Archaeology in Practice

Edited by Jane Balme
and Alistair Paterson

Archaeology in Practice

A Student Guide to Archaeological Analyses

Blackwell
Publishing

BLACKWELL PUBLISHING
350 Main Street, Malden, MA 02148-5020, USA
9600 Garsington Road, Oxford OX4 2DQ, UK
550 Swanston Street, Carlton, Victoria 3053, Australia

First published 2006 by Blackwell Publishing Ltd

1 2006

Library of Congress Cataloging-in-Publication Data

Archaeology in practice : a student guide to archaeological analyses / edited by Jane Balme and Alistair Paterson.
p. cm.
Includes bibliographical references and index.
ISBN-13: 978-0-631-23573-6 (hardback : alk. paper)
ISBN-10: 0-631-23573-6 (hardback : alk. paper)
ISBN-13: 978-0-631-23574-3 (pbk.: alk. paper)
ISBN-10: 0-631-23574-4 (pbk. : alk. paper) 1. Archaeology—Methodology. 2. Archaeology—Laboratory manuals. I. Balme, Jane. II. Paterson, Alistair 1968–

CC75.A657 2006
930.1—dc22

2005006163

A catalog record for this title is available from the British Library.

Set in 11/13.5pt Dante
by Graphicraft Limited, Hong Kong
Printed and bound in India
by Replika Press, PVT Ltd, India

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Contents

Chapter Abstracts

Chapter 1 This chapter provides an introduction to the many ways and means by which both submarine and terrestrial landscapes may be explored for archaeological sites, and how these can be further examined and mapped using nondestructive techniques. Attention is given to aerial and satellite remote imaging, but the main emphasis is on ground-based and submarine geophysical methods. These are areas of highly significant recent development and they hold considerable potential in the future of cultural resource management.

Chapter 2 Archaeology's stakeholders are many and diverse, but we must learn to consult with them. Many believe that they own the past of their ancestors; that it is not a public heritage. The chapter briefly examines the history of archaeological interaction with stakeholders and epistemological issues that may block successful consultation. Consultation problems involve informed consent, competing claims, and notions of cultural property. Successful consultation involves building partnerships out of mutual respect.

Chapter 3 Rock-art is an evocative form of material evidence for past peoples. Rock-art takes many different forms around the world. Two primary forms result from their production either as engraving or by the use of pigment. Rock-art can be classified according to technique, form, motif, and size. The recording technique will depend on the site context. Effective field recording will require technical skills and training. The appropriate analysis of rock-art will depend on the questions asked by researchers, and might include spatial distribution analysis, information exchange and stylistic analyses, questions of gender, statistical techniques, dating techniques, and examination of change over time and space.

Chapter 4 Stratigraphy is the study of stratification; that is, the interpretation of layers that form the deposits of a site over time. This study of stratification is of

crucial importance for understanding what happened at an archaeological site – in particular, the order in which events occurred. There are four main principles, drawn from Earth science disciplines, upon which the interpretation of stratigraphy is based, but the human element in the accumulation of archaeological sites makes the application of these principles especially difficult. Discussion of change over time within and between sites is usually done by creating analytical units that are formed by combining material from stratigraphic units.

Chapter 5

The varieties of methods that archaeologists use to obtain age estimates for the materials that they analyze are outlined under the term "chronometry." Most of the major techniques are discussed, with a particular emphasis on radiocarbon. The chapter then reviews the range of assumptions involved in taking the resulting age estimates and developing these into archaeological chronologies. Case studies emphasize the need for archaeologists to relate the temporal scales at which deposits may be resolved to the nature of the inferences about past behavior that they subsequently draw.

Chapter 6

This chapter discusses a range of methodological issues and analytical techniques that offer modern alternatives to traditional typology of stone artifacts. This approach emphasizes the identification and description of variation and time-ordering in manufacturing activities and their effects on artifact form, selection for further modification, and discard. A range of issues are also discussed, including research design, classification, data management, sample size effects, statistics, fragmentation, sourcing, and other topics of relevance to current and prospective stone analysts.

Chapter 7

Usewear and residues can provide reliable indicators of how stone, bone, ceramic, and other artifacts were used in the past. In this chapter, procedures and methods are described for undertaking functional analysis, including introductory experiments and microscope equipment. The identification of organic residues requires knowledge of typical plant and animal structures, properties, and composition. Stone tools provide an example for discussing the main forms of usewear (scarring, striations, polish, and edge rounding), and the wear patterns that are diagnostic of particular tasks, such as sawing bone, cutting wood, and scraping hides. There is a focus on recent archaeological applications and methodological problems.

Chapter 8

After describing the geology and chemistry of clays and technology of ceramic production, suggestions are provided for excavating, cleaning, marking, and

handling of ceramics, followed by discussion of sampling and quantitative analysis. Initiating an analytical program requires appropriate laboratory methods matched carefully with areas of ceramics research (technology studies, usewear studies, dating, identification of potters, and provenance studies). Also included are suggestions for further study, a table of analytical methods, and a ceramics examination report.

Chapter 9 The chapter stresses the importance of project planning and recovery procedures of animal bones. Consistency in sieving and sampling and full documentation of all on-site procedures are essential to ensure data quality. Recording protocols balance the need for an archive and the research aims of the project. We discuss the categories of data that form the majority of any zooarchaeological record, and exemplify the link between recording and analysis by reviewing bone quantification.

Chapter 10 Plant remains survive at archaeological sites more often than might be expected. This chapter briefly reviews the major areas of current research into macroscopic plant remains in archaeology. The first of these areas is the question of what plant remains can contribute to archaeology as a whole; the second is the problems associated with the identification and origin of plant remains; and the third is the available methods that can be effectively used to retrieve and analyze plant remains.

Chapter 11 This chapter describes the processes involved in analyzing a shell midden site, which is defined as an archaeological deposit that contains 50 percent or more by weight of shellfish remains, or one in which the principal visible constituent is shell. Problems in the identification of such sites are discussed, as are processes that may disturb them. Sampling issues are critical in midden analysis, and appropriate excavation techniques are canvassed. Some basic approaches to analyzing shell remains are described, and more complex techniques are mentioned.

Chapter 12 Although the focus in archaeology is on material culture, it is the sedimentary matrix containing the material culture that provides key contextual information such as chronology, site formation, and paleoenvironments essential for fully understanding human behavior. Some of the most common techniques used in laboratory sediment analysis are grain size, pH, organic matter, and phosphorous content. The selection of the particular analyses performed will depend on the nature of the samples, the research questions at hand, and, of course, cost. Granulometry was the main laboratory method used to understand

the vulnerability of Hokokam canal systems in the American Southwest, while several techniques were used in combination to determine the age of Kennewick Man in Washington State, without recourse to destructive sampling of the skeleton.

Chapter 13

Basic principles used in cataloging artifacts common to historical archaeological sites are reviewed, together with some of the major categories of artifacts found at historical archaeological sites. These categories include domestic ceramics and glass, building materials, and, more briefly, clay tobacco pipes, beads and buttons, glass tools, firearms, and metal containers. Methods used by historical archaeologists for quantifying and analyzing artifact information are discussed, with specific reference to minimum vessel counts and mean dates, and a guide to the most important literature on historic artifacts is provided.

Chapter 14

A review of historical sources includes general guidelines for research preparation, selecting materials, and judging source credibility. A case study illustrates the use of documents at Braudel's three broad scales of history: long-term history, social time, and individual time. Relationships between documents and archaeological evidence are described as (i) identification, (ii) complement, (iii) hypothesis formation and testing, (iv) contradiction, (v) confronting myths, and (vi) creating context. An appeal is made for archaeological contributions to history.

Chapter 15

The starting points of writing are knowing what you want to say and who your audience is. Writing in the science structure – aims, background, methods, results, and conclusions – is suitable for most presentations, especially if you remember KISS (Keep It Simple, Stupid). All writing benefits from being read and critiqued by your friends and colleagues; writing well requires constant practice. When writing for publication, follow the instructions meticulously, use only clear and relevant illustrations, and get your references right.

Preface and Acknowledgments

This volume is intended for archaeology students who are learning how to analyze archaeological materials. For many years, we have been involved in teaching university courses in field and laboratory techniques in archaeology. Over a cup of coffee during one of these courses, we were bemoaning the fact that, although there are many books on field methods (especially excavation techniques), much less is available on archaeological analysis techniques beyond the introductory first-year archaeology level. What we wanted was a series of essays that showed students how different kinds of archaeological materials are used to answer research questions. In our experience, students are more likely to understand this link when they learn from archaeologists who are talking about their own research problems and how they solved them. It brings a sense of immediacy to the work that makes it much more fun for them to read. Thus, to remedy the problem of the lack of such materials for students to read, we decided to assemble a collection of essays by experts on archaeological analysis.

There is such a variety of archaeological evidence, and so many differences across time and space, that we could not possibly cover all material types in all places and all time periods. To make the book manageable, we have restricted ourselves to those topics that are usually covered in general university courses on archaeological analysis. To identify which topics to include, with the help of Blackwell Publishing, we sent out a questionnaire to university teachers of field and laboratory methods mainly in North America, the United Kingdom, and the Australia Pacific region, asking them which topics they would want included in a text for higher undergraduate/lower graduate students. The final selection of chapters for this book is a result of the respondents' feedback, for which we were very grateful.

Not surprisingly, given our original reasons for beginning this book, most of the topics suggested by our reviewers are about post-excavation analysis. Thus the 15 chapters that comprise this volume concentrate on what archaeologists do with the archaeological evidence, rather than on how to obtain the archaeological evidence in the field. "Finding sites" (Chapter 1) and "Rock-art" (Chapter 3) are the main exceptions to this. They have been included because,

although neither the sites nor the art are brought back from the field for analysis, the records of both are. We were also keen to have a chapter on the ethical context of doing archaeology (Chapter 2, "Consulting stakeholders"), so that students are constantly aware of this important issue in all the work that they do. Most of the remaining chapters deal with particular types of evidence available to archaeologists. The final chapter on writing up the results is the important conclusion to any analysis in archaeology, and its usefulness to students will be self-evident.

When we originally imagined this book we thought that each chapter would include student exercises, but it seems from our respondents that teachers like to do their courses their own way. What they wanted instead was a series of essays that drew together the main areas of the subject matter and directed students to related further reading.

All of the authors who have contributed to this book are leading experts in their subject areas. Because the book is intended as a textbook, for the most part we selected contributors who have experience in teaching at university level. As a guide to the content of each chapter, we asked authors to think about what they would like their students to know about their particular topic in a university course on laboratory methods in archaeology. The remaining part of their brief was to make sure that they explained the main techniques of analysis, and used examples from their own work to demonstrate how some of those techniques are applied.

The resulting book of essays does not pretend to cover all aspects of all possible forms of analysis of the archaeological evidence discussed. To do so would have resulted in a book of insufficient depth for our target audience. We therefore had to make some decisions about what could and could not be included within each topic. Thus, for example, Chapter 6 is restricted to stone artifacts in prehistory, as this technology provides the major evidence for most of the human past and is an important aspect of most university courses. Rather than trying to include something on every historical period, we included a chapter on artifacts of the modern world (Chapter 13), as this topic was nominated by our respondents.

We have not attempted to provide case studies from every corner of the globe. As we have said above, our overall objective was to demonstrate the link between research question, analysis, and conclusion rather than produce a book on world archaeology. By and large, the methods by which archaeologists achieve their aims are global. To show the diverse applications of techniques, each chapter provides additional references to other work on the particular archaeological evidence that has been discussed. We expect that the book will be relevant to many archaeology students across the globe and that it will provide insight into the breadth of modern archaeology.

We would like to thank all of the people who have helped to bring this book to fruition. The contributors produced to schedule and responded promptly to our ongoing requests. We would also like to give thanks to the

Blackwell editors who guided us through, and especially to the many anonymous reviewers who responded to the Blackwell questionnaire and provided much advice on the content. We think that the final book has benefited from this advice. Each chapter can be read by students before a laboratory class, so that they know the context of the work that they are about to do in the laboratory. For students who are at the stage at which they are thinking about designing their own projects, the chapters in this book will be a guide to the possibilities from their evidence and the problems of which they need to be aware.

Jane Balme and Alistair Paterson

Notes on Contributors

Jane Balme is a Senior Lecturer in archaeology at the University of Western Australia. She has been teaching undergraduate and graduate students in Australian universities for 15 years. Areas of research and publication include the archaeology of hunter–gatherer societies (especially subsistence) and Australian Indigenous archaeology.

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Chris Clarkson is a postdoctoral fellow in the School of Social Science, University of Queensland. He undertook doctoral research at the Australian National University on lithic technology and land use in northern Australia. Chris then took up a postdoctoral fellowship at the University of Cambridge, investigating modern human dispersals, and is continuing research into early human lithic technologies. Chris has co-edited a forthcoming book, *Rocking the Boat: New Approaches to Stone Artefact Reduction, Use and Classification in Australia*.

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Jo McDonald is the managing director of an archaeological consulting company. She conducted her doctoral research on rock-art in the Sydney region and has written rock-art conservation plans and heritage management studies for the art of that region. She co-edited an Aura occasional publication on regional rock-art studies in Australia and Melanesia, and is published in *The Archaeology of Rock-Art* (C. Chippindale and P. Taçon, eds.), *Rock Art Research*, *Archaeology in Oceania*, and *Australian Archaeology*.

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Alistair Paterson is an archaeology lecturer at the University of Western Australia. He researches the archaeology of colonial Australia and culture contact. He has taught archaeological field and laboratory schools since 1999. He has published in *Australian Archaeology*, *Archaeology in Oceania*, and *Historical Archaeology*, and has contributed to the *Encyclopedia of Historical Archaeology* (C. E. Orser, ed.; Routledge, 2002).

Peter White is Reader in Archaeology at the University of Sydney. His books include *The Past is Human* and *A Prehistory of Australia, New Guinea and Sahul*. He has edited refereed journals such as *Archaeology in Oceania* all his professional life.

Larry J. Zimmerman is Professor of Anthropology and Museum Studies and Public Scholar of Native American Representation at Indiana University–Purdue University Indianapolis and the Eiteljorg Museum. He has served as Head of the Archaeology Department for the Minnesota Historical Society, Chair of American Indian and Native Studies at the University of Iowa, and Distinguished Regents Professor of Anthropology at the University of South Dakota. His research emphases include the Great Plains of the United States and Indigenous relationships with archaeology.

Andrew David

1
Finding Sites

Introduction

There are many ways in which the physical traces of past societies are made apparent and become a part of archaeological analysis. Of course, a multitude of structural remains obtrude themselves unmistakably above ground, where they are obvious for all to see and to study. Here, we will mainly concern ourselves with those remains that are concealed below ground or water level, or are only partially comprehensible at the surface. The discovery and analysis of such remains, either as sites or as part of the cultural fabric of the wider landscape, is fundamental to archaeology.

Early in the history of archaeology attention was drawn, naturally enough, to the highly visible remains of former societies and civilizations, for instance in the Mediterranean and East Asia and, later, in the Americas. Literary sources such as the Bible and the Homeric sagas encouraged the search for particular sites, and much else was revealed by simple exploration, observation, and – especially – by chance. The deliberate and systematic exploration of landscapes for signs of past human activity as a discipline in its own right came of age following the realization, early in the twentieth century, that vertical and oblique aerial photographs could reveal an astonishing wealth of information about monuments and their settings. Most importantly, aerial exploration was seen to be able to identify new sites that were invisible or incomprehensible at the ground surface. This literal overview from the air allowed both the recognition of new sites and their interpretation within the wider physical and cultural landscape. At the time, the airborne camera was declared to be "as valuable to archaeology as that of the telescope has proved to astronomy" (Crawford 1923: 358).

Archaeological Prospection

This is the term that has lately been adopted to encompass all those methods by which past human activity can be located and characterized. Typically, these are presumed to include the nondestructive techniques of remote sensing, from the air, using optical and multispectral sensors, from the ground

surface, or below the water, using geophysical techniques. Chemical and geochemical surveys are also included, as are the slightly more intrusive uses of coring, augering, or probing. Not least, of course, are the more traditional methods of surface observation and the mapping of artifact scatters and topographic variation. Nowadays, all of these methods can and do generate digital data that can be geo-referenced and hence presented, integrated, and analyzed through the medium of Geographic Information Systems (GIS). Such systems can themselves contribute to site location by helping to identify the factors that seem to influence recurrent patterns of behavior and then modeling or predicting the presence of sites unseen (Kvamme 1999).

Remote Sensing

In its broadest sense, remote sensing is defined as the imaging of phenomena from a distance (Shennan & Donoghue 1992). It thus includes photography and imaging from kites, aircraft, and satellites, and contrasts with ground-based or underwater remote sensing, which takes place at or below the Earth's surface.

Aerial photography

There are several ways in which archaeological features are made visible by aerial photography (Wilson 2000). Most familiar are crop marks, which – as Figure 1.1 shows – may be positive or negative. Positive marks occur in dry conditions, when the moisture and fertility of the soil in a buried ditch or pit (comprising an underlying archaeological feature) allows the crop above it to grow more vigorously than the surrounding crop, reproducing the plan of the feature as a pattern of differential crop growth. This growth results in a color difference, with the stronger crop, which is usually visible as a greener mark, surrounded by yellow, ripening crops. Negative marks occur when the

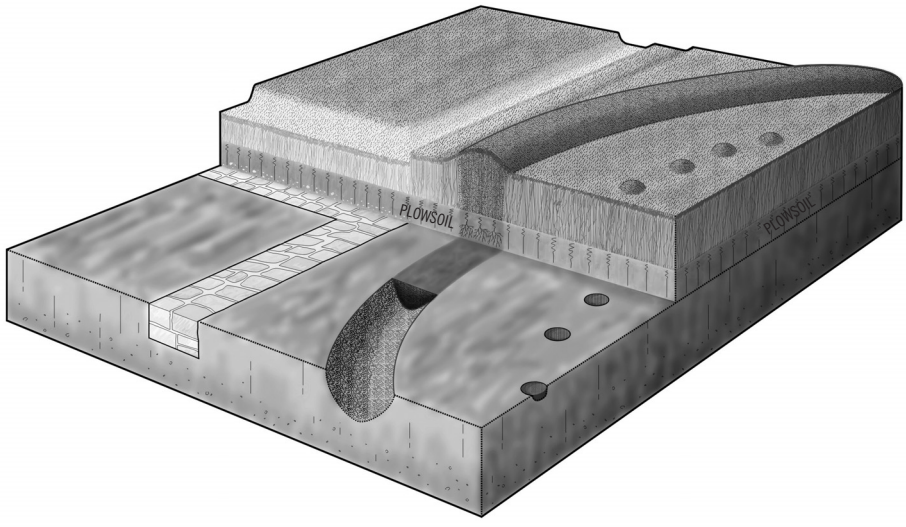

Figure 1.1 A schematic diagram illustrating crop mark formation (copyright English Heritage).

Figure 1.2 An aerial photograph showing crop marks that reveal traces of settlements, field systems, and burials, dating from the Neolithic to Iron Age: Foxley Farm, Eynsham, Oxfordshire, UK (copyright English Heritage).

underlying feature (a buried wall, for instance) restricts the crop growth, and thus the crops ripen sooner (as they have less water) and a yellow mark is visible in a green field. One of the main factors affecting the development of crop marks is therefore the moisture distribution in the soil. In turn, this is a function of the contrasting physical properties of the archaeological features and their surroundings. The generation and clarity of crop marks are thus influenced primarily by soil conditions and season, as well as the depth of the features (within the rooting zone of the crop), the nature of the overlying crop itself, its stage of growth, and the time and lighting conditions when photographs are taken. When all these conditions are favorable, the outcome is often dramatic, with the definition of remarkable detail (Figure 1.2). Crop marks are most commonly seen in cereal crops, but root and fodder crops are also susceptible, and marks have also been recorded in a diversity of other vegetation types, such as vines, sisal, lavender, maize, tea plantations, and paddy fields.

Aside from differential crop growth, the bare soil is itself capable of revealing significant variations that can resolve into archaeological patterning when viewed from aloft. For this to be the case, however, the soil usually has to be exposed by cultivation, and this means that the plow is already biting into the archaeological features and deposits. Some soils and substrates are more suited than others to the development of the color and tonal contrasts upon which recognition depends. In chalky areas, for instance, the red and brown marks of archaeological soils contrast clearly with the paler shades of up-cast chalk, and in such areas the traces of ancient field systems and plowed-down burial mounds are very distinctive. As in all aerial photography, weather conditions and timing are critical, as many types of mark are fleeting and ephemeral and may only be seen when a certain combination of conditions momentarily prevails. For example, the differential melting of a light frost in the early morning can briefly reveal and accentuate subtle patterning of a former garden (Keevil & Linford 1998).

Aerial images can also capture the patterns of archaeological sites that still survive as topographic features, but where the earthworks or structures are either too complex or too weakly defined to be easily comprehended at ground level. From the aerial perspective, seemingly jumbled earthworks can resolve themselves into a coherent plan; for instance, of a deserted village or town. The success of such viewing usually depends upon the favorable direction and angle of sunlight. Low-raking light casts shadows that can reveal even the most delicate variations in topography. Such details can also be picked out by variations in snowfall, waterlogging, or flooding. Differences in the health of vegetation can sometimes be accentuated when photographed with film that is sensitive to the near-infrared part of the spectrum (viewed either in monochrome or as "false color"), but black-and-white or color panchromatic film is usually preferred.

Once it is accepted that such a wealth of otherwise obscure detail can be made visible by aerial photography, there follows the need to interpret and analyze the resulting images – for instance, making necessary distinctions between genuine archaeological features and those that are natural or spurious. Stereoscopic interpretation of vertical photographic coverage allows landscape form to be better appreciated. However, most photographs are oblique views and these will require geometric correction, or rectification, before the archaeological features can be accurately mapped and correctly geo-referenced. Rectification is now easily achieved by computer and specifically dedicated programs are available (for instance, AirPhoto by Irwin Scollar (2002), and Aerial 5 by John Haigh (1998). Relevant websites are listed below, under "Resources."

Remote imaging

It is the reflection of visible light that allows images to be captured on aerial photographs taken from aircraft, as described, and now also from cameras orbiting the Earth on satellites. There are also reflections generated by