universitätsbibliothek Göttingen.*

the process of melting and coagulation (fig. 6, nos. 2, 4, and 5). He states that 'through the force of which [this process] they are pounded into a hard material' and obtain 'such shapes and characteristics, as is permitted by the constraint of the particles and the mixture of material'.[37] Again the words of the Amsterdam collector convey a serious interest for the *naturalia* in his collection.

Remarkably, Schijnvoet does not comment on the author's noteworthy explanation of the special forms of thunderstones. Rumphius presents an elaborate explanation of this matter, which on the one hand shows the richness of ideas he could draw upon when thinking about nature's procedures, and on the other is at odds with his reputation as a harbinger of modern biology. He remarks that thunderstones come in different forms, but always seem to have the shape of 'an Instrument that can strike or wound, such as hammer, axe, chisel, arrows, gouge, etc.'[38] First, he recounts the superstition of the locals, who believed the stones to be the teeth of a giant bull that rides through the sky during a storm.[39] For his own explanation, he harks back to older notions of the influences of the planets:

> The reason that it always has the shape of a striking Instrument, must be ascribed to the hidden quality of a Martial spirit: Because *secretiori Philosophia & Magia naturali* teaches us, that all Natural bodies are generated, after particular concepts have incorporated the Astral flow, which is the basis of natural signatures.[40]

Thus, whereas Schijnvoet speaks only about the structure of the objects and their compound matter, Rumphius proposes hidden analogies between the mineral world and the macrocosm for an explanation, and ascribes the curious, weapon-like forms of thunderstones to the planet Mars, named after the god of war.

That this is not an incidental proposition, but formed a more constitutive opinion of Rumphius's view on natural processes, can be seen in his more extensive repetition of the argument in the chapters on thunder shovels and agates. In the former, he states his reservations, explaining that he would rather wonder about the incomprehensible powers of nature than fall into some fallacy. Following this, he explains how the human arts and the instruments accompanying those arts come to mankind under the influence of the planets. It is possible, he states, that the 'Astral smith' responsible for this process can also make these instruments directly, without the mediation of human hands, but aided by 'thunder fire' which he commands.[41]

In the chapter on agates, he discusses the so-called figured stones that seem to have been painted with delightful scenes by Nature herself, recalling trees, landscapes, cityscapes, heather, moss, ground plans, human figures, body parts, animals, and more.[42] Rumphius wonders why these stones show such diverse figures and proposes an explanation which

37 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 211; translated in Rumphius, *Ambonese Curiosity Cabinet*, 245.

38 Rumphius, *D'Amboinsche Rariteitkamer*, 207; translated in Rumphius, *Ambonese Curiosity Cabinet*, 240.

39 For Rumphius's ambiguous relation to local knowledge, see Arens and Kießling, 'Knowledge and Power'; Leuker, 'Wonder en Weten'; Leuker, 'Knowledge Transfer'.

40 Rumphius, *D'Amboinsche Rariteitkamer*, 210; translated in Rumphius, *Ambonese Curiosity Cabinet*, 244.

41 Rumphius, *D'Amboinsche Rariteitkamer*, 213.

42 Rumphius, *D'Amboinsche Rariteitkamer*, 287-290. For classic studies on figured stones, see Baltrušaitis, *Aberrations*; Janson, 'Image Made by Chance'. See also Adamowsky, *Ludi Naturae*; Baker-Bates and Calvillo, eds., *Almost Eternal*; Daston and Park, *Wonders and the Order of Nature*, ch. 7; Felfe, *Naturform*, part II.

references his digression on thunderstones. He explains how the sublunary world is filled with a very fine matter, called *zoopyra* or 'seminal sparks', and how this matter attracts the specific characteristics of the planets and adheres them to the objects and beings in the sublunary world. Through this process, all objects obtain their distinct form, as assigned to them during Creation. He explains how this procedure is at work in the vegetable kingdom: Jupiter produces soft and woolly plants, Mars makes them fiery and thorny, and the Sun and Venus create beautiful flowers. He suggests that the diversity of forms found in agates comes about under the influence of the capricious and whimsical planet Mercury. While Mars creates weapon-like forms, Mercury produces variable and fluid images.[43] Rumphius ends his speculations on the astral influences in agates with a devout reservation: 'So let us rather be amazed at the possibilities which nature affords, and praise the wisdom of the Creator, and refrain from trying to be too wise or from examining things which are beyond our understanding, and be content, if we can only guess at them.'[44] This attitude is repeated in other places. It is the same kind of wonderment for creation that was expressed by Schijnvoet discussing the Caput Medusa, but here it is deployed differently. Where Rumphius's expression follows his explanations as a cautious admonition against too much curiosity, Schijnvoet, in line with the growing physico-theological discourse, joyfully exclaims his wonderment beforehand at the beginning of his mathematical description of the wondrous animal, without reservation.[45]

Although Rumphius mentions astrological influences only three times in a book full of empirical observations, it seems that astrological explanatory models still played a substantial part in his concept of nature.[46] That the man who in traditional historiography has been heralded as a forerunner of Linnaeus also adhered to these age-old insights makes his conception of nature richer and less coherent than earlier presumed. One might wonder what Schijnvoet would have thought about Rumphius's explanations of the forms of thunderstones. Astrological ways of thinking are not present in his footnotes, nor in any of his other writings, and as is shown above, his scant remarks on the matter only concerned the material characteristics. Interestingly and quite to the contrary, his opinions on the localisations of fossils was inspired by a totally different school of thought.

The Mechanisms of the Deluge

Schijnvoet's comments on Rumphius's chapters on fossils are particularly interesting, because we are again confronted with the richness of ideas expressed in the book. His

43 Rumphius, *D'Amboinsche Rariteitkamer*, 289.
44 Rumphius, *D'Amboinsche Rariteitkamer*, 288; translated in Rumphius, *Ambonese Curiosity Cabinet*, 323.
45 Compare Leuker, 'Wonder en Weten', 123. The same can be said about the 'third voice' in *the D'Amboinsche Rariteitkamer*, that of Schijnvoet's contemporary, the printer François Halma, who opens the book with a dedication to the reader and a two-page long ode to its creator: Halma in Rumphius, *D'Amboinsche Rariteitkamer*, 'Voorreden'.
46 Fix, *Fallen Angels*; Geneva, *Astrology*; Oestman, *Horoscopes*; Daston and Park, *Early Modern Science*, 541-561. Beekman asserts that, in the last decades of his life, Rumphius came under the influence of Paracelsian theories through Andreas Cleyer, head of the VOC's pharmacy in Batavia, and through his connection with the Academia Naturae Curiosorum: Rumphius, *Ambonese Herbal*, 129-134.

notes can be found in two places, as Rumphius discusses petrified shells in both the part on shells and the part on minerals, which reflects their ambivalent status.[47] Schijnvoet largely follows the opinion of Rumphius. Fossils were vehemently debated at the end of the seventeenth century, but it would be incorrect to take the present-day concept of fossils as a framework for considering these discussions. 'Fossil' (derived from the past participle of the Latin *fodere*, 'to dig') was a term initially used for everything that was excavated from the ground and had a peculiar form resembling an organism or an artefact. Usually these stones were classified by outward appearances like form, colour, or design, and not by their origin, as they are now. All of these different categories, which included our modern fossils as well as the thunderstones and figured stones discussed above, needed explanation. Concerning stones that resembled natural organism, three questions concerned the minds of naturalists. Did these stones originate in the mineral, animal, or vegetable kingdom? And if from an organic origin, how did they turn into stone? And, especially concerning the frequently discovered shells and marine life, why were these objects found in such remote places, like high in the mountains or deep in the ground, far away from the sea?[48]

Both Schijnvoet and Rumphius agreed that the shell-shaped stones were not accidental forms of mineral processes, but were organisms that had turned into stones. Rumphius states they are not 'fruits' of the earth, because the forms of shell stones are too specific and diverse for a purely mineral origin, while actual stones and minerals, like crystals and gemstones, show a regular shape according their 'matrix'.[49] Also, the forms are often similar to that of living species. Schijnvoet finds Rumphius's feelings on the topic 'undoubtable', but also dwells on the second question. Apparently, he found it necessary to present additional information about the process of petrification, which is not discussed by Rumphius. For this, the annotator refers to another work: 'Those who might still doubt that living and soulless things can become petrified, read Kircherus *Onderaardsche Weereld* in part two of the eighth book, where he speaks at length about the same and about stone saps.'[50] It might be surprising that Schijnvoet relied on the famous Jesuit Athanasius Kircher (1602-1680), who was summoned to Rome to defend the old Aristotelian views against the New Philosophy that had attracted many followers in northern Europe. In his day, Kircher already had a controversial reputation as a polymath with a great deal of knowledge, which, however, also included a significant amount of fantasy.[51] Yet the knowledgeable Kircher was still an

47 Rumphius, *D'Amboinsche Rariteitkamer*, 134-138; 315-316. In chapter 29 the naturalist discusses the *Chama Montana sive Noachina*, and in chapter 64 the *Cochlites, Cochlea Saxea*. In the latter chapter he only describes three sorts of fossilised periwinkles.

48 The best overview on the discussions on fossils is still Rudwick, *Meaning of Fossils*. See also Rossi, *Dark Abyss*; Daston and Park, *Wonders and the Order of Nature*, ch. 7; Nicolson, *Mountain Gloom*.

49 Rumphius, *D'Amboinsche Rariteitkamer*, 135.

50 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 138; translated in Rumphius, *Ambonese Curiosity Cabinet*, 191. The book *Mundus subterraneus* was translated into Dutch and published in Amsterdam in 1682 as *d'Onder-aardse weereld in haar goddelijk maaksel*. His views on the petrifying liquids can be found in book eight of the second part. On Kircher, see Asmussen, *Scientia Kircherianum*; Findlen, *Athanasius Kircher*; Fletcher, *Study of the Life*. Rumphius knew the work of Kircher, but refers to him with some disdain. He states that Kircher wants to 'sell' a miraculous image of Mary with child in a Chilean cave as a miracle of God: Rumphius, *D'Amboinsche Rariteitkamer*, 328.

51 Findlen, *Athanasius Kircher*; Asmussen, *Scientia Kircherianum*.

authority to reckon with. As Stephen Jay Gould has shown in his rehabilitation of Kircher's palaeontological views, the Jesuit was, contrary to what his later reputation might suggest, quite convinced of the organic origins of many stones, and he was also curious to learn about different origins in great detail.[52] Kircher explains in *Mundus Subterraneus* – of which Schijnvoet owned the Dutch translation – that in principle, everything can turn to stone, even whole villages, and that the liquids responsible for this process are composed out of solutions of water, salts, vitriol, stony particles, and a stone-making force which lies in the salts.[53] Schijnvoet probably adhered to Kircher's material explanation of this natural phenomenon, the way petrifying liquids permeated objects and turned them in stone. Once again, it shows he had a sincere interest in the workings of nature.[54] For him it was not a problem to align the insights of the Jesuit Kircher with ideas recently developed in England.

To explain the strange places where shell-like stones were found, both Rumphius and Schijnvoet referred back to the biblical account of the Deluge, like most naturalists of their time: the name Rumphius uses, *Chama Noachina*, or 'Noah Shells', is rather revealing. It was generally accepted that during the Deluge, shells and fishes were flung onto the mountaintops. What precisely happened was a matter of debate, however, and in his almost three-page footnote following the chapter on *Cochlites*, Schijnvoet mentions two English sources: the Dutch translations of *Miscellaneous discourses concerning the dissolution and changes of the world* (1692), by the physico-theologian and Royal Society founder John Ray (1627-1705), and of *Telluris theoria sacra* (1680-1689), by the chaplain and Cartesian Thomas Burnet (1635-1715).[55] Although the books were written in opposition to one another – Ray is responding to Burnet – they share the basic principles of a religio-mechanistic view on nature.[56] However, Burnet applied a rationalist and Cartesian way of reasoning more strictly, and according to many, more dangerously.[57] He described the seven phases of the terrestrial globe in the past and future with the aim of correlating the facts revealed in the Holy Scripture on this topic with rational-mechanistic physical explanations (fig. 7). This should not be seen as an attempt to bridge a conflict between the Bible and the natural sciences, but more as an attempt to ratify the facts from the Scripture with rationalist arguments.[58]

52 Gould, 'Father Athanasius'.

53 Kircher, *d'Onder-aardse weereld*, part II, 6.

54 It is questionable that he would have followed the more Aristotelian views of Kircher, such as his digression on the four causes of the petrifying process. Kircher discerns three causes: a formal cause, which is the stone-making force that causes stones grow; a material cause, which are the salts of the earth that carry this stone-making force; and an efficient cause, which is an omnipresent force called *vis plastica* that gives everything its form and shape.

55 Schijnvoet, in Rumphius, *D'Amboinsche Rariteitkamer*, 138, 318. The Dutch translation of John Ray's treatise was published in 1694 as *De werelt van haar begin tot haar einde of Dry natuurkundige godgeleerde redeneringen*, and that of Thomas Brunet in 1696 as *Heilige beschouwinge des aardkloots*.

56 Rudwick, 'Earth History'. Both books belong to a genre that became popular at the end of the seventeenth century, which Rudwick coined 'earth theories': books that described the past, present, and future states of the globe.

57 For more on Burnet and his work, see Gould, *Time's Arrow*, 21-59; Rossi, *Dark Abyss*, 33-41; Rudwick, *Meaning of Fossils*, 77-84; Vermij, 'Flood'.

58 Rudwick, 'Earth History', 305. See also Gould, *Time's Arrow*, 26.

Fig. 7 Anonymous, Frontispiece, engraving, 1,70 × 12,0 cm, in: T. Burnet, Telluris theoria sacra, *Amsterdam 1694, Bijzondere Collecties, Universiteit van Amsterdam, O 63-9705.*

According to Burnet, humankind lived on the remains of a once perfectly shaped Earth. In the paradisiacal state the Earth was a perfectly smooth, round globe. However, this state was disrupted during the Deluge, which Burnet explains with the aid of mechanical natural processes. Under pressure from an ever growing and thickening crust, the heat inside the Earth became too strong and forced the surface to crack open. Under the crust were subterranean waters that flooded the Earth. Parts of the broken crust were submerged, while other parts ultimately rose from the water again, leaving Earth in its present, ruined state, with irregular mountain chains and deep oceans. Burnet saw these surroundings as more appropriate for the sinful humans that inhabited the world after the Fall and the Deluge. Despite Burnet's devout aspirations, the book garnered much criticism from orthodox thinkers, and even received a reputation as being 'atheistic' and 'Spinozist'. Burnet used the Bible as a source of truth – for example, it was written that 'the great deep' cracked open – but confirmed this with clear physical reasoning and elaborate calculations.[59] According to his critics, Burnet was incorrect in his suggestion that the Deluge had been potentially present from Creation onwards as a physical natural law and an inevitable fact. This left little room for the idea of a wrathful, omnipotent God who decided, supremely and autonomously, to punish humankind. A milder manner of rationalistic reasoning could be found in the work of Ray.[60] Schijnvoet refers to this work in a more general way when he discusses why certain stones always have the form of seashells. Ray partly adopted Burnet's theory about subterranean waters, but emphasises that mountains were part of God's original plan. In line with physico-theological reasoning, he showed the usefulness of mountains as an essential part of the larger whole called Nature.[61]

Schijnvoet explicitly expresses his support for Burnet's reading of the Deluge by his remark that the work 'has as much influence [*ingang*] on the reader as it had on me'. It suggests that he was aware of the book's controversial reputation and that he did not follow Ray's opinion. That he was sympathetic towards a rationalistic-mechanistic way of reasoning is apparent in another expression of support, which is not connected to Rumphius but must be briefly mentioned, because it contributes to a fuller view of Schijnvoet's attitudes towards nature. Around 1700, he published a print with a design for a fictitious monument to commemorate and defend the Frisian preacher Balthasar Bekker (1634-1698), whose history is comparable with that of Burnet. Between 1691 and 1693, Bekker published *De betooverde weereld* (The World Bewitched), which was intended to purify Christianity of popular superstitions like the devil, demons, witches, and magic. He used a Cartesian-rationalistic method to achieve his goal, but like Burnet he was accused by

59 For instance, he first calculated that it was impossible to rain so hard in forty days that the whole Earth, with all its mountains, would be covered under water. This was only imaginable if one assumed that God created extra water during the Deluge, but this was incompatible with his mechanistic world view. Burnet argued that the additional water was located below the Earth's crust.

60 For more on John Ray, see Raven, *John Ray*; Rudwick, *Meaning of Fossils*, 63; Rudwick, 'Shape and Meaning'. Ray took different positions concerning fossils during his life. Here I only discuss the ideas as far as Schijnvoet could have known them.

61 Ray, *De werelt van haar begin*, 109-110.

orthodox thinkers of Spinozism and atheism.[62] It is telling that Schijnvoet openly defended this controversial man, as it reveals his susceptibility for Cartesian-mechanistic approaches to natural phenomena, and makes his positive perception of Burnet's debated account of the Deluge more likely. Furthermore, it demonstrates again Schijnvoet's sincere interest in the processes of nature, and that, as a collector, he reflected on these topics.

Where Burnet represents the 'dangerous' Cartesian view that could lead to atheism, Ray represents the 'safe' physico-theological view that leads to godliness. Yet in neither mode of reasoning was there a place for hidden correspondences between the natural world and the macrocosm, as Rumphius suggested. As far as I could find, views such as those expressed by Burnet and Ray are absent in the writings of Rumphius. When it comes to the Deluge, Rumphius instead cites another source, Ovid's *Metamorphosis*. The famous poem recounts the ancient flood and describes how fleshy seals were now inhabiting the places where goats once frolicked.[63] In this way he correlated the biblical account with another authoritative text from Antiquity. This reference must without doubt be seen more as a literary embellishment that appealed to Rumphius, and not as a serious explanation or confirmation. However, it shows once again how much Rumphius's empirical observations were still framed by a view of nature that was, in a not inconsiderable manner, informed by ancient texts and the views of nature contained within.

Conclusion

D'Amboinsche Rariteitkamer taken as 'knowledge aggregate' shows a wealth of sources, mind frames, and practices that were deployed to create and transfer knowledge about the exotic nature of Ambon and its surroundings to a European public. The Bible, Pliny, and Ovid were used as authoritative voices; empirical observations, taxonomies, and experiments were used to determine nature's structure; and nature's processes were explored with the aid of astrological influences, Aristotelian deductions, Cartesian mechanisms, and physico-theological discourse. It is not easy to restrict one of the voices in the book to one coherent system of thought. Both Schijnvoet and Rumphius proved to be somewhat eclectic in forming their thoughts about different aspects of nature, choosing from a multitude of ideas, sources, and notions. By doing so they sometimes combined ideas that seem nowadays incompatible. Rumphius would not have felt any tension in combining minute empirical observations and pre-Linnaean classification with Neoplatonic and Paracelsian views about astrological influences. Likewise, Schijnvoet relied on the Bible, the ardent Aristotelian Kircher, and rational-mechanistic thinkers like Burnet to help formulate his thoughts on fossils. Indeed, the minds of early modern naturalists were quite flexible.[64]

62 Schijnvoet made this print together with the draughtman Jan Goeree; Schijnvoet was the inventor and Goeree the executor. For more on Bekker, see Israel, *Radical Enlightenment*, 375-392; Fix, *Fallen Angels*; Knuttel, *Balthasar Bekker*. Bekker's devout intentions were not understood, and he was suspended of his duties and his book was forbidden. In the relatively liberal city of Amsterdam, Bekker had many supporters.

63 Ovid, *Metamorphoses*, 1:299-300.

64 Findlen, 'Jokes of Nature', 296.

However, this article has also sought to demonstrate that while there are some differences between Rumphius and Schijnvoet, the extrapolated images of the 'serious naturalist' and the 'frivolous collector' as described in traditional historiography are no longer tenable. This re-evaluation should not lead to the placing of Schijnvoet on a pedestal instead of Rumphius, or to their positioning at different places in the teleological line of modernity and scientific progress. Nor is the question of who was right or wrong in the cases discussed here of interest. There is no doubt that the scientific legacy of Rumphius is much greater than that of Schijnvoet, but I have tried to show that their reputations are still based on a presupposed and outdated discrepancy between sincere natural research and trivial collecting. Schijnvoet's easily distinguishable comments show that he was not just showing off his own collectables or his contacts with other collectors, nor was he questioning the authorship of Rumphius. In many cases they reveal him to be just as inquisitive about certain aspects of natural history as Rumphius. On the other hand, Rumphius's research was still firmly framed by the wishes and practices of the enthusiast and collectors in Europe, as his book's preface and chapter on collecting and embellishing shells make clear. The two men were not that different. This reassessment thus serves as an example of how linear narratives in the history of science can place historical actors in specific roles that can be assessed differently following the broader notions of a 'scientific culture' and 'knowledge production'.

Bibliography

Anonymous, *Een versameling van veele keurlyke boeken, onder dewelke veele op groot Papier en heerlyk geconditioneert, naagelaten door Simon Schynvoet* (Amsterdam: Hendrik Bosch, 1728).

Arens, Esther Helena, and Charlotte Kießling, 'Knowledge and Power. Rumphius' *Ambonese Herbal* and *Ambonese Curiosity Cabinet* as Colonial Contact Zones', *European Review* 26 (2018/3) 461-470.

Asmussen, Tina, *Scientia Kircheriana. Die Fabrikation von Wissen bei Athanasius Kircher* (Affalterbach 2013).

Adamowsky, Natascha, Hartmut Böhme, and Robert Felfe, *Ludi Naturae. Spiele der Natur in Kunst und Wissenschaft* (Munich 2011).

Baker-Bates, Piers, and Elena M. Calvillo (eds.), *Almost Eternal. Painting on Stone and Material Innovation in Early Modern Europe* (Leiden 2018).

Baltrušaitis, Jurgis, *Aberrations. Quatre essais sur la légende des forms* (Paris 1957).

Blinkenberg, Christian S., *The Thunderweapon in Religion and Folklore. A Study in Comparative Archaeology* (Cambridge 1911).

Bogaert, Abraham, *S. Schynvoets Muntkabinet der Roomsche keizers en keizerinnen* (Amsterdam: Erven Jakob Lescaille, 1695).

Burnet, Thomas, *Heilige beshouwinge des aardkloots* (Amsterdam: Daniel van Dalen, 1696).

Buijze, Wim, *Leven en werk van Georg Everhard Rumphius (1627-1702). Een natuurhistoricus in dienst van de voc* (Den Haag 2006).

Buijze, Wim, *Rumphius' bibliotheek op Ambon, 1654-1702. Een biografisch lexicon van wetenschappelijke contacten destijds in Azië en vanuit Azië met Europa* (Den Haag 2004).

Curry, Helen Anne, Nicholas Jardine, James Secord, and Emma Spary, *Worlds of Natural History* (Cambridge 2018).

Dance, S. Peter, *A History of Shell Collecting* (Leiden 1986).

Daston, Lorraine, and Katharine Park, *Early Modern Science* (Cambridge 2006).

Daston, Lorraine and Katharina Park, *Wonders and the Order of Nature, 1150-1750* (New York 1998).
Dietz, Bettina, 'Mobile Objects. The Space of Shells in Eighteenth-Century France', *The British Journal for the History of Science* 39 (2006/3) 363-382.
Felfe, Robert, *Naturform und bildnerische Prozesse. Elemente einer Wissensgeschichte in der Kunst des 16. und 17. Jahrhunderts* (Berlin 2015).
Findlen, Paula (ed.), *Athanasius Kircher. The Last Man Who Knew Everything* (New York 2004).
Findlen, Paula, 'Jokes of Nature and Jokes of Knowledge. The Playfulness of Scientific Discourse in Early Modern Europe', *Renaissance Quarterly* 43 (1990) 292-331.
Fix, Andrew, *Fallen Angels. Balthasar Bekker, Spirit Belief, and Confessionalism in the Seventeenth Century Dutch Republic* (Dordrecht 1999).
Fletcher, John, and Elizabeth, *A Study of the Life and Works of Athanasius Kircher, 'Germanus incredibilis'* (Leiden 2011).
Frasca Spada, Marina, and Nicholas Jardine (eds.), *Books and the Sciences in History* (Cambridge 2000).
Geneva, Ann, *Astrology and the Seventeenth Century Mind. William Lilly and the Language of the Stars* (Manchester 1995).
Goodrum, Matthew R., 'Questioning Thunderstones and Arrowheads. The Problem of Recognizing and Interpreting Stone Artifacts in the Seventeenth Century', *Early Science and Medicine* 13 (2008) 482-508.
Gould, Stephan Jay, 'Father Athanasius on the Isthmus of a Middle State. Understanding Kircher's Paleontology', in Paula Findlen (ed.), *Athanasius Kircher. The Last Man Who Knew Everything* (New York 2004) 207-237.
Gould, Stephan Jay, *Time's Arrow, Time's Cycle. Myth and Metaphor in the Discovery of Geological Time* (London 1991).
Heesen, Anke te, and Emma Spary, *Sammeln als Wissen. Das Sammeln und seine wissenschaftgeschichtliche Bedeutung* (Göttingen 2001).
Israel, Jonathan, *Radical Enlightenment. Philosophy and the Making of Modernity 1650-1750* (Oxford 2001).
Janson, Horst W., 'The "Image Made by Chance" in Renaissance Thought', in Millard Meiss (ed.), *De Artibus Opuscula xl. Essays in Honor of Erwin Panofsky* (New York 1961) 254-266.
Jardine, Nicholas, and Emma Spary, 'Worlds of history', in Helen Anne Curry, Nicholas Jardine, James Secord, and Emma Spary (eds.), *Worlds of Natural History* (Cambridge 2018) 3-13.
Jardine, Nicholas, and Emma Spary, 'Natures of Cultural History', in Nicholas Jardine, James Secord, and Emma Spary (eds.), *Cultures of Natural History* (Cambridge 1996) 3-13.
Johns, Adrian, *The Nature of the Book. Print and Knowledge in the Making* (Chicago 1998).
Jorink, Eric, and Bart Ramakers, 'Undivided territory. "Art" and "science" in the early modern Netherlands', *Netherlands Yearbook for History of Art* 61 (Zwolle 2011) 6-33.
Jorink, Eric, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715* (Leiden 2010).
Kircher, Athanasius, *D'Onder-aardse weereld in haar goddelijk maaksel* (Amsterdam: Erven Johannes Janssonius van Waesberge, 1682).
Knuttel, Willem P.C., *Balthasar Bekker. De bestrijder van het bijgeloof* (Groningen 1979).
Leonhard, Karin, and Maria-Theresia Leuker, 'Who commissioned Hollar's shells?', *Simiolus* 37 (2015/3) 208-220.
Leuker, Maria-Theresia, 'Im Buch der Natur lesen. Antikerezeption im Werk von Georg Everhard Rumphius', in Dietrich Boschung and Erich Kleinschmiet (eds.), *Lesbarkeiten. Antikerezeption zwischen Barock und Aufklärung* (Würzburg 2010) 243-268.
Leuker, Maria-Theresia, 'Knowledge Transfer and Cultural Appropriation. Georg Everhard Rumphius's *D'Amboinsche Rariteitkamer* (1705)', in Siegfried Huigen, Jan de Jong, and Elmer Kolfin (eds.), *The Dutch Trading Companies as Knowledge Networks* (Leiden 2010) 145-168.
Leuker, Maria-Theresia, 'Wonder en weten. Rumphius' *Amboinsche Rariteitkamer* (1705) vanuit een kennispoëtisch perspectief', *Internationale Neerlandistiek* 55 (2017/2) 115-134.

Margócsy, Dániel, *Commercial Visions. Science, Trade, and Visual Culture in the Dutch Golden Age* (Chicago 2014).
Margócsy, Dániel, '"Refer to Folio and Number". Encyclopedias, the Exchange of Curiosities, and Practices of Identification before Linnaeus', *Journal of the History of Ideas* 71 (2010/1) 63-89.
Macgregor, Arthur, *Curiosity and Enlightenment. Collectors and Collections from the Sixteenth to the Nineteenth Century* (New Haven 2007).
Marx, Barbara, and Karl-Siegbert Rehberg (eds.), *Sammeln als Institution. Von der fürstlichen Wunderkammer zum Mäzenatentum des Staates* (Munich and Berlin 2006).
Martens, Eduard von, 'Die Mollusken (Conchylien) und die übrigen wirbellosen Thiere im Rumpf's Rariteitkammer', in M. Greshoff and J.E. Heeres (eds.), *Rumphius Gedenkboek* (Haarlem 1902) 109-36.
Meijer, Fred G., 'Surinaamse insecten door Cornelia de Rijck', *Bulletin RKD* 2 (1994) 5-7.
Moolenbeek, Rob, and Florence Pieters, 'Rare schelpen en schaaldieren. Raadsels rond de illustraties bij *D'Amboinsche rariteitkamer* van Georgius Everhardus Rumphius', *Jaarboek van het Nederlands Genootschap van Bibliofielen* 12 (2005) 111-136.
Mulder, Hans, and Marieke van Delft (eds.), *Maria Sibylla Merian 'Metamorphosis insectorum Surinamensium' 1705* (Den Haag 2016).
Nicolson, Marjorie Hope, *Mountain Gloom and Mountain Glory. The Development of the Aesthetic of the Infinite* (Seattle 1997).
Oestmann, Günther, H. Darrel Rutkin, and Kocku von Stuckrad (eds.), *Horoscopes and Public Spheres. Essays on the History of Astrology* (Berlin 2005).
Ogilvie, Brian, *The Science of Describing. Natural History in Renaissance Europe* (Chicago 2006).
Ray, John, *De werelt van haar begin tot haar einde of Dry natuurkundige godgeleerde redeneringen* (Rotterdam: Barent Bos, 1694).
Raven, Charles E., *John Ray, Naturalist. His Life and Works* (Cambridge 1950).
Roemer, Gijsbert M. van de, 'Neat nature. The relation between nature and art in a Dutch cabinet of curiosities from the early eighteenth century', *History of Science* 42 (2004/1) 47-84.
Roemer, Gijsbert M. van de, 'Nature Painting. Theories about figured stones around 1700', in Natascha Adamowsky, H. Böhme, and Robert Felfe (eds.), *Ludi Naturae. Spiele der Natur in Kunst und Wissenschaft* (Munich 2010) 218-234.
Rossi, Paolo, *The Dark Abyss of Time. The History of the Earth and the History of Nations from Hooke to Vico* (Milan 1984).
Rudwick, Martin J.S., 'The Shape and Meaning of Earth History', in David C. Lindberg and Ronald L. Numbers (eds.), *God and Nature. Historical Essays on the Encounter between Christianity and Science* (Berkeley 1986) 296-32.
Rudwick, Martin J.S., *The Meaning of Fossils. Episodes in the History of Palaeontology* (London 1972).
Rumphius, Georg Everhard, *D'Amboinsche Rariteitkamer* (Amsterdam: François Halma, 1705).
Rumphius, Georg Everhard, *The Ambonese Curiosity Cabinet*, Eric M. Beekman trans. (New Haven 2011).
Rumphius, Georg Everhard, *The Ambonese Herbal*, Eric M. Beekman trans. (New Haven 1999).
Smith, Pamela, 'Science on the Move. Recent Trends in the History of Early Modern Science', *Renaissance Quarterly* 62 (2009) 345-375.
Spary, Emma, 'Scientific Symmetries', *History of Science* 42 (2004/1) 1-46.
Theunissen, Bert, and Casper Hakfoort (eds.), *Newtons God & Mendels bastaarden. Nieuwe visies op de 'helden van de wetenschap'* (Amsterdam 1996).
Uffenbach, Zacharias C. von, *Merkwürdige Reisen durch Niedersachsen, Holland und Engelland*, 3 vols. (Ulm: Johann Friedrich Gaum, 1753-1754).
Ullmann, Ernst, *Maria Sibylla Merian. Leningrader Aquarelle*, 2 vols. (Luzern 1974).
Vermij, Rienk, 'Nature in defence of Scripture. Physico-theology and experimental philosophy in the work of Bernard Nieuwentijt', in Klaas van Berkel and Arjo Vanderjagt (eds.), *The Book of Nature in Early Modern and Modern history* (Leuven 2006) 83-96.

Vermij, Rienk, *The Calvinist Copernicans. The Reception of the New Astronomy in the Dutch Republic, 1575-1750* (Amsterdam 2002).
Vermij, Rienk, *Secularisering en natuurwetenschap in de zeventiende en achttiende eeuw. Bernard Nieuwentijt* (Amsterdam 1991).
Vermij, Rienk, 'The Flood and the Scientific Revolution. Thomas Burnet's System of Natural Providence', in F. García Martinez and G.P. Luttikhuizen (eds.), *Interpretations of the Flood* (Leiden 1999) 150-166.