

# Seriation, Stratigraphy, and Index Fossils

The Backbone  
of Archaeological Dating

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of Archaeological Dating

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# Preface



It is difficult for today's students of archaeology to imagine an era when chronometric dating methods—radiocarbon and thermoluminescence, for example—were unavailable. How, they might ask, were archaeologists working in the preradiocarbon era able to keep track of time; that is, how were they able to place objects and sites in proper sequence and to assess the ages of sites and objects? Given the important roles that chronometric methods play in modern archaeology, it is little wonder that today's students might view earlier efforts to establish chronological ordering as imprecise and unworthy of in-depth study. This is unfortunate, because even casual perusal of the large body of literature that resulted from the efforts of archaeologists working during the first half of the twentieth century reveals that they devised a battery of clever methods to determine the ages of archaeological phenomena, often with considerable precision.

This kind of chronological control is referred to colloquially as *relative dating*: production of a sequence of events for which no fixed or calendric dates exist. Instead of knowing that a certain kind of pottery was made between, say AD 100 and AD 300, and that another kind was made between AD 300 and AD 600, all we know is that the latter kind is of more recent origin than the former. The latter kind could postdate the earlier kind by several hundred years or by a thousand years, but we do not know this; all we know is that it is more recent. In like manner, we might know, perhaps through historical evidence, the terminal calendric date of manufacture and use of the later kind of pottery, but we might not know when on a calendric scale that kind was first made, and thus when it began replacing the earlier kind.

Numerous methods for working out relative chronological orderings have been devised in archaeology, one of which, stratigraphic excavation, had its roots in geological observations of the eighteenth century. Stratigraphic excavation is perhaps the best known of the various relative-dating methods used by prehistorians, no doubt because the majority of the archaeological record has a geological mode of occurrence. There are as well two other methods—seriation and cross dating—that deserve special consideration. These three general methods each comprise numerous techniques that prehistorians earlier this century worked out in order to keep track of time. Usually these are treated in cursory fashion in general archaeology texts, and the history of their development is summarized in superficial, and often inaccurate, fashion. Thus our goals in this volume are two. We seek first to describe in some detail the various ways each method works. Second, in

order to understand how the various techniques for implementing each method were developed and why they work the way they do, we place our discussion within the historical context of its development, focusing particularly on what happened in North America. Our reason for doing so is simply that we believe a detailed understanding of the history of a method or technique can clear up various misunderstandings and omit ambiguities, both in terms of analytical technique and disciplinary history.

There are several techniques of using artifacts from superposed strata to measure time, but these are rarely, if ever, differentiated; the more common practice is to lump them under the heading "stratigraphic excavation." As we will see, there is considerable disparity in terms of exactly what stratigraphic excavation means. Culture historians of the early twentieth century often are credited with bringing about a "stratigraphic revolution," generally taken to mean that it was not until a few years after 1910 that prehistorians began to excavate stratigraphically and to make observations concerning superposition. However, the *real* revolution was in *how* prehistorians generated information from the items gathered from the excavation of superposed strata, not the fact that they were excavating stratigraphically. That had been routine procedure for decades. But without a firm understanding of the history behind relative-dating methods and of the myriad changes that the methods went through over time, it is easy not only to conflate various methods and techniques but also to muddy that history of who did what, when they did it, why they did it, and how it differed from what came before it.

Our personal interest in dating methods grew out of our larger and more general interest in the culture history period of Americanist archaeology, which extended from about 1910 to 1960. We produced three volumes on that period: a book that examines the archaeology of a particular state in terms of how it reflected general trends in Americanist archaeology (O'Brien, 1996a), a reader containing what we consider benchmark papers (Lyman, *et al.*, 1997a), and a detailed account of why culture history took the form that it did (Lyman *et al.*, 1997b). Our interest in the culture history paradigm in turn grew out of the appreciation that American prehistorians working in the first half of the twentieth century went through many of the same contortions and engaged in many of the same kinds of epistemological discussions that contemporary evolutionary biologists do. Always in the background of archaeological discussion was the notion of culture development and how prehistorians could best structure their work to understand culture change as it was manifest in the archaeological record. Not surprisingly then, time came to have a lead role in archaeologists' efforts to understand the past, since any interpretation of cultural development had to be constructed around that variable. Until about 1915, temporal ordering of archaeological phenomena was rarely accomplished because of the general belief that there was minimal temporal depth to the archaeological record of the Americas,

and what little there was comprised cultures that were not very different from those documented by early explorers, settlers, and anthropologists.

We mark the middle of the second decade of the twentieth century as the turning point in Americanist archaeology in terms of when it became scientific. It was at that point that archaeology could be wrong and *know* it was wrong relative to matters of chronology. Archaeologists wanted to be scientific in how they studied cultural phenomena, and they began borrowing heavily, but implicitly, from other fields, especially evolutionary biology. Many of the archaeological schemes that grew up during the culture historical period, for instance, taxonomic schemes for classifying archaeological phenomena, were loosely constructed analogues borrowed wholesale from biology with little or no thought given to their applicability to archaeological data, or lack thereof.

As archaeologists interested in evolution, we view our roots as grounded heavily in culture history. The problems with which culture historians wrestled, such as how to order phenomena chronologically, as well as how to sort homologies from analogies, were as germane to archaeology as they were, and still are, to paleontology and evolutionary biology. In this volume we do not discuss the deep connections between modern evolutionary archaeology and culture history [we do that elsewhere in considerable detail (Lyman and O'Brien, 1997; O'Brien and Lyman, n.d.)] but rather we examine not only the various chronological methods that arose within the intellectual climate of culture history but also some of the assumptions that underlay their formation and development.

We have attempted to produce a book that will appeal to all generations of archaeologists, from graduate students to seasoned professionals. Our desire to bridge the gap in expertise necessitated careful consideration of what to include and what to leave out. The danger in such an exercise is that one group will perhaps want to see more historical discussion, whereas another will be more interested in how relative-dating methods are used today, if indeed they are. Many of the case examples that we use to highlight the methods come from the culture historical period. It is easy to find modern examples of stratigraphy, since stratigraphic observation is still at the center of what archaeologists do, and is relatively easy to do for cross correlation given that many archaeological types have become index fossils, but it is difficult to find modern examples of seriation. Several modern studies make it sound as if this method still plays a significant role in Americanist archaeology, only because the term *seriation* now includes a variety of techniques and methods that are but remotely related to what seriation was early in the twentieth century.

We gratefully acknowledge the advice and assistance of our editor at Plenum, Eliot Werner. All figures were drafted by Dan Glover, who tracked down various source materials, prepared the references, and made numerous other significant contribu-

tions to the project. E. J. O'Brien read the manuscript in its entirety and edited it for content as well as for style; he also wrote the discussion of cosmological time in Chapter 1. This is the fourth of our books on which he has worked, and we greatly appreciate the help and advice he has provided over the years. Finally, we acknowledge an intellectual debt of gratitude to Bob Dunnell for his advice and constructive criticism over the last two decades.

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