



IUGS International Commission on the History of Geological Sciences (INHIGEO)

IUGS INHIGEO Anniversaries: Scientific Examination of the *Falun* of Touraine, 300 Years Ago

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Figure 1 - Portrait of R. A. F. de Réaumur. Engraving by Philippe Simonneau, from painting by Alexis-Simon Belle. Image from Wikimedia Commons. Wellcome Images

In 1720 the French naturalist René Antoine Ferchault de Réaumur (Fig. 1) presented a paper to the Paris Academy of Sciences on the *falun* of Touraine — a huge deposit of fossil marine shells (in modern terms, Upper Miocene). Well known to the region's farmers who commonly excavated it as fertilizer for their fields, the *falun* described by Réaumur occupied at a minimum a surface of nine square leagues, or approximately 200 square Kilometers (depending on the league measure in question). The deposit's full extent was difficult to determine, as most of it was buried under a thin overlying cover. (Fig. 2.)

Réaumur (1683–1757) was a versatile savant with a strong background in mathematics and a firm commitment to assist in fulfilling the Paris Academy's officially assigned task of applying scientific knowledge to the goal of industrial improvement. His interests as a naturalist ranged broadly across the animal, plant, and mineral kingdoms, but in the course of time his very considerable reputation came to rest especially on his work in entomology and his investigations in metallurgical and ceramics technology. Probably no other French scientific academician of the first half of the eighteenth century was more admired. His prestige rested on so wide a body of important work that two

of the most respected modern treatments of his scientific work actually make no mention at all of the 1720 memoir on the Touraine *falun* which this notice claims to have been a landmark in geoscience. (One of these, Gough 1975, is an article of eight pages in a standard biographical compendium; the other, Terrall 2014, is a book focused on Réaumur's practices as a natural history investigator, concentrating especially on his zoological researches).

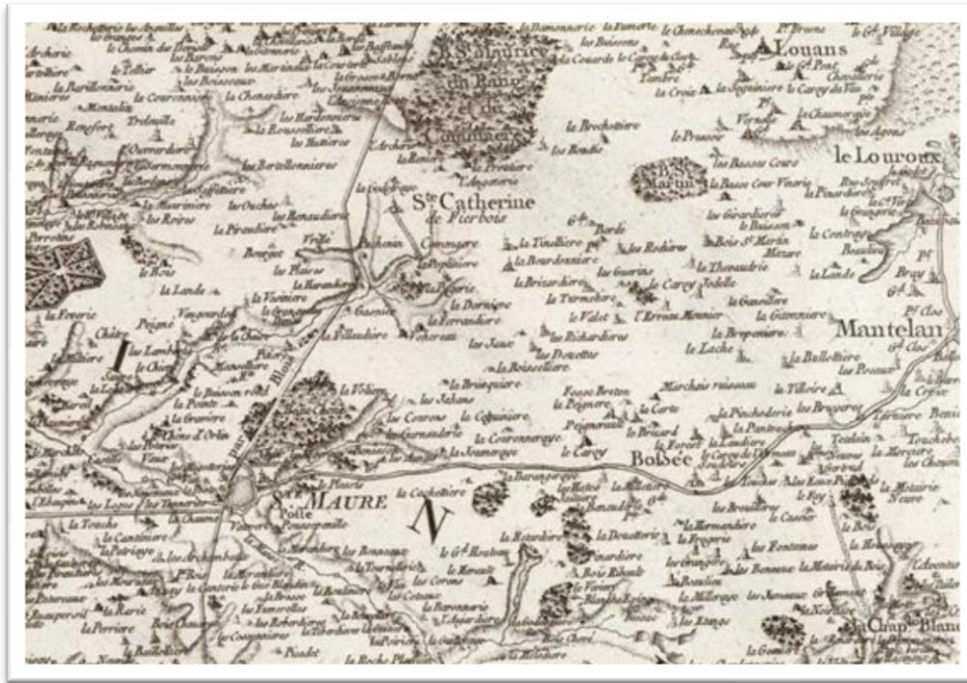


Figura 2 - Detail from the famous eighteenth-century Cassini map showing the location of the falun discussed by Réaumur. He reported it extended from Sainte-Maure to Mantelan, and included the parishes of Sainte-Catherine de Fierbois, Louans, and Bossée. The area is approximately 15–20 Km south of Tours.

César François Cassini, Carte de France levée par ordre du Roy, no. 66 (Richelieu – Saumur), 1765. Courtesy of David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

Among the key points of Réaumur's account were the following: (a) While the *falun* displays occasional surface outcrops, most of it lies under a superficial cover only a few feet in thickness. Local agricultural exploitation yields some limited information on the deposit's magnitude; for practical reasons excavation seldom penetrates beyond twenty feet of depth, so it is not known how much deeper the fossil masses go. (b) The *falun* consists entirely of shell remnants, broken up for the most part, but with some shells intact. Shell fragments are often large enough to enable determination of species. Some shell species identified in the *falun* are not known on France's present coasts. The deposit is unmixed with other materials. Thus its substance is entirely made up of shells and the debris of shells. (c) Close examination of the shells' orientation indicates that the beds were accumulated with the contents already broken. Fragments are nearly always in horizontal position, whereas if breakage were subsequent to deposition their arrangement would be confused and irregular. (d) The Deluge, or any momentary event, would be inadequate to account for these deposits. The sea bed as we know it is never strewn with shells of any considerable thickness; such a thick assemblage of broken shells all in one place, with its components in such order, requires some other explanation. (e) Réaumur concluded that this locality, now distant from the sea by no less than 36 leagues, must once have been a sea gulf or basin, a receptacle into which sea currents continually transported shells and shell pieces.



Figura 3 - Portrait of B. Le B. de Fontenelle. Detail from portrait by Nicolas de Largillière. From Wikimedia Commons. Musée des Beaux-Arts de Chartres.

Faithful to the Academy's dual obligation to advance knowledge and show its uses, Réaumur spent no less time in his report on the *falun*'s practical exploitation for agriculture than in describing it and discussing its possible scientific significance.

No such balance is seen, however, in the summary written by the Academy's Permanent Secretary, the opening piece of the *Histoire* for 1720. Ignoring utility, Fontenelle focused on what this phenomenon might mean for an understanding of Earth's history (Fig. 3).

Bernard Le Bovier de Fontenelle (1657–1757) was, like Réaumur, one of the Paris Academy's most conspicuous members. His renown, however, rested not on original scientific researches, but rather on his skill as an expositor and disseminator of science for an educated public. Perhaps his most famous work was

Conversations on the Plurality of Worlds (1686), a popular treatment of cosmological ideas in which he portrayed the advantages of the heliocentric (Copernican) theory as understood through the physics advocated by Descartes. Fontenelle served as the Academy's Permanent Secretary for four decades (1699–1740), and in this capacity he provided summaries and interpretive commentaries on a selection of the scientific papers published by academicians in the annual *Mémoires*. In the *Histoire* for 1720 Fontenelle led with a spirited discussion of Réaumur's paper, emphasizing the potential offered by study of deposits like the *falun* for deriving a history of the Earth out of its fossil relics.

Fontenelle declared the phenomena analyzed by Réaumur to be astounding. He calculated that the Touraine *falun* amounted at the very least to a volume of more than 130,000,000 cubic *toises* [fathoms] of calcareous material. All of this consisted of fossil shells or shell fragments, unmixed with other materials, and it lay a considerable distance from the sea. Fontenelle remarked pointedly on Réaumur's attentive observation of how shell fragments consistently lay in horizontal position, and thus were evidently deposited in succession over an extremely long period of time. Fontenelle agreed with Réaumur's judgment that it was not possible to invoke diluvialism to explain these effects, i.e., to ascribe this assemblage of fossils to a universal Deluge, which would necessarily leave signs of violence that are not detected here. His concluding comments suggested presciently that it would be possible to gain valuable insight into the past by assembling information about fossil deposits on maps.

Two distinguished historians of early geology have expressed agreement that the de facto 'collaboration' between Réaumur and Fontenelle constituted a landmark in study of sedimentation, and in growing confidence in extraction of information about past changes from sedimentary deposits (Rappaport 1991; Ellenberger 1994, esp. 171–182). These phenomena were now coming to be viewed, in prophetic words Fontenelle would use only a short time later, as reliable monuments for attempts at constituting “histories written by the hand of nature itself” (Fontenelle 1722, 4).

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