

## The meaning of *ceraunia*: archaeology, natural history and the interpretation of prehistoric stone artefacts in the eighteenth century

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**Abstract.** Historians of archaeology have noted that prehistoric stone artefacts were first identified as such during the seventeenth century, and a great deal has been written about the formulation of the idea of a Stone Age in the nineteenth century. Much less attention has been devoted to the study of prehistoric artefacts during the eighteenth century. Yet it was during this time that researchers first began systematically to collect, classify and interpret the cultural and historical meaning of these objects as archaeological specimens rather than geological specimens. These investigations were conducted within the broader context of eighteenth-century antiquarianism and natural history. As a result, they offer an opportunity to trace the interrelationships that existed between the natural sciences and the science of prehistoric archaeology, which demonstrates that geological theories of the history of the earth, ethnographic observations of ‘savage peoples’ and natural history museums all played important roles in the interpretation of prehistoric stone implements during the eighteenth century.

Prehistoric stone implements have long been an important source of information about the earliest stages of human technological and cultural evolution. Stone implements were also among the first objects to be recognized by naturalists as evidence that a prehistoric human past even existed. Historians of archaeology have written extensively on certain specific problems relating to the study of prehistoric artefacts, but many of these studies are narrowly focused and either ignore or leave obscure interesting and important historical changes. Moreover, historians of science have shown little interest in this subject, or in the history of prehistoric archaeology in general. This is despite the fact that the study and interpretation of prehistoric stone implements has been, from the very beginning, closely related to developments in the natural sciences, especially geology.<sup>1</sup>

Historians investigating the early history of prehistoric archaeology have emphasized two critical episodes in the study of stone implements. The first involves the initial recognition, at the end of the seventeenth century, that these objects were in fact human artefacts. Stone implements had been known and collected for centuries by naturalists who considered them to be stones that had acquired their unique form through some kind of

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<sup>1</sup> The process by which prehistoric stone implements were eventually understood to be archaeological remains shares many features with the gradual recognition of the organic origin of fossils, which also occurred during the seventeenth century. Despite this, little has been written on how these problems may have been related. On the debates over the interpretation of fossils and the process by which their organic nature was accepted see Martin J. S. Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology*, 2nd edn., New York, 1976.

natural process. As a result, stone arrowheads and axe heads were often placed in the general category of ‘fossils’, or objects dug out of the ground. It was also commonly believed that these objects were produced when lightning struck the ground, and because of this they were called ‘ceraunia’ or ‘thunderbolts’.<sup>2</sup> By the end of the seventeenth century, however, several works had been published that argued that these objects were implements of human manufacture. Although the prehistoric origin of these objects was not recognized until over a century later, this change has been heralded by historians of archaeology as fundamentally important in the development of prehistoric archaeology.<sup>3</sup>

The second influential episode in the study of stone implements that has drawn the attention of historians of archaeology was the formulation, during the first half of the nineteenth century, of the three-age system. The idea that prehistoric artefacts could be arranged chronologically into three periods (the Stone Age, the Bronze Age and the Iron Age) provided a powerful new framework for interpreting prehistoric artefacts and all subsequent archaeological research has been grounded on this basic scheme. It is not surprising to find, therefore, that the search for precursors to the invention of the three-age system, its formulation by the Danish archaeologist Christian Jurgensen Thomsen (1788–1865), and its subsequent modification by Jens Jacob Asmussen Worsaae (1821–85) have been the focus of many historical studies.<sup>4</sup> Scholars have shown very little interest, however, in what occurred during the eighteenth century, the period between the initial realization that stone implements were human artefacts and not a geological phenomenon and the postulation of a chronological Stone Age defined as a stage of cultural development where tools, weapons and other implements were made of stone.

The problem of stone artefacts, of what they could mean and how they should be interpreted, was the subject of much discussion during the eighteenth century. Antiquaries collected them and speculated about their origins, but so too did naturalists. The long tradition of classifying stone implements with fossils and gems influenced the way they were studied throughout the eighteenth century, and while it was increasingly accepted that they were an archaeological and not a natural phenomenon, naturalists continued to participate in their interpretation.<sup>5</sup> Likewise, the natural history collections and cabinets of curiosities amassed by naturalists and antiquaries frequently contained prehistoric stone artefacts. The fact that stone artefacts were often displayed side by side with geological specimens and ethnographic objects collected from the ‘savages’ of the New World, and

2 The French term for them, *pierre de foudre*, literally means ‘thunder stones’. *Ceraunia* is a Latin word, derived from the Greek word κεραυνος, both of which mean ‘thunderbolt’.

3 See Glyn Daniel, *The Idea of Prehistory*, London, 1962, Chapter 2; Stuart Piggott, *Ancient Britons and the Antiquarian Imagination: Ideas from the Renaissance to the Regency*, London, 1989, 89–94.

4 See Glyn Daniel, *The Three Ages: An Essay on Archaeological Method*, Cambridge, 1943; Robert F. Heizer, ‘The background of Thomsen’s three-age system’, *Technology and Culture* (1962), 3, 259–66; Ole Klindt-Jensen, *A History of Scandinavian Archaeology*, London, 1975, Chapters 4–5; Judith Rodden, ‘The development of the three age system: archaeology’s first paradigm’, in *Towards a History of Archaeology* (ed. Glyn Daniel), London, 1981, 51–68; Bo Gräslund, ‘The background to C. J. Thomsen’s three age system’, in *Towards a History of Archaeology* (ed. Glyn Daniel), London, 1981, 45–50; and Bo Gräslund, *The Birth of Prehistoric Chronology: Dating Methods and Dating Systems in Nineteenth-Century Scandinavian Archaeology*, Cambridge, 1987.

5 It is fundamentally important to understand that throughout the sixteenth and seventeenth centuries, and in some cases even into the eighteenth century, stone implements (ceraunia) were treated as a geological phenomenon and that they were collected and studied in large part by naturalists interested in geology.

later from the South Pacific, also contributed in critical ways to the understanding of stone implements in the eighteenth century. Because the natural sciences played such an important role in studies of prehistoric stone artefacts, it is essential not only that the problem of their meaning be viewed not solely from the perspective of the history of archaeology, but that it also be situated within the history of eighteenth-century natural science.

Some significant research has been done on the history of prehistoric archaeology during the eighteenth century and on the study of stone artefacts. Much of this research, however, emphasizes the work of just a few individuals<sup>6</sup> or else it primarily seeks precursors to the idea of the three-age system.<sup>7</sup> Other studies have shown more interest in situating the archaeological investigation of stone implements within the broader context of eighteenth-century archaeology, scientific institutions and society,<sup>8</sup> but these often fail to discuss important aspects of the problems posed by prehistoric stone implements or the ideas that were proposed to account for their existence. Any comprehensive historical understanding of the way *ceraunia* were reinterpreted and reconceptualized during the seventeenth and eighteenth centuries must look at contemporary developments in natural history, antiquarianism, and historical scholarship, as well as in the ways these disciplines were used to construct a meaningful interpretation of the origin and significance of *ceraunia*. Both antiquaries and naturalists utilized ethnographic and historical data in their attempts to determine who might have made these implements, which were being discovered right across Europe, but in their effort to discover the meaning of stone artefacts they were gradually forced to construct a radically different conception of early human history. New ideas and discoveries arising from many different kinds of scientific and scholarly research resulted in the need to revise long-held conceptions about the origin and early history of humanity. This broader intellectual context is often pushed into the background in many studies but, as this paper aims to demonstrate, it is only by investigating the way that antiquaries and naturalists applied archaeological, geological, historical, religious and ethnographic knowledge to the problem of stone artefacts that their meaning could be uncovered.

#### Ceraunia as objects of study: antiquarianism and natural history

Curiously shaped stone objects, labelled *ceraunia*, frequently appear in sixteenth- and seventeenth-century scientific works devoted to stones and fossils, where they are treated as a naturally occurring geological phenomenon. Late in the sixteenth century, the Italian naturalist Michele Mercati (1541–93) formulated the first reasoned argument supporting

<sup>6</sup> An example is Annette Laming-Emperaire, *Origines de l'archéologie préhistorique en France: Des Supersitions medievales à la découverte de l'homme fossile*, Paris, 1964.

<sup>7</sup> This is the approach taken by Heizer, *op. cit.* (4), which identifies some important eighteenth-century works that discuss stone implements but only to the extent that they serve as steps towards the idea of a Stone Age.

<sup>8</sup> Alain Schnapp's *Le Conquête du passé: Aux Origines de l'archéologie*, Paris, 1993 presents a very interesting and wide-ranging analysis of archaeological thought, including many of the major developments in the interpretation of stone artefacts during the seventeenth and eighteenth centuries. See also B. D. Lynch and T. F. Lynch, 'The beginnings of a scientific approach to prehistoric archaeology in seventeenth-century and eighteenth-century Britain', *Southwestern Journal of Anthropology* (1968), 24, 33–65.

the idea that ceraunia were not produced when lightning struck the ground, but were instead implements made by humans. He arrived at this novel conclusion as a result of being the curator of the Vatican botanical garden, where he was responsible for an expanding natural history collection that included fossils and other geological specimens, as well as ethnographic material sent from the New World. It was through working with these materials that Mercati noticed that the ceraunia in the geological collection closely resembled some stone arrowheads made by the peoples of the Americas. This insight led him to suggest that all ceraunia were implements made for use as weapons or tools.<sup>9</sup>

Because Mercati's ideas were not published until the early eighteenth century it is difficult to determine their relation to seventeenth-century discussions of ceraunia, but it appears to have been slight since works that mention ceraunia continued to describe them as a geological phenomenon. It was not until late in the seventeenth century that antiquaries and naturalists began to discuss widely the idea that ceraunia were objects manufactured by humans and not produced by nature. Despite this, ceraunia continued to be treated as geological specimens into the eighteenth century and as a result naturalists were compelled to compose increasingly convincing arguments to support their archaeological nature.

For some naturalists, such as the British geologist John Woodward (1665–1728), it was obvious that ceraunia had been made by humans. In his estimation, ceraunia 'carry in them so plain Tokens of *Art*, and their Shapes be such as apparently to point forth, to any Man that rightly considers them, the *Use* each was destined to', thus making it remarkable that anyone should ever have considered them natural productions.<sup>10</sup> But for those who did not find it so obvious, stronger evidence was available. The ability to compare ceraunia with stone implements collected from the New World, and later from the South Pacific, proved critical to the new interpretation of the origin and use of ceraunia. Private museums and natural history cabinets played a pivotal role in this. Natural history collections often contained archaeological and ethnographic objects arrayed alongside zoological, botanical and geological specimens. From the first voyages to the New World, ethnographic material of various kinds began to be collected and sent to museums and cabinets in Europe.<sup>11</sup> Weapons, implements, clothing and even human beings were sent to Europe, while travellers and artists contributed valuable ethnographic information through their accounts and illustrations of 'savage peoples' and their way of life.<sup>12</sup> This material was to be exploited in the interpretation of ceraunia in the eighteenth century.

9 Mercati discussed ceraunia in a manuscript work on geology, but it was not published until the eighteenth century. While there is evidence the manuscript circulated, it is unclear if Mercati's ideas influenced seventeenth-century thought on ceraunia. See Michele Mercati, *Metallototeca opus posthumum*, Rome, 1717. On Mercati's discovery that ceraunia were prehistoric artefacts see Laming-Emperaire, op. cit. (6), 44–8. For an excellent account of Mercati's scientific work, and of the publication and content of the *Metallototeca*, see Bruno Accordi, 'Michele Mercati (1541–1593) e la Metallototeca', *Geologica Romana* (1980), 19, 1–50.

10 John Woodward, *Fossils of All Kinds, Digested into a Method, Suitable to Their Mutual Relation and Affinity*, London, 1728, Part 2, 37. Original italics.

11 See Christian F. Feest, 'North America in the European Wunderkammer', *Archiv für Völkerkunde* (1992), 46, 61–109.

12 See Christian F. Feest, 'The collecting of American Indian artifacts in Europe, 1493–1750', in *America in European Consciousness, 1493–1750* (ed. K. O. Kupperman), Chapel Hill, 1995, 324–60.

The French naturalist Antoine de Jussieu (1686–1758) found convincing proof of the human origin of *ceraunia* in the resemblance they bore to the stone implements used by the inhabitants of the New World. The renowned Welsh naturalist and antiquary Edward Lhwyd (1660–1709) had remarked upon this a quarter of a century earlier, noting simply that certain triangular pieces of stone found throughout Britain were ‘just the same chip’d Flints the Natives of *New England* head their Arrows with at this Day’.<sup>13</sup> Jussieu drew upon an even wider range of ethnographic material for his own studies and found striking similarities in form between the *ceraunia* he had seen and such objects as an axe taken from a Caribbean tribe, a stone wedge from Canada, and some flint arrowheads. From these observed similarities, Jussieu felt assured that the ‘thunder stones’ (*pierres de foudre*) mentioned in books on fossils or ‘figured stones’ (*pierres figurées*), must be regarded as man-made implements, at least when they resemble wedges, axe heads or arrowheads.<sup>14</sup>

The interest of antiquaries in collecting archaeological objects was just as important in determining what *ceraunia* were and what they had been used for. It is important to note that in the seventeenth and eighteenth centuries antiquarian and scientific studies were closely related, sharing institutional, methodological and social ties.<sup>15</sup> Many naturalists engaged in antiquarian research and vice versa, and memberships in such institutions as the Royal Society and the Society of Antiquaries frequently overlapped. While naturalists had long collected *ceraunia* as geological specimens, antiquaries in the late seventeenth and early eighteenth centuries began to collect them as examples of stone implements used by the early inhabitants of Europe.<sup>16</sup>

The collection and identification of prehistoric stone artefacts began early in Scandinavia. The museum and publications of the Danish antiquary Ole Worm (1588–1654) are a prominent example, although there were many other Scandinavian antiquaries who wrote on this subject.<sup>17</sup> In England, the seventeenth-century naturalists and antiquaries Robert Plot and Edward Lhwyd gathered prehistoric stone implements, many of which found their

13 Edward Lhwyd, ‘Extracts of several letters from Mr. Edward Lhwyd, (M.A.) Late Keeper of the Ashmolean Museum in Oxford, to Dr. Rich. Richardson, (M.D.) of North Bierly in Yorkshire; containing observations in natural history and antiquities, made in his travels thro’ Wales and Scotland’, *Philosophical Transactions* (1713), 99. Lhwyd also noted the similarity between the stone hatchets used by the natives of America and some types of *ceraunia* found in Britain.

14 Antoine de Jussieu, ‘De l’Origine et des usages de la pierre de foudre’, *Mémoires de l’Académie royale des sciences* (1723), 7.

15 On this see Michael Hunter, ‘The Royal Society and the origins of British archaeology: I’, *Antiquity* (1971), 45, 113–21; Joseph M. Levine, *Dr. Woodward’s Shield: History, Science, and Satire in Augustan England*, Berkeley, 1977; Stanley Mendyk, ‘*Speculum Britanniae*’: *Regional Study, Antiquarianism, and Science in Britain to 1700*, Toronto, 1989; Piggott, *op. cit.* (3).

16 Scientific institutions and the virtuoso culture of Britain, especially as they relate to the Royal Society during the eighteenth century, have been explored by Michael Hunter in ‘The cabinet institutionalized: the Royal Society’s “repository” and its background’, in *The Origins of Museums: The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe* (ed. Oliver Impey and Arthur MacGregor), Oxford, 1985, 159–68; David P. Miller, ‘The “Hardwicke circle”: the whig supremacy and its demise in the eighteenth-century Royal Society’, *Notes and Records of the Royal Society of London* (1998), 52, 73–91; and G. S. Rousseau and D. Haycock, ‘The Jew of Crane Court: Emanuel Mendes da Costa (1717–91), natural history and natural excess’, *History of Science* (2000), 38, 127–70.

17 On Worm’s museum and archaeological work see Schnapp, *op. cit.* (8), 160–7; and H. D. Schepelern, *Museum Wormianum, dets Forudsætninger og Tilblivelse*, Odense, 1971.

way to the Ashmolean Museum, where first Plot and then Lhywd were curators.<sup>18</sup> Thomas Hearne (1678–1735), the renowned English antiquary and keeper of the Bodleian Library, possessed some flint arrowheads and axe heads, while his friend Richard Richardson (1663–1741), an antiquary and Fellow of the Royal Society, also owned several ‘heads of Darts that are Flints of several Colours’, which he thought were probably used by the ancient Britons.<sup>19</sup> The Yorkshire antiquary Ralph Thoresby (1658–1725) assembled an impressive collection of prehistoric stone implements in his private museum, and the immense collection of prehistoric British artefacts of the naturalist Sir Hans Sloane eventually became the foundation for the British Museum’s collection of prehistoric antiquities.<sup>20</sup>

Perhaps the most dramatic single discovery of stone implements was made in 1685 in the French town of Cocherel. Workmen digging on an estate there stumbled upon a tomb containing the bodies of several individuals, along with a large number of objects shaped from stone and bone. Accounts of the excavation and the objects found were widely known and they prompted much discussion about the contents of the tomb and their historical significance. The Cocherel tomb eventually drew the attention of Bernard de Montfaucon (1655–1741). Montfaucon was a highly respected scholar who had travelled widely in Europe studying Roman antiquities. His monumental work *L’Antiquité expliquée et représentée en figures* (1719) was a thorough and erudite study of classical art and archaeology, and in the latter parts of this work Montfaucon discussed some of the prehistoric ruins he was familiar with, including the tomb at Cocherel.

Montfaucon described several of the stones found in the tomb as being shaped like an axe head (*à la manière du fer d’un hache*) with a very sharp edge. These stone axes were all of the same form, but the stones themselves were of different kinds and colours. He noted with particular interest that one axe head was perforated with a hole, and a piece of stag horn had also been recovered from the tomb that had been perforated in such a way as to receive a wooden handle at one end and a stone axe head at the other. Moreover, there were stone points that clearly were used to head arrows.<sup>21</sup> Montfaucon drew from a variety of sources to support his view that these objects were stone weapons. He quoted Herodotus on the practice of the Ethiopians of heading their arrows with stone instead of iron, while Pausanias and Tacitus noted similar practices among the Sarmatians and

18 R. F. Ovenell’s *The Ashmolean Museum 1683–1894*, Oxford, 1986 contains a valuable account of Plot and Lhywd’s contributions to the museum and the place of the Ashmolean in seventeenth- and eighteenth-century science.

19 Thomas Hearne, ‘A discourse concerning some antiquities lately found in Yorkshire’, in *The Itinerary of John Leland the Antiquary*, 3rd edn., 9 vols., Oxford, 1770, i, 123–4, 143. This discourse is dated 1709.

20 On Sloane’s collection see Arthur MacGregor, ‘Prehistoric and Romano-British antiquities’, in *Sir Hans Sloane: Collector, Scientist, Antiquary, Founding Father of the British Museum* (ed. Arthur MacGregor), London, 1994, 180–97. It is important to note here that Sloane also assembled an important collection of North American ethnographic material; see J. C. H. King, ‘North American ethnography in the collection of Sir Hans Sloane’, in *The Origins of Museums: The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe* (ed. Oliver Impey and Arthur MacGregor), Oxford, 1985, 232–6. Another eighteenth-century naturalist who collected prehistoric artefacts as well as ethnographic material was Joseph Banks. On this see John Gascoigne, *Joseph Banks and the English Enlightenment: Useful Knowledge and Polite Culture*, Cambridge, 1994.

21 Bernard de Montfaucon, *L’Antiquité expliquée et représentée en figures*, 2nd edn., 5 vols., Paris, 1722, v, Part 2, 194–5.

Germans.<sup>22</sup> Stone hammers had also been used in war by the ancient Gauls and they were still used by tribes in America.<sup>23</sup> Thus Montfaucon relied upon both textual and ethnographic sources to support his identifications. He also noted the similarity in form between the stone points found at Cocherel and the iron points used to head halberds.<sup>24</sup>

Montfaucon, Hearne and Thoresby seem to have had few problems distancing themselves from the traditional view of ceraunia held by many naturalists and readily accepted stone implements for what they were. But once ceraunia were identified as ancient stone weapons and tools a host of new questions readily arose. Foremost among them was the question of who had made them. For men educated in the classical authors and the Bible there was only a limited set of possibilities. Hearne believed his flint implements were made by the ancient Britons, but he thought they could have been Roman as well.<sup>25</sup> Yet he considered a stone hammer described by Thoresby to be of Danish origin, based partly on similarities to an object described by Ole Worm and because the Danes had once inhabited the British Isles.<sup>26</sup> Montfaucon, however, appears to have sensed that great expanses of time might be confronting the antiquary in the stone weapons of Cocherel. He thought the tomb belonged to peoples of the 'highest antiquity', but this still did not deter him from identifying those peoples as Gauls or some other barbarous European nation.<sup>27</sup> There could be no question of antiquaries and naturalists in the eighteenth century imagining that these objects might have been produced in some remote geological epoch, tens or hundreds of thousands of years ago. For most antiquaries and naturalists of the eighteenth century, the makers of stone implements had to be sought among the historic peoples of Roman or pre-Roman Europe, or to hitherto unknown barbaric tribes who, nonetheless, had lived only a few thousand years in the past.

Far more troubling was the question of why ancient Europeans had made implements from stone in the first place, given the superiority of metal and the supposed early origin of metallurgy. Montfaucon suggested that the stone weapons of Cocherel had been manufactured by barbarians who did not know how to use iron or copper. This did not mean that all Europeans had passed through a stone age, but merely that some peoples might have inhabited regions without natural sources of metal or that they lacked commerce with nations that could have provided it to them.<sup>28</sup> John Woodward suggested that stone implements had been used before iron was discovered and that they had subsequently been replaced by iron ones when people had learned how to use the metal.<sup>29</sup> As we will see, the idea that there had been a time in European history when metals were not known raised serious questions and prompted much speculation about the meaning this held for the history of mankind. But as a basic solution to the question of why stone

22 Montfaucon, op. cit. (21), iv, Part 1, 28.

23 Montfaucon, op. cit. (21), iv, Part 1, 70–1.

24 Montfaucon, op. cit. (21), iv, Part 1, 68.

25 Hearne, op. cit. (19), 124.

26 Thomas Hearne, 'Some remarks occasion'd by the foregoing letter', in *The Itinerary of John Leland the Antiquary*, 3rd edn., 9 vols., Oxford, 1770, iv, pp. xii–xiii.

27 Montfaucon, op. cit. (21), v, Part 2, 196.

28 Montfaucon, op. cit. (21), v, Part 2, 196–7.

29 Woodward, op. cit. (10), 39. Ralph Thoresby suggested that the ancient Britons made arrowheads of flint because iron was so rare that they had even used it for money.

artefacts were found in Europe, most scholars drew the same conclusion that Montfaucon and Woodward had.

Once antiquaries and naturalists agreed that ceraunia were implements made before the use of metal was known they immediately began to question how these implements had been made, what they had been used for, and what kinds of weapons and tools had been manufactured by these ancient peoples. Here again, the comparison of ceraunia with the implements made by contemporary ‘savage’ peoples and with the ways those peoples made and used tools was an important guide to the interpretation of prehistoric European stone implements. Woodward concluded, by looking simply at their form, that ceraunia were used as axes, wedges, chisels, arrowheads, darts and lances by peoples ‘in the most early Ages’.<sup>30</sup> Antoine de Jussieu, too, judged from their form that the large wedge-shaped ceraunia had been used as axes and wedges for cutting wood, while the smaller pointed forms were used as arrowheads for hunting.<sup>31</sup> Jussieu felt confident in his interpretation of their use because just as the natives of North America used stone implements to cut wood, kill animals for food and defend themselves against enemies, so too the earliest peoples, living under similar conditions, would need similar tools to fulfil the same needs.<sup>32</sup>

The French antiquary Nicolas Mahudel (1673–1747), who presented one of the last arguments against the identification of ceraunia as ‘thunder stones’ in a paper read before the Académie royale des inscriptions et belles lettres in 1734, noted that stone is also well suited as a material for making weapons and tools. Stone, and flint in particular, is readily available, is easily fractured and is durable and solid. When struck, flint breaks into pieces that are sharp and of the right size to serve as axes, knives or arrowheads. In addition, some fragments can be ground and polished so as to be easily held in one’s hand.<sup>33</sup> Jussieu, because of his extensive knowledge of geology, also recognized that the stone from which some implements were made was not indigenous to the location where they were sometimes found, which meant that ancient peoples must have traded for these stones when they were not locally available.<sup>34</sup>

Mahudel also commented upon the efforts made to identify different types of implement among ceraunia. He noted that some people had recognized axes, both those designed to be attached to a handle and those designed to be wielded by hand, as well as hammers and other types of tool in collections of ceraunia.<sup>35</sup> But these early identifications and the methods used to make them appeared somewhat speculative. While artefacts continued to be discovered over the next few decades, antiquaries did little to refine their methods for identifying and classifying them. This state of affairs prompted the British antiquary Samuel Pegge (1704–96) to complain in 1770, in a paper read before the Society of Antiquaries, that his fellow scholars were not carefully distinguishing between different kinds of artefact, and that this often led to erroneous interpretations of them.<sup>36</sup>

30 Woodward, op. cit. (10), 39.

31 Jussieu, op. cit. (14), 8.

32 Jussieu, op. cit. (14), 7.

33 Nicolas Mahudel, ‘Sur les Prétendues Pierres de foudre’, *Histoire de l’Académie royale des inscriptions et belles lettres* (1740), 12, 165–7.

34 Jussieu, op. cit. (14), 8.

35 Mahudel, op. cit. (33), 168.

36 Samuel Pegge, ‘Observations on stone hammers’, *Archaeologia* (1773), 2, 127–8.

It was the naturalists, in fact, who took a lead in classifying stone artefacts in the middle of the century. This is hardly surprising since natural history was grounded in the task of classification and taxonomy. The Swiss naturalist Élie Bertrand (1712–90), for example, did not attempt to compile a comprehensive list of types, but he did mention that one could recognize hammers, wedges, weapons and clubs among the *ceraunia* that he had seen. He explained the existence of such weapons by stating that before the widespread use of iron many peoples headed their arrows, spears (*dards*) and pikes (*piques*) with pointed stones.<sup>37</sup> The prominent French naturalist Antoine-Joseph Dezallier d'Argenville (1680–1765) identified axes, hammers, knives, arrowheads and wedges in collections of *ceraunia*.<sup>38</sup> The Swedish mineralogist Johan Gottschalk Wallerius (1709–85) added tongues of stone (*langues de pierre*) to Dezallier d'Argenville's list, without saying what they might have been used for or how they differed from other forms.<sup>39</sup> In all these cases the classification of artefacts into different types and the interpretation of their uses was based almost exclusively on their form.

New artefacts continued to be found and described throughout the remainder of the century, however, and antiquaries continued to speculate about their identification and their possible uses. A stone celt found in Cornwall,<sup>40</sup> a polished stone axe head ploughed up in Carlisle<sup>41</sup> and some stone hammers<sup>42</sup> all elicited learned discourses about who had made them and what they had been used for. But the weight of evidence accumulated in the first half of the century had largely settled the question of the human origin of *ceraunia*. Geological texts, where *ceraunia* had long been discussed, now either ignored *ceraunia* or corrected their identification of them. Dezallier d'Argenville promulgated the new interpretation of *ceraunia* in his *Histoire naturelle éclaircie* (1742), stating that *ceraunia*, commonly called '*pierres de foudre*', were stones shaped by the hands of men who made weapons and tools from stone before the use of iron.<sup>43</sup> Wallerius expressed the same opinion in his widely read work on mineralogy, which was translated into French in 1753.<sup>44</sup> Élie Bertrand still found it necessary in 1763 to mention *ceraunia* in his work on fossils, where he explained that they were stones shaped by art and used by ancient peoples for

37 Élie Bertrand, *Dictionnaire universel des fossiles propres, et des fossiles accidentels contenant une description des terres, des sables, des sels, des soufres, des bitumes, des pierres simples and composées, communes and précieuses, transparentes & opaques, amorphes & figurées, des minéraux, des métaux, des pétrifications du règne animal, & du règne végétal &c. avec des recherches sur la formation de ces fossiles, sur leur origine, leurs usages*, Avignon, 1763, 135–6.

38 Antoine-Joseph Dezallier d'Argenville, *L'Histoire naturelle éclaircie dans deux de ses parties principales. La Lithologie et la conchyliologie, dont l'une traite des pierres et l'autre des coquillages. Ouvrage dans lequel on trouve une nouvelle méthode & une notice critique des principaux auteurs qui ont écrit sur ces Matières*, Paris, 1742, 68–9.

39 Johan Gottschalk Wallerius, *Minéralogie, ou description générale des substances du règne minéral*, 2 vols., Paris, 1753, ii, 134.

40 William Borlase, *Antiquities, Historical and Monumental, of the County of Cornwall. Consisting of Several Essays on the First Inhabitants, Druid-Superstitions, Customs, and Remains of the most Remote Antiquity in Britain, and the British Isles, Exemplified and Proved by Monuments now Extant in Cornwall and the Scilly Islands, with a Vocabulary of the Cornu-British Language*, 2nd edn., London, 1769, 287–9.

41 Charles Lyttelton, 'Observations on stone hatchets', *Archaeologia* (1773), 2, 118–23.

42 Pegge, op. cit. (36), 124–8.

43 Dezallier d'Argenville, op. cit. (38), 68–9.

44 Wallerius, op. cit. (39), 133–5.

various purposes before the common use of iron.<sup>45</sup> Yet, while naturalists and antiquaries had succeeded, by 1740, in resolving the problem of the origin and probable use of ceraunia, there still remained many difficulties and questions surrounding their archaeological and historical meaning. As more artefacts were discovered, naturalists and antiquaries faced an increasing challenge to situate these objects within their conception of human history and to understand what these objects might tell them about the earliest conditions of human life.

### **The cultural and historical meaning of ceraunia**

The paramount problem confronting naturalists and scholars with the discovery of stone artefacts right across the continent of Europe was to explain why early Europeans made implements from stone instead of metal. This was a reasonable question given the superiority of metal for this purpose and the fact that, according to the Bible, the use of metal had been introduced in the earliest ages of the world. The presence of stone artefacts conjured troubling images and disturbing questions about the earliest Europeans and even about the history of mankind. The use of ethnographic comparisons in the interpretation of prehistoric stone artefacts opened the way for more general cultural comparisons to be made between the earliest Europeans and the recently discovered peoples of the New World and the Pacific islands. Jussieu imagined that before the ancient peoples of France, Germany and northern Europe had discovered the use of iron they resembled the Americans and Pacific islanders in their way of life. They would have used stone implements to cut wood, hunt for food and defend themselves against their enemies. Since stone does not corrode or decay, these same stone implements survived to be discovered in modern times.<sup>46</sup> The French Jesuit missionary Joseph François Lafitau came to the same conclusion after living among the Iroquois in North America between 1712 and 1717, although he applied it in the opposite direction. He argued that the weapons used by the natives of America were essentially the same as those used by all peoples in the earliest ages (*premiers temps*).<sup>47</sup>

The suggestion that the first Europeans had once been like the wild savages of America was not only disconcerting to some, but it also required a rethinking of human history in order to explain how ancient Europeans had reached such a state of existence. This is because it was generally believed that the first Europeans had descended from Japheth, a son of Noah, who had led the first migration of people into Europe after the Deluge.<sup>48</sup> Since Genesis clearly describes the invention of metallurgy by Tubal-Cain only a few generations after the creation of Adam and since Noah preserved the knowledge and skills of his ancestors then some account had to be given for how the descendents of Noah could have lost the art of metallurgy. This problem was recognized and confronted by Michele Mercati in his account of ceraunia and his solution may have provided the framework for most subsequent discussions of the matter. Mercati suggested that, due to the catastrophic

45 Bertrand, *op. cit.* (37), 135–6.

46 Jussieu, *op. cit.* (14), 9. Mahudel *op. cit.* (33), 169 expresses much the same opinion.

47 Joseph François Lafitau, *Moeurs des sauvages Américains, comparée aux mœurs des premiers temps*, 2 vols., Paris, 1724, ii, 195.

48 For a general outline of these beliefs in Britain see Piggott, *op. cit.* (3), 59–61.

consequences of the biblical Flood, the sons of Noah who migrated out of the land of the Hebrews to populate Europe, Africa and Asia gradually degenerated over time, even to the point where they lost the knowledge of metallurgy, fire and other arts.<sup>49</sup>

John Woodward expounded a very similar view. He accepted the tradition that Tubal-Cain had invented metallurgy and that iron had been used before the Deluge. He also believed, as many of his contemporaries did, that Noah retained the knowledge of metallurgy after the Flood. But the devastation of the Deluge, Woodward argued, and the change it wrought upon the earth subjected the survivors and their descendants to conditions so harsh that they had to concern themselves almost solely with the necessities of life. So much time had to be devoted to obtaining food and supplying the basic needs of life that little time was left for the cultivation of the arts. 'In so calamitous a Condition, *Iron* might be perfectly *forgot*, and the Knowledge of it quite worn out', Woodward wrote.<sup>50</sup> To make matters worse, he also believed that all metal implements existing before the Deluge were destroyed by that event. Consequently, there followed a long period of time when almost all humans had to use stone implements before metallurgy was rediscovered. Woodward inferred from the 'most indubitably authentick Monuments ... that the *Use of Iron* was not recovered in *Asia* ... till some *Ages after the Deluge*', and from there this knowledge then passed to Europe and finally to America.<sup>51</sup>

A somewhat more complex scheme was proposed by Nicolas Mahudel. He too accepted the invention of metallurgy by Tubal-Cain and a degeneration of mankind after the Deluge, but he introduced the idea that there had been two extended periods of time when stone was the primary material for making implements. He began his account with the commonly held opinion that Tubal-Cain lived nearly a thousand years after the creation of Adam. If this is accepted then there was a long span of time after the creation of the first humans when metal was not used. Mahudel noted, however, that scriptural writers and other authors state that people prior to the invention of metallurgy tilled the earth, cut trees, sheared sheep and hunted animals. All these activities, not to mention the building of a city by Cain, would have required a variety of tools and weapons and since metal was unknown then stone must have taken its place.<sup>52</sup> For many centuries, then, the first humans must have relied solely upon implements of stone, which were only later replaced by those made from bronze and iron. After the Deluge people once again had to settle lands without the aid of metal implements, and stone supplied that deficiency until such time as metallurgy was rediscovered.<sup>53</sup>

There is, in these historical schemes, no notion of a vast period of human prehistory. A fairly substantial period of time during which people relied upon a stone technology could easily be made to fit into the brief six thousand years of accepted biblical chronology. It is important to note that in these schemes there is no concept of a Stone Age as a stage of cultural and technological development from which all peoples emerged or as a

49 See the discussion of this in Laming-Emperaire, op. cit. (6), 45–8. Don Cameron Allen, *The Legend of Noah; Renaissance Rationalism in Art, Science, and Letters*, Urbana, 1949 investigates this and other generally accepted ideas relating to Noah and the Deluge.

50 Woodward, op. cit. (10), 41–2. Original italics.

51 Woodward, op. cit. (10), 41. Original italics.

52 Mahudel, op. cit. (33), 165.

53 Mahudel, op. cit. (33), 164.

chronological period characterizing an epoch in human historical development. These naturalists and antiquaries of the eighteenth century did utilize concepts and empirical discoveries that would later play a role in the formulation of the idea of human prehistory and of a Stone Age, but it is equally true that their interpretation of stone artefacts and the reconstructions of early human history that they created from them contrast sharply with a modern conception of human prehistory.<sup>54</sup>

There were instances later in the century, however, where one can detect in the writings of naturalists and antiquaries a dawning suspicion that these stone artefacts were far older than had previously been thought. While considering the possible origin and use of the stone axes found in Britain, Charles Lyttelton (1714–68), an antiquary and fellow of both the Royal Society and Society of Antiquaries, remarked that there was ‘not the least doubt of these stone instruments having been fabricated in the earliest times, and by barbarous people, before the use of iron or other metals was known’.<sup>55</sup> This appears to be a mere reiteration of what Montfaucon and others had said earlier, but he added that stone axes and arrowheads not only originated from a period before the early inhabitants of Britain made weapons from metal, they originated from a time before these people even had a knowledge of metal. Thus they must have been made at a very early period indeed. From this, Lyttelton concluded that the stone weapons in question were the most ancient antiquities of Britain and were probably coeval with the first inhabitants of the island.<sup>56</sup> Lyttelton did not claim an antiquity for these objects greater than the six thousand years of biblical chronology, and it is difficult to judge whether those first inhabitants of Britain of which he speaks were simply the ancient Britons or some hitherto unknown primordial tribe.

There were other discoveries scattered throughout the century that keenly demonstrate the difficulties early naturalists and antiquaries faced when interpreting the archaeological and historical meaning of stone artefacts. The first occurred at the very beginning of the century when John Conyers, an apothecary and amateur antiquary living in London, discovered a flint weapon lying beside the ‘Body of an Elephant’ while digging for gravel in a field. In his account of this curious find John Bagford (1650–1716), a shoemaker and avid collector of books and antiquities, found the remains of the elephant more difficult to account for than the stone implement. ‘How this Elephant came here? is the Question’, he revealingly remarked.<sup>57</sup>

Bagford acknowledged that many people would explain the elephant as a vestige of the biblical Flood, but he proposed instead that it might have been brought to Britain by the armies of the Roman emperor Claudius and ‘killed in some Fight by a Britain’. This

<sup>54</sup> On the rather complex relationship between natural history, human history and Earth history in the seventeenth and eighteenth centuries see Paolo Rossi, *The Dark Abyss of Time: The History of the Earth & the History of Nations from Hooke to Vico* (tr. Lydia G. Cochrane), Chicago, 1984 and Rhoda Rappaport, *When Geologists Were Historians, 1665–1750*, Ithaca, 1997.

<sup>55</sup> Lyttelton, op. cit. (41), 118. This paper was written in 1765 and read before the Society of Antiquaries in 1766.

<sup>56</sup> Lyttelton, op. cit. (40), 121–2.

<sup>57</sup> John Bagford, ‘A letter to the publisher, written by the ingenious Mr. John Bagford, in which are many curious remarks relating to the city of London, and some things about Leland’, in *Joannis Lelandi Antiquarii de rebus Britannicis collectanea*, 6 vols., Oxford, 1715, p. lxiv.

conjecture would have appeared plausible since the Romans were known to have used elephants in war, and because ‘not far from the Place where it [the supposed elephant] was found, a British Weapon made of a Flint Lance like unto the Head of a Spear, fastened into a Shaft of a good Length, which was a Weapon very common amongst the Ancient Britains, was also dug up, they having not at that time the use of Iron or Brass’.<sup>58</sup> Bagford thus creatively deployed the historical and scientific knowledge available to him to construct a convincing and satisfying explanation of these discoveries.

A similar situation faced Johann Friedrich Esper (1732–81) near the end of the century when he discovered human remains associated with fossilized animal bones in Gailenreuth Cave, in the Bayreuth area of Germany. In his account of the discovery, Esper acknowledged that the animal remains were of species that were not known and that might have become extinct. From the position of the human bones he concluded that the event that had deposited the animal bones there was also responsible for the presence of the human remains. Although there were no stone implements present, Esper realized that the remains were extremely old, but when he attempted to explain his discovery only three possibilities seemed reasonable: either the remains were of a Druid, or of an antediluvian man, or of a more recent origin.<sup>59</sup> Esper’s conviction that the geology of the earth’s surface was the product of a great catastrophe, his belief in the historical reality of the biblical Deluge, and his confidence in the tradition that people had lived prior to that catastrophic event, all led him to conclude that the human and animal remains were from the antediluvian world. Like John Bagford, Esper explained an unusual discovery using the accepted scientific and historical knowledge of his day.

Developments in the sciences of palaeontology and geology during the last half of the century, however, created a situation where stone artefacts began to be viewed in new ways. This is exemplified in the discovery of a stone axe in a quarry near Brussels, Belgium, which came to the attention of the Dutch/Belgian geologist François-Xavier Burtin (1743–1818). Burtin was familiar with the geological literature on *ceraunia* and with the generally accepted ethnographic and archaeological opinions surrounding them, and this provided a framework for him to interpret this new discovery. What made this particular discovery significant, however, was the attention Burtin gave to the geological context and stratigraphic position of where the axe was found. Upon investigating the quarry, he found that it consisted of three distinct stratigraphic layers, the geology of which he described in some detail. He took great pains to ascertain that the axe had been found at the bottom of the lower-most bed, near the fossilized remains of a tortoise, of oysters and of nautilites.<sup>60</sup>

Burtin was justifiably excited by this fact, for it carried quite profound implications. Indeed, he was quick to note that ‘this situation under three beds of such petrifications is

<sup>58</sup> Bagford, *op. cit.* (57), p. lxiv.

<sup>59</sup> For a thorough discussion of Esper’s discovery and its significance in the history of prehistoric anthropology and archaeology see Donald K. Grayson, *The Establishment of Human Antiquity*, New York, 1983, 89–95. For the relevant passages see Esper, *Ausführliche Nachricht von neuentdeckten Zoolithen unbekannter vierfüssiger Thiere*, 1774, 26. A French translation of this work appeared in the same year, which greatly expanded the influence of the book.

<sup>60</sup> François-Xavier Burtin, *Oryctographie de Bruxelles ou description des fossiles tant naturels qu’accidentels découverts jusqu’à ce jour dans les environs de cette ville*, Bruxelles, 1784, 66.

so interesting, it leads to consequences so singular', that he felt it necessary to take great pains to verify this fact with the workmen who were present when the axe was discovered.<sup>61</sup> The fact that the axe was found in that geological context indicated not just a very great historical age for the object, with human history still considered to extend about six thousand years, but also a geological antiquity that certainly must exceed the limits of acknowledged human history. Burtin cautiously claimed only that the axe appeared to be 'a monument so respectable of the most remote antiquity that nothing regarding it can be indifferent, or treated lightly'.<sup>62</sup> But he did allude to the bearing that this find could have on the question of human antiquity and on the relationship between human history and Earth history when he referred to the singular relation (*rapport singulier*) that stone artefacts have to the physical history and the moral history of the Earth (*l'histoire physique et morale de notre globe*).

Burtin's comments are important because he was one of the first geologists to observe the stratigraphic location of a prehistoric implement and to infer from this a relative age for an artefact that exceeded the bounds of accepted biblical chronology. His interest in the geological context of the discovery, and his recognition that the stratigraphic and palaeontological evidence suggested an extreme antiquity for the artefact, reflect a new attitude towards prehistoric artefacts and the way they should be studied. The rapid growth of geology and palaeontology in the late eighteenth and early nineteenth centuries radically transformed the study of human prehistory. This was in part because of the discovery of more stone implements and in part because more of these implements were found in association with extinct fauna or in geological strata that indicated a very great age for them. The well-known discovery of a hand-axe in Hoxne by John Frere in 1797 marks in many ways this transition from eighteenth-century interpretations of stone artefacts to the approaches and attitudes that would prevail in the nineteenth.<sup>63</sup> In addition, new geological theories were profoundly changing long-held opinions about the age and history of the Earth. All these developments led geologists and archaeologists to formulate the existence of a Stone Age, as well as argue for the coexistence of early humans with the Ice Age fauna, later in the nineteenth century.<sup>64</sup>

## Conclusion

The investigations of eighteenth-century naturalists and antiquaries are not important simply because they 'correctly' interpreted *ceraunia* to be artefacts of human manufacture. For the historian of science and the historian of archaeology there is much to be learned

<sup>61</sup> Burtin, *op. cit.* (60), 66.

<sup>62</sup> 'Un monument si respectable d'une antiquité la plus réculée, que rien de ce qui la regarde ne peut être indifférent, ni traité légèrement'. Burtin, *op. cit.* (60), 66.

<sup>63</sup> Frere made this discovery in 1797 but his description of it was not published until 1800 (in the journal *Archaeologia*). I have not discussed Frere's ideas here because they mark the beginning of a quite new approach to the study and conceptualization of stone artefacts, which sets Frere's paper on the Hoxne axe apart from what went before. The significance of this paper as a pivotal transition between two somewhat distinct periods or traditions in the study and interpretation of prehistoric stone implements would demand a lengthier discussion than is possible here.

<sup>64</sup> These developments are discussed at length in Grayson, *op. cit.* (59).

from the way ceraunia were transformed, during the eighteenth century, from poorly understood geological specimens to archaeological artefacts. This process highlights the role that natural history played in the early development of a science of archaeology and reflects the close relationship that the natural sciences have often had with the human sciences. The pivotal role of natural history cabinets and early museums in the process of redefining ceraunia, where the comparison of such disparate items as fossils and rare ethnographic material was made possible, offers a compelling illustration of the importance of such collections in the history of science. The resolve of naturalists and antiquaries to discover the origin of ceraunia and to interpret their broader historical and cultural meaning led them to seek answers from a wide variety of sources. This provides us with further insight into the nature of scientific practice in the eighteenth century. Ceraunia were collected as curiosities, as rare geological specimens and as evidence of humanity's past. In order to interpret their meaning, naturalists and antiquaries resorted to descriptions of early Europeans in classical texts, to information reported about the savage peoples inhabiting remote parts of the globe, to geological hypotheses about the age and history of the Earth and to the biblical account of early human history. Such materials would in turn provide a later generation with some of the basic ingredients for the making of a new science of human prehistory.