DATING AND CHRONOLOGY BUILDING

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Contents

Summary

One of the purposes of archaeological research is the examination of the evolution of human cultures. Since a fundamental definition of evolution is “change over time,” chronology is a fundamental archaeological parameter. Archaeology shares with a number of other sciences concerned with temporally mediated phenomenon the need to view its data within an accurate chronological framework. For archaeology, such a requirement needs to be met if any meaningful understanding of evolutionary processes is to be inferred from the physical residue of past human behavior.

1. Chronological Frameworks

Chronology orders the sequential relationship of physical events by associating these events with some type of time scale. Depending on the phenomenon for which temporal placement is required, it is helpful to distinguish different types of time scales.

Geochronological (geological) time scales temporally relates physical structures of the Earth's solid surface and buried features, documenting the 4.5–5.0 billion year history of the planet. The paleontological time scale orders the physical remains (fossils) of once living organisms. The paleontological record extends more than a billion years if the remains of simple early marine organisms are considered. The last 500–600 million years witnessed the emergence of major phyla with hard parts whose physical structures have been preserved within the geologic column.

The paleoanthropological time scale encompasses the fossil record over at least the last 4–5 million year period documenting the evolution of the *Hominidae* (hominid/hominin), the group of bipedal primates of which *Homo sapiens sapiens* is the only remaining or extant species—all others having become extinct. The archaeological time scale temporally orders the physical remains (artifacts) and features reflecting hominid behavior over about at least the last two million years. Finally, the historical time scale involves a period of time—not more than about the last 5000 years—during which, at first, only a few human societies documented their activities with textual data whose meanings, at least in part, can be deciphered. Most of the societies possessing textual records also developed calendar systems that formally recorded notations about the passage of temporally significant increments such as the yearly or monthly cycle or other recurring astronomical phenomenon.

1.1 Relative and Chronometric Time

Different historic and scientific disciplines require and utilize chronologies using vastly different time scales. However, a fundamental distinction of particular significance in archaeology involves relative ordering or "relative dating" in contrast to chronometric or time placement dating. Relative ordering places or serializes events in temporal sequence—that is, earlier than or later than—without specifying any temporal scale that specifies how much earlier or how much later. Chronometric placement applies a unitized time scale utilizing some type of fixed-rate incrementing or scaling mechanism. The mechanism is based on, among other things, observable recurring natural phenomenon (e.g. the Earth's rotation, revolution around the sun, or physical principles such as radioactive decay or the yearly growth of a tree ring) in the case of a physical dating method.

1.2 History and Prehistory

The primary basis of chronology building in most historic or text-aided archaeological contexts is dependent on the recovery of various types of documentary or inscriptional data or materials. Such text-based data is used to provide chronologically significant information such as sequential listing of rulers or eponymous officials. Such data are sometime recorded in association with the interpretation of notations of a calendar system, and rarely in relationship to some astronomical event such as a solar eclipse that can be securely dated on the basis of modern calculations. An example of this process is seen in the use of Egyptian texts recording the appearance of the star Sirius (Egyptian Sothis) at sunrise at, or near the beginning of, the Egyptian New Year. This event occurs approximately every 1460 years, and the so-called Sothic Cycle has been used to

calculate the date of important inscriptions or documents that can be related to the reigns of kings and important events in Egyptian political or cultural history.

The scholarship required to undertake the study of textual source data most directly involves linguistic and epigraphic expertise. Although there are notable exceptions, in most cases the principal purpose of archaeological excavation within such contexts is to recover complementary evidence or supplementary textual data reflecting a society whose cultural and political history has already been documented by a textual corpus, at least in broad outline.

In contrast, the principal basis of chronology building for text-less or prehistoric societies is the artifact record itself, together with associated materials reflecting the depositional and environmental contexts. Currently, primary archaeological chronologies are constructed based on analysis and comparisons of artifacts, from the geological or paleoenvironmental contexts from which these artifacts are recovered, and from the application of various instrument-based chronometric methods, for example radiocarbon dating.

2. Chronology in Archaeology

Archaeology shares with geology, paleontology, and other sciences concerned with temporally mediated phenomenon the need to view its data within as accurate and precise a temporal context as possible. For archaeology, such a requirement needs to be met if any meaningful understanding of evolutionary processes is to be inferred from the physical residue of past human behavior.

Sophisticated higher level generalizations and approaches that seek to understand the dynamics of cultural evolution by examining the complex interplay of ideological, ecological, functional, and/or culturally or behaviorally adaptive factors must, in the end, depend on chronology. An accurate chronology is needed for the events associated with the behavior of our species and our biological and cultural ancestors that various theories and models are attempting to explain.

2.1 Historical Development

One of the major advancements in scientific understanding of the natural world has been the progressive unfolding over the last two centuries of an understanding of the geological history of our planet. This includes the most recent geological periods during which *Homo sapiens* came to occupy a dominant position in the natural world, not in terms of numbers but in terms of the ability to dramatically modify and even destroy that natural world.

With few exceptions, until the early nineteenth century traditional Western concepts of time and thus chronology were tightly constrained by the cosmological assumptions reflected in the Judeo-Christian Biblical textual corpus, as interpreted by theologians and scholars primarily operating with in the institutional framework of the Western medieval and early modern Christian Church. In the absence of knowledge of any other data thought to be relevant, the Hebrew Creation and Noahian flood narratives along

with the genealogical data contained in *Bereshit* [Hebrew] or *Genesis* [Greek], the first book of the Hebrew Bible, were considered chronologically normative, authoritative, and capable of providing reliable temporal data that could be employed in tracing human history back to its beginning. In this context, within such a framework for the Western world until less than 300 years ago, the entire period human presence on Earth was conceived by all but a small handful of individuals as being historically documented.

Scholastic and literary scholarship linked the chronological data contained in the Biblical narratives with post- and extra-Biblical historical sources to create a traditional Western historical chronological framework ranging over some 6000–7000 years since the supposed original Creation event. In the modern English speaking world, the best known example of such a traditional chronological synthesis was that developed by the English scholar and churchman, James Ussher (1581–1656). His dates for important traditional events in Hebrew history (e.g. Creation, Flood, Exodus) were included in the margins of the Biblical text beginning with a 1650 reprint of the original text of the 1611 Authorized King James English translation of the biblical text. His calculations set the Creation event at 4004 BC.

Developments beginning in late eighteenth century and early nineteenth century geology and paleontology were largely responsible for the relatively rapid and profound transformation of Western scholarly consciousness concerning the temporal dimensions of both Earth and human history. It is important to note that this intellectual transformation was primarily the result of very pragmatic motivations to understand the nature of the geological and paleontological record, to facilitate the exploitation of natural resources as Western Europe underwent its Industrial Revolution.

By the middle of the nineteenth century, with the realization that the geologic record reflects the record of vast amounts of time—or as it has been termed “deep time”—for Earth history, geological chronology or geochronology was now conceived in units of hundreds of millions of years. The most recent geological periods were associated with the development of human kind, in part due to the first evidence of human fossils (e.g. *Homo sapiens neanderthalensis*) and the association of what were assumed to be artifacts with fossils of a number of extinct animals. By the middle of the nineteenth century, prehistory had emerged as an area of concern to a type of archaeologist who now viewed as one of his tasks the providing of chronological frameworks for the newly discovered prehistoric past. Initially, the strategies and approaches that were employed were, in large part, directly borrowed from that which had been developed by geologists and paleontologists over the preceding century.

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Biographical Sketch

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