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Preface

Over the past several decades, a number of volumes have appeared on the subject of “Archaeological Geology” or “Geoarchaeology” (Davidson and Shackley, 1976; Herz and Garrison, 1998; Rapp and Gifford, 1985; Rapp and Hill, 1998; Waters, 1992). Although the supposed differences between these two endeavors continue to be discussed (e.g., Butzer, 1982; Rapp and Hill, 1998), here we are basically concerned with any subject that bridges the interface between the earth sciences and archaeology, with the earth sciences including a wide array of subjects, such as sedimentology, stratigraphy, geomorphology, pedology, geochemistry, geophysics, and geochronology. The number of books that focus on geoarchaeology (and the organization of groups such as the Archaeological Geology Division of the Geological Society of America, and the Geoarchaeology Interest Group of the Society for American Archaeology) demonstrate the increasing amount of and interest in geoarchaeology and the validity of considering geoarchaeology as a subdiscipline in its own right. These volumes also reflect the interest in geoarchaeology in universities throughout North America; this interest is further demonstrated by the Guide to Geoarchaeology Programs and Departments published by the Archaeological Geology Division of the GSA.

Among the earliest of the volumes on geoarchaeology was a collection of papers from a symposium titled “Sediments in Archaeology” held in England in the early 1970s (Davidson and Shackley, 1976). The papers from this groundbreaking effort were organized into themes that included Techniques, Sedimentary Environments (coastal, lacustrine, and terrestrial environments), and Biological Sediments. Although some of these articles were local in scope, those on methodology encompassed a number of techniques that included stratigraphy, magnetic properties of sediments as applied to prospection, petrography, phosphate chemistry, and cave sediments.

A decade or so later, Rapp and Gifford (1985) produced a multiauthored volume that was very much methodology oriented. It included a broad array of subjects and techniques and their applications to archaeological problems, including the following: geomorphology (including sedimentary and palaeoenviron-
ments), palynology, anthroools, geophysical surveying and archaeomagnetism, isotope and dating studies, and sourcing of materials.

More recently, a number of general geoarchaeology textbooks have appeared. The first in this group is by Waters (1992), which takes on a larger scale perspective, stressing geomorphology and site formation from a North American viewpoint. *Geoarchaeology* by Rapp and Hill (1998) covers most of the topics that are encompassed in modern geoarchaeological studies, ranging from field-based geomorphology/sedimentology to laboratory techniques. Published at about the same time was *Geological Methods for Archaeology* by Herz and Garrison (1998), which considers with some detail geological techniques in archaeology from a variety of aspects: geomorphology, sediments and soils, dating techniques, site exploration, and artifact analysis.

What struck us about these earlier collections—but less so with the most recent publications—is that articles tended to describe an earth science technique used in archaeology, provide some theoretical background, and then discuss the results. What seemed to be typically lacking were explicit statements of a number of issues: (1) the type(s) of problem being solved; (2) why a particular technique (or techniques) was being applied in the first place; (3) why this technique was the most suitable to tackle this problem; and (4) the implications of the results to both the archaeological and the earth science communities. Any ramifications directed toward these groups were commonly left to the readers to figure out for themselves.

We developed this book to avoid these shortcomings by making it as didactic as possible. We wanted to present a sampling of a variety of earth science techniques and strategies that can be used to answer problems that are of interest to both archaeologists and earth scientists. We attempted to choose techniques and their practitioners that represent up-to-date thinking and methodology on each subject. Some of these techniques are not widely performed or widely known. We stressed that authors should not present just a summary of technique or types of studies (and that they also avoid simply summarizing old research or publishing new results), but demonstrate how such studies are actually carried out. We wished the authors to convey some of their experiences as means of furnishing some practical information, a type of information that rarely gets into press. Finally, we wanted to acquaint different members of the academic community with concrete geoarchaeological problems and their significance. We hope that by explicitly stating the goals, techniques, and implications in each case, archaeologists will be made aware of the value of a particular technique, whereas the practicing or potential geoscientist would be exposed to possible problems that can be attacked along the suture of archaeological and geological research.

We hope this volume will have wide appeal to archaeologists and earth scientists alike. Archaeologists are increasingly making use of modern technologies and are becoming increasingly aware of the role of earth sciences in modern archaeology. The interest of earth scientists as well is much higher than it was in the late 1980s, and many universities are currently offering formal courses in geoarchaeology, when then there were few. The increased collaboration and awareness is clear to those of us who are involved in the production of the journal *Geoarchaeology*, where most of the contributions are joint efforts between archae-
ologists and earth scientists. Finally, the “explicit approach” we wish to promote in this collection of articles should make clear to scholars in both fields the wealth of opportunity that each community has to offer.

Not surprisingly, we were not able to provide papers on all subjects. First, this was not possible because of space limitations and the ever-increasing breadth of the discipline. For example, we would have liked to include chapters on a broad spectrum of aeolian deposits (both dunes and loess), but this would have been a formidable task for anyone. Similarly, coastal and periglacial environments, as well as colluvial settings, could also merit their own chapters. A discussion of general geoarchaeological problems that repeatedly arise would have been especially useful. Any number of regional or site-specific studies that carefully document the interface and interaction between archaeology and the earth sciences would have also constituted cogent additions. On the other hand, we believed that so much has been written about radiocarbon that we could reasonably forgo its inclusion in this publication. These and similar topics could readily fit into a volume of their own, and we can only hope that continued interest in the subject will bring about publication of such a book.

Second, certain subjects that were included in the original table of contents simply never made it to press. They were promised but not delivered. There was no time to approach other authors without significantly delaying the volume beyond our 2-year schedule. Such delays would also hold up those authors who did provide chapters. So, for example, a timely chapter on the “Stratigraphy and Sedimentology of Caves and Rockshelters” is missing. We had also wished to cover the topic of magnetic susceptibility in soils and in archaeological deposits, a subject well known in Europe, but unfortunately used relatively little in North America. A chapter specifically on fluvial landscapes in arid environments is also absent, much to our regret. Nevertheless, the subjects that are presented in this volume do constitute a realistic representation of the majority of techniques and themes involving the interaction of earth sciences and archaeology.

The book is organized into a series of sections that share common themes. The articles in Part I furnish background material that reflect broader issues. Holliday’s chapter titled “Quaternary Geosciences in Archaeology” considers a number of important issues, such as geologic time, the record of and reason for Quaternary environmental changes, and approaches to reconstructing past environments. These issues are critical in the communication and execution of proper and modern geoarchaeological research. Stein, in Chapter 2, provides a historical background of the study of site formation studies. This theme is critical to correctly documenting and interpreting the archaeological record, and now forms—or should form—the basis for modern archaeological research.

Geomorphological studies are the main focus of Part II. Frederick (Chapter 3) examines the nature of alluvial sequences and discusses in detail the explanations of some of their causes and interpretations, ranging from “natural” ones to those induced by human activities. Chapter 4 by Ferring examines fluvial landscapes from both arid and humid environments; he provides some basic information on this archaeologically significant geomorphic setting and shows how geoarchaeological sequences have been studied in the past. Wells, in Chapter 5, considers the relationship of settlement pattern to geomorphological change,
providing examples from both the New and Old Worlds. The second part concludes with a view by Noller (Chapter 6) of a promising new avenue of research along the interdisciplinary junction between archaeology and the earth sciences, archaeoseismology. He demonstrates how the archaeological record provides valuable information in understanding the effects of earthquakes on both past and modern societies.

Soils, sediments, and microstratigraphy are dealt with in Part III. These issues constitute the bulk of geoarchaeological research in North America and somewhat less so in Europe. In this part we present chapters that range from general issues and problems to environmentally and technique-specific ones. So, for example, Mandel and Bettis (Chapter 7) discuss the practical details of soils and landscapes, such as distinguishing soils from sediments, an often daunting problem to archaeologists and earth scientists alike; their discussion on soils and archaeological surveys provides practical information that is timely to field problems associated with modern cultural resource management projects. The chapters by Courty (Chapter 8) and Macphail and Cruise (Chapter 9) provide a somewhat different approach to many of the studies in the volume, with their emphasis on microstratigraphy and site formation dynamics and the methodological means to study them using soil micromorphology. They also furnish a valued European perspective because these types of studies are relatively uncommon in North America. Finally, Leigh (Chapter 10) examines the relationships among artifacts found in sandy contexts. These settings are widespread but not very well documented or understood, and the question of artifact mobilization is of critical importance here.

In Part IV, the shift is to studies involving more specific techniques. Stoltman (Chapter 11), for example, discusses the use and methodologies involved in ceramic petrography, including its application to issues of trade and its relationship to geochemical methodologies. Sherwood (Chapter 12) provides insights into the methodology, use, and interpretation of microartifact studies in archaeology. She shows how the method—one inspired from the earth sciences—can be used to interpret space in the archaeological context. Turning to geophysical methods, Kvamme (Chapter 13) demonstrates how modern remote sensing techniques are conducted. He illustrates the differences in suitability of different geophysical techniques at the same site and thus provides some valuable insights as to the choice of available techniques.

Part V includes three chapters dealing with geochemical methods. Rink (Chapter 14) explains the variety of techniques—including field and laboratory procedures—appropriate for dating artifacts and contexts that are beyond the range of radiocarbon. This information is particularly useful to those working on sites from the Old World, where archaeological records extend well beyond the Holocene. Chapter 15 by Nordt considers isotope analysis of soils, a subject that has proven to provide valuable paleoenvironmental data in Quaternary and geoarchaeological studies in both the New and Old Worlds. Chapter 16 by Herz reveals his extensive experience with the use and application of instrumental analyses in the sourcing of lithic materials.

Part VI concludes the volume with a prehistorian’s perspective of the earth scientist and archaeology. It utilizes Bar-Yosef’s background in earth science and
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archaeology, as well as decades of collaboration with earth scientists and environmentalists. It provides a number of lessons learned from his experience in Near Eastern sites on how (geo)archaeological research has been carried out and how it might be better conducted in the future, regardless of locale.

In sum, our ultimate goal here is to provide pragmatic information that is translatable into better field and lab studies, as well as more and better interaction between archaeology and the earth sciences. We hope that practitioners from both disciplines will benefit from the perspectives and talents of our authors.

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