World Prehistory and Natural Science

By GRAHAME CLARK

A J. C. Jacobsen Memorial Lecture

Det Kongelige Danske Videnskabernes Selskab
Historisk-filosofiske Meddelelser **50:1**

Kommissionær: Munksgaard
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Synopsis

As a way of recovering human history preceding and beyond the range of oral traditions or written records *archaeology* developed alongside *geology* and *palaeontology*. Each involved the replacement of authority by experiment. Although archaeology advances by bringing *natural science* to bear on the material detritus of former societies, the phenomenon of man remains firmly in the sphere of *history*. Paradoxially the triumph of the scientific world view threatens the very values documented in prehistory. The *cultural diversity* that formerly characterised the more advanced human societies in marked contrast to the genetically coded behavioural patterns of non-human species is now increasingly menaced by the *homogenizing* and socially flattening tendencies of modern *industrial society*.

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In this Jacobsen Memorial Lecture my aim is to convey two interlocking ideas;

first, that the concept of world prehistory as a study concerned with the emergence of man, the growth and differentiation of his cultural heritage has developed as part of the shift from a traditional to a more rational view of man, society and the natural universe and is only capable of being realised through the application of many branches of natural science,

second, that human history, even the prehistoric parts is not amenable to explanation in the same terms as natural history – in other words that archaeology is above all a method of studying the emergence and realisation of what it means to be human. Indeed that the consequences of the advance of a rational world view combined with modern technology, to which we owe the possibility of conceiving world prehistory, offer threats to our humanity as powerful as those they are recognised to offer to our environment. Whereas *Homo sapiens* has realised his humanity through enriching and diversifying his culture, the advances of science, technology and not least of "progressive" ideas have already gone some way to impoverishing our heritage through a relentless and accelerating process of homogenisation.

In accepting your invitation I have chosen a topic which involves disciplines within each of the two main classes of the Academy. In doing so I follow the example of the Carlsberg Foundation which has won international acclaim for the support it has given to interdisciplinary research in this field. I would recall in particular investigations directed to the way in which the earlier Stone Age hunter-fisher-forager populations adapted to environmental changes since the Lateglacial period and, again, those bearing on the introduction of a Neolithic economy. As in the case of modern agriculture, indeed of modern Danish society, the key has lain in co-operation.

To the archaeologists, even to some of the historians among you, it must be sufficiently plain that no firm interpretation of archaeological evidence can be given without the kind of exact knowledge of the

environment and of raw materials and techniques that only natural scientists, often of a highly specialised kind, can provide. It took longer for the converse to be admitted, namely that the benefits should be mutual, that in contemporary jargon there ought to be a two-way feed-back or pay-off and that natural science has something more substantial than improving its image to gain by co-operating with the humanities. Yet, surely, this is basic to the concept of ecology. Human societies must needs interact with each of the other components of the systems in which they operate. Here again Danish science, notably in the person of the late Johannes Iversen, gave a decisive lead. It was Iversen's genius that, while prepared to follow the routines of palynology as if vegetational change could be explained wholly in terms of such natural factors as climate and plant succession, he was always on the watch for anomalies as challenges to the conventional wisdom. It was for instance precisely because this failed to account for the sudden increase in the pollen of birch, immediately following a temporary decline in forest trees and a corresponding increase in non-tree pollen, that he sought alternative explanations. The hypothesis[1] that all three phenomena were due to temporary clearance followed by recolonisation on the part of rapid spreading birch trees effectively introduced the idea of prehistoric man as an active agent in ecological change. This opened up new perspectives for palaeo-botanists and archaeologists alike and further advertised the over-riding need to pursue Quaternary Research on the basis of intimate co-operation. Recognition that economic forces played a significant, in some cases a dominant role in shaping the environment even during prehistoric times, carried with it the possibility that economic history could be read as much from pollen diagrams, soil profiles, molluscan and faunal assemblages and the like as from the artefacts of early man.

The experience of those actively engaged in research was soon reflected in the attitude of bodies concerned with the allocation of funds. If I speak of the situation in Britain this is partly because it is one with which I am most familiar but partly also because until very lately it is a country in which the provision for science and the

1: Johs. Iversen, *Land Occupation in Denmark's Stone Age. A Pollen-analytical study of the influence of farmer culture on the vegetational development.* Danmarks Geol. Unders. II R. Nr. 66. Copenhagen, 1941. of. *Det Kgl. Danske Videnskabernes Selskab Oversigt* 1972-3, 142-3.

humanities has been more widely separated than in most others. Whereas in Denmark your Academy presides over the whole field of learning, in Britain, as is well known, responsibility has been divided between the Royal Society and the British Academy, the former overseeing the equivalent of your Mathematical-Physical, the latter that of your Historical-Philosophical class. In Britain the division has been further exaggerated by a marked difference in public financial provision. Whereas the Natural Sciences have long been recognized to be expensive but acceptable as a form of national investment, research in the humanities has been and still is to some extent regarded as a luxury.

Understandably it was the archaeologists who felt most emphatically the need for more than a quiet place to sit. The mere expense of recovering their basic data by excavation and survey, has soared with the rise of wages, not least in overseas territories. Moreover, the more scientifically archaeologists have sought to operate and the more closely they have sought to work with colleagues over a wide range of natural sciences in the analysis of their data, the more closely their financial needs approximate to those at least of the less expensive sciences. Although financial needs were important – and archaeologists were by no means the only group of humanistic scholars to call for more adequate provision – I would not wish to exaggerate their influence. Nor would it be right to over-emphasise the extent to which scientific leaders have come to accept the need to display a more positive attitude to society and its concerns over and above satisfying its material, medical and defence needs. The discontents of humanists and the apprehensions of scientists have certainly played a part, but I would prefer to stress the growing awareness on both sides of what they have to gain from cooperation. This has already found practical expression in the series of symposia designed to illustrate the outcome of joint humanistic and natural scientific research organised by the British Academy and the Royal Society.[2] More than one of these dealt with areas of research in which

2: According to the Preface of *The Impact of the Natural Sciences on Archaeology.* (edt. T. E. Allibone, Sir M. Wheeler et al., Oxford Univ. Press, 1970) the first joint symposium held in the rooms of the Royal Society in December, 1969 marked a conscious "decision of the Royal Society, and the British Academy to work together in the many fields of learning where their interests overlap". It is significant that at the working lunch held in the previous year to consider ways of forwarding co-operation between the two bodies it "was felt by all present that a

the Carlsberg Foundation has long displayed a special interest and it is significant that Danish scholars made leading contributions to the symposia. In introducing[3] that devoted to *The Early History of Agriculture,* I specified in some detail the Sections within the organisation of the two bodies involved: no doubt this analysis could have been worked out in more detail, but it is plain that many lines of study are needed to effect serious advances, an operation that is bound to be costly.

In this connection the Department of Scientific Research, the main organisation for channelling public funds to scientific research in Britain, has recently recognised its concern for humanistic studies by setting up a Science Based Archaeology Committee.[4] One of the arguments to carry conviction was the prospect that intensive application of natural science to archaeology might benefit both sides.

When I began to think about this lecture I was inclined to the view that World Prehistory could usefully be thought of as in a sense an artefact of Natural Science. It is true enough that the prime stimulus to the idea of prehistory came from geology, biology and palaeontology and further that the advance of archaeology in the case of all periods has owed much to the application of scientific techniques and procedures. Yet on reflection prehistory can hardly be regarded as a product, still less as itself a branch of natural science. Since communities are human to the extent that they conform to patterns of behaviour shaped to an increasing degree by cultural rather than genetic inheritance, they can only be regarded in the final analysis as

joint enterprise was called for and that there could be no more appropriate subject, linking science with the humanities than archaeology". The first symposium, which included a celebration of the first twenty years of radiocarbon dating, was followed in 1972 by one on *The Place of Astronomy in the Ancient World* (edt. D. G. Kendall, S. Piggott et al., Oxford Univ. Press, 1974) and in 1975 by a third on *The Early History of Agriculture* (edt. Sir J. Hutchinson, G. Clark, et al., Oxford Univ. Press, 1977).

3: In the opening paper »Domestication and Social Evolution«, see esp. pp. 5-7.

4: The Committee was established by the Science Research Council in July 1976 on the recommendation of the Advisory Board for the Research Councils following an expression of concern by the British Academy and other bodies over the inadequacy of the funds available for the development and application of scientific methods in archaeology. A valuable insight into the work of the Committee can be obtained from the *Annual Report 78/79* of the Science Based Archaeology Committee of the Science Research Council.

products of the historical process. If prehistory has to be categorised it can only be as an historical discipline.

History itself is part of the cultural inheritance of all peoples. Even the most primitive of men, when questioned by explorers, traders, missionaries, administrators or anthropologists, attribute their adherence to particular customs to the example of ancestors. An awareness of history, however this is conceived and expressed, has consistently served to promote and deepen the sense of humanity that informs communities of men.[5] It does so in three distinct though interlocking ways. It enhances the confidence, of which men feel the need as they embark on increasingly artificial modes of life in the face of natural forces, by legitimizing and validating their institutions. Secondly, it intensifies the cohesion and in consequence the effectiveness of communities by emphasizing their common inheritance. Thirdly, and complementarily, the possession of a unique history enhances the sense of identity of human societies vis-à-vis their neighbours. In each of these ways a sense of history is of adaptive value by making human societies more effective and at the same time more enduring. Conversely every advance in culture, every increase in the degree to which behaviour is conditioned by historical rather than merely biological factors, may be assumed to involve an increase both in the range and depth of human awareness. In a general sense it can be admitted that man's awareness of history as much as his economy or technology is subject to the selective processes of evolution.

It seems to follow that human societies are likely to entertain a sense of history appropriate to their circumstances. In terms of space the range of historical awareness is and must necessarily be restricted to territories known to a society either directly through its annual exploitation cycle or indirectly through exchange or other social networks. Similarly the temporal range of historical awareness can be expected to be confined to what is relevant to a particular society and permitted by its intellectual attainments. Thus a community restricted to oral communication would hardly be as capable of transmitting the kind of detailed history open to a literate one, even supposing that this would have served any useful purpose to people who had not yet attained the degree of organisation that required literacy. On the other hand, as we are reminded by the oral literature

5: For a fuller exposition see Chap. 1 "The Relevance of World Prehistory" in my *Aspects of Prehistory*. Univ. Cal. Press, 1970 and 1974.

of the Greek, Celtic or Teutonic peoples of Europe or the wealth of lore enshrined in the stories, riddles, dances, mimes, representations, decorative designs, social structure and customs and not least in the religious beliefs, rituals and symbols of the preliterate peoples until recently beyond the direct influence of the industrial world, the written word is by no means the only medium for transmitting history. The fact remains that in preliterate societies everywhere the dimensions of historical awareness were more or less narrowly confined both in time and space. By the same token, the possibility of envisaging history as comprehending the whole world and the entire span of human existence depended on the spread of western civilization equipped with means of transport and communication that reduced the world to readily comprehensible proportions and informed and propelled by scientific modes of thought.

The first constraint to go was the geographical one.[6] Five hundred years ago Christendom, with few exceptions like those afforded by the reports of travellers and missionaries to the Mongol court, was less well informed about territories within immediate reach than the peoples of Classical antiquity. Indeed it was the translation into Latin in c. 1406 of a Greek manuscript of Ptolemy's *Geographia* that provided a base and one of the main stimuli for the voyages of discovery which as much as anything defined the onset of the modern age. Paradoxically, although inspired by Ptolemy, the Portuguese navigators who rounded the Cape of Good Hope and within fifteen years had not merely crossed the Indian Ocean to the Malabar coast but made contact with the western terminus of the China trade and even reached Canton, by exposing the error of his Southern Continent and a land-locked Indian Ocean, helped to break the grip of ancient book learning on the imagination of western man. Similarly the navigators who in the final decade of the fifteenth century voyaged west across the Atlantic imagined themselves to be heading for the eastern extremity of Asia. When Columbus sighted the Bahamas he thought he must be encountering the outliers of Japan and when John Cabot encountered Greenland and Labrador he identified these as peninsulas of north-east Asia. As renewed voyages brought more clearly into view the true outlines of the world, the limitations of traditional book-learning were rammed

6: J. H. Parry, *The Age of Reconnaissance. Discovery, Exploration and Settlement 1450 to 1650.* Weidenfeld and Nicolson, London, 1963.

home by the very prows of the exploring vessels. Even more important than the stimulus to astronomy and magnetics involved in navigation was the lesson that new knowledge of the world could only be won by observing and testing nature herself; as has recently been pointed out[7] "unlettered seamen, travellers and merchants by simple observation gave the lie to the greatest philosophers of Antiquity".

The age of reconnaissance made Europeans aware of more than new territories. It brought them face to face with peoples having previously unknown racial characteristics and social customs. Indeed when Europeans first encountered the inhabitants of the New World they doubted whether to classify them as apes or accept them as men. When the Pope solved this particular problem in 1512 by pronouncing them true descendants of Adam and Eve,[8] this only raised another question. If all the peoples encountered in the course of geographical reconnaissance were indeed descended from the same pair, how could one account for the diversity of race, language and cultural level? It is symptomatic of the theological patterns of thought still prevailing in the 16th-17th centuries and persisting sporadically through the 18th and even into the 19th century, that the diversity encountered by explorers was squared with the doctrine of monogenesis by reference to the dispersal of the sons of Noah[9] or even the builders of the Tower of Babel.[10] The fact that all men, however much they differed from Europeans, were acknowledged to be descendants of Adam and Eve stimulated missionary zeal and in so doing led to the intensive observation of the indigenous inhabitants that laid the basis for systematic ethnology.[11]

The temporal limits to the span of human history inferred from literal interpretation of the Old Testament were scarcely threatened during the initial phase of the scientific revolution. As Stephen Toulmin and June Goodfield have brought out so clearly[12] the

7: By R. Hooijkaas, 'Humanism and the voyages of discovery in 16th century Portuguese science and letters', *Med. d. kon. Nederlandse Akad. v. Wetenschappen, Afd. Letterkunde,* N. R. Deel 42, no. 4, p. 106.

8: T. K. Penniman, *A. Hundred Years of Anthropology,* 41. Duckworth, 1935.

9: Margaret H. Rubel, 'Savage and Barbarian. Historical Attitudes in the Criticism of Homer and Ossian in Britain, 1760–1800', 105. *Verh.d. Kon. Nederlandse Akad. v. Wetenschappen, Afd. Letterkunde, N. R.,* deel 96. Amsterdam, 1978.

10: *ibid.,* 109f.

11: A. C. Haddon, *History of Anthropology,* 102-3. Watts & Co., 1934; T. K. Penniman, op.cit., 39 ff.

model of the world and the universe devised by Galileo, Descartes and Newton was essentially timeless: the world-machine was conceived of as operating continuously on self-evident principles or at least on principles demonstrable in mathematical terms as these were conceived of in western Europe at the time, and it should be remembered that Isaac Newton himself displayed a profound concern for theology. It was much the same with the biological sciences. Physiology was marked above all by Harvey's studies in the circulation of the blood and in botany and zoology, as with archaeology, the emphasis lay above all on classification as exemplified in the work of Ray (1627–1705) and Linnaeus (1707-78).

The notion that the universe and everything therein was the product of a still unfolding evolutionary development did not appear effectively until the middle of the 18th century. The first systematic attempt to give an evolutionary account of cosmic history was provided not by a physicist or a mathematician but by a philosopher. In his *General History of Nature and Theory of the Heavens* (1755) Immanuel Kant[13] held that "The creation is never finished or complete. It did indeed once have a beginning, but it will never cease. It is always busy producing new scenes of nature, new objects, and new Worlds. The work which it brings about has a relationship to the time which it expends upon it. It needs nothing less than an Eternity to animate the whole boundless range of the infinite extension of Space with Worlds, without number and without end". One of Kant's pupils, J. C. Herder[14] in a four volume work *Ideas towards a Philosophy of Man* applied his master's system to the earth and the species that lived upon it, including man and his history. Geology which like archaeology began with collections of curiosities entered on an intensive phase of classification largely to meet the need for minerals and means of communications generated and sustained by the Industrial Revolution. Faced with sequences of rocks containing fossils of widely differing character, geologists of the late eighteenth and early nineteenth century were divided into those like the eminent French authority Cuvier who explained them in terms of recurrent catastrophes and those who like John Hutton of Edinburgh preferred to see them as outcomes of processes similar

12: *The Discovery of Time*, 80. Hutchinson, 1965.
13: Quoted from Toulmin and Goodfield *op.cit.*, 130 ff.
14: *ibid.* 135–9.

to those still operating at the present time. The most influential proponent of Hutton's transformist thesis, Charles Lyell (1797–1875), confirmed in his *Principles of Geology*[15] (3 vols. 1830–33) that the sequence observed in the rocks could be explained as products of processes similar to those operating today. All that the uniformitarian needed was a sufficiency of time. If men clung to the chronology inferred by Archbishop Ussher from Old Testament genealogies only six thousand years or so were available. So when flint artefacts began to be recognised in the same layers as remains of extinct animals the catastrophic hypothesis was invoked: as late as 1823 William Buckland, Professor of Geology as well as Dean of Christchurch, Oxford, did not hesitate to attribute discoveries made during the excavation of caves to the operation of the Biblical Flood.[16]

For many people, including Charles Darwin, the publication of Lyell's *Principles* was decisive, but it was the combination of biological and geological evidence that finally destroyed the credibility of a traditional chronology and convinced the educated world that man and his culture had developed over immensely long periods. Jean B. Lamarck based his view that existing species had emerged from earlier ones by a process of slow transformation on his observation that there was a clear palaeontological succession, the older rocks containing the simpler fossils and the younger ones progressively more complex ones. Again, Charles Darwin acknowledged his debt to Lyell who was one of the foremost in urging publication of *The Origin of Species by Means of Natural Selection* (1859).

The publication in 1863 of Lyell's *The Geological Evidences of the Antiquity of Man* and of Huxley's *Evidence as to Man's Place in Nature* made it crystal clear that Darwin's hypothesis applied to man himself. The notion that existing races had diverged from the parent stem by

15: 3 vols., London, 1930–3.

16: The full title of the book in which the Revd. William Buckland F.R.S. summarised his researches was *Reliquiae Diluvianae; or, Observations on the Organic Remains contained in Caves, Fissures, and Diluvian Gravel, and on other Geological Phenomena, attesting the Action of an Universal Deluge.* London, 1823. In the dedication inscribed to the Lord Bishop of Durham from his Deanery of Christchurch the Professor of Geology at Oxford University expressed the hope that "by affording the strongest evidence of an universal deluge... it will no longer be asserted, as it has been by high authorities, that geology supplies no proofs of an event in the reality of which the truth of the Mosaic records is so materially involved".

a process of gradual transformation was already half a century old when Huxley published his essay. Indeed in his *Researches into the Physical History of Man* (1813) J. C. Prichard had to some extent anticipated Darwin by stressing the role of selection in the process of diversification. What was new when Huxley addressed himself to the problem was that the evolution of man could then be viewed in the dimension of geological time. In this respect the discovery in the Neanderthal[17] between Düsseldorf and Elberfeld, West Germany, in 1857 of a human cranium displaying features of a notably more primitive character than those of modern man was providential, since it gave Huxley just what he needed to stimulate the development of Human Palaeontology. I shall not be touching on the physical and neural evolution of early man, beyond reminding you that this not only limited but was to a significant degree conditioned by his cultural history.

The Darwinian revolution further impelled research into the cultural and social history of man along paths blazed in the course of the previous hundred years. The most immediate, though ultimately fallacious results were claimed by ethnologists. The first impact of encounters with peoples living in remote parts of the world outside the scope of European civilization lay with political economy. For one thing it led men like Hobbes, Locke and Rousseau to conceive of a time when men lived in or close to a State of Nature. For another it prompted speculation into the stages by which men advanced from this basal level to that reflected in classical literature or that of the *philosophes.* Montesquieu's *L'Esprit des Lois* and Condorcet's *Progress of the Human Mind* drew data from as far afield as North America and the South Seas.[18] The speculations of political philosophers about the progress of mankind were systematized by ethnologists on the basis of the much fuller knowledge of so-called primitive peoples available by the latter half of the nineteenth century. Lewis H. Morgan, American author of the most influential work in this now discredited genre, *Ancient Society or Researches in the Lines of Human Progress from Savagery to Civilization,* admitted that he only changed his views "respecting the relation of savages to barbarians and of barbarians to civilized man" in the face of the new evidence for the high antiquity

17: T. K. Penniman, *op.cit.,* 68. This stimulated a spate of new discoveries in western and central Europe, *ibid.* 225 ff.

18: *ibid.,* 50ff.

of man brought forward by the Victorian evolutionists. If there was time enough to account for the diversity of rocks, of plants and of animals, there was more than sufficient to explain the emergence of human societies at differing levels of cultural attainment. In the euphoria of evolutionary doctrine Morgan was prepared to state as a matter of certainty "that savagery preceded barbarism in all the tribes of mankind, as barbarism is known to have preceded civilization" and furthermore that "since mankind were one in origin, their career has been essentially one, running in different but uniform channels upon all continents".[19] In specifying the seven phases through which he supposed human societies had passed in the course of social evolution Morgan was even helpful enough to provide clues for archaeologists:

Lewis H. Morgan's stages in social Evolution (1877).

	Stages	*Material Clues*
VII	Civilization	Inscriptions
VI	Upper Barbarism	Iron
V	Middle Barbarism	Domesticated animals & plants
IV	Lower Barbarism	Pottery
III	Upper Savagery	Bow
II	Middle Savagery	Fishing, fire
I	Lower Savagery	

Although unilinear schemes of social evolution were transmitted down to modern times embalmed in Marxist dogma by Engels and enforced by Marr as head of the Institute of the History of Material Culture at Moscow,[20] they were doubly fallacious. They rested on the false assumption that human cultural traditions evolved as though they were natural organisms instead of in the context of unique historical processes. Again, they assumed that by arranging societies in order of their cultural complexity they had found an infallible guide to the evolutionary sequence in time. If such was indeed the case, archaeology would have been reduced to a method of recovering fossils of an already known course of unilinear evolution. Conversely the pioneers of social anthropology who dismissed the writings of the early ethnologists as hypothetical history were fighting for space in which to cultivate the new discipline concerned

19: See p. LIV of the Introduction to the Meridian Book edition of 1963.

20: See M. W. Thompson's foreword (p. 29) to his translation of A. L. Mongait,

with how the societies still functioning beyond the range of the world industrial economy in fact operated.

The alternative and only reliable way of exploring the remote past was to deploy the proven methods of archaeology. From the nature of their calling archaeologists were accustomed to the notion that for them there was no easy way. For the prehistoric period at least there was no other source, apart from a few texts from contemporary records bearing on the final phases, than ancient monuments and the vestiges buried in the soil. The idea that understanding of the past could be achieved through the medium of its material as well as its written records is much older than the discipline of archaeology as this has developed in the course of the last two centuries. Again, it is not peculiar to western civilisation. As early as the Han dynasty Chinese scholars engaged in careful and respectful study of the antique bronzes relating to their ancestors and it is significant that Chinese products have ever since displayed archaising tendencies based on a close understanding of ancient prototypes.[21] Although the Classical Greeks and Romans seem to have speculated about the remote past more in a philosophical and poetic than in a scholarly vein, Hesiod was well aware that the use of iron was preceded by bronze and, as is well known, Lucretius anticipated the sequence embodied in the Three Age system.[22] Again, in importing and copying the works of Greek sculptors wealthy Romans of imperial times anticipated the practice of a future age. The renewed interest in Classical Literature that marked the Renaissance was accompanied by a growing concern with the art of the Greeks and Romans. The fashion for assembling collections of sculpture, vases, coins, medals quarried from ancient sites first developed by Italian magnates of the fifteenth century spread north of the Alps to former provinces of the Roman Empire. Apart from the direct and immediate impact on taste, this helped to provide the basis from which two distinct branches of archaeology ultimately developed. On the one hand the recovery of Classical artefacts made it possible for Winckelmann and his successors to devise the stylistic criteria on which Classical Archaeology was founded.[23] On the other study of classical writers in

Archaeology in the U.S.S.R. Penguin Books, 1961.

21: Cheng Te-K'un, *Archaeology of China*, vol. 1, xvi. Heffer, 1959; G. Clark, *Aspects of Prehistory*, 6 n.6. Univ. Cal. Press, 1974.

22: G. E. Daniel, *A Hundred Years of Archaeology*, 14–16. Duckworth, 1950.

23: *ibid.* 16–21.

itself directed attention to the non-classical barbarians at the very moment when the new nations stemming from the break up of medieval Christendom were actively concerned with establishing their identities. Indigenous antiquities were cherished as symbols of identity as they still are among newly emergent nations.

Initially interest was primarily topographical. Before the end of the 16th century William Camden was illustrating Stonehenge[24] in the original edition of *Britannia*.[25] Careful field studies of monuments like Avebury and Stonehenge were undertaken by John Aubrey not long after the foundation of the Royal Society and even more detailed surveys of the same monuments were carried out during the first half of the 18th century by the antiquary William Stukeley.[26] On the other hand, Stukeley's views about the meaning and context of the monuments accorded ill with the excellence of his field records and published illustrations. His preoccupation with the Druids shows for one thing that he belonged to an age, although as it happened to its final stage, when it was normal to rely for explanations on the authority of the written word, even as was more commonly the case on more or less far-fetched conjectures based however speciously on classical or biblical texts. The first adequately recorded attempt to recover information by the excavation of ancient monuments in Britain in the spirit of experimental science was in fact begun by the Revd. Bryan Fausset in 1754,[27] the year before Stukeley's death. Resort to scientific excavation by leading to the recovery of an ever-increasing number of artefacts of varying age in turn emphasised the need to classify data. It is hardly surprising

24: Reproduced in G. Clark *op.cit.* 1974, fig. 1.

25: For a perceptive study of Camden's contribution to antiquarian studies in Britain, see Stuart Piggott's Reckitt Lecture, 'William Camden and the Britannia', *Proc. Brit. Acad.* XXXVII (1951), 199–217.

26: Stukeley entitled his most notable publication *Abury, a Temple of the British Druids, with Some Others, Described.* London, 1743.

27: Unfortunately the Revd. B. Faussett died without publishing his results. We have testimony to the systematic manner in which he recovered his data from the late 18th century antiquary and excavator the Revd. James Douglas, in his well illustrated *Nenia Britannica* (1793), 37 fn. Douglas who dedicated his volume to his royal master, the Prince of Wales, began his Preface with a sentence which reflects the transition from the acquisition of curiosities to the systematic salvage of the materials for reconstructing the past. "If the study of Antiquity (he wrote) be undertaken in the cause of History, it will rescue itself from a reproach indiscriminately and fastidiously bestowed on works which have been deemed frivolous".

that the Three Age System should have been devised and applied by a museum curator embarrassed by an ever growing mass of materials.[28]

A point to be emphasised at this juncture is that the change from a conjectural to a more scientific approach to the study of archaeological monuments and relics since the middle of the 18th century formed part of a major shift in European thought from reliance on authority and traditional procedures to a greater readiness to apply new techniques in the rational understanding and manipulation of nature and society. Seen from this point of view archaeology was a by-product of the Age of Enlightenment,[29] an age that witnessed not merely the Industrial and French Revolutions but also the genesis of the main disciplines of natural & social scientific research, not to mention a radical transformation of historical scholarship extending even to the Bible. As might have been expected in view of the key role played by geology in the genesis of transformist ideas the early prehistorians turned to stratigraphy as a way of gaining the initial objective of a temporal frame of reference. It was largely due to its rich endowment of Quaternary sequences in river terraces and caves that the extended chronology opened up by the victory of the evolutionists was first effectively documented in France. Within months of the key papers of Darwin and Wallace the archaeologist John Evans accompanied by the geologist John Prestwich visited Abbeville in the Somme Valley and returned convinced that Boucher de Perthes was justified in his claim to have found hand-axes in true association with the fossils of Middle Pleistocene Elephant and Rhinoceros.[30] Systematic investigation of the Late Pleistocene deposits in the Dordogne caves was begun by the French palaeontologist Edouard Lartet and the Englishman Henry Christy as early as 1863.[31] By 1865 enough primary data had been recovered from

28: This is well brought out by G. E. Daniel, *The Three Ages. An Essay in Archaeological Method*, 6–8. Cambridge, 1943.

29: Jean Starobinski, *Bull. Am. Acad. of Arts and Sciences* XXXII (1979), 5–9.

30: G. E. Daniel, *op.cit.*, 1950, 60 ff.; Joan Evans, *Time and Chance*, 100f. Oxford, 1943.

31: In 1863 Lartet was joined by Henry Christy. Owing to the death of Christy in 1865 and Lartet in 1871 their joint publication, *Reliquiae Aquitanicae; being contributions to the Archaeology and Palaeontology of Perigord and the adjoining provinces of southern France*, edited by Prof. Rupert Jones, did not appear until 1875. The volume is distinguished both by the accuracy of its illustrations and by the attention paid to animal remains.

western Europe for John Lubbock to distinguish between the Palaeolithic and the Neolithic phases of the Stone Age, the former represented by the material from diluvial deposits and the infill of caves, the latter by finds from megalithic tombs and the settlements exposed round the margins of the Swiss lakes during the drought of 1853–4.[32] The accelerating tempo of excavation made it possible by 1881 to publish a scheme of classification for the Stone Age in France based on a conflation of detailed stratigraphical observations.[33]

Within France and adjacent regions de Mortillet's scheme as modified by Breuil[34] still retains some validity. Its main fault lay with those who sought, like the Soviet prehistorians of a certain period,[35] to apply the French local terminology to their discoveries in quite a different territory. A more egregious but also a revealing error was perpetrated by a geologist, W. J. Sollas, who by a strange irony occupied the same chair at Oxford as that from which Dean Buckland had urged the scriptural merits of his cave researches on the Lord Bishop of Durham. Sollas equated the Eskimo with the Magdalenian phase of the French sequence and even went so far as to opine that the Tasmanians might "be regarded with great probability as representing an ancient Mousterian race which cut off from free communication with the surrounding world had preserved almost unchanged the habits and industrial arts which existed during the later days of the Lower Monastirian age",[36] for all the world as though the Mousterian was the equivalent of a geological stratum buried deep in Europe but outcropping in Tasmania. As Gordon Childe was to stress in his inaugural address to the Prehistoric Society in 1935[37] prehistorians had had to waste much time during the preceding half century in clearing away misconceived analogies between cultural and geological sequences. I would

32: In his *Prehistoric Times, as Illustrated by Ancient Remains, and the Manners and Customs of Modern Savages.*

33: G. de Mortillet, *Musée préhistorique.* Paris, 1881.

34: Abbé H. Breuil, 'Les Subdivisions du Paléolithique Supérieur et leur Signification'. *Cong. Int. d'Anthrop. et d'Archéol. Préhistoriques,* C.R. XIV Sess. Geneva 1912. A revised edition (pp. 5–78) was issued by the Abbé in 1937.

35: e.g. E. A. Golomshtok, *The Old Stone Age in European Russia,* Am. Phil. Soc., Philadelphia, 1938. See index entries under 'Aurignacian', 'Solutrean' and 'Magdalenian'.

36: W. J. Sollas, *Ancient Hunters,* 131–2. Third edition, 1924.

37: V. G. Childe, 'Changing Methods and Aims of Prehistory', *Proc. Prehist. Soc.* I (1935), 1–15.

only add that the need to keep clearly in mind the historical nature of archaeological data grows the more insistent as more effective scientific procedures are brought to bear on its decipherment.

The prerequisites for even an outline of world prehistory, in particular the world-wide spread of archaeological research and the application of geophysical methods of dating, have only been available during our own generation. The world-wide spread of archaeology and its scientific aids was due in the first instance to the expansion of European thought and technology, in part through colonisation, trade and administration and increasingly during the 20th century under the impulse of research in North America. The process began already during the first phase of disciplined archaeology.[38] When in 1784 Thomas Jefferson addressed himself to the excavation of a burial mound on his estate in Virginia he was acting in quite the same way as a country gentleman of his period on this side of the Atlantic. His special quality showed through in his strict observance of stratigraphy and in his appreciation of the public importance of the study of antiquity. As president of the American Philosophical Society he held that the members had "always considered the antiquity, changes and present state of their own country as primary objects of their research". The first volume of the *Transactions and Collections of the American Antiquarian Society* appeared in 1820 and the first issue of the *Smithsonian Contributions to Knowledge* was devoted to the classic account of the earthworks of the Mississippi Valley by E. G. Squier and E. H. Davies.

Professional archaeology based on university training and involving the employment of full-time specialists and the funding of major research projects developed earlier in the United States of America and on a more comprehensive basis than in most European countries. Whereas in Europe archaeology grew up in the main as a leisure hobby within the polite ambience of history, the classics or oriental studies, in North America it developed as a branch of anthropology at a time when the American Indian was still a vivid memory when not indeed a feature of daily life. In 1866 George Peabody founded the first of the great university power houses of archaeology in the Museum of Archaeology and Ethnology at Harvard. This was followed in 1875 by the first session of the still active Congress of Americanists and in 1879 by the foundation in the

38: Gordon R. Willey & Jeremy A. Sabloff, *A History of American Archaeology*. London, 1974.

Bureau of Ethnology at Washington and the Department of Anthropology of the American Museum of Natural History at New York of two of the main institutions devoted to advancing knowledge of the Amerinds and their origins and early history. The foundation that same year of the Archaeological Institute of America served notice that the ambitions of American scholarship were by no means confined to the New World as was soon to be demonstrated in the founding of the several American Schools working overseas.

So long as western Europe remained the economic and political focus of the world it retained the lead in expanding the range of archaeological research. This was pursued in a variety of ways. Much of the pioneering work was accomplished by individuals, wealthy men such as Schliemann, Arthur Evans or Maudslay or experts working on overseas assignment like J. G. Anderson who single-handed opened up the vista of Stone Age China extending from the cave-dwellers of Chou-kou-tien to the peasant cultivators who prepared the ground for the Shang. As archaeology grew in complexity it began to require full-time professionals, large scale expeditions and long term programmes of research. Although in the case of Europe these requirements did not begin to be met at all adequately until 1918, Funds and Schools for furthering training, research and the all-important dialogue with the scholars of host countries had already been set up by several European countries in respect of Biblical, Classical and Egyptological scholarship.[39] Since then British scholars for example have set up institutes in territories of the former Ottoman Empire, Iran and territories outside the Hellenistic world as far away as East Africa and South-East Asia.[40]

The advance of learning and higher education were by no means the only factors behind the spread of archaeology from its European base. The pursuit of national prestige and the expansion of overseas empires have also been potent factors. Napoleon's inclusion of scholars in his expedition to the Nile[41] effectively gave birth to Egyptology and incidentally resulted in the discovery of the Rosetta

39: The Palestine Exploration Fund was founded in 1865, the Egypt Exploration Fund in 1883, the British School of Archaeology at Athens in 1886 and the British School at Rome in 1901.

40: *A Handbook to the British Schools & Institutes Abroad.* British Academy 1977. It is significant of the changed relation of Europe to the third world that the last School was that of Iraq in 1932. Since the war of 1939–46 only Institutes have been founded as if to emphasise cooperation and dialogue.

41: Glyn E. Daniel, *A Hundred Years of Archaeology*, 21–2. London, 1950.

stone, now by the spoils of war safely lodged in the British Museum. The French colonisation of Algeria set in train the effective beginning of systematic research into the older stone age of Africa[42] and that of Indo-China revealed South-East Asia as an early focus of high civilization[43] just as French ambitions in Persia and Syria contributed mightily to opening up the archaeology of these key territories in the archaeology of South-West Asia.[44] In the long term European involvement in Africa and southern Asia contributed most to archaeology by imparting modern traditions of research and leaving behind trained personnel and institutions. It was a recurring theme of the British administrators in India to care for ancient monuments. The first Director-General of Archaeology was appointed in 1868 only thirteen years after the proclamation of the Empire in India. One of Lord Curzon's first acts as Viceroy (1899–1905) was to reconstruct the Survey and charge it »to dig and to discover, to classify, reproduce and describe, and to cherish and conserve«.[45] In the work he did for India's past as much as in his planning of the architecture of New Delhi as an integrating and symbolic focus Lord Curzon was, as we know, looking beyond the Raj to a time when as he hoped the sub-continent would be united under its own regime. The recall of Mortimer Wheeler from active service in North Africa during the depth of the last war at the personal request of the penultimate viceroy falls into place as the final act in a long continued policy.[46] When Wheeler had completed his period as Director-General he left behind not merely apt pupils, but as their brilliant achievements have since demonstrated pupils of a kind every teacher dreams of – they applied the methods they had been taught and came up with fresh answers.[47]

Interest in Nigerian art and antiquities, first aroused by the bronzes and ivories removed from Benin during the punitive expedition of 1897, was strongly revived by the life-like heads of

42. L. Balout, *Préhistoire de l'Afrique du Nord.* Paris, 1955.
43. B. R. Groslier, *Indochina: Archaeologia Mundi.* London, 1966.
44. In 1897 the French bought the right to excavate antiquities in Persia and sent out the Délégation Française en Perse to dig at Susa under de Morgan. Work resumed after the 1914–18 war by de Mecquenem.
45. G. Clark, *Aspects of Prehistory,* 23. Univ. Cal. Press, 1970.
46. Mortimer Wheeler, *My Archaeological Mission to India & Pakistan.* London, 1976.
47. Among others: D. P. Agrawal, S. B. Deo, A. Gosh, V. N. Misra, H. D. Sankalia, B. Subbarao, B. K. Thapar & M. S. Vats.

fired clay recovered during tin workings on the plateau of Jos in 1929.[48] One outcome was the appointment in 1943 of an Antiquities Officer. Another was that disciplined excavations were undertaken in both Ghana and Nigeria in 1943–44.[49] The immediate post-war years saw a rapid build-up of the infrastructure of archaeology in both states against independence which came in 1957 and 1960. Particular stress was laid on the building of museums for public instruction and on the creation of chairs of archaeology in the universities of Ghana[50] and Ibadan[51] with a strong emphasis on research. During Thurstan Shaw's tenure of the chair at Ibadan he and his chief colleague at the Institute of African Studies, Graham Connah, introduced several of the main techniques of science-based archaeology to West Africa, including the diagnosis of disease by X-ray analysis of bones, the determination of bronze composition and not least systematic radiocarbon dating.[52] In cutting through the 11.50 m mound of Daima in the *firki* south of Lake Chad and interpreting the section as a key to the early settlement of a little known part of the continent, Connah acknowledged[53] cooperation from colleagues in many departments of the University, notably Forestry, Botany, Zoology, Geology, Chemistry, Arabic Studies and History, confirmation from what was then a dark part of Africa of the value of interdisciplinary research and the role of archaeology in stimulating interaction between academic disciplines.

Although Europe, increasingly strongly reinforced since the war of 1914–18 by the United States acting mainly through university institutions like the Peabody at Harvard, the Oriental Institute at

48: B. Fagg, 'The Nok terracottas in West African art history', *Actes du 4 Congr. Pan-Africain de Préhistoire,* II, 445–50. Tervuren, 1959.

49: Thurstan Shaw, *Proc. Prehist. Soc.* X (1944), 1–67; Bernard Fagg, *ibid.*, 68–9.

50: The first holder of the chair (1951–7), A. W. Lawrence of Cambridge, established museums, created a Monuments Board and undertook the restoration of Portuguese trading posts and forts. His successor P. L. Shinnie arranged for Ghanaian participation in the Unesco Nubian Monuments Campaign. A useful insight into the position of archaeology in Ghana is given in Prof. Merrick Posnansky's inaugural lecture *Myth and Methodology – the archaeological contribution to African History.* Ghana Univ. Press, Accra. 1969.

51. Thurston Shaw's inaugural lecture at Ibadan provides a useful survey. *Archaeology and Nigeria.* Univ. of Ibadan Press. 1963.

52. Thurstan Shaw, *Radiocarbon Dating in Nigeria.* Univ. of Ibadan Press. 1968.

53: Graham Connah, 'Settlement Mounds of the Firki – The reconstruction of a Lost Society', *Ibadan,* no. 26 (1969), 48–62.

Chicago, the University of Pennsylvania Museum and latterly the University of California at Berkeley, took the lead in mediating archaeology to extensive tracts of Asia, Africa and Australasia, the rise of Japan and the Soviet Union to the front rank of industrial powers broadened support for the advance of world archaeology. Prehistoric archaeology first reached the Japanese homeland as part of the apparatus of Western knowledge adopted in the wake of the Meiji restoration of 1868 and from the beginning the leading role was taken by the (then) Imperial University of Tokyo. The progress of archaeological research within Japan can be seen in the number of 'Neolithic' sites, as defined by the presence of pottery and the absence of metallurgy, officially listed by the university: c.3500 in 1900, c. 4000 by 1911 and c.10.000 by 1928.[54] Japanese archaeological enterprise first broke out of the Far East on the flood tide of prosperity that followed the war of 1939–46. Among its outstanding contributions to world prehistory are the campaigns mounted by the Institute for Oriental Culture in Iran and Iraq[55] and excavations at Kotosh which have thrown new light on the early development of civilisation in Peru.[56] Although archaeology had been vigorously pursued under the old regime in Russia more especially in the south and in the East Baltic states, it received strong aid from the Soviet state on account of the support it was thought to offer for the materialist interpretation of history. Intensified industrialisation and a notable shift of economic development to the east after the war of 1939–46 led to notable excavations in the circumpolar and inner Asian territories of the Soviet Union. It has been shown for example that the bearers of Mousterian culture had extended the range of settlement up to c.65°N. in the Pechora basin and that Upper Palaeolithic groups had colonised well beyond the Arctic Circle in Siberia as well as penetrating as far east as Kamchatka. They were only able to do so on account of the elaborate houses which in themselves form one of the main contributions of Soviet archaeology

54: N. G. Munro, *Prehistoric Japan,* 44. Yokohama, 1911; J. E. Kidder, *Japan before Buddhism,* 28. London, 1959.

55: Under Prof. Namio Egami's leadership the Institute has published 15 magnificently illustrated volumes, including series on *Marv-Dasht* (3 vols. 1962–73), *Dailaman* (4 vols. 1965–71) and *Telul Eth Thalathat* (3 vols, 1958–74).

56: Gordon Willey, *An Introduction to American Archaeology* vol. 2, 102–4. Prentice-Hall, New Jersey. 1971.

to prehistory.[57] In central Asia major advances have been achieved in our knowledge of nomads contemporary with the Scyths of South Russia through excavation of frozen tombs in the Altai,[58] and exploration of arid territories further west has thrown important light on the rise of early states in Chorasmia.[59]

The eclipse of European hegemony in the aftermath of the 1939–46 war assisted the advance of archaeology in two main ways. The newly emergent states for their part were anxious to reinforce their identity but were deficient in historical records beyond orally transmitted genealogies, myths and legends. For such archaeology was providential, since although many of their people were unable to read they were still responsive to the traditional forms and styles of artefacts. No wonder that the governments of so many of the new nations were prepared to invest in archaeology. On the other hand Europe's loss not merely of Empire but of economic and even intellectual dominance brought about a radical change in attitudes to history. Europocentricism was out and with it European systematisations of archaeology. There was still concern for the origins of man, but there was a growing interest in the emergence not merely of European but of all the other civilisations of mankind. Since archaeology has been so widely recognised as the only means for achieving this, local efforts have been enhanced and supplemented by internationally conceived projects aimed at solving specific problems. The quest for identity has indeed proved as infectious as it is demanding, calling as it does for scientific and technical skills, sensitivity to form and style and above all historical insight.

A key factor in the advance of the last three decades, one that has at the same time stimulated research and made it possible to write prehistory, has been the devising and systematic application of geophysical dating methods. Even those like potassium-argon capable only of yielding dates within a wide range of error were of value for periods as remote in time as the lower beds at Olduvai[60] when the tempo of change was still extremely slow. It is all the more fortunate

57: For a well illustrated and critical summary, see C. B. M. McBurney, *Early Man in the Soviet Union*. Reckitt Archaeological Lecture, 1975. British Academy, 1976.

58: S. I. Rudenko, *Frozen Tombs of Siberia*. (Transl. M. W. Thompson). London, 1970.

59: A. L. Mongait, *Archaeology in the USSR*, 235–44. Penguin Books, London, 1961.

60: Glynn Ll. Isaac & Elizabeth R. McCown (ed.), *Human Origins. Louis Leakey and the East African Evidence*, 126 ff. W. A. Benjamin Inc., California. 1976.

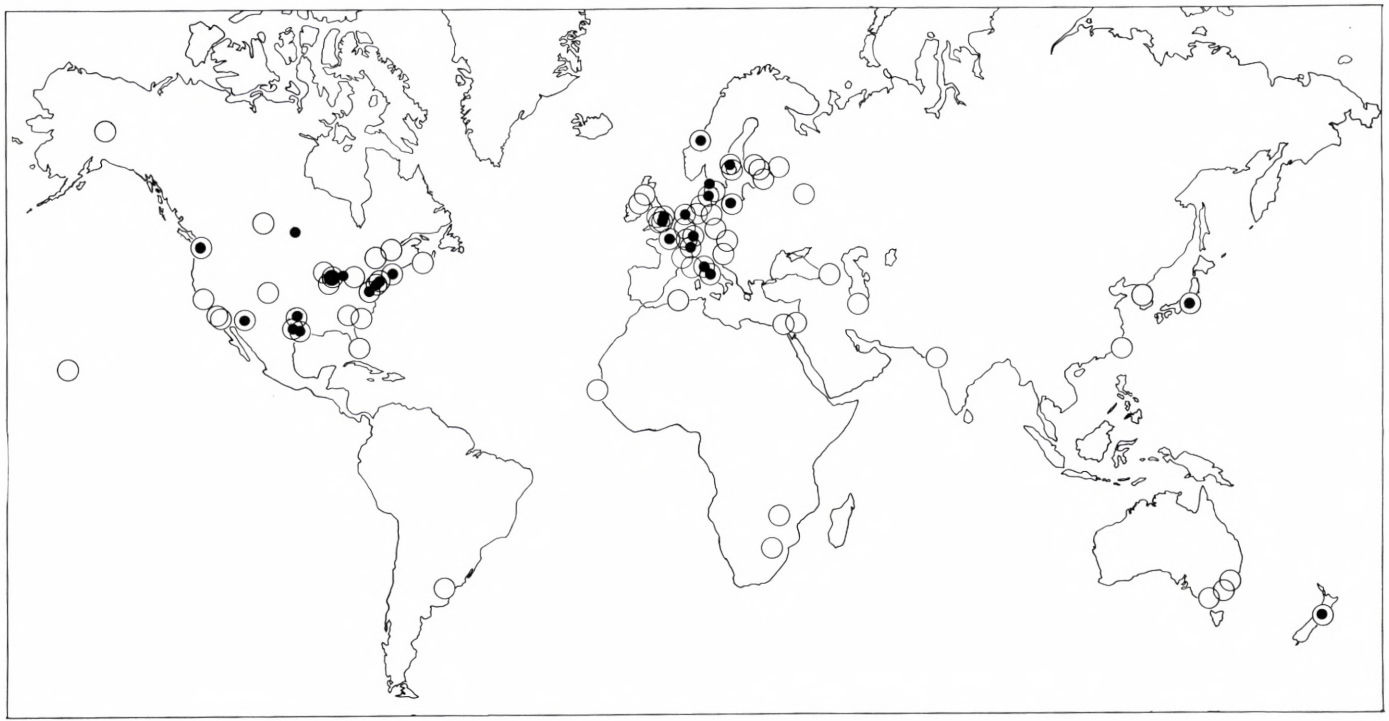
that the radiocarbon method[61] capable of establishing within certain limits of probability a much finer chronology extends neatly over the more dynamic phases of prehistory enacted by *Homo sapiens sapiens.* The utility of radiocarbon chronology is only marginally affected, notably in linking late prehistoric with historically dated sequences, by its deviations from solar chronology due to fluctuations in solar radiation. The prospect has already opened up of adjusting radiocarbon to solar chronology by measuring and plotting the curve of its deviations through time.[62] In any case, as Libby himself has recently emphasised,[63] these fluctuations do not affect the simultaneity principle which permits the correlation of local sequences in different parts of the world. A clear sign of its value is its rapid spread. When the first issue of *Radiocarbon,* the international vehicle for publishing results, first appeared in 1955 the original laboratory in Chicago had already been supplemented in North America, and in Western Europe, though elsewhere only at single stations in Japan and New Zealand. By 1977 New World stations had expanded north to Canada and south to the Argentine, many stations were operating in central and eastern as well as in western Europe and more strikingly, radiocarbon samples were being processed in Africa, India, Australia and the Pacific.

Among the many services rendered by radiocarbon analysis to archaeology one of the most obvious is that of tracing man's expansion over northern Eurasia and into the New World, as well as from southeast Asia into Australia and more recently his settlement of islands scattered over the Pacific ocean. In achieving this natural science has in effect added new provinces to world prehistory. The impact of the new method was felt most decisively precisely in the new territories. For instance in the case of Australia, a continent in which the first stratigraphic demonstration of a cultural succession was made as recently as 1929, radiocarbon dating extended the range of its prehistory within a few years to twenty, perhaps more than thirty millennia. Australian archaeologists were presented with a challenge almost as urgent as that with which Darwin and Huxley had

61: W. F. Libby, *Radiocarbon Dating.* Chicago, 1955; E. H. Willis, 'Radiocarbon Dating', *Science in Archaeology* (ed. Brothwell & Higgs), 46–57. 2nd.ed. London, 1969.

62: W. F. Libby, 'Radiocarbon Dating', *The Impact of the Natural Sciences on Archaeology* (ed. T. E. Allibone), 1–10. British Academy, 1970.

63: *ibid.,* 9.



Map illustrating the expansion of radiocarbon dating laboratories

● The original station in the Institute of Nuclear Physics, Chicago

• Stations operating at the time of the first issue of *Radiocarbon* (1955)

○ Stations operating in 1977.

Note: In certain cases symbols represent more than one station.

once confronted the British and French pioneers of prehistory. An Australian midden sample was among the determinations in the first corrected list issued in 1951[64] alongside as it happens ones from Aamosen & Star Carr. Examination of the lists of Australian dates published by Mulvaney between 1961 and 1975[65] illustrates the rapid tempo of this research and its increasingly international involvement as well as the stimulus it gave to Australian archaeology and natural science:

	1961	1969	1975
	(16)	(81)	(108)
Location of laboratories	%	%	%
Australia	–	40.8	60.0
New Zealand	27.7	9.9	4.6
Japan	–	23.5	16.7
U.K.	–	11.1	6.5
U.S.A.	72.3	14.8	12.2

Changes in the participation of radio-carbon laboratories from different areas in the determination of prehistoric samples from Australia.

Radiocarbon dating has also been of exceptional value in building up the chronology not merely of the new but also of the old territories which pioneered prehistory. One of the first concerted tests of the new method indeed was that directed at the Upper Palaeolithic sequence in Europe.[66] The method has also proved itself in the investigation of specific problems in cultural history, in some cases by compelling revision of existing views. For instance the high radiocarbon dates obtained even without calibration for megalithic tombs in western and for metallurgy in eastern Europe[67] suggest that the continent was far less retarded in relation to the Near and Middle East than had once been thought. Again, the radiocarbon testing of Chalcolithic sites in India carried out by Agrawal in the Tata

64: Dates assembled in February 1951 and released in June were listed in Table I of Frederick Johnson, *Radiocarbon Dating.* Mem. 8, Soc. American Archaeology. Supplement to *American Antiquity* XVII (1951).

65: J. D. Mulvaney, 'The Stone Age of Australia', *Proc. Prehist. Soc.* XXVII (1961), 101; *The Prehistory of Australia,* 178–82. London, 1969; *ibid.* Penguin Books, 1975. The lists of 1969 and 1975 are of selected dates, but this does not affect the trend.

66: H. L. Movius, 'Radiocarbon dates and Upper Palaeolithic archaeology in central and western Europe', *Current Archaeology* I (1960), 355–91.

67: Colin Renfrew, 'The autonomy of the East European Copper Age', *Proc. Prehist. Soc.* XXXV (1969), 12–47.

Institute of Fundamental Research at Bombay[68] has provided clear terminal dates for the Harappan civilization while at the same time placing the termination of this efflorescence in a less dramatic light than it has previously been viewed. In particular the testing of many sites in central and northern parts of south India has gone far to restoring the continuity of Indian history by showing that a similar tradition persisted though at a humbler level through most of the second millennium B.C. For a final example one may turn to Japanese prehistory. Although the high radiocarbon dates from the early ceramic levels of Japanese middens were at first received with incredulity, their consistency with the internal development of Jomon pottery[69] has since brought widespread acceptance and with this the rejection of the doctrine, prevalent since the time of Lubbock, that the making of pottery appeared at the same 'stage' as farming economy.

The value of a precise method of relative chronology like radiocarbon dating thus extends far beyond refining the mere framework of prehistory into its very dynamics. In particular it is capable of defining foci of innovation and rates and zones of diffusion. One area in which it is proving itself is the crucial one of subsistence. Systematic radiocarbon dating carried out in association with the detailed assessment of territories, careful stratigraphic excavation and the critical sampling and specialist examination of food refuse has achieved classic results in the case of two key areas. In respect of the Valley of Mexico[70] and parts of southwest Asia[71] it has already shown that the shift from hunter-forager to farming economies was in each case a slow process and one that however profound in its implications is better understood as a gradual transformation than as a revolution.[72] This suggests among other things that one might expect farming to emerge among hunter-foragers wherever the right ecological and social conditions obtai-

68: D. P. Agrawal, *The Copper Age in India.* New Delhi, 1971.

69: J. E. Kidder & T. Esaka, *Jomon Pottery.* Tokyo, 1968.

70: For useful summaries, G. H. S. Bushnell, 'The beginning and growth of agriculture in Mexico', *The Early History of Agriculture* (Hutchinson & Clark ed.), 117–20 & N. Hammond, 'The early history of American agriculture: recent research and current controversy', *ibid.* 120–8. British Academy 1977.

71: G. Clark, *World Prehistory in new perspective,* 41–61. 3rd ed. Cambridge, 1977.

72: G. Clark, 'Neothermal Orientations', *The Early Postglacial Settlement of Northern Europe* (ed. Paul Mellars), 1–10. Duckworth, London, 1978.

ned. Radiocarbon dating is already defining foci of plant domestication in the New World[73] other than that already known in the Valley of Mexico and in the Old is serving as a probe to define the original focus of rice cultivation,[74] one of the key objectives of prehistoric research at the present time. Again, if farming was slow to develop, it is only to be expected that the expansion of domestic crop plants should also have been a gradual process more especially when it involved the penetration of territories beyond the range of the wild prototypes. Here again radiocarbon dating soon began to make its contribution.[75]

Another application of radiocarbon dating has been to link archaeological sequences more closely with the evolution of the natural environment and in this way make it possible to view economic systems in their precise ecological contexts, the only way in which such historical processes as the genesis and diffusion of cultivated crops can be adequately understood. The quest for such understanding in turn implies new strategies in archaeological research and the close association of archaeologists and biologists in the recovery and analysis of data. Thus, whereas a limited range of relatively imperishable artefacts from stratified deposits suffices to define archaeological cultures and establish local sequences, any attempt to understand how the societies concerned were structured and functioned involves an altogether more sophisticated approach and the application of techniques drawn from a variety of disciplines. There is already an impressive literature bearing on the new approaches to archaeology,[76] on data recovery,[77] and on the analysis

73: N. Hammond, *op.cit.* fig. 3.

74: Te-Tzu Chang, 'The Rice Cultures', *The Early History of Agriculture* (ed. Hutchinson & Clark), 143–57.

75: G. Clark, 'Radiocarbon dating and the expansion of farming culture from the Near East over Europe', *Proc. Preh. Soc.* XXXI (1965), 58–73. Subsequent work has modified this particularly in relation to the Mediterranean basin: see J. Guilaine, 'The earliest Neolithic in the West Mediterranean: a new appraisal', *Antiquity* LIII (1979), 22–30.

76: K. C. Chang, *Rethinking Archaeology.* New York, 1967; Sally R. and Lewis R. Binford (ed.), *New Perspectives in Archaeology.* Aldine, Chicago, 1968; D. L. Clarke, *Analytical Archaeology.* London, 1968; M. P. Leone (ed.), *Contemporary Archaeology.* Illinois Univ. Press, 1972; E. S. Higgs (ed.), *Papers in Economic Prehistory.* Cambridge Univ. Press, 1972.

77: See, notably, *Archaeometry,* the annual review of progress in techniques of data recovery and analysis issued since 1968 by the Research Laboratory for

and interpretation in ecological terms of the artefactual and organic materials recovered in the course of excavation.[78] Here I will only touch upon two areas in which Danish scientists and scholars have made conspicuous contributions, namely Quaternary Research and Experimental Archaeology.

Quaternary Research, although now concerned with investigating the history of ecosystems since the first emergence of human societies and applied with varying degrees of success wherever prehistory is studied,[79] was originally devised by Scandinavian and not least by Danish scientists for advancing knowledge of the comparatively brief period since the Scandinavian ice-sheet began to contract. There are several reasons why Scandinavia should have taken the lead. For one there are the stark facts of geography. It was not only that the mere possibility of a Scandinavian history depended on the freeing of its territory from ice but that the lives of the prehistoric inhabitants were conditioned by the changes of climate, geography, vegetation and animal life inherent in the dynamics of deglaciation. Then the development of economic life in recent times had placed a premium on geological and biological research and the formation of strong institutional and professional bases for precisely the branches of expertise required for effective Quaternary Research. Again, it is worth emphasising that the region is exceptionally well endowed with the recent formations on which this type of research depends. Finally it should not be overlooked that the very brevity of recorded history in the north focussed attention on prehistoric settlement and provided a favourable environment for archaeological research and the provision of institutions dedicated to it.

Archaeology and the History of Art, Oxford. There is an extensive literature on particular fields, e.g. George F. Bass, *Archaeology under the Water.* Thames and Hudson, London, 1966; Lerichi Foundation, *A Great Adventure of Italian Archaeology. 1955/65. Ten Years of Archaeological Prospecting;* D. Brothwell and E. Higgs (ed.), *Science in Archaeology,* sect. VII. 2nd ed. Thames and Hudson, London, 1969.

78: *Archaeometry, op.cit.*; Brothwell and Higgs (ed.), Sect. II–IV; M. S. Tite, *Methods of Physical Examination in Archaeology.* Seminar Press, London, 1972; T. R. Hester and R. Heizer, *Bibliography of Archaeology, I: Experiments, Lithic Technology and Petrography.* Addison-Wesley Modules in Anthropology, no. 29. Reading, Mass., 1973.

79: e.g. Karl W. Butzer, *Environment and Archaeology. An Introduction to Pleistocene Geography.* Chicago, 1964.

At least it is a matter of history that the first systematic essays in Quaternary Research were undertaken in Scandinavia and I need hardly remind this audience that it was the Royal Danish Academy of Sciences which pioneered group research in this field by setting up a Commission to investigate the kitchenmiddens of the Danish Stone Age as long ago as 1848, composed of the archaeologist Worsaae, the geologist Forchhammer and the zoologist Japetus Steenstrup, and publishing the results in its *Proceedings.* When the attack was renewed towards the close of the century (1893–8) the lead was undertaken by the National Museum, the institution that in the very early days of prehistory had seen the genesis of the Three Age System, and the range of specialists was extended to include a botanist.[80]

The third campaign, that brought to focus the excavations at Dyrholmen in 1938–9, was interdisciplinary both in its sponsorship and at a research level. It was led by the National Museum assisted by the Danish Geological Survey and the University Zoological Museum, financed by the Carlsberg Foundation and published by the Royal Danish Academy.[81] In respect of research it was aimed first and foremost to refine the history of coastal settlement by subdividing its history in relation to the fourfold recurrence of Litorina marine transgressions demonstrated by Iversen in 1937 at Søborg Sø on the basis of fluctuations in the pollen of *Chenopodiaceae* and of parallel variations in the frequencies of salt-demanding diatoms.[82] Mathiassen's careful excavations made it possible to distinguish the artefact assemblages and animal refuse discarded immediately prior to the second, third and fourth transgressions. Supplemented by observations from elsewhere this archaeological sequence confirmed those based on geology and palaeontology and at the same time provided new insights into cultural history. Among other things it demonstrated the continuity of coastal settlement in Denmark during Atlantic and Sub-boreal times and reflected the introduction during the latter period of the elements of farming economy.[83]

80: A. P. Madsen, S. Müller et. al., *Affaldsdynger fra Stenalderen i Danmark undersøgte for Nationalmuseet,* 3. Copenhagen, 1900.

81: T. Mathiassen, M. Degerbøl and J. Troels-Smith, *Dyrholmen. En Stenalderboplads på Djursland.* Kong. Danske Videnskab. Selsk., Ark.-Kunsthist. Skr., Bd. 1, Nr. 1. Copenhagen, 1942.

82: Johs. Iversen, *Undersøgelser over Litorina transgressioner i Denmark.* Dansk Geol. For., Bd. 9, Hft. 2. Copenhagen, 1937.

83: For a discussion see Grahame Clark, *The Earlier Stone Age Settlement of Scandinavia,* Chap. 5. Cambridge, 1975.

Possibly the most important single technique to emerge from Quaternary Research in northern Europe was pollen analysis, developed originally as a way of zoning deposits but applied in due course in an increasingly sophisticated manner to gaining insights into the ecological setting of early cultures. Pollen grains were first recognised from geological deposits as far back as the early half of the nineteenth century in Germany but the possibility of using their survival as a way of reconstituting the nature of early vegetation was not appreciated until the early years of the twentieth century. Indeed the first diagram to illustrate fluctuations in vegetation through time in terms of percentage changes in the pollen of different species was constructed by the Swedish state geologist Lennart von Post as recently as 1916.

The standard text-book[84] on the technique of pollen-analysis was understandably written by Scandinavian botanists, Kurt Fægri of Bergen and Johs. Iversen of Copenhagen. Dedicated to the Swede von Post, it made special acknowledgements of the work of Knud Jessen and J. Troels-Smith and was published by a Copenhagen publishing house with subventions from Norwegian and Danish funds, including The Carlsberg Foundation. At the same time it is one of the beauties of natural science that wherever its techniques were invented they are capable of worldwide application provided the right conditions obtain. Already in 1950 the authors were able to cite original contributions from central and western as well as northern Europe, and also from many parts of the New World from Greenland and Labrador to Patagonia and even from New Zealand and Hawaii in the Pacific zone. Pollen-analysis had already been applied in the USSR [85] and since then has been adopted as far afield as India,[86] Australia[87] and the Far East (China[88] and Japan[89]).

84: Kurt Faegri and Johs. Iversen, *Textbook of Modern Pollen Analysis.* Munksgaard, Copenhagen, 1950.

85: See A. J. Brjussow, *Geschichte der neolithischen Stämme im europäischen Teil der Ud. SSR,* 52 and 176f. Moscow, 1952.

86: Gurdeep Singh, 'A preliminary survey of the post-glacial vegetational history of the Kashmir Valley', *Palaeobotanist* 12 (1963), 73–108.

87: D. M. Churchill, *Australian J. of Botany* 1968, 125–51.

88: Kwang-chih Chang, *The Archaeology of Ancient China,* 34. Yale, 1968.

89: Shoichi Hori in N. Matsumato et al. *Kamo: a study of the Neolithic site and a Neolithic dug-out canoe discovered in Kamo, Chiba Prefecture, Japan,* Chap. XI. Arch. & Ethn. Ser. no. 3. Hist. Dept., Keio Univ., Tokyo. 1952.

It is understandable that the first essays in Experimental Archaeology should have been made by amateurs[90] since the few professionals, mainly in the museum profession, were preoccupied with chronological and cultural classification. Professional work in this field[91] arose from a more critical approach to the retrieval of the primary data[92] and above all from a growing concern with interpreting this in terms of functioning societies. Description or systematic analysis of the spheres to which Experimental Archaeology has been applied, including subsistence, technology, defence or ideology, would call for a lengthy course of lectures. Two points of general application may be made. The first is that the most successful essays in experimental archaeology are interdisciplinary, involving practical men as well as experts in particular branches of natural science and humane scholarship. Early agriculture is a case in point. Danish archaeology has been well forward in this field in respect both of excavation[93] and of expert determination of samples. Going back only a few decades one may recall the fine stratigraphical work, in many cases involving pollen-analysis, carried out by Knud Jessen,[94] Johs. Iversen and Jørgen Troels-Smith, or the labours of Magnus Degerbøl[95] on the animal remains from Late-glacial and Postglacial

90: Examples include: the experiments made in the manufacture and use of polished flint and stone axes by N. F. B. Sehested *(Archaeologiske Undersögelser* 1878–1881, 1. Copenhagen, 1884; the investigation of silica gloss on flint sickles by F. C. Spurrel *(Arch. J.* 49, 1892, 53–69); and the testing of bronze trumpets from Ireland by MacAdam *(Ulster J. of Archaeology* 8 (1860) 99–110).

91: J. M. Coles, *Archaeology by Experiment.* Hutchinson, London. 1973.

92: The first archaeologist to test the erosion and silting of earthworks appears to have been Gen. Pitt-Rivers in respect of Wor Barrow: See *Excavations in Cranborne Chase,* vol. IV, 1898, 24. More exhaustive tests are those set up by a Research Committee of the British Association based on the experimental earthwork built for the purpose on Overton Dawn, Wiltshire: see P. A. Jewell (ed.) *The Experimental Earth-work on Overton Down, Wiltshire, 1960.* London, 1963. For studies in data retrieval, see Sect. II of *Papers in Economic Prehistory* (ed. E. S. Higgs). Camb. Univ. Press, 1972.

93: Notably by Gudmund Hatt as summarised in his *Landbrug i Danmarks Oldtid.* Copenhagen, 1937. See also the same author's monograph 'Oldtidsagre', *Kong. Danske Vidensk. Selskab, Ark.-Kunsthist. Skr.,* Bd. II, Nr. 1. Copenhagen, 1949.

94: Acknowledged among other ways in *Studies in Vegetational History in honour of Knud Jessen* presented by an international body of colleagues in 1954 and edited by Johs. Iversen. Danmarks Geol. Unders. IIR. Nr. 80. Copenhagen.

95: See for example his magisterial *Danmarks Pattedyr i Fortiden i Sammenligning med recente Former.* Vidensk. Medd. Dansk naturh. Foren. Bd. 96, 2, 357–641.

deposits, or again the virtuosity of Hans Helbæk in identifying grain imprints and plant refuse.[96] The initiative for undertaking the experimental work in the forest of Draved in South Jutland on the clearance cultivations of forest land and the reaping and preparation of crops in fact stemmed in Denmark predominantly from palynologists and in particular from Dr Johs. Iversen.[97]

As part of the controlled experiments conducted in the forest of Draved in South Jutland between 1953–5 two main agencies of clearance were tested for their impact on vegetation, namely the axe and fire. For the former Iversen obtained the co-operation of Svend Jørgensen and Jørgen Troels-Smith of the National Museum. Using polished flint axe-blades hafted in the style known to have been employed by Neolithic man in Denmark, Jørgensen soon discovered that to minimise breakage he had to use a gentler technique than that suited to steel ones.[98] In the case of burning Iversen was fortunate in being able to call upon Professor Kuusta Vilkuna of the University of Helsingfors with direct experience of *Brandwirtschaft* as recently practised in parts of Finland. The use of ethnographic expertise alongside simulation has all along been a fruitful aspect of experimental archaeology. This has been particularly true where comparisons are taken from the same or a closely analogous culture area.[99] In this respect Scandinavia is happily endowed not only with the possibilities arising from a comparatively late industrialisation but no less with active scholars. In this connection I would cite Professor

Copenhagen, 1945. Or, again, his work jointly with Bent Fredskild of the Danish Geological Survey on *The Urus (Bos primigenius* Bojanus) *and Neolithic Domestic Cattle (Bos taurus domesticus* Linné) *in Denmark.* Kong. Danske Vidensk. Selskab. Biol. Skr. 17, 1, 1–224.

96: In addition to specialised reports for excavators in Denmark and many countries of Europe and South West Asia, including an exceptionally elegant 'Botanical Study of the Stomach Contents of the Tollund Man' in *Aarbøger* 1950, 311–41, Dr. Helbaek contributed a comprehensive treatment of prehistoric cereal imprints for the British Isles up to 1952 in *Cereals in Great Britain and Ireland in Prehistoric and Early Historic Times.* Kong. Danske Videnskab. Selskab. Biol. Skr., Bd. III, Nr. 2. 1944; and in 'Early Crops in Southern England', *Proc. Prehist. Soc.* 1952. 194–233.

97: Johs. Iversen, 'Forest Clearance in the Stone Age', *Scientific American,* 1956, vol. 194, no. 3, 36–41.

98: Svend Jørgensen, 'Skovrydning med flintøxse', *Fra Nationalmuseets Arbejdsmark,* 1953, 36–43.

99: Grahame Clark, 'Folk-culture and the study of European Prehistory', *Aspects of Archaeology in Britain and beyond* (ed. W. F. Grimes), 49–65, esp. 55 f. London, 1951.

Axel Steensberg's work, strongly supported by the Carlsberg Foundation, on the implements and techniques used in the practice of every aspect of agriculture.[100] The value of wide comparative knowledge in this field is well exemplified in his well known study 'Med bragende flammer. Brændingskulturens metoder i fortid og nutid'.[101]

A second point is that, although modelled on the standard procedures of natural science, experimental archaeology cannot promise answers of the same order of precision or certainty. The historical dimension in human culture and its manifestations in the archaeological record introduce variables which quite simply are not amenable to explanation solely in terms of natural science. No matter how impressive the analytical expertise, the technical apparatus or the degree of statistical manipulation brought to bear on archaeological data the prehistorian has to rely in the final resort on historical insight. Experimental archaeology remains a valid and useful approach. It can sometimes limit but more often widen the range of possible alternatives. A major barrier to inferring historical conclusions from experiments lies in the very ingenuity, adaptability and manual dexterity of men. The same forms can be made and used in diverse ways. The method chosen by members of a particular society is commonly itself a cultural attribute, even in some cases an identifying mark of a particular culture. In such cases success in the experimental reproduction of a particular type does not of itself prove that the method chosen was in fact used in antiquity. For proof, or at least the high order of probability which is the closest to proof attainable in respect of past events beyond the range of direct observation, one needs to have recourse to physical tests. As Dr M. W. Thompson phrased it in his translator's preface to S. A. Semenov's major work on Prehistoric Technology[102] "in modern experiments one can do practically anything with flints:[103] the only reliable guide to the original purpose of a tool is the traces of wear that it bears".

100: The wide range of Steensberg's interests has been reflected in the periodical *Tools and Tillage* since its appearance in 1968. See also his contribution 'The husbandry of food production' in *The Early History of Agriculture* (ed. Sir Joseph Hutchinson, Grahame Clark et. al.) 43–54. British Academy, 1977.

101: *Kuml* 1955, 65–130.

102: S. A. Semenov, *Prehistoric Technology. An Experimental Study of the oldest Tools and Artefacts from traces of Manufacture and Wear.* English edition, London, 1964.

103: *ibid.*, X.

An illustration familiar to northern prehistorians is C.-A. Moberg's experiments on Rovaniemi stone picks.[104] Suitably mounted, these could with ingenuity and practice have been used for any of a number of the purposes suggested, among them hoeing the soil, wood-working, breaking the ice for winter fishing or even removing or preparing the hides of hunted animals. Such demonstrations would prove nothing beyond the extent of human adaptability and ingenuity. Of the four possibilities Moberg concentrated on hoeing as the only one amenable to scientific testing. By mounting a stone pick on an electrically operated apparatus simulating the action of hoeing soil, Moberg showed that after a spell of 142,000 blows the stone blade was marked by clearly visible striations. The absence of these from ancient specimens argued that whatever else they had been used for it could hardly have been for hoeing. As between the other three hypotheses the prehistorian has to be guided by historical judgement, that is in effect by context.

To take another even more familiar example, Thor Heyerdahl's[105] experiments in testing primitive craft against the hazards of long-distance navigation in themselves demonstrate only what is physically and psychologically possible to sophisticated men of the twentieth century, not what happened in history. The voyage of the Kontiki from South America across Polynesia of itself proves nothing about the drift of culture in antiquity. The test of an historical question can only be historical, in this case archaeological evidence. The fact is that so far no artefacts of certainly South American origin have been found further west than the Galápagos Islands.[106]

Experimental archaeology also has potential for investigating social structure and demography. One way it can do this is to simulate the construction of cult monuments or defensive works or the manufacture of such things as personal ornaments and from this estimate the time needed to make them. While it gives no direct guidance how the work was organised, experiments are capable of illustrating the order of effort involved. Calculations of the cost in

104: C. A. Moberg, *Studier i Bottnisk Stenålder*, fig. 49–55 and pp. 108 ff. Stockholm, 1955.

105: Thor Heyerdahl, *American Indians in the Paeific: the theory behind the Kon-Tiki expedition.* London, 1953.

106: Thor Heyerdahl and Arne Skjolsvold, *Archaeological evidence of Pre-Spanish visits to the Galápagos Islands.* Mem. 12 Soc. American Archaeology. Salt Lake City, 1956.

labour of constructing barrows, megalithic tombs,[107] ceremonial monuments[108] or defensive works, and, alternatively, of shaping and perforating and stringing the necklaces of upwards of 15,000 beads of minute size found with Pueblo cremations in Arizona[109] or carving the nephrite *Hei tiki* worn by Maori[110] are valuable as clues to political integration and social hierarchy. It must be equally evident that information of this kind needs to be interpreted in terms of history, and at the same time suggests objectives for research. If the mere presence of personal ornaments embodying high concentrations of labour cannot prove the existence of social hierarchy, at least it points to the need to analyse the associations of such things with other kinds of artefact and where possible with large numbers of burials of individuals of widely varying ages and of either sex.[111]

In the final analysis archaeology, by widening the sources of history and enlarging its geographical and temporal range to embrace all territories occupied by man and all periods since his emergence from the Primate stem, has transformed the context of our existential concerns. We have of course to accept that what history can tell us is limited by the nature of its sources. Since individuals are lost to us from prehistory we can hardly evaluate their moral choices. If our interests lie in that direction we must turn to literature or recorded history. This does not mean that because archaeology depends on material data it need be wedded to a materialist interpretation of history or that its concern with *Homo*

107: For references to estimates based ultimately on military experience of earthwork see Grahame Clark, 'The Economic Context of Dolmens and Passage-Graves in Sweden', *Ancient Europe and the Mediterranean* (ed. V. Markotic), 35. Warminster, 1977.

108: One may cite as examples the experiments conducted to simulate the transport of the bluestone components of Stonehenge by water and overland summarised by Prof. R. J. C. Atkinson, *Stonehenge*, 98–110. London, 1956.

109: It was shown by experiment that Pueblo necklaces might embody as many as 480 eight-hour days of work. E. W. Haury, 'Minute beads from prehistoric pueblos', *American Antiquity* 33 (1931), 80–7.

110: Using only those techniques available in Maori technology it was found that it took some 350 man hours to carve a *hei tiki* from nephrite. T. Barrow, 'An experiment in working nephrite', *J. Polynesian Soc.* 71 (1962), 254.

111: As carried out recently by Dr Susan E. Shennan in her analysis of the social hierarchy represented in cemeteries dating from the Early Bronze Age in Czechoslovakia. See her Ph. D. thesis on *Social Organisation in the earliest Bronze Age in Czechoslovakia: a study based on the Cemeteries of the Nitra Group.* Cambridge University Library Ph. D. thesis no. 10767. December, 1978.

faber precludes it from throwing light on *Homo sapiens* and his problems, any more than its reliance on natural science and modern technology for the retrieval and analysis of its basic evidence implies that it is limited to the kind of conclusions attainable by the Natural or Social Sciences. On the contrary, by one of those paradoxes in which history abounds the doctrine of evolution, once considered a threat to our humanity, has in practice served to underline the community of men af all races and cultural levels. Further, in promoting anthropology, animal ethology and prehistoric archaeology, it has helped to indicate where the essential differences between men and other forms of primate in fact lie.

The gradualness inherent in the evolutionary process and its immense duration in time, making even the most expanded estimate of human prehistory seem brief, confined as it is to the outer crust of the geological sequence, should warn against expecting sharp definition. As the palaeontological record becomes more complete it is reasonable to expect that it will reveal a continuous development between the physique of the earliest fossil men at present known to us and fossils of the common ancestors of anthropoids and hominids. Again, we hardly need the elaborate studies of animal behaviourists to tell us that the appetites and desires of men are hardly to be distinguished by any abrupt line from those which animate apes, monkeys and indeed a wide range of our fellow creatures: we have only had to live through decades of the twentieth century, visit the cinema or even glance at film reviews to know that. The uniqueness of man lies surely in the extent to which his behaviour is conditioned or at least influenced by cultural patterns transmitted by the fact of belonging to communities constituted not by genetic inheritance but by history. The prime and overriding interest of archaeology is that the artefacts which form its stock in trade are in themselves embodiments of the cultural patterns in and through which we can hope to trace the progress of humanisation.

One of the keys to archaeology's appeal lies in what it has to tell us about our identity. If it be true that we are human to the degree that we channel our animal appetites through cultural forms and if the artefacts recovered by archaeology provide the only continuous record of these, then prehistoric archaeology should provide us with a scale for measuring degrees of humanity. Viewed in the perspective prehistory allows, two main phases may be detected in the process of humanisation. The first, which endured throughout the

million years or so of the Lower and Middle Pleistocene, was marked by the simplicity of the lithic industries, almost the sole cultural traces to survive from this time, by a rate of change so slow that it can only be measured in geological terms and not least by the large degree of homogeneity that prevailed over the warmer parts of the world to which human settlement was then confined. In contemplating Middle Pleistocene hand-axes one is struck equally by the immensity of the gap between them and anything within reach of the cleverest ape and on the beauty and economy with which they have been shaped to forms standard over large parts of Europe, Africa and peninsular India.

By contrast the second phase was featured by an increasingly complex cultural endowment, a progressive increase in the tempo of change and an accelerating diversity of culture that culminated in the high civilisations of the literate societies recorded in history.

The process of cultural diversification[112] began during the Upper Pleistocene with the appearance of *Homo sapiens*. Regional specialisation took off with the colonization of new territories, including the forest zones of sub-Saharan Africa, extensive tracts of northern Europe and Asia and ultimately of the Americas and Australia. The adoption of settled life and the domestication of a wide variety of animals and plants in different regions gave a further thrust to the process of diversification. Sedentary life favoured the accumulation of property and apparatus and more certain supplies of food. Even more potent was the shift from relatively homogeneous social groups structured on a segmental basis to vertically structured hierarchies. This not merely gave rise to social diversification but also heightened the sense of identity in communities more highly integrated by the very fact of their hierarchical structure. The artefacts and styles by which archaeologists are so readily able to distinguish between the cultures of Celtic and Anglo-Saxon Britain or Dynastic Egypt and Minoan Crete or Imperial Rome and Han China were enhanced and indeed elicited in large measure by their ruling classes if not indeed by their rulers. The compilers of books issued in connexion with the recent Exhibition of Archaeological Finds of the People's Republic of China wrote in ambivalent terms of some of the richest finds. For instance admiration for the patience and skill of the workers who

112: G. Clark, 'Archaeology and Human Diversity', *Ann. Rev. Anthropology* 8 (1979), 1–20. Palo Alto, Cal.

fabricated the jade plate funeral clothes of a princess of the Han period was combined with severe condemnation of "the feudal class's luxury and depravity at the expense of the labouring people". Really one cannot have it both ways. If not made for superiors in hierarchies silks, porcelains, fine metal work and lacquers as well as jades which lend lustre to the very name of China would never have been made.

The shift from homogeneity to increasing diversity in the archaeological record was a move away from a condition common to the genetically determined patterns that restrict the scope of other animals. The growth of cultural diversity at a later stage of prehistory symbolised the progress of humanisation. It has been truly-said that archaeology and the natural sciences between them have helped to recover the kind of history appropriate to our world of shrunken space, standardised products, egalitarian sentiment and generalising modes of thought. Certainly we may agree that in an age of nuclear fission we need to nourish a sense of community. Equally surely, though, we need to hold fast to our identity, in other words to our cultural integrity, remembering that we achieved our full humanity as members of the species *Homo sapiens* by subscribing to the traditions of particular cultures.

The forces making for homogenisation are indeed formidable, all the more so that they march under the banner of progress. Let us make no mistake. What is at stake is nothing less than the humanity we have attained, if only very partially, in the course of the last few thousand generations. The feeling is entertained in the wilder regions of the far west and even nearer home that culture is in some respect discriminatory, elitist and only fit in this progressive day and age to be displaced by nature. No one who has spent his life studying the arts, literature or history of mankind would feel inclined to take such a charge seriously to heart. If our forebears of the Pliocene or Lower Pleistocene had been content with equality or rested content solely with what was needed to support their biological needs, our species would never have emerged, let alone created the heritage salvaged by archaeology. Certainly we ignore nature at our peril. As the Chinese long ago understood and expressed in their arts as well as in life, the artificial life of culture still depends as it has always done on maintaining harmony with the natural world. But harmony can only reign between parties. Mankind cannot be saved by

reverting to nature. Allow me to conclude this lecture by quoting a couple of sentences from a work by Karl Popper:[113]

> The choice of conformity with 'nature' as a supreme standard leads to consequences which few will be prepared to face; it does not lead to a more natural form of civilization, but to beastliness.
>
> Or again, and this time printed in italics:
>
> *There is no return to a harmonious state of nature. If we turn back, then we must go the whole way – we must return to the beasts.*

113: K. R. Popper, *The Open Society and its Enemies*, vol. 1,70 & 200. Routledge & Paul: London. 5th ed. 1966.

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