



General Palaeontology, Systematics and Evolution (History of Sciences)

The Discourse on the seashells [. . . , found] in Champagne,
written by Vignier to Peiresc (1635): An early text supporting
the organic origin of fossils



Le Discours sur les coquilles de mer [. . . , trouvées] en Champagne,
adressé par Vignier à Peiresc (1635) : un texte précoce sur l'origine
organique des fossiles

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ABSTRACT

The 'Bibliothèque nationale de France' keeps a manuscript entitled *Discourse on the seashells that are found on dry land, particularly in Champagne*, written in French in 1635 by the Jesuit Jacques Vignier. Vignier describes, 55 years after Palissy, the Lutetian fossils of Champagne (France) and discusses their presence in a place as far from the sea; 32 years before Steno, he refutes the *in-situ* generation of the fossils, which he considers to be seashells transported by the Flood. Peiresc, to whom the manuscript was addressed, endorses the marine origin, brings other examples of such fossils, but suggests a deposit by the sea prior to the Flood. In a second version of the discourse, written 20 years later, Vignier equates roughly the Flood with an "invasion" of the sea, shifting towards the modern concept of marine transgression. In the 1750s, Dieudonné, Calmet, Musard and Guettard continued to debate on the origin of these fossils.

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RÉSUMÉ

La Bibliothèque nationale de France possède un manuscrit intitulé *Discours sur les coquilles de mer qu'on trouve en terre ferme, particulièrement en Champagne*, rédigé en 1635 par le jésuite Jacques Vignier. L'auteur y décrit, 55 ans après Palissy, les fossiles lutétiens de la montagne de Reims et disserte sur leur présence en un lieu aussi éloigné de la mer. Trente-deux ans avant Sténon, il réfute la génération spontanée de ces fossiles, dont il fait des coquilles marines apportées par le Déluge. Peiresc, auquel le manuscrit était adressé, cite d'autres exemples de tels fossiles et envisage leur dépôt par la mer avant le Déluge. Dans une

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seconde version du même *Discours*, rédigée vingt ans plus tard, Vignier semble assimiler le Déluge à une « inondation » de la mer, traduisant une évolution vers le concept moderne de transgression marine. Vers 1750, Dieudonné, Calmet, Musard et Guettard allaient poursuivre le débat sur l'origine de ces fossiles.

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At the beginning of the 17th century, the theory of the organic origin of the “figured stones” (*i.e.* fossils), which is so familiar to us, still wrestled with the presence of fossils of marine origin preserved in places far from the sea. In 1635, the Jesuit Jacques Vignier wrote a manuscript that dealt with this issue for Nicolas-Claude Fabri de Peiresc (1580–1637), an astronomer and savant, who was a councillor in the Parliament of Provence in Aix, and an important protagonist in the nascent field of geology during the early 17th century (Godard, 1996, 2005b, 2009). This “Discourse on the sea shells that are found on dry land, particularly in Champagne”, written in French, contains the second description, after Palissy’s (1580), of the Eocene fossils of the Montagne de Reims (Champagne, France), and discusses their origin. After Peiresc’s reply, Vignier wrote a new version of his manuscript, taking into account some of Peiresc’s remarks. I review here the history of the manuscript, before analysing the ideas of Vignier and Peiresc on the origin of such seashells. Peiresc’s reply and the second version of the *Discours*, translated into English, are transcribed in Appendix, and the original French texts are available as [electronic supplementary material](#) (see SM1, SM2 and SM3).

1. Presentation of the manuscript

1.1. Muddled history of a forgotten manuscript

In the collections of the ‘Bibliothèque nationale de France’ (BNF) is a manuscript entitled *Discours sur les coquilles de mer qu'on trouve en terre ferme, particulièrement en Champagne* (Appendix A1; Godard, 2004, 2005a; Miller, 2006), explicitly addressed to Peiresc.

Peiresc gives his opinion on Vignier’s *Discours* in a letter dated 26 April 1635, sent to Charles Venot (see the English translation in Appendix A2). Venot, a Jesuit born in Autun in 1574 (Sommervogel, 1890–1932, VIII, 564–565), had transmitted the manuscript to Peiresc, together with a letter now lost, without revealing the author’s identity, because Peiresc asks him to “decipher for [him] the three capital letters which [the author] undersigned his learned discourse”, so he could thank him. The *Discours* was accompanied by specimens of “marine shells”, which reportedly joined the collections of the Sainte-Geneviève Abbey in Paris around 1647, before being dispersed during the French Revolution (Zehnacker and Petit, 1989).

The identity of the author of the *Discours* is revealed in a second version of the manuscript, kept in Philibert de La Mare’s collection at the Arsenal Library (BNF) in Paris (see the English translation in Appendix A3), and where it is literally written that “this discourse written by Father Jacques Vignier, of the Society of Jesus, was sent more than 20 years

ago to Mr. de Peiresc”. This version diverges from the first one by minor changes that are, however, quite substantial when the author expresses his thoughts on the origin of the shells. The author summarises and partially takes into account the remarks that Peiresc made in his 1635 letter to Venot. The same volume at the Arsenal Library comprises another manuscript, written between 1631 and 1672, and devoted to the Miocene fossils of the Sales region, near Bordeaux (Appendix A4). The author, who remains unknown, is not Vignier, from whom he clearly differs by style and contrasting ideas.

Jacques Vignier was born in 1603 at Bar-sur-Seine. Like Venot, he was a Jesuit – although his parents were Calvinists (Sommervogel, 1890–1932, VIII, 748–751). He taught humanities and philosophy, and became rector at the Jesuit colleges of Bar-le-Duc, Sens, Chaumont, and Langres. He died in 1669 in Dijon where La Mare, councillor at the Parliament of Bourgogne, inherited part of his papers. Vignier wrote a dozen works on the life of saints and the history of the diocese of Langres, of which most were tardily published during the 19th century. In a letter, he refers to a scientific work, which he had abandoned, on “some rarities of various parts of the Earth” (Sommervogel, 1890–1932, VIII, 751).

1.2. Biblical Flood or “invasion” of the sea?

The fossils described by Jacques Vignier were observed at Le Cosson, near the village of Nogent-Sermier, ca. 11 km south of Reims. The author collected the shells in a sand pit, located in the vineyards of “Coste de Rheims” (*i.e.* Côte de l’Île-de-France), on the northern slopes of Montagne de Reims (Fig. 1). One species, of “the length and size of the arm of a man”, appears to be the giant cerithid gastropod *Campanile giganteum*, described by Lamarck (1804, pp. 439–440) as *Cerithium giganteum*. Thus, the geological formation can be identified with a Lutetian fossiliferous level of sea sand that occurs on the slope of the Côte de l’Île-de-France (Fig. 1; e^{5m} , on the geological map by Laurain et al., 1981). To ca. 1 km of Le Cosson, this level is marked on 400 m by an alignment of old pits (*e.g.*, 49°9’42” N; 3°57’37” E), from which was dug a fine beige calcareous sand, outstandingly fossiliferous (Fig. 2).

In the first part of his *Discours*, Vignier describes the fossils, among which he distinguishes seven species of gastropods and bivalves. Then he discusses at length the origin of the shells, for which he proposes three hypotheses (Appendices A1, A3):

- (a) the shells were formed by extinct land animals, similar to snails;

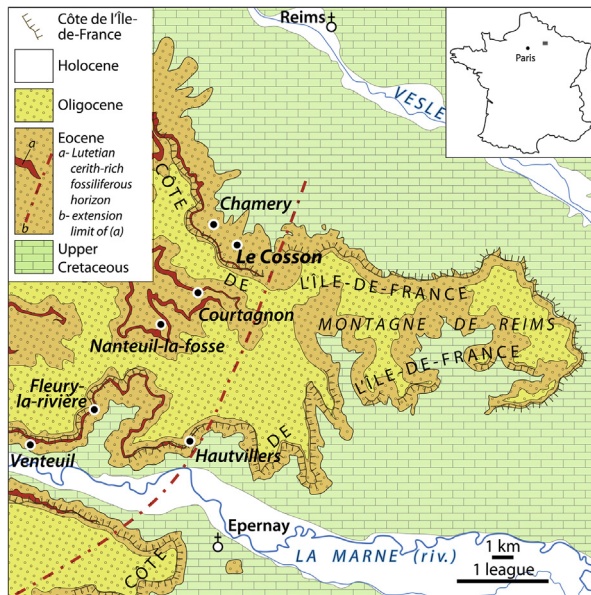


Fig. 1. Geological map of the Montagne de Reims.

Fig. 1. Carte géologique de la montagne de Reims.

(b) they resulted from the “freaks and fantasies of an industrious earth and of a nature that relaxes”. This theory of the “freaks of nature” denied the organic origin of the fossils, and attributed them to a spontaneous generation in the ground. Vignier evokes Aristotle and his four causes (material, efficient, formal and final); the production of shells through the “freaks of nature” has neither efficient cause, nor finality, which makes this assumption unacceptable: “If it is a home to house animals, did nature [...] make it without animals, that is, without inhabitants to live in it?” Moreover, spontaneous generation would have also produced unfinished shells, but here they are all completed;



Fig. 2. Fossiliferous sand at Le Cosson. The gastropods *Haustator imbricarius* Lamarck, 1804, and *Athleta (Volutospina) spinosa*, Linnaeus, 1758, can be recognized.

Fig. 2. Sable fossilifère du Cosson. On peut y reconnaître les gastéropodes *Haustator imbricarius* et *Athleta (Volutospina) spinosa*. Linné, 1758.

(c) these marine shells were brought by the Flood. In support of this thesis, the author quotes many texts from Antiquity (Polybius, Plutarch, Apuleius, Strabo, Solinus, Pomponius Mela, Ovid, Orose and Tertullian: see Appendix A3), and rejects the contrary opinion of Jacques Gaffarel (1629a), who denied the universal Flood.

The author finishes by addressing his *Discours* to Peiresc, to whom he sends some of the shells.

In his letter to Venot (Appendix A2), Peiresc presents two other examples of “marine shells” far from the sea. The first occurrence, near Rome, is unnamed but is undoubtedly the Plio-Pleistocene formation of Monte Mario, about which Peiresc exchanged an important correspondence with Claude Menestrier, who occupied in Rome the charge of librarian of Cardinal Francesco Barberini, nephew of Pope Urban VIII. In January 1629, Menestrier informed Peiresc of his study of the Monte Mario fossils (Godard, 2005b), which he had observed under the “tube of Drebel’s” – i.e. the first microscope. The second example is provided by the Jurassic terrains of Provence, in southern France, in particular by the surroundings of “Boisgency” (Belgentier, north of Toulon) where Peiresc was born and owned a residence. Peiresc had already described the fossiliferous horizons of this area; one year later, in 1636, he made determine their altitude relative to the Mediterranean by a work of land surveying (Godard, 2005b). He evokes here “snail shells [...] enhanced by branches, serrations and patterns [...] with several floors”, in which ammonites with suture patterns and septa can be recognized, and he compares them with Besler’s *Nautilus* (Besler, 1616) (Fig. 3). Peiresc notes that these species are unknown in the Mediterranean Sea and hypothesizes their survival in remote seas, like the Red Sea, an idea that several authors had formulated before him (e.g., Palissy, 1580; see Ellenberger, 1988). Neglecting the Flood, Peiresc imagines that “water originally covered all the surface of the Earth”, before an emergence occurred. On several occasions, Peiresc evokes uplifts and collapses to explain at one point the emergence of marine shells and at another the immersion of the Baltic amber, in which he observed “midges” (Godard, 2005b).

Finally, in the second version of his manuscript, written some 20 years later (Appendix A3), Jacques Vignier does not abandon the Flood thesis, but tends to equate it with an invasion of the sea, adding that “the sea extended up there not only by its underground channels but also by its overflow, and that the tide left these remains of the inundation”. Thus, the second version takes into consideration Peiresc’s ideas, which are quoted. Vignier rejects again the “Freaks of nature” and Gaffarel’s ideas, and quotes in a Jesuitic way van Gorp (1569) who, in reality, was a partisan of the *in-situ* generation of fossils.

2. Discussion: an early text upon the marine origin of fossils

The fossils from the Montagne de Reims were first described in 1580 by Bernard Palissy in his *Discours admirables* (Palissy, 1580, e.g., p. 226). Palissy observed them at “Venteul-en-Valois”, where he would have also

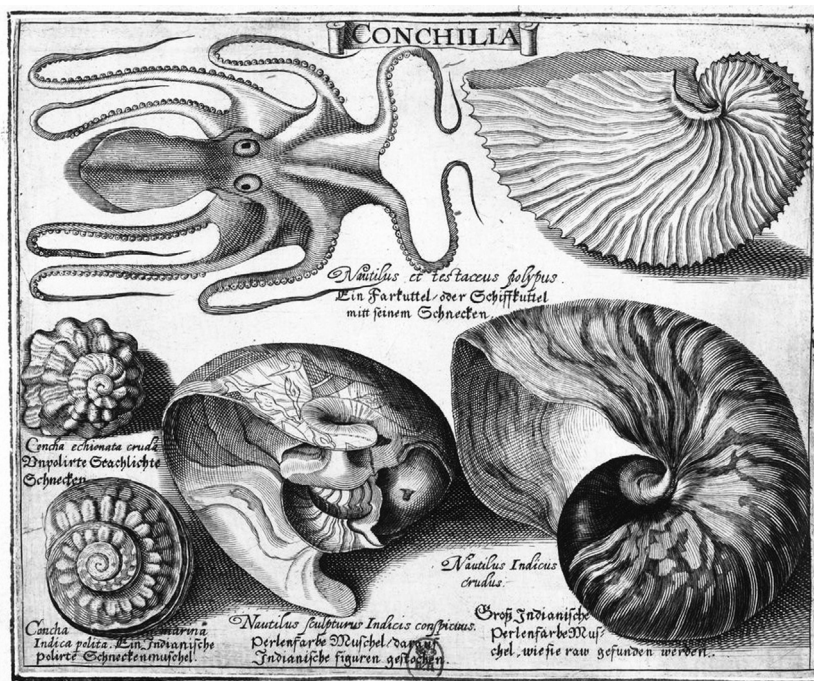


Fig. 3. Plate 12 from Besler (1616). The plate shows a nautilus which Peiresc quoted as approximating some fossils of Provence ©BNF.

Fig. 3. Planche 12 de Besler (1616). La planche montre un nautilus cité par Peiresc comme se rapprochant de certains fossiles de Provence ©BNF.

extracted the Lutetian shells that adorn some of his enamelled dishes known as *rustiques figulines* (Plaziat, 1997). Plaziat (2006, 2009a, 2009b, 2011) identified this locality with Venteuil, situated 13 km southwest of Le Cosson and where the same fossiliferous horizon crops out (Fig. 1). Palissy clearly supported an organic origin for these shells; however, contrary to what has long been claimed, he did not make them live in the sea – he believed that coastline changes would conflict with the Bible –, but in fresh water basins (e.g., Ellenberger, 1988; Plaziat, 2011).

Vignier evidently ignored Palissy's contribution, which was brought out of oblivion in the 1720s (Ellenberger, 1988). During the 18th century, this fossiliferous level of the Montagne de Reims became much appreciated by connoisseurs such as Marie-Catherine Lefranc, who arranged a natural history cabinet at Courtagnon, only 2.5 km from Le Cosson (Fig. 4; Appendix A5; Dezallier d'Argenville, 1757, ch. V, pp. 48–79; Dieudonné, 1763). In 1751–1752, Dom Sébastien Dieudonné, monk at Hautvillers Abbey – like Dom Pérignon, a famous pioneer of Champagne wine –,

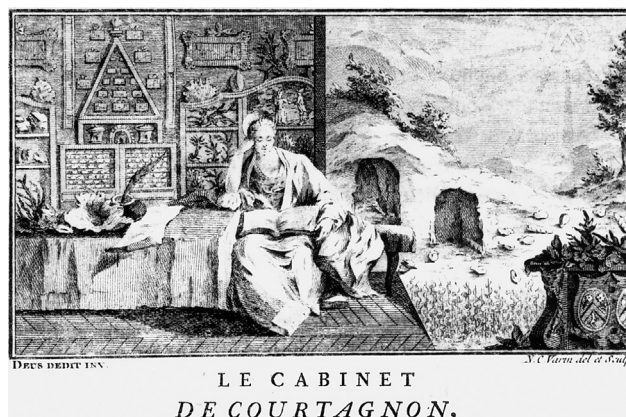


Fig. 4. Marie-Catherine Lefranc at Courtagnon, by Dieudonné (1763). The cabinet (to the left) and fossil site (to the right) ©BNF.

Fig. 4. Marie-Catherine Lefranc à Courtagnon, selon Dieudonné (1763). Le cabinet de fossiles (à gauche) et le site fossilifère (à droite) ©BNF.

described for his superior, Dom Augustin Calmet, several of these cerithid occurrences at Hautvillers, Nanteuil-la-Fosse, Courtagnon and Fleury-la-Rivière (Fig. 1; Appendix A6). From Dieudonné's descriptions, Calmet deduced an *in-situ* generation of the fossils in the ground (Appendix A6; Calmet, 1877–78), whereas Dieudonné considered them sea shells carried by the Flood (Appendix A6; Dieudonné, 1763: “Coquilles paraissent. Parlez par vos figures/Prouvez le grand Déluge à nos races futures/Que vos tas de débris, votre déplacement/Avec vos traits marins, soient tout votre argument.”). Meanwhile, Musard (1753) and Boulanger (1753) thought that the Courtagnon shells were “in the places where the sea deposited them”. Jean-Étienne Guettard, a member of the French Academy of Sciences, also studied the shells from Lefranc's collection at Courtagnon (Appendix A5; Fig. 4). Neglecting religious beliefs, he performed the first modern description of these fossils, emphasizing some anatomical peculiarities as the adductor muscle scar, and concluded that they had a marine origin (Guettard, 1751, 1754, 1759). The notoriety of the Lutetian layer with gigantic cerithids culminated during the 19th century, in particular with the Chamery occurrence contiguous to those of Le Cosson and Courtagnon (see Gaudant, 2004; Plaziat, 2009a; Plaziat and Guérin, 2011). The *Discours sur les coquilles* thus belongs to a four-century tradition of interest in the fossiliferous layer from the Côte de l'Île-de-France, considered by Vignier an “*eschole de philosophie*” (school of philosophy) for curious minds.

Before the important contributions of Steno (Steensen, 1667), Woodward (1695) and Scheuchzer (1708) (see Gaudant, 2008), a majority of naturalists assumed an *in-situ* generation of fossils in the ground (i.e. “freaks of nature”). So did Vignier's contemporaries, such as Gaffarel (1629a) and the unknown author of *Reflections sommaires* (Appendix A4), as well as van Gorp (1569) before them. Conversely, Vignier and Peiresc, as well as Menestrier and Gassend, two close friends of Peiresc, championed an organic origin, as did Fracastoro, Alessandri, Palissy, Cesalpino and Colonna. However, these authors did not always admit the daring thesis of flooding of the land by the sea: Bernard Palissy (1580) inferred that the shells lived in fresh water (e.g., Plaziat, 2011) and Pierre Gassend (1658) thought that they lived in underground cavities filled with water; Jacques Vignier thought they were brought by the Flood, which he mentions as a real historic event in his *Chroniques de l'évêché de Langres*, but he evolves towards the opinion of Peiresc who does not hesitate to call upon variations of the marine level related to vertical movements of the earth surface; as for Menestrier, he sets the Flood aside, being convinced of the past flooding of the sea in Rome (Godard, 2005b). Actually, Reverend Vignier and more evidently Peiresc belong to the same vein as Alessandro Alessandri (1532), quoted in Vignier's *Discours*, and some others whom Ellenberger (1988) qualified as “hesitant diluvianists”, because they were above all convinced of the marine origin of the fossils and considered the Flood merely a convenient artifice admitted by all. After Steno's memoir on the *Glossopetrae* (Steensen, 1667), the ideas evolved from the *in-situ* generation toward marine origins, but this evolution was not linear, as illustrated in the 1750s by the debate on the Champagne fossils between

Dieudonné (marine shells carried by the Flood), Calmet (*in-situ* origin in the ground), and Musard, Boulanger and Guettard (deposited in place by the sea).

Jacques Vignier did not perceive that the fossiliferous level at Le Cosson was interlayered and rooted in the Montagne de Reims, imagining instead a film of sand deposited by the Flood or the sea in a gulf, formed here by the Côte de l'Île-de-France (Fig. 1). However, he strangely added in his second version that “the whole mountain is from the Flood”, which is contradictory. It was not until 1753 that Nicolas-Antoine Boulanger exposed, in his *Anecdotes de la Nature*, a more modern thought on the geology of the area (Ellenberger, 1994; Hampton, 1955). Jacques Vignier, on the contrary, neither perceived the initial extension of the layers nor noticed the shaping by the erosion of the Côte de l'Île-de-France. At the same time, Peiresc had a clear idea of the continuity of the strata, of which he noted the symmetrical arrangement on both sides of the Arc, Var and Verdon valleys (Godard, 2005b). According to him, the layers had been deposited with their current dip, before being eroded by the rivers “when these rocks were not so hardened as now.”

3. Conclusion

In 1635, the Jesuit Jacques Vignier addressed to Peiresc a discourse on the cerithid-rich Lutetian sands of Montagne de Reims, in Champagne, whose fossils have long fascinated naturalists since Palissy (1580). This text is remarkable because, some 30 years before Steno's memoir on the *Glossopetrae* (Steensen, 1667) and 60 years before Woodward (1695), this author refutes the *in-situ* generation of fossils and considers them sea shells transported by the Flood. In his answer to Vignier, Peiresc endorses without restraint the marine origin of fossils and suggests a deposition by the sea prior to the Flood. In contrast to Peiresc, Vignier did not perceive the initial extension of strata, and his geological views are very basic. However, he is the second author after Palissy to have described the fossils of Champagne and thus deserves a small place in the pantheon of the geologists of the Anglo-Parisian Basin.

Acknowledgments

This article is dedicated to the memory of Jean Gaudant, who encouraged its publication. Didier Merle is thanked for having determined the fossils from Le Cosson (e.g., Fig. 2). Philippe Taquet is warmly thanked for the editorial handling. Prof. Kevin Padian (Berkeley) revised the English style.

Appendix A. Sources

A.1. First version of *Discours sur les coquilles de mer qu'on trouve en terre ferme, particulièrement en Champagne* (1635)

BNF, Fonds Dupuy, recueil 669 (“*Histoires naturelles d'animaux & autres matières curieuses. Diverses relations d'Égypte, MDCXLVIII*”), ff. 43r–49v; published by Godard (2005a); see SM1 in the Electronic Supplementary Material.

A.2. Letter from Peiresc to Charles Venot of 26 April 1635. *Bibl. Inguimbertaine of Carpentras, ms 1876* (“*Lettres de M. de Peiresc. STVXYZ*”), ff. 528r–528v; see *SM2 in the Electronic Supplementary Material, Godard (2014)*, and the English translation below

I received your mail of the 11th of this month [. . . , with] these seashells accompanied by a very learned and judicious discourse that I read with great pleasure, being fairly able to assess the accuracy and soundness of the arguments of this good Father [. . .]. Would you please decipher for me the three capital letters which he undersigned his learned discourse, so I could write and express him my gratitude. Meanwhile, in confirmation of his relevant opinion, you can tell him that in Rome there are underground aqueducts across certain hills, all stuffed with seashells of a thousand different species and of different largeness and smallness, some of which would go almost invisible without the aid of Drebbel’s optical tube [i.e. the first microscope], and which are embedded in some clay that can be dissolved in water by washing them. Curiously, they are found to have kept not only their form and ornaments but also their different natural colours. In this country [i.e. in Provence], we have seen such shells in lots of different places of the province, up to the highest mountains of Peiresc, but especially near Boisgency¹. There are certain veins or some layers of the thickness of about 3 or 4 *toises* [i.e. 5.4–7.3 m] joining up here and there in whole valleys spaced more than 3 or 4 leagues [~10–13 km], as if it had been previously a level of the sea water that had brought to its edges all these shells, now accompanied with fragments of sea plants and their fruit. It is true that in some places of this level, depending on the characters of the ground, these shells are embedded in more or less hard rocks, and consequently stuffed with different kinds of coloured stone, whereas in other places they are set in clay or sand like those of Le Causson. What appears most wonderful is the occurrence of sea mushrooms and plants² that our [Mediterranean] sea does not produce but only the Red sea. Similarly, there are snail shells [*limaçons*] of such a prodigious size that they exceed two feet in diameter, all enhanced by branches, serrations and patterns that are the most extraordinary in the world³. There are these kinds of snails with several floors⁴ [septa] (like those from the Philippine Islands worked in the Chinese style) that are lithified and embedded in the rock. *Basilius Beslerus* inserted a drawing of them *intaglio* in his booklet *Fasciculus rariorum*, etc. fol. XII [Besler, 1616], in the second plate of *conchilia* under the label *Nautilus sculpturis indicis conspicuus*, which is shown broken up to allow the various floors to be seen [Fig. 3]. Yet, our sea produces nothing similar, nor approaching that, which can bring about major

consequences well beyond the Flood, since we can assume that the waters originally covered the entire surface of the Earth and that *Spiritus domini ferebatur super aquas*⁵, earlier than God, by His omnipotence, pulled out the land from the water. But this requires more leisure and a longer discourse than even a book might contain [. . .].

In Aix[-en-Provence], this 26 of April, 1635.

I forgot to tell you that I would gladly see all the species and different sizes of these shells from Le Causson near Reims in their sand, in order to examine them in my own way, that is to say a little more accurately than the common people.

A.3. Second version of *Discours sur les coquilles de mer qu'on trouve en terre ferme, particulièrement en Champagne*, BNF, Arsenal, ms. fr. 2890,126 S.A.F., 58th ms. of “Portefeuille LXIII de Philibert de la Marre, tome 1”, ff. 402r–403v; see *SM3 in the Electronic Supplementary Material, Godard (2014)*, and the English translation below

A good two leagues from the city of Reims in Champagne, there is a castle named Le Causson, belonging to the Baron du Tour, with a village nearby. This castle is built partly of stones and partly of bricks made of sand mixed with lime and thrown into the mould, as usual in this country. This sand was extracted from a place of the nearby hill [Montagne de Reims], which is very dry, among quite good vineyards like all those of the slope called Côte de Reims. This place, from the time that this castle was built, became a school of philosophy or an amphitheatre to forge curious minds, who often visit the site to see and admire either the remains of a universal flood, or the freaks and fantasies of an industrious earth and of a nature that plays, or the works of some animals whose name is unknown and whose species is lost.

These are some shells made in the same way as those of the sea, found there among the sand in such abundance, for the tiniest, that one would think them sown liberally. Some of them, very many, are medium, that is to say of the size of three or four fingers, and others that exceed the length and size of a man’s arm are formed as pyramids [*Campanile giganteum*], marked and armed with prickles and nodes to the outside, smooth and polished but filled with sand to the inside. These large and medium shells are all pyramid-shaped. As for the small, they all relate to four kinds of figures and species. The first are pyramidal [the gastropods *Turritellidae*, such as *Haustator sp.*]; the second are like *cul-de-lampe* [a gastropod, possibly *Athleta sp.*], some of which are fairly large; the third are like our snail shells [a gastropod like *Ampullina sp.?*], and the fourth like oysters, some smooth and polished both inside and outside, and others striped and fluted outside, like those here called *Coquilles Saint-Michel* [i.e. a small scallop shell], which species can be seen in *Gesnerus* [Gesner, 1565].

The question is what made these shells or what carried them there, and whether they are freaks of nature or works of some land animals, or finally relics of the Flood, because

¹ The village of Peyresq, of which Peiresc was lord, is located near Annot (now in the Alpes-de-Haute-Provence); “Boisgency” (now Belgentier, north of Toulon) was Peiresc’s native place.

² Probably *Stephanophyllia sp.* and fossil madrepores, respectively.

³ Peiresc certainly describes here the suture lines and rich ornamentation of ammonite shells.

⁴ These “floors” (“*estages*”) are indeed the septa of cephalopod shells; Besler’s plate (1616) effectively represents a *Nautilus* (see Fig. 3).

⁵ The spirit of the Lord swept over the waters (Genesis, I, 2).

everything that we can say relates to one of these three causes, and such an outcome deserves the search for its true cause.

The first and weakest opinion, it seems to me, is from those who say that some animals have formed these shells in place, like snails build theirs from their slime or the mud they find around them. But until now, no one has been able to find any of these animals alive nor dead, and it is believable that their species would not be lost. If we are told that these are sea animals unknown here, what carried them, if not the Deluge that would have flooded those lands? And so, saying this is the same as moving on to the third opinion, which inclines for the Flood.

The second opinion, which is more likely and is supported by simple people and a few scholars, says that these shells are generated by themselves in the earth, that nature makes them germinate, that the influences of Heaven contribute to it, that the meeting of soil and water in some veins forms them, and that the Sun bakes them especially in this slope that is turned right to the east. Some call that a stale stone quarry. They justify this opinion by an infinity of productions that occur in nature without purpose, apparently, and by accident. Numerous curiosities are cited in support of it. They put forward agates with all kinds of fancy figures, marbles and jaspers so diverse, without skill and without plan. They even consider the pebbles of the Crau in Provence. They cite the wonders of amber, the secrets of the magnet, and even the virtues of herbs.

But we answer, first, that these comparisons are amiss. Second, we consider that fortune, chance, and hazard are never well met twice, and there is some coincidence and the application of a general or specific reason for what is always done in the same way; and where there is artfulness there is skill and care. If there were only a few and imperfect shells, we could attribute them to chance and fate, but this is not so. Third, we should give details, when we say that the earth or nature did this, because we are talking about a cause without declaring it, and what is more, we ask for more than one. We do not seek the formal cause that we have, nor the material cause about which we would soon agree if we knew about the other two. It is the efficient cause that we are hard pressed to find, and the final cause⁶. Now, it can be proven that the earth or the soil of this region is not the efficient cause, because the elements only contribute as matter to the composition of the compounds⁷, otherwise the less perfect would have the virtues of the perfect, and therefore would be more noble than it, which contradicts itself. Then, it is visible to the eye that these shells are compounds, with specific shape and figure, and more than one component [*estoffe*]. And what's more: To what aim? For what purpose? If you are going to tell me

that the nature or the sun and the specific influences of some sector of the sky make that, I ask where the mould is, and why such a diversity in a so small space! Moreover, it's a big dispute to know whether these higher causes make that alone. If they are said to be helped, I wonder where this help is, where are these secondary causes that assist those first? Will [these shells] return to this heavy, rough and insensitive ground? And do not tell me that, into the insides of this very land, stones, lead and gold are also made, because to give figures and shapes [to shells] is a different task than combining earth with earth and then taking a certain colour, an hardness and other qualities, which can be done without mould and model. If one resorts to God, the instigator of everything, so I give up, since, if He wants to do these little wonders, He can do it without forcing Himself, but I doubt He wants to achieve this alone, without support and against His order, for I beg you to tell me why is this, for what purpose and to what aim? Is it just for His pleasure or to make us debate? If it is a home to house animals, did nature, divine wisdom or some created intelligence made it without animals, that is without inhabitants to live in it? Nature is too wise and better takes her assessments; and we would make fun of a man who, finding empty snail shells in a vineyard, would believe that the earth made them inadvertently, but not the snails whom they ordinarily serve as home during their life, and their sepulchre after they die.

I still beg the supporters of this view to consider the lovely artworks of these shells, with these buttons and bows from point to point, as if they were arranged by an animal, working and darning, that stops its task when it is tired. Let them tell us who smoothed so precisely the inside, who emptied so accurately these natural screws, who invented these various figures and forms of shells similar to those from the sea formed by animals and not by the earth or by the sand? And finally, let them tell us if the big [shells] are made all at once and born in one night, or if they grow and increase at will through a vital food, as do the trees and animals? If it is told to me that within this sand, which is real sea sand, there is a salt that acts as the germ of these shells, it does not avoid what we want to run away, and then we do not escape from the Flood, since even so we should always admit that the sea extended up there not only by its underground channels⁸ but also by its overflow, and that the tide has left these remains of the flood. Moreover, preserving there that seed without evaporating it for three or four thousand years, is it not as difficult as preserving the shells themselves?

Therefore, I hold the third opinion that relates these shells to the Flood in front of whoever wants to discuss it. And because at first glance the thing seems difficult to believe, I support it by the authority and the reason.

First, I think that this place is not the only place in the world where such sorts of shells occur far from their natural places, and I am not the only one who takes them for evidence and relicts of the Flood. Thevet, lib. 7 Cosmogr.

⁶ Vignier refers here to the four causes, according to Aristotle. The material, formal, efficient and final causes of a statue, for example, are respectively some marble, the sculptor's project, the carving process and the statue's scope. Fossils formed as "freaks of nature" would have neither an efficient cause nor a finality.

⁷ Vignier refers here to the theory of matter of the ancient Greeks (e.g., Empedocles, Plato), with the four ultimate elements (fire, air, water and earth) that can aggregate and combine.

⁸ It was then thought that sea water circulated within channels inside the Earth, in order to compensate for the sea currents that always flow in the same direction, such as those in the Strait of Gibraltar and Bosphorus.

cap. 3 [Thevet, 1575, f. 202 v], writes that certain mountains near Nicosia, town of Cyprus, at the centre of the island, are all covered with large oyster shells [i.e. Kakkaris-stra Formation, Pliocene]. I cannot think, he adds, that they are nothing else than remnants of the Flood, especially because there are no oysters on the shores of Cyprus. Henrion, lib. 5 Cosmogr. cap. 38 [Henrion, 1626, p. 745; originally from Fracastoro] reports that while digging the ditches of Verona a quantity of sea shells, bird beaks [glossopetrae], and lithified fishes was found, which certainly provide arguments for the Flood. As for the lithified fishes that have been sometimes drawn from the Pyrenees Mountains, digging there, as reported by Polybius [Pol. XXXIV, 10: Ἰχθῶς ὀρυκτούς in Corbières], and Frey after him [Frey, 1628, p. 42], that is the same proof. But before all those, did not Herodotus⁹, lib. 1 [Her. II (instead of I), 12], demonstrate that shells occur in the highest places of Egypt? Did not Plutarch draw, in his essay on Isis and Osiris [cap. 40], this consequence that Egypt was formerly all covered with sea, since even today, he says, are found in pits and among mountains a lot of sea shells? Apuleius [2nd century, *Apologia*, 41] puts in Gaetulia [now eastern Algeria], on the highest mountains [of the Atlas], fishes that he says to have been carried by the deluge of Deucalion. Strabo [*Geographia*, I, 3, 4] wrote that Egypt, the district of Libya where the temple of Ammon is [i.e. Siwa, in western Egypt, with Miocene limestones] and Armenia were once lands under the sea, as demonstrated by shells and other brands. Similarly, Solinus, cap. 25 [3rd century, *De Mirabilibus Mundi*, 14 instead of 25] and [Pomponius] Mela [1st century, *Situs orbis descriptio*, I, 6] recognize a flood in Thessaly from the same shells remains¹⁰. And these verses from Ovid's *Metamorphoses*, Book 5, do not mean other thing: *Vidi ego, quod fuerat quondam solidissima terra [tellus],/Esse fretum, vidi fractas ex aequore terras,/Et procul a pelago conchae iacuere marinae*¹¹. And what he adds: *Et vetus inventa est in montibus anchora summis*¹², has been verified in Spain, on the mountain of Stella, as reported by Mercator.

Finally, one should not find strange that, having had a universal flood on Earth, there remain vestiges of it, with sea shells as evidence, which is elegantly and christianly deduced by Orose in the first book of his History [ca. 416 AD, *Historiarum adversus paganos libri septem*, I, 3], saying *Fuisse diluvium [etiam] illi contestati sunt, qui praeterita quidem tempora, ipsumque auctorem temporum nescientes, tamen ex indicio & conjectura lapidum, quos in remotis montibus conchis & ostreis scabros, saepe etiam cavatos aquis visere solemus, conyincendo didicerunt*¹³. Here is a citation of Tertullian, which is scarcely as good as the former. It is from

the book *De Pallio* [ca. 200 AD, cap. 2]: *Mutavit & totus orbis, aliquando aquis omnibus obsitus adhuc maris conchæ & buccinæ peregrinantur in montibus, cupientes Platonis probare etiam ardua fluitasse*¹⁴. All these authors believe that such land shells originated elsewhere and remain on the mountains or inside them as banished from their country, and even the shellfishes that used them are out of their element if they are out of the water.

The reason, reinforcing the authority, strongly supports this view, because the shape of this slope [of the Côte de l'Île-de-France] is such that it would make a perfect cove of the sea, or a gulf, if the Reims countryside was covered with water, being curved as an arch or a crescent over about a league, and this pit of sea sand being at the very back of this bay, so we can assess almost visually that unfailingly some sea flow had thrown there rather than elsewhere this heap of sand and shells. People will scarcely believe that small shells, which seem to have formed the day before, are this way since the Flood and Noah, and will wonder that they have been kept so long without deteriorating. However, this must have little strength to the minds of thoughtful people who will consider that, the whole hill being from the time of the Flood, the sand that composes it must also be and, such sand being natural to such shells, it is no wonder that these latter are preserved in it, being there as in their birthplace. I draw even from this a proof which can serve as evidence against such people, that is, if the shells are self-created there, one must find among them some fresh, started and uncompleted, which is not the case, all appearing perfect and completed and looking equally old or equally young.

This discourse written by Father Jacques Vignier, of the Society of Jesus, was sent over 20 years ago to Mr. Peiresc, councillor at the Parliament of Provence, known to all men of letters, who replied¹⁵, in confirmation of the existence of such shells on land, that there were in Rome aqueducts passing through hills all stuffed with various species of marine shells of all sizes, that similar shells also exist in different parts of Provence, up to the highest mountains of Peiresc and Boisgny, where there are some veins or beds of shells, 3 or 4 miles long and only 3 or 4 fathoms in width or thickness, mixed with marine plants [corals], stony mushrooms [mushroom corals] and snails similarly petrified [ammonoids] and of extraordinary figure and size comparable to those brought from the Philippine Islands, and which Basileus Beslerus has represented in his booklet entitled *Fasciculum rariorum* etc. [Besler, 1616; Fig. 3]. Because our sea, he adds, produces nothing similar and since there are, in the midst of these shells, star-dotted sea plants [corals] similar to those which only the Red Sea produces, it is easy to draw consequences that surpass even the Flood and regard the first origin of things, when the surface of the Earth was all covered with water, and that

⁹ For the ancient authors cited by Vignier, see also von Lasaulx (1851) and Ellenberger (1988).

¹⁰ Pomponius Mela actually mentions fossils in Numidia, now Algeria.

¹¹ I saw myself that what was once firm land, / was now the sea. I saw new lands emerging from the sea, / and sea-shells lying far away from the shore.

¹² And an ancient anchor was found at the summit of the mountains.

¹³ That there had been a Flood, have testified even those who, though ignorant of the past and even of the very Creator of the ages, have nevertheless learned by inferring from evidence offered by stones that, on

far-away mountains, we are accustomed to see encrusted with shells and oysters, and often corroded by water.

¹⁴ The whole Earth changed and was covered by all the water. Even today sea shells and whelks wander in the mountains, craving to corroborate Plato that even the highest regions were flooded.

¹⁵ See the above Appendix A2 and its notes.

*Spiritus domini ferebatur super aquas*¹⁶. That is the opinion of this clever man, little different from that of Alexander ab Alexandro, reported at length in the 5th book of *Genialium dierum* [Alessandri, 1532].

The Sieur de Gaffarel in Chapter 5 of his *Curiosités inouïes* [Gaffarel, 1629a] was of the opinion that seems peculiar and different from the previous ones, calling such shells *Camaïeux* or *Gamahéz*, and considering them stony shells, shaped like shellfish but self-created or produced by nature, that is to say not by animals, either of land or sea; in fact, his opinion is practically the same as the second described above. As for what he cites from Goropius on his behalf and contrasts him with Cardan, it seems to me that, for his assessment, he took his scepticism from Goropius' *Niloscopy* [van Gorp, 1569], inasmuch as this author, after having written that marine shells occur in the marble quarries from the regions of Liege and Ardennes, in the quarries from the surroundings of Paris and in the mountains of England, concludes with these words favouring instead the third opinion: *omnibus ergo eius modi locis [mare] aliquando superius fuisse necesse erit fateri, si proba illa sit collectio, quae de conchyliis marinis Neptunum aruorum finibus induxit, et caetera*¹⁷. The same Sieur de Gaffarel, having re-examined his work¹⁸ and promised us countless beautiful curiosities, may have changed his mind for the second or third time, and I will change mine when he presents me reasons or observations that will force me to divest myself of the third opinion.

A.4. Reflections sommaires sur quelques pierres de la Terre de Sales

BNF, Arsenal, ms. fr. 2890,126 S.A.F., 59th ms. of “porte-feuille LXIII de Philibert de la Marre, tome 1”, ff. 404r–405r; see SM4 in the Electronic Supplementary Material.

A.5. Letter from Madame Lefranc de Courtagon to Jean-Étienne Guettard of 17 October, 1754. Bibl. Centrale, MNHN, Paris, Ms 1996/46; see SM5 in the Electronic Supplementary Material

Catalogue du cabinet d'histoire naturelle de Courtagon, ébauché sur la fin de décembre 1756, addressed to J.-E. Guettard; ibidem, Ms 1859, 24 f.

A.6. **Correspondence between Sébastien Dieudonné and Augustin Calmet.** Letter from Calmet (1 October 1751); Letters from Dieudonné (29 October 1751, no date); private collection of M^{me} Barral d'Arènes; edited by Manceaux (1880, vol. 3, pp. 520–528). Letters from Dieudonné (12 January, 3 February, 16 June 1752, no date); Recueil de lettres autographes [...] adressées, pour la plupart, à dom Calmet [...] (1731–1756), Médiathèque, Saint-Dié, Ms 94, ff. 187, 188, 189, 192. See also: Recueil de lettres adressées à Dom Calmet, du 1er juin 1718 au 28 décembre 1754; Bibliothèque, Nancy, Ms 38.

Dissertation sur la nature des coquillages terrestres et sur la manière dont ils ont été produits, by A. Calmet; Médiathèque, Saint-Dié, Ms 80, vol. XI, pp. 90–125; copy, Nancy, Ms 2197.

Conjectures sur les coquillages qu'on trouve sous la terre et sur les montagnes; Saint-Dié, ibidem, pp. 125–192; edited in Calmet (1877–78).

Appendix B. Supplementary data

Supplementary data (SM1, SM2, SM3) associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.crpv.2016.06.002>.

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¹⁶ The spirit of the Lord swept over the waters (Genesis, 1, 2).

¹⁷ It will be necessary to admit that in all such places was once the sea, if this mass of marine shells, which Neptune has carried to the land boundaries, proves to be true, etc.

¹⁸ Actually, Gaffarel, who considered that “in the Books of the Hebrews, there are several ridiculous and dangerous things that are sustained without criticism by Christian Doctors”, was forced to retract at La Sorbonne on October 4, 1629 (Gaffarel, 1629b).

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