

A photograph of two archaeologists working in a dimly lit cave. One person is kneeling on the left, and another is kneeling on the right, focused on a small object in their hands. A large metal pot sits on the ground to the right. Light streams in from an opening at the top of the cave, illuminating the scene.

Edited by **Jane Balme**
and **Alistair Paterson**

Archaeology in Practice

**A Student Guide to
Archaeological Analyses**

Second Edition

WILEY Blackwell

Archaeology in Practice



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and Alistair Paterson**

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Archaeological Analyses**

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Chapter Abstracts

Archaeology's stakeholders are many and diverse, but we must learn to collaborate with them. Many believe that they own the past of their ancestors; that it is not a public heritage. This 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 1

Stratigraphy is the study of stratification, that is, the interpretation of layers that form the deposits of a site over time. The 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. This chapter describes these principles and problems and the way in which a Harris Matrix can be used to describe the relationships between different layers and features at some sites. Approaches to the creation of analytical units, formed by combining material from stratigraphic units, to identify changes over time within and between sites is another important part of archaeological analysis discussed in this chapter.

Chapter 2

In archaeology, it is the sedimentary matrix that normally provides key contextual information for the interpretation of material culture: chronology, site formation, *in situ* transformations of archaeological information resident in soils and sediments and specifying past environments form core goals of sediment analysis when researching past human behavior. Modern technical approaches increasingly blend field and laboratory activities using “mixed methods” – deployed alongside established sampling and analytical for techniques such as grain size, pH, organic matter, and phosphorous content. Selection of approach and analytical procedures is cost-sensitive and has to be led by the research questions at hand. This chapter illustrates the process of

Chapter 3

matching analytical approach to research goals – with examples from Hokokam canal systems in the American Southwest, and the Kennewick Man in Washington State, where several techniques were used in combination without recourse to destructive sampling of the skeleton.

Chapter 4 The varieties of methods that archaeologists use to obtain age estimates for the materials that they analyze are outlined under the term “chronometry.” In this chapter, 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 5 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 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 After describing the geology and chemistry of clays, and technology of ceramic handling, suggestions are provided in this chapter 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.

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. This chapter concentrates on recent archaeological applications and methodological problems.

Chapter 8

The importance of project planning and recovery procedures of animal bones is stressed in this chapter. 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 9

This chapter discusses why human remains are studied, how this area of the discipline has developed, ethical concerns and human remains, processes covering survival, funerary context, and excavation and postexcavation treatment and all their effects on analysis and interpretation of data. Normal (measurements and nonmetric traits) and abnormal (pathological lesions) variations in human remains are discussed, and an introduction to the analysis of human remains including the identification of sex, age at death, and demography is also provided.

Chapter 10

Plant remains survive at archaeological sites more often than might be expected. This chapter 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% 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

Chapter 12

analyzing shell remains are described, and more complex techniques are mentioned.

- Chapter 13** Basic principles used in cataloging artifacts common to historical archaeological sites are reviewed in this chapter, 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 in this chapter 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 (1) identification, (2) complement, (3) hypothesis formation and testing, (4) contradiction, (5) confronting myths, and (6) 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 students about the practices used by archaeologists in the analyses of archaeological materials. It can also be used as a sourcebook for professional archaeologists. Both of the authors have been involved for many years in teaching university courses in field and laboratory techniques in archaeology. The first edition of this book arose from the fact that, although there are many books for archaeology students on field methods (especially excavation techniques), much less is available for archaeological analysis techniques for students beyond the first-year university level. The gap, we believed, was a sourcebook on the practical methods of recording and analysis of different kinds of archaeological materials.

The process of archaeological research, which is summarized very simply in Figure 0.1, consists of much more than recording and analysis or even excavation as much of our public audience believes. Although most research follows this unidirectional step 1 to step 7 process, in reality, sometimes there will be feedback where, for example, data collection in step 5 may lead to some reformulation of the research plan.

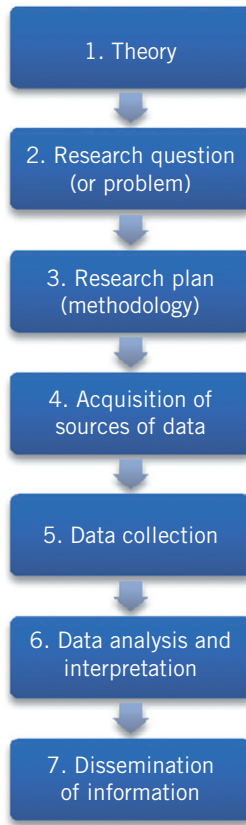


Figure 0.1. The process of archaeological research.

All archaeological research is driven by steps one and two, that is, a research question or problem which is informed by theory that could be high level, such as evolutionary theory, or from lower level theory, such as the relationship between gender and material goods. The precise research question has to also identify a gap in knowledge that is informed by previous work relating to the theory. It is only by having a research question that the research plan (methodology), including the principles, methods, and tasks that are needed, can be developed to examine the question (step 3). The research plan should identify the sources, such as sites, historical documents, artefacts, animal, and plant remains, from which data can be obtained.

The next step is to acquire these sources of data. This may include finding books in libraries, archaeological survey, excavation to recover artifacts, plant remains, charcoal for dating or the like, but, it should be made clear that books, objects, and so on, are not data in themselves, they are the sources from which the data, or information about the objects, are taken. The research plan informs the data that needs to be collected from these sources (step 5) and the analysis of that data that allows it to be interpreted (step 6), and it is these two steps with which this book is primarily concerned, although the

individual chapters may sometimes necessarily touch on others steps of the archaeological process.

Not all data are collected in the laboratory. Some, such as the spatial position of archaeological sites or objects, sizes of buildings, and records of rock art motifs are collected in the field and some, such as data collected from texts and photographs, are collected in libraries and offices. Sometimes objects are recorded *in situ* (in place) in the field rather than being brought into the laboratory. Because numerous excellent books on field archaeology include advice on data collection in the field, we have concentrated on the data that are collected in the laboratory, office and libraries. We have, however, included a chapter on rock art recording (Chapter 5) and a chapter on stratigraphy (Chapter 2) because the former is usually not dealt with in detail in field method books, and the latter is needed for the discussion on chronometric techniques (Chapter 4).

We have also had to be selective about the kinds of data collection covered in the remainder of the book. There is such a variety of evidence in archaeology around the globe, 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 analyses. Topics such as DNA methods, while now widely used in archaeology, are too specialized for our target audience. The selection of topics was largely based on a questionnaire sent to university teachers in field and laboratory techniques before the first edition was published. These academics, mainly from North America, the United Kingdom, and the Australia Pacific region, were asked which topics they would want included in a text for higher undergraduate/lower graduate students. When a second, revised edition was proposed, the (now Wiley) editors obtained reviews of the first edition to identify any major changes that were required. Apart from updates to the existing chapters, the major result of that review is that a new chapter on human remains (Chapter 10) has been added and a chapter on finding sites included in the first edition was removed as it was thought to relate more to field techniques.

This book 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 the target audience. We therefore had to make further decisions about what could and could not be included within each topic. Thus, for example, Chapters 6 and 7 are restricted to 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 in particular was nominated by our respondents.

One of the problems with “how to” books is that the “why” is often forgotten. From our own experience, we were very conscious of the need to ensure that students are aware of the links between the data collection methods and the remaining steps in the archaeological research process. It is for this reason that we decided that our approach to the book would be 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. All of the authors contributing to this book are a leading expert or experts in their subject area. 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 to use examples from their own work to demonstrate how some of those techniques are applied and interpreted.

To further demonstrate the process of archaeological research we have included a chapter on writing up the results for an academic audience (step 7; Chapter 15). Of course this is not the only way that archaeologists disseminate their information as it is important to provide the results of our research to other audiences, including the wider public. These other audiences will require different methods of communication that are beyond the scope of this book. We have begun this book with a chapter on collaborating stakeholders for two reasons (Chapter 1). First, the topic was suggested by several respondents in the original questionnaire of topics that university teachers asked for and second, it is not covered well in other “how to” books on archaeology, but the ethical context of doing archaeology is an important part of all archaeological practice, and we thought it a good way to begin a book on the topic of practice.

Finally, we have not attempted to provide case studies from every corner of the globe. Our overall objective is to guide students on methods of data collection and analysis and to demonstrate the link between research question, analysis techniques, 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 diverse applications of techniques, each chapter provides additional references to other work on particular archaeological evidence that has been discussed. We believe 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. 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

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Notes on Contributors

Jane Balme is a Professor in Archaeology at the University of Western Australia. She has been teaching undergraduate and graduate students in Australian universities for 20 years. Areas of research and publication include the archaeology of hunter-gatherer societies (especially subsistence) and Australian Indigenous archaeology.

Anthony Barham is convenor of the Masters of Archaeological Science Program at the Australian National University, having previously lectured in Geoarchaeology at the Institute of Archaeology, University College London. His research and teaching is cross-disciplinary and international in focus, studying sediments and stratigraphy on diverse urban development and mine sites, tells, middens, and Holocene shorelines. He has long-standing career foci in applied geoarchaeological practice in archaeological mitigation, coastal geoarchaeology, and the role of Quaternary stratigraphic architectures in determining the preserved archaeological record.

James Barrett is Deputy Director of the McDonald Institute for Archaeological Research and Reader in Medieval Archaeology at the University of Cambridge, United Kingdom. His particular research interests are the “long” Viking Age, political economy, migration, and the comparative study of maritime societies. Recent publications include *Being an Islander*, based on his work at Quoygreew, Orkney.

Wendy Beck is an Associate Professor in Archaeology at the University of New England in New South Wales. Her recent research and teaching interests include hunter-gatherer subsistence, especially plant food resources, and Indigenous and community archaeology and archaeological education. Her publications include articles in *Economic Botany*, *Journal of Archaeological Science*, and *Australian Aboriginal Studies*, and she coedited the book *Plants in Australian Archaeology*.

Sandra Bowdler is Emeritus Professor of Archaeology at the University of Western Australia. She has long been interested in coastal archaeology and

hence midden analysis, having published an earlier paper of which this is a revised version (“Sieving seashells: midden analysis in Australian archaeology,” in G. E. Connah (ed.) *Australian Archaeology: a Guide to Field Techniques*, 1983). She is also the author of *Hunter Hill, Hunter Island* which describes her research in Tasmania, and numerous articles on her research at Shark Bay in Western Australia.

Kelly M. Branam, PhD, is an Associate Professor of Anthropology at Saint Cloud State University (SCSU). In addition to teaching undergraduate cultural anthropology courses, she teaches and works with graduate students in SCSU’s Cultural Resource Management Master’s program. Her ethnographic dissertation research on Crow Indian politics instigated research concerning the contentious relationship between the Yellowtail Dam, the Bighorn Canyon National Recreation Area (NRA) (which was created as a result of the dam), and the Crow Indian community. She has been an instructor for several different archaeological field projects that have taken place in the Bighorn Canyon NRA. These field projects bring archaeologists, anthropologists, students, and tribal community members together for collaboration on cultural resource preservation.

Chris Clarkson is a Senior Lecturer and QEII Fellow in the School of Social Science, The University of Queensland. He is an expert in lithic analysis and works in various regions, including Australia, Africa, India, and Southeast Asia. His current research revolves around understanding the dispersal of modern humans out of Africa to Arabia, India, Asia, and Australian, as well as behavioral and cognitive similarities and differences between modern humans and Neanderthals. Chris is also working on developing better quantitative methods of lithic analysis and testing hypotheses about the evolution of technology through archaeology, theory, and experiment.

Emilie Dotte-Sarout is an Archaeobotanist at the University of Western Australia. She completed her cotutelle PhD in 2010 at the Australian National University and Sorbonne University. She researches the relationships between people and forests in the Pacific through the analysis of wood charcoal macroremains. These are directly related to issues of landscape changes, arboricultural practices, or plant introduction and domestication. She has also been working on enhancing resources on the anatomy of woody taxa from Australasia and promoting the development of anthracology in the region. Results of her doctoral research have recently been published as book chapters or articles in various volumes related to Pacific Archaeology.

Linda Ellis is Senior Curator of the University Museum and Professor/Founding Director of the Museum Studies Program at San Francisco State University. Her books include *Archaeological Method and Theory: An Encyclopedia*. Areas of research and publication include laboratory methods in archaeology, museum professional practices, and archaeology of Eastern Europe from prehistory to Late Antiquity.

Richard Fullagar is Honorary Principal Research Fellow in the Centre for Archaeological Science, School of Earth and Environmental Science, University of Wollongong, Australia, and a Director of Scarp Archaeology. He has recently published papers in *Science*, *Quaternary International*, *Archaeology in Oceania*, and *Antiquity* on early utilization of starchy plants in Papua New Guinea and China, stone technology, and Australian prehistory. Current interests include initial colonization of Australia, megafaunal extinctions, and the history of plant food processing.

Simon Holdaway is a Professor in the Department of Anthropology, The University of Auckland. His research interests include the arid zone and coastal archaeology of Australia, the Neolithic of Egypt, and the historical archaeology of New Zealand. He has written extensively on stone artifact analysis and human environmental interaction.

Gary Huckleberry is an Adjunct Research Associate, Department of Geosciences, University of Arizona. His specialties are geoarchaeology and geomorphology, and he has published in several journals, including *American Antiquity*, *Journal of Field Archaeology*, *Geology*, and *Quaternary Research*. He is coeditor of *Geoarchaeology: An International Journal*.

Susan Lawrence is an Associate Professor in Archaeology at La Trobe University, Melbourne, and a past president of the Australasian Society for Historical Archaeology. She is the author (with Peter Davies) of *An Archaeology of Australia Since 1788*. Other publications include *Dolly's Creek: Archaeology and History of a Victorian Goldfields Community* and *Archaeologies of the British*.

Barbara J. Little is an archaeologist with the US National Park Service in Washington, DC, and Adjunct Professor at the University of Maryland. Her interests include public benefits of archaeology and citizen engagement via heritage. Her recent publications include the books *Historical Archaeology: Why the Past Matters* and *Archaeology as a Tool of Civic Engagement*, coedited with Paul A. Shackel.

Jo McDonald has been recording Australian rock art for over 30 years. While being a career consultant, she has also held a research position at the Australian National University. She was Principal Investigator on the Canning Stock Route Project (rock art and *Jukurrpa*) and is now an ARC Future Fellow, comparing desert rock art in Australia and North America. She has published widely on information-exchange theory, gender, and rock art management, and has been involved in national and World Heritage nominations for rock art provinces. She is the Director of the Centre for Rock Art Research + Management at the University of Western Australia, and holds the endowed Rio Tinto Chair in Rock Art Studies.

Sue O'Connor is an Australian Research Council Laureate Fellow in the Australian National University's College of Australia and the Pacific, researching modern human dispersal, adaptation, and behavior en route to Australia. Her

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Terry O'Connor is Professor of Archaeological Science at the University of York, United Kingdom. His books include *The Archaeology of Animal Bones, Environmental Archaeology, Principles and Methods* (with J. G. Evans), and volumes in the Archaeology of York series. Interests and publications range across zooarchaeology, particularly bone taphonomy and human–animal behavioral coevolution.

Alistair Paterson is a Professor of Archaeology and Head of the School of Social Sciences at the University of Western Australia. His research and teaching covers culture contact, historical archaeology in maritime and terrestrial settings, European colonization, historical rock art, and archaeological and historical methodology. He is the author of *A Millennium of Cultural Contact* (Left Coast, 2011), and *The Lost Legions: Culture Contact in Colonial Australia* (AltaMira, 2008). He is past President of the Australian Archaeological Association (2005–2007), and has been involved with editing for, and publishing in, key archaeology journals, including *Archaeology in Oceania*, *Internet Archaeology*, *Australasian Historical Archaeology*, and *Australian Archaeology*.

Charlotte Roberts is a Professor of Archaeology at Durham University, United Kingdom. She is a bioarchaeologist with a first career in nursing, who has primarily focused for 30 years on the study and interpretation of evidence of disease (paleopathology) in archaeological skeletal remains using traditional and more advanced analytical techniques (e.g., stable isotope and ancient pathogen DNA analyses). She is interested in the contextualized approaches to studying the interaction of people with their environments in the past by exploring patterns of health and disease. Her books include *The Archaeology of Disease, Human Remains in Archaeology: A Handbook, Health and Disease in Britain: From Prehistory to the Present Day, A Global History of Paleopathology: Pioneers and Prospects*, and *The Bioarchaeology of Tuberculosis: A Global Perspective on a Re-Emerging Disease*.

Peter White is Honorary Research Associate 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 at Indiana University-Purdue University Indianapolis and Public Scholar of Native American Representation at the Eiteljorg Museum. He has served as Head of the Archaeology Department of the Minnesota Historical Society, as Chair of American Indian and Native Studies at the University of Iowa, and as Distinguished Regents Professor of Anthropology at the University of South Dakota. His research emphases include North American archaeology, Indigenous archaeology, and archaeological analysis of contemporary sites.