'An essential aid for beginners and professionals'
Emeritus Professor John Mulvaney

the ARCHAEOLOGIST'S FIELD HANDBOOK

Heather Burke & Claire Smith

The Archaeologist's Field Handbook

For Jane, Wendy, Mike and Iain

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ALLEN & UNWIN

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Visit www.allenandunwin.com/arch_handbook.pdf for the heritage directory and codes of ethics:

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PREFACE

This book is a successor to John Mulvaney's *Australian Archaeology: A Guide to Field and Laboratory Techniques* (1972) and Graham Connah's *Australian Field Archaeology: A Guide to Techniques* (1983). These were the texts we used as undergraduate students, but they have been out of print for some time, leaving Australian archaeology without a field book suited to local conditions. This book was produced to fill that gap. It is a hands-on field manual which provides a step-by-step guide to undertaking and successfully completing a wide variety of archaeological fieldwork projects, from simple site recordings to professional consultancies. Our aim has been to combine clear and easy-to-understand information on conducting fieldwork for undergraduate and postgraduate students with practical advice for successfully undertaking archaeological consultancies. While this book is intended primarily for archaeologists, you don't need to be an archaeologist to use it. We expect that it will also be of value to interested members of the public, such as members of historical societies or the National Trust. In this respect, our intention is to make people aware of the legal and ethical obligations inherent in documenting and recording cultural heritage sites responsibly and well. To this end, there are some methods which have been omitted entirely from this manual because they should not be undertaken by amateurs. In particular, sampling rock art motifs for dating, or any restoration or conservation work, should only be done by trained professionals.

The main problem with writing a manual, particularly in archaeology, is that many cases must be dealt with on their own merits. There can be no hard and fast 'recipes' for being a responsible archaeologist, although there is a clear need for guidelines and standards to ensure high-quality work. The methods and guidelines presented in this book outline thresholds for professional practice rather than the *only* methods that can be used in a given situation. Every site is different, and to some extent the field methods employed in each situation will be different. The key is to be flexible: while there are basic principles and methods, each field project will present its own challenges and inspire its own solutions. Moreover, there is so much variation in the legislation dealing with cultural heritage across Australia that there is also considerable diversity in the standards for professional conduct which are considered acceptable within each state. Through this book, we are trying to promote some generally accepted standards and protocols, and to make this information available within the one, easy-to-carry volume. By firmly grounding essential practical techniques in an understanding of the contemporary ethical issues surrounding Australian archaeology today, we hope that this combination will teach people how to conduct ethical archaeology whilst at the same time providing much-needed hands-on practical advice.

ARCHAEOLOGY IN AUSTRALIA

Archaeology is the study of past human behaviour through material remains. In Australia, this translates to a variety of interests: from Indigenous archaeology which focusses on the Aboriginal and Torres Strait Islander occupation of Australia over the last 50 000 years to historical archaeology which deals with the last few hundred years since colonial contact. Another important branch of Australian archaeology is maritime archaeology, which deals with underwater and coastal archaeology. While there are areas of overlap between all of these, each has its own specific challenges and opportunities.

Archaeologists in Australia work in a range of professional capacities. The main employment opportunities come from universities, museums, government departments and consulting. Archaeologists in universities work in either a teaching or research capacity, or both. Most university positions are for lecturers, who teach undergraduate courses, supervise postgraduate students and conduct independent research. These people normally possess a PhD in archaeology. Many universities also have postdoctoral fellows, whose main task is to conduct research in their field of interest.

When working in a museum, the task of an archaeologist is either that of a curator, who manages and cares for collections, or a researcher. A curator needs to have a minimum of a good Honours degree in archaeology, normally with a museum specialisation, but research positions usually are filled by people with PhDs. Archaeologists working in museums deal with various aspects of maintaining the museum's collections, such as liaising with other archaeologists who have conducted excavations and may wish to deposit material, or with researchers who wish to study the museum's collections. They also are involved in liaising with members of the public, researching exhibitions and conducting independent research projects.

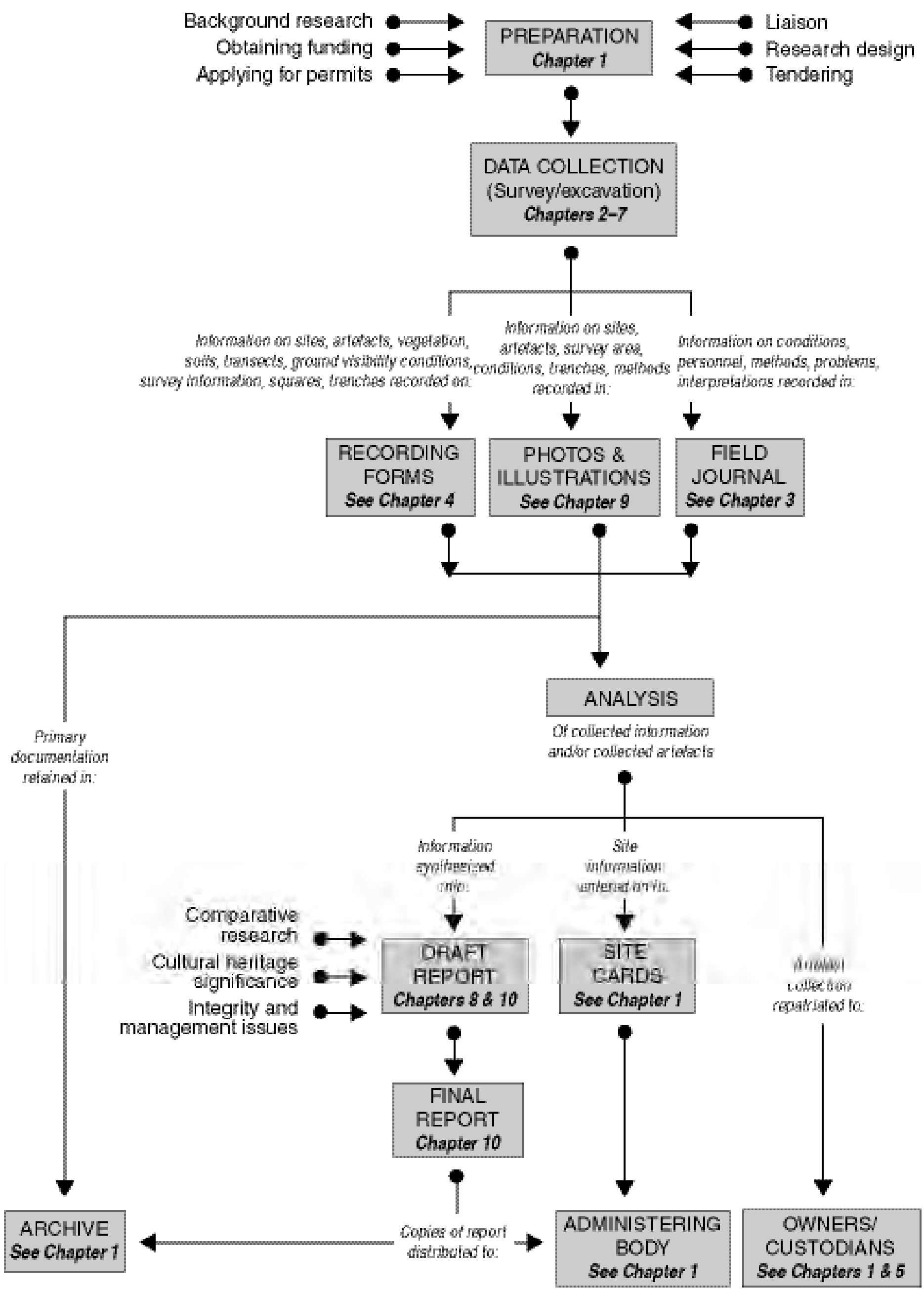
In recent years, there has been an increasing demand for archaeologists to mediate between the needs of development and the desire to preserve our cultural heritage as much as possible. This work is usually undertaken on a consultancy basis, and is generically referred to as cultural heritage management. Archaeologists can be involved in a variety of consultancies, ranging from recording and assessing the importance of sites and undertaking emergency excavations prior to development to devising protection schemes for sites and artefacts and creating interpretive materials. Because development is governed by cultural heritage legislation in each state and territory, however, these consultants work very closely with archaeologists in the various government departments whose job it is to administer this legislation. These departments are responsible for maintaining registers of sites, establishing guidelines for best practice, assessing consultants' reports and liaising with developers and members of the public. Archaeologists employed in these departments also conduct research projects related to the management needs of their particular department. Increasingly, archaeologists also are being employed by Indigenous groups. The kinds of work undertaken here include researching native title claims, developing cultural programs or community management programs and developing interpretive materials for cultural centres.

All of these forms of archaeology involve a commitment to high ethical standards and good professional practice. Archaeologists employed in any of these jobs are likely to work in many different and interesting places and will need to call upon a diverse range of archaeological methods. This handbook has been designed to provide undergraduate and postgraduate students, as well as first-time consultants, with the basic tools needed to plan and undertake fieldwork in a wide range of field situations. The structure of this book follows the pattern of a typical archaeological field project: first a site has to be located, then recorded and interpreted, and the results properly documented. Each chapter deals with a segment of this process and covers the various methods which can be employed to achieve this on Indigenous and non-Indigenous sites. See Figure P.1 for an overview. While each chapter can stand alone, the information is cross-referenced to help you locate related materials. Specialist terms are flagged throughout the text in bold and explained in the text rather than in a separate glossary.

Boxed texts in each chapter outline the skills; the 'fieldwork kit' sections outline the basic equipment needed to undertake each phase of fieldwork; and each chapter finishes with a list of further readings and useful resources. In order to teach some of the lessons of 'real' archaeology, we have included handy hints from professional archaeologists, who have developed their own ways to collect data in the field. The appendices collate the four main codes of ethics used by Australian archaeologists today and provide lists of professional contacts and sample recording forms to make field preparation and recording simpler. These recording forms are not intended to cater for every archaeological excavation or survey, but to give you a guide to the kinds of information you should be recording routinely. Inevitably, you will have to adapt them to suit your own particular purposes. Some aspects of fieldwork require you to contact relevant organisations and bodies. Throughout this book, this symbol (*) is used to indicate important points of contact. The relevant addresses and contact details are provided on the website which complements this book (www.allenandunwin.com/arch_handbook.pdf).

While this book is intended as a basic field manual, it is not an exhaustive treatment of all techniques which are used in archaeology. In particular, because the post-field analysis of artefacts and sites has its own methods and problems, this book stops at the point where laboratory analysis begins. For information on this aspect of archaeology, we

FIGURE P.1: Content overview



recommend Jane Balme's and Alistair Paterson's *Doing Archaeology: A Student Guide to Archaeological Analysis* (Blackwell, 2004).

ACKNOWLEDGMENTS

This book, like any other archaeological project, could not have been completed without the help of many people. First, we would like to thank the people who gave us special advice or assistance. In particular, we thank Val Attenbrow for thoughtful comments on our original proposal, as well as Tessa Corkhill, Richard Fullagar and Alice Gorman. Wendy Beck, Sandra Bowdler, Jay Hall, Matthew Kelly, Ian Lilley and Peter Veth all provided detailed comments on the manuscript. Their feedback has been invaluable. Second, thanks to all those who took the time to contribute field tips: Val Attenbrow, Jane Balme, Aedeen Cremin, Bruno David, Iain Davidson, Ines Domingo-Sanz, Richard Fullagar, Denis Gojak, Alice Gorman, Gordon Grimwade, Nicky Horsfall, Wayne Johnson, Lyn Leader-Elliot, Robyn Najar, Jack Radley, Richard Robins, Jennifer Rodrigues, June Ross, Anita Smith, Mark Staniforth, Stephen Sutton and Joe Watkins. Third, Tracey Treloar spent many hours chasing up errant details, making the compilation process much less painful. We would also like to thank Gordon Grimwade for use of his library and Martin Rowney for the matchbox illustrations in Chapter 9 and Appendix 5.

Aidan Ash, Wayne Johnson, Penny McCardle, June Ross, Matt Schlitz and Mark Staniforth kindly provided us with photographs. The scarred trees in Figures 7.1 and 7.9 are published in memory of Josie Carney and courtesy of the Macquarie Warren Aboriginal Land Council. The photo of the grieving mother in Figure 7.1 is published with the kind permission of Avis Gale, Amy Levai, June McInerney (Kunyi), Shereen Rankin and Silvio Apponyi. The axe grinding grooves in Figure 7.1 are published courtesy of the Toomelah Aboriginal Land Council. All other images in Figure 7.1 are published with thanks to Phyllis Wiynjorroc, Peter Manabaru, Jimmy Wesan and Barunga-Wugularr Community Government Council. All other photographs were taken by the authors. Finally, we thank the students of ARCH3302: Field Methods in Australian Archaeology in 2002 and 2003. This book was developed while we were teaching this class and their opinions and feedback helped us to clarify our ideas, our teaching and our writing.

Finally, archaeologists seek to learn about people in the past through the objects that they made or used and left behind them. It is not just the objects (artefacts) themselves that are important, but also where they are found (the sites), and what other objects or traces of objects they are found with (their context). An artefact by itself can only tell us so much, and it is often the context which is most important for understanding the behaviour or activities which put the artefact there in the first place. The most important thing to learn about archaeological fieldwork is to pay as much attention to the context as to the artefact. In writing this book, we have tried not to privilege the artefact above the context, or the large or visually impressive site above the ordinary. When conducting archaeological fieldwork, it is important to remember that *all* traces of past human behaviour are important, not just the most obvious or impressive ones. There is no substitute for field experience, but if you can keep this in mind, you are already behaving like a good field archaeologist.

CHAPTER ONE
PREPARING FOR FIELDWORK

WHAT YOU WILL LEARN FROM THIS CHAPTER

- What it means to be a responsible archaeologist
- The legal requirements for conducting heritage fieldwork in each state and territory
- The importance of properly planning your research and fieldwork
- Essential skills for finding funding
- The importance of accurate record keeping
- The ethical responsibilities of working with others

The basic fieldwork toolkit

Good boots
Hat and water bottle
Sunscreen and insect repellent
Prismatic compass
Global Positioning System (GPS) (with spare batteries)
Relevant topographic maps for the area (preferably current editions at 1:50,000 or 1:100 000 scale)
Recording forms, field notebook, pens and pencils
Scale ruler
Protractor (either a 360° full circle, or a square Douglas protractor is best)

Clipboard
Photographic scales (at least one 50 centimetre and one small scale for artefact photography)
A 2 metre ranging pole (preferably collapsible or telescopic for ease of carrying)
A roll of flagging tape (preferably the bio-degradable kind) and/or individual artefact flags
Graph paper
Camera and film (with spare batteries)
A 30 metre tape measure and a 5 metre retractable tape measure
Ziplock® plastic bags, in various sizes
Hand brush for cleaning off hard surfaces such as brickwork
Gardening gloves and secateurs for clearing away vegetation
Good first-aid kit (see below)
Pocket knife
Whistle—this can be used to locate a person if they get separated

Optional:
Camping/general site equipment (billy, camp cooking gear, swag, chairs, folding tables, canvas or shade cover)

The basic fieldwork first-aid kit

Flashlight (with spare batteries)—a small one that tucks easily into a corner will do
Tweezers for removing splinters, thorns, prickles or ticks
Bandage tape and a small pair of scissors to cut it with
Several triangular and roll bandages
Band aids
Cream for itches and bites
Thermometer
Matches or a lighter
Anaesthetic spray
Betadine or other antiseptic ointment
Both paracetamol and codeine tablets (in case someone is allergic to one type)
Aspirin, or similar anti-inflammatory
A small first-aid handbook: these come in travel sizes and will provide instructions on what to do in most emergencies

Archaeological fieldwork is not something that can be done *ad hoc*. Fieldwork has to be tailored to particular research questions and should only be undertaken with proper planning. Before going into the field, you need to think through the aims of your fieldwork and what it is you want to know. What questions do you want to answer? What data do you need to address these questions? What methods will be required to collect these data? It is rarely possible to record everything, and in most situations you will need to prioritise the information you collect. If you are looking for Indigenous sites in a large river valley, for instance, but have only one and a half days to complete your survey, you are not going to be able to record the contents of every site in detail, but you will be able to plot all site locations and record some minimum information for each. On the other hand, if your fieldwork consists of recording a single building, you will probably be able to make a far more detailed and exhaustive record. Of course, even the most well thought-out and carefully planned research must be flexible enough to cope with the changing conditions of fieldwork. Only in an ideal world could an archaeologist create a project based solely on the requirements of research alone. In reality, you will need to balance what you would like to do with the various constraints placed upon you and the project (Orser and Fagan 1995: 159). Routine constraints include time, not enough funding (there is *never* enough funding in archaeological research) and not being able to access certain sites or areas. If you can think of any ways to narrow down the focus of your project before you begin and thus make your time spent in the field more efficient, this can only result in a more manageable project.

DESIGNING YOUR RESEARCH

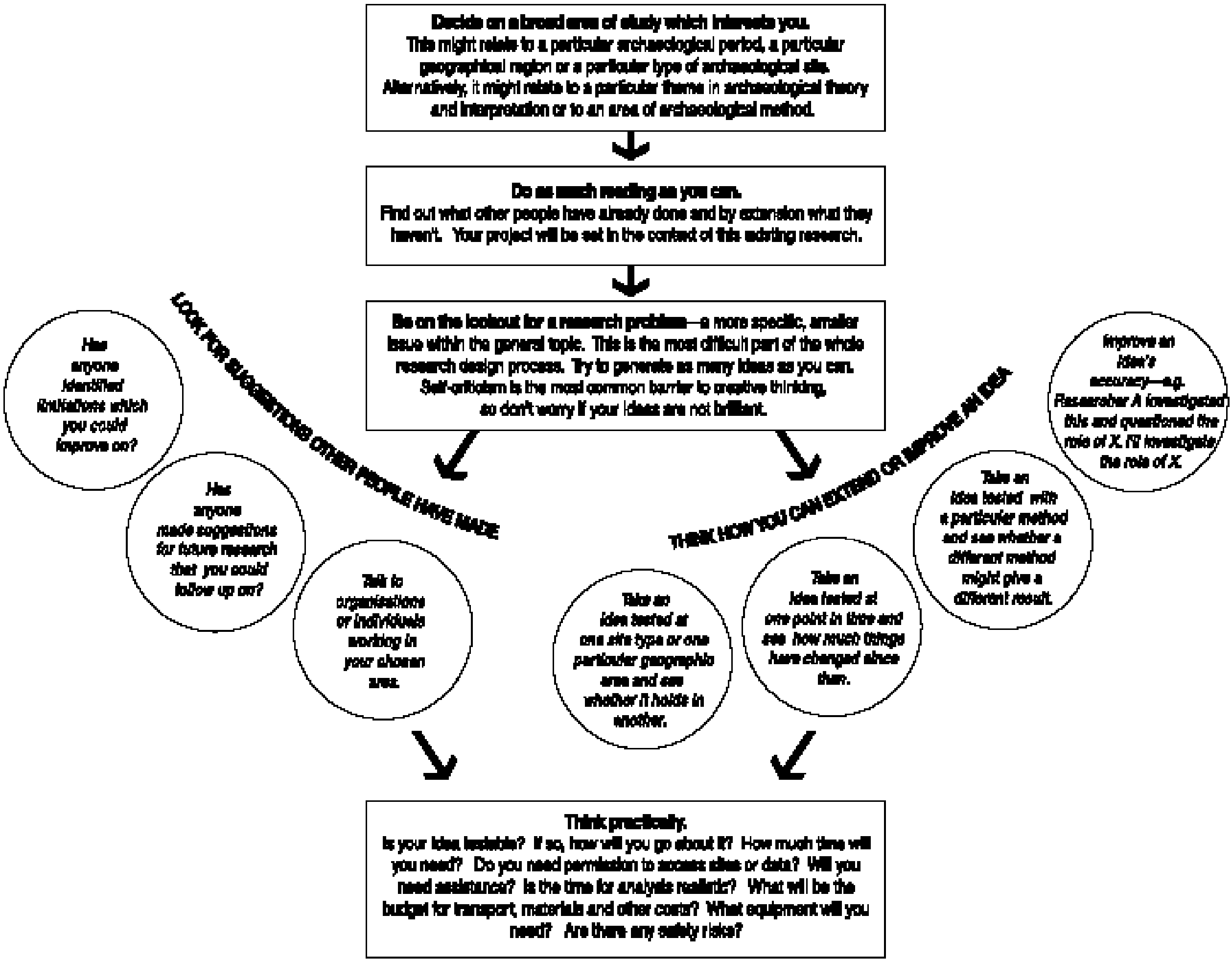
The most important thing to clarify at the beginning of any project is the purpose of your fieldwork. What are you doing fieldwork for? What questions are you interested in investigating? What kinds of sites do you expect to find? What information will you need to collect to get the job done? Without some clear idea as to what you want to know, and how best you will be able to get it, your project will be doomed from the start. For this reason, it is a good idea to work out your plan of attack in advance. This is not so urgent if you are working alone, and will become less necessary as you gain more experience, but if you are working with a field crew it can be a very expensive (not to mention frustrating) exercise to keep them waiting while you work out what to do.

The most important first step in designing research is to outline the problem. This is essentially why you think your research is important, and how you think it will contribute to the discipline of archaeology. Some research problems might contribute new light on theories of human behaviour in the past, while others might contribute new methods for how we go about collecting or analysing archaeological data. Not every study will be earth shattering in its findings, but every research project should be sufficiently well thought out so that it does not simply reinvent the wheel. This means that you will have to do some reading in and around your chosen research area to find out what other people have done in similar situations. You will also have to think through how you are going to operationalise your research problem: if I want to know this, what will I have to look for in the field to answer my problem? It is no use wanting to answer questions about the living conditions of nineteenth century miners if you haven't collected any data from nineteenth century miners' house sites. In fact, to answer this question properly you would probably need to know what they were eating and drinking and how much of each product they consumed—in other words, you would probably need to excavate a nineteenth century miner's rubbish dump, rather than simply collect data from a surface survey.

One way to develop the planning for your project is through writing a research design. In a research design, you outline your research questions and explain how these were developed, the methods you intend to use to address these questions, and how your proposed work relates to existing research. This will help you to think through each step of the project and will allow others (colleagues, government bodies, clients) to understand your project clearly. All research designs must be logical and structured around a problem or question that is worthwhile answering—in other words, that will contribute in some way to archaeological knowledge. Narrowing down your research to focus on a particular problem is the hardest part of writing a research design, although it is the core of any good research program (see Figure 1.1 on page 5). Writing a formal research design is not something you would undertake before every trip into the field, but it is necessary if you are planning an academic research project or applying for an excavation permit. Under current legislation in all states of Australia, a research design forms an essential part of any application for an excavation permit, so it is well worth knowing how to write an acceptable one. In a sense, the worth of your project will be evaluated through your research design: it is both a statement of how you intend to go about things and an outline of why your research is important. When developing a research problem, keep these factors firmly in mind (Figure 1.1 on page 5):

- You must establish that the problem addresses a question, or a set of related questions, the answers to which will make an important contribution to archaeological knowledge. The archaeology should also be able to provide insights which no other discipline can. If the research proposes to answer questions that are marginal, or outside the range of current discussion in the discipline, you will need to show even more clearly that the answer to these questions will make a contribution. Adequately justifying your research problem is a necessary ingredient in any scientific research.
- You must define the nature and scope of the question. A research project should address a specific, clearly stated question, not just a general topic area or a set of data.

FIGURE 1.1: Thinking through your research problem



Topical or data questions are rarely sufficient starting points for the design of scientific research.

- You must establish that the answer can in fact be reached. Trying to establish the site of the first use of specific Indigenous artefact types, for example, is unanswerable. This is part of thinking through your research and of narrowing down the focus of your project to make it practical.
- Your research problem will condition nearly all aspects of fieldwork. The more carefully it is conceived, the more efficient and productive your field program will be.

AUSARCH-L: A list-server dedicated to Australian archaeology

A useful way of searching for information on Australian archaeology which might not otherwise be available from published sources is to subscribe to the **AUSARCH-L** list-server. Its purpose is to facilitate discussion about all aspects of Australian archaeology (Indigenous, historical, maritime, etc.). It is essentially a digital 'mail room' where you can exchange information with others. Messages regularly include questions to other subscribers, presentations of information and discussions of results. To subscribe to the list, send the message 'SUBSCRIBE AUSARCH-L [insert your name here]' to listproc@listproc.anu.edu.au. Listproc will take your email address from the header in your message (such as an automatic signature). Please do not add any other text to the message. If you do, you will still be subscribed but will receive an additional message reporting an error because the list server will not understand the first word of additional text. When you want to send an actual message (request, question, comment, etc.), you must send it to AUSARCH-L@listproc.anu.edu.au. The list is unmoderated and anyone can subscribe and send messages to it. It is a great way to get feedback on your ideas or to find out what other archaeologists are doing. The 'owners' of AUSARCH-L are Peter Hiscock, Peter Veth and David Roe.

Steps in developing a research design

Your research design will need to include information on the following:

- The *research objectives*. What are you trying to do? Make sure you lay these out clearly, so that readers do not have to guess.
- *Previous research in the study area* or on the project's research questions. What have other people done that is relevant?
- *Background environmental or other relevant information* on the study area.
- The *methods* you intend to use. You should go into as much detail as possible here and think beyond the fieldwork itself. What methods will you need for fieldwork, analysis and other data collection (e.g. oral histories)?
- The *timeframe* you envisage for the project, including the time you will need to analyse your results and write up the report.
- If you are intending to excavate or collect material, then you will need to outline *relevant conservation techniques*, and short- and long-term measures for the appropriate *curation* and *storage* of the material.
- If you are intending to work with *Indigenous communities*, then you should indicate their attitudes to the project and the extent of community involvement and support.
- Finally, you should outline the *benefits* of the project. What will it contribute to the discipline? How will you return the results to the archaeological and wider community?

FINDING FUNDING

Finding funding for your project is important. Many projects cannot be undertaken without funds to cover fuel and travel costs, or to buy essential equipment. More importantly, funding also allows you to increase the quality of your work, in that it may allow you to pay specialists to undertake highly skilled technical tasks. The first step in the process is to locate an appropriate funding body. You do this through reading the job/funding description of your proposed funding agency to see whether you fulfil their essential criteria. If you don't, then applying is a waste of time. The essentials when applying for funding are a product to sell, a good track record and a good or novel research proposal.

There are two main factors which will determine whether or not you will obtain financial support for your project. The first is the standard of your application. Whenever you apply for funding, it is crucial that you submit the best possible application. For any funding body, you will need to demonstrate what you are going to do, how you are going to do it and why the project is important.

The second factor is whether the funding body has a mandate to fund the type of project for which you are seeking support. Bear in mind that all funding programs have particular purposes. If the purpose of the program is to support Indigenous archaeology, for instance, it is probably pointless to apply for a maritime archaeology project unless there is some clear overlap (i.e. the Indigenous sites are under water). The point to remember is that funding is always targeted at achieving specific outcomes. If you intend to apply for funding from a particular body, then you will need to show that your project will help that body fulfil those outcomes. No matter how worthwhile the project or how well written the application, if the project falls outside the organisation's objectives, it will be eliminated in the first round.

There are three main sources of funding for heritage fieldwork: government programs; industry partners; and foundations. While all three sources have common elements, there are also some specific strategies you can use for each.

Obtaining government funding

Both state and federal governments have a range of funding programs that support archaeological research. One of the most important things to bear in mind when applying for government funding is that your application will be assessed by professionals. This means that you have to be particularly careful to show how your work relates to that of others. You will have to refer to the work of people who have done fieldwork in your project's geographic area, as well as to any previous research which has used a similar theoretical approach or dealt with a similar range of artefacts and sites. For example, if you are planning a cultural heritage project in Mount Isa, you will need to refer to previous research in the Mount Isa region, as well as to any work which has focused on the archaeological or cultural heritage management issues relevant to your project.

The other thing to remember is to check current priority areas. These can change from year to year and it will strengthen your application if you are able to key into a priority area. Finally, some government programs will ask you to justify your budget. The normal process is for an assessment panel to decide which projects it would like to fund and then to look closely at the budgets to see whether they can be cut back. It is not enough to say that you need film or a research assistant and assume that the assessment panel will agree with you. You need to explain what you plan to photograph and how these photographs are essential to the completion of the project, or outline what tasks the research assistant will undertake and why the project cannot be completed without them. Remember, any item that is not justified properly will be the first to be cut if the panel decides to trim your budget.

Obtaining industry funding

Finding industry money requires slightly different skills. Some government programs—such as the Discovery program of the Australian Research Council* (ARC)—simply exist to further knowledge. This is rarely the case with industry funding, however. Industry bodies have specific purposes that are usually related to making money. Therefore, getting an industry partner to support your project will involve working out some way in which your research can help them to make money. This does not have to be a direct link—it might simply be through enhancing their profile or bonding with target groups, such as with the corporate sponsorship of conferences, or through providing the research that can be used in interpretive centres or cultural tourism. In short, industry sponsors do not fund projects for the warm and fuzzy feelings they will get out of doing so. Their job is to achieve specific outcomes that are at least partly economic, and they do not have the flexibility to give money away to good causes. The main question the industry sponsor will ask is: 'What am I going to get out of this?' If you bear this in mind, then you can develop your proposal so that you are able to meet both their needs and yours. For example, a local council might need archaeological sites identified to develop some cultural tourism programs. At the time you first approach them, they may be thinking of cultural tourism as food, wine and the arts. Your task becomes getting them to extend their thinking to recognise heritage as part of cultural tourism, and to identify some specific ways in which your fieldwork will help them. This could simply be by providing information for interpretive pamphlets or signs. Remember, you will have to draw the link for them—do not expect them to see this by themselves.

Obtaining foundation funding

Getting funding from foundations follows the same general rules. Like government programs, foundations are established for specific purposes, and it is important to show how your project will help them to fulfil their aims. There are two special things to remember about getting foundation money. The first is that your application will be assessed by a board of people who are unlikely to be archaeologists. This means that you will need to be especially clear in your explanation of the project and its significance, so that it can be understood by a lay audience.

The second thing to remember is that they, like industry partners, need to be seen to be conducting good work. You can help foundations, not only through helping them to advance their agendas, but also by giving them public recognition. For example, if the Ian Potter Foundation* funds an overseas speaker for your conference, then you will probably have to refer to them as the 'Ian Potter Foundation Keynote Speaker'. You should also remember to recognise all your sponsors, but particularly foundations, in all publications and reports that arise from your project. You need to be especially vigilant when submitting reports to foundations. Often, the reports will be presented to the same board that assesses your applications, giving you a good opportunity to show the high quality of your work. This helps you to establish a track record for excellence—and will strengthen future applications to that foundation.

Things to bear in mind when applying for funding

- *Take your funding application seriously.* In many ways, applying for funding is like applying for a job—treat it as a major project.
- *Identify an appropriate funding body* and make sure that your proposal is consistent with its objectives.
- *Read the guidelines for applicants carefully* and make sure your application falls within them.
- *If at all possible, visit the people involved in the allocation of funding to explain your project.* This gives them the opportunity to ask questions and to clarify any confusion. In addition, it gives them the opportunity to make personal judgments about your ability and reliability. This is most important for students, as you cannot expect organisations to routinely fund unknown researchers.
- *Submit the best possible application* and get colleagues to comment on it to help you refine it.
- *Refine your application to highlight how it fits within the organisation's program objectives.* Any organisation will favour projects that relate to its priority areas.

- *Choose your referees carefully.* Make sure you choose people who can comment knowledgably on the project and on your capacity to achieve a successful outcome. Most importantly, make sure they will produce the reference on time. This is your responsibility, not theirs, since you are the one who will receive the funding. The best approach is to choose referees who know either you or the project well and then remind them about four to five days in advance that the submission deadline is approaching. Once the deadline has passed, you should check with the funding agency to make certain that all references have been received and, if any are outstanding, go back to the referee, politely pointing out that the reference is overdue.
- *Aim to establish a reputation for producing results.* This means that the funding body can be more certain you will use the funding granted to you to actually complete a project.
- *Take great care with all reports that you submit.* Interim reports are often an institution's principal method for evaluating exactly how your work is progressing. It is up to you to satisfy the funding body that its money is being spent correctly. Take even greater care with final reports, showing that you have completed the project as planned and fulfilled all of your responsibilities. After all, you may wish to apply to this funding body again.
- *Don't confine yourself to one funding organisation per project.* Apply wherever your project fulfils the criteria, but let each funding body know of any other sources you have approached. If you end up with more than one successful application, you could try to renegotiate the terms of the funding. For example: 'I have money from Foundation X for this aspect of the project, can I use the funding from you for this complementary aspect?'

Getting the budget for your project right is one of the hardest parts of any funding application. The most important thing is to make sure that it is realistic—there is no point in getting only a small amount of funding for what is really a very large job. One of the worst outcomes for any project is when there is enough money to undertake the fieldwork, but not enough to analyse or write up the results—this is not only bad ethical practice, but could have been avoided from the beginning. In short, don't undertake a project if you cannot finish it. Make sure your budget:

- allows for preliminary research, fieldwork, analysis and writing-up time (as a guide, you can usually allow for three days in the lab or office for every one day you spend in the field) and, if necessary, conservation of the artefacts in the long term;
- includes fees for Indigenous consultants (both for their time in providing you with information and their labour if they have acted as fieldwork assistants);

- includes any other necessary specialists' fees (e.g. surveyors, conservators or historians);
- only includes items that are related to the part of the project for which you are seeking funding, and that each item is fully justified.

Checklist for funding applications

Have you demonstrated:

- ❑ the inherent value of the project;
- ❑ how the project will further the aims of the funding body;
- ❑ the extent of community support for the project (especially that of Indigenous people who may be involved);
- ❑ your ability to carry out the aims and objectives of the project;
- ❑ your previous track record? If you are applying for funding for the first time it may be best to start out by applying for reasonably small amounts. You have not yet established your ability and dependability. Every funding body has a responsibility to fund projects that will be completed, and until you have established that you can be relied upon you cannot expect to be granted substantial funding;
- ❑ the tangible outcomes of the project (e.g. a report, a video, photos, tapes, the physical protection of sites, a thank you letter in the newspaper)?

Does your application:

- ❑ fulfil each of the eligibility criteria;
- ❑ have methods that are consistent with achieving the aims of the study;
- ❑ have a budget that is sufficient to produce the promised outcomes, but not inflated;
- ❑ have a structure that is logical and well organised;
- ❑ have a timeframe that is realistic and 'doable'?

ARCHAEOLOGISTS AND ETHICS

Unless your project involves work on your own personal or family history, you will inevitably be working with other people's cultural heritage. Many different groups can have an interest in archaeology, including:

- Indigenous people;
- government agencies (see 'Working with the legislation' on page 20);
- developers or other heritage clients (see Chapter 8, 'Managing cultural heritage');
- local community groups and organisations;

- landowners and tenants;
- other members of the heritage profession.

As a heritage practitioner, you have ethical responsibilities to each of these interest groups. When conducting fieldwork, you need to think about how your work is likely to affect them. Do you need to ask any of them for permission? Will your work promote positive change? Is it collaborative? Are there measures you can take to make sure that the people you are working with will get some benefit from the research? Thinking through and acting on these kinds of questions can make the difference between ethical and unethical research. The Australian Archaeological Association*, the Australian Anthropological Society* and the Australian Association of Consulting Archaeologists* all have their own codes of ethics which clearly set out the ethical behaviours expected of heritage professionals (see Appendix 9, www.allenandunwin.com/arch_handbook.pdf). Other professional groups, such as the Australian Institute of Maritime Archaeology* and the World Archaeological Congress*, have similar codes of ethics which you should be aware of.

Contacting Indigenous communities

Correct and adequate consultation with Indigenous communities and custodians is one of the main ethical responsibilities of anyone working with Indigenous cultural heritage. In many states, this is mandatory practice, and is 'policed' in a sense by the various government departments which administer cultural heritage legislation. In Queensland, for example, proper consultation must be demonstrated before you will be granted a survey permit to even look for sites, and Indigenous permission must be obtained to view archaeological reports in the government database (including reports on historical archaeological sites). In all states, adequate consultation is an essential prerequisite for obtaining an excavation permit (see 'Working with the legislation' on page 20). No fieldwork on Indigenous sites in Australia should be conducted without proper consultation. Initially you will need to establish who the correct custodians are for your study area—usually the best way to do this is to contact the appropriate local or regional Aboriginal Land Council*, which may be able to put you in contact with the correct people. Positions on these committees are elected and the composition of the executive or other details may change, so it is advisable to contact the relevant Land Council immediately prior to consultation to make certain that you are dealing with the correct community. *Ask First: A Guide to Respecting Indigenous Heritage Places and Values*, a booklet produced by the Australian Heritage Commission and available on the web (www.ahc.gov.au/infores/publications/indigenousheritage/index.html#pdf), outlines the steps involved in best practice for contacting and consulting with Indigenous communities throughout Australia and contains tips on how to resolve conflict.

It is not enough to consult with any Indigenous person, however. You need to make sure you have consulted with the correct people who are acknowledged as the proper custodians for their country. Because this can sometimes be a long and complex process, you should start consultation as soon as possible and not leave it to the last minute. Indigenous people will not necessarily wish to work to your time schedule and you may need to alter your plans to accommodate their wishes. Wherever possible, you should also try to include Indigenous people as part of the fieldwork team—even if it is only to invite the senior custodians to visit and observe what you are doing in the field. Bear in mind that any such involvement of Indigenous people will require appropriate payments for their time, even if they have only participated in an interview. Although the recommended fee will vary from organisation to organisation (many Aboriginal Land Councils have set their own schedules of fees according to age and seniority), you can budget for at least $25 per hour or $300 per day. Also, remember that working with you is only one part of their lives and they will have other things they need to do and obligations they have to fulfil. You should be prepared to work around these.

In most states, access to non-confidential Indigenous material (whether photographic, artefactual or documentary) held in government collections (such as the National Museum*, or the Australian Institute of Aboriginal and Torres Strait Islander Studies—AIATSIS*) can only be obtained with written approval from the custodians of the region under study. If you are affiliated to a university, all research to do with Indigenous Australians (i.e. which has the words 'Aboriginal' or 'Torres Strait Islander' in the project outline) will have to be approved by the university's ethics committee. The thinking behind this procedure is that all research on Indigenous peoples will impact upon them, even if the non-Indigenous people conducting the research cannot foresee that impact themselves. Riley-Mundine (1988: 13, emphasis in original) argues that Indigenous people should have control of, or at the very least involvement in, all research that involves them: 'Aboriginal people, as *people*, surely have the right to be involved in what is said about them, how it is said and what research is carried out.'

The Code of Ethics of the Australian Archaeological Association recognises that Australian archaeology deals with the living heritage of Indigenous people and encourages archaeologists to work in close collaboration with Indigenous people at all times. If you are undertaking a project that involves Indigenous sites, it is essential that you contact local Indigenous people during the early stages, while there is still room to shape the research so that it fulfils both your needs and theirs.

Working with Indigenous peoples

The main foundation for good ethical practice in archaeology is a respect for other people's cultural traditions. This means that your opinions and attitudes may need to be tempered by other worldviews which are not necessarily compatible with the scientific dictates of archaeology. While this does not mean that you must subject yourself to unreasonable demands, working with Indigenous communities will routinely require that you behave appropriately. This can take a number of forms, from not appearing in clothing which may be deemed offensive to not visiting restricted areas or sites, or not pressuring people to accept your opinion or to answer your questions.

One of the main areas of ethical responsibility is in the use of information provided by Indigenous consultants: in Indigenous systems, knowledge is not 'open' in the sense that all people have an equal right to it. Indigenous knowledge is rarely definitive (in the sense that there is only one 'right' answer) and it is often restricted. Because access to this knowledge is a source of power, it must be controlled by people with the appropriate qualifications (usually based on age seniority). In terms of archaeological fieldwork, this means that it is essential you obtain your information from the correct people—those who hold the appropriate knowledge of those sites. Bear in mind that, even if you are working on historical sites, you may still need to consult with the senior custodians of the people on whose land the sites are located.

Good ethical practice also means that you have a commensurate responsibility to ensure that the information is used correctly. What a scientist may view dispassionately as 'data', a senior custodian may view as highly sensitive secret/sacred information. Sometimes Indigenous people will impart restricted information to you; it then becomes your continuing responsibility to ensure that this information is not seen or heard by an inappropriate audience. Maintaining continuing consultation is a long-term (but often unforeseen) aspect of a working relationship, particularly when it comes to the publication of your results. If you intend to publish your fieldwork, you should return to the community to show them what it is you wish to publish and how you will present the information. It is your duty to make sure that the publication does not contain information or images which the senior custodians require to be kept restricted. Permission is not given forever, and you will probably need to get separate permission each time you wish to publish. If your fieldwork involves artefact collection or excavation, you may also be required to return the material to the Indigenous community after the completion of fieldwork.

Working with other community groups

Consultation is not solely limited to Indigenous groups. Particularly if you are conducting historical heritage fieldwork, you may need to consult with local community groups, such as the local branch of the National Trust, or members of the local historical society. While it is not usually considered mandatory to consult with local communities in the same way it is for Indigenous groups, such consultation can have many benefits. It can help facilitate access to sites or information and may suggest fruitful directions for your research. 'Community' includes all the people who live in the area in which an archaeological project is being undertaken and will include a range of interest groups, each of which might bring particular desires or skills to a project.

Approaching landowners or tenants for permission to access their land is a mandatory aspect of consultation however, both as a matter of politeness and privacy, and of good ethical practice. In some states, obtaining this permission is an essential prerequisite to undertaking fieldwork—in Queensland, for example, you need written permission to prove you may enter land before you can obtain a permit to survey. The simple rule of thumb is 'if in doubt, consult'—and certainly the more consultation you undertake, the less likely you are to alienate anyone and the fewer problems you should encounter in the course of your project. It is both good manners and good judgment to consult with the community with whom you are working and to make sure that the community benefits from the research you are undertaking.

This, in turn, raises another ethical responsibility: communicating your results to the wider community. Public excavations and site tours, school talks, public lectures, a project website and popular publications, guidebooks and interpretive materials are all excellent ways to make your project and its findings accessible (see Chapter 10: Getting your results out there). While this seems easy in theory, in fact it can take a great deal of time and commitment. While many academic archaeologists have stressed the importance of communicating the results of archaeological research to the wider public, few do this in practice. It is important to remember that the public are interested not only in the results, but also in the process. Site tours and public excavations are popular because they teach people about what has been found and, in the process, about how we go about 'doing' archaeology.

Archaeologists and their profession

Archaeologists also have responsibilities to others in their profession. This relates mainly to the ways in which data are collected, recorded and archived and the potential for your results to be comparable with other projects. One of the main problems with many consultancy projects is that their survey methods and the results of their recording and analysis are not clearly presented, or use unclear or idiosyncratic descriptive terms. If no one understands what you mean by a 'convex flake tool', or if you simply refer to an artefact as 'unusual', this will prevent anyone from drawing comparisons between their data and yours. This means that your results cannot be compared to similar projects elsewhere, and therefore will not contribute to the pool of current knowledge.

Similarly, reports from your fieldwork should be available for others to refer to. This is not always possible, of course—particularly if your report contains secret/sacred or otherwise confidential information—but ideally you should supply one copy to the client or funding body, one copy to the appropriate state or federal heritage authority, copies to any interest groups who participated in the project, one copy to accompany the finds (if your project involved collection or excavation), and one copy to the nearest appropriate public archive or library (Birmingham and Murray 1987: 92).

At a very basic level, it is important to make detailed recordings of all fieldwork and to make certain that you retain and archive your field journal (see 'Keeping a field journal' in Chapter 3 on page 70), notes, recording forms and photographs. An archive should contain all the primary information relating to the collection and analysis of the data, including:

- your field notebook(s);
- originals of your site recording forms;
- originals of your artefact analysis forms;
- originals of any other form of data collection;
- a complete photographic archive;
- the originals of any site plans, sketches, maps or other drawings;
- copies of any oral history tapes or transcriptions made as part of the project;
- copies of any historical documents collected as part of the project;
- an original copy of your report;
- all relevant correspondence and permissions you sent or received as part of the project.

If part of your project uses a computer database, don't just store this on disk—computer programs can be completely outdated within a few years, rendering your database inaccessible. If you have given your archive to a client, government repository or museum, you probably will have no control over updating the database or its software; if this is the case, make sure paper copies of your database are available. Many archaeologists routinely use computerised data collection, especially for photographs, but you will need to have hard copy backups of essential files for the long term (for more advice on digital archiving, see 'Storing photographs and illustrations' in Chapter 9 on page 305).

Tips for making your archive last

It is not enough simply to create an archive by putting all your materials together. You must also ensure that you have used the correct media so that the recordings last and that everything is properly labelled and cross-referenced, so that if anything becomes separated from the rest of the archive, it can be replaced correctly.

- Never take field notes or fill in recording forms with a felt-tipped pen, because this will run if dampened.
- Highlighter pens, all water-based markers and soft-lead pencils are also unacceptable.
- Instead, use a ballpoint pen, a hard lead pencil, permanent pens, or ink-filled technical drawing pens.
- Avoid recycled paper for your notes and forms, as this is less chemically stable. Also avoid colour-stock paper, sticky tape and post-it notes, as these will all deteriorate over time.
- Because an archive needs to last for a long time, don't use metal staples or paperclips to fasten papers, or spiral bound notebooks for your field notes, as these will rust.
- Never include carbon copies of documents, dyeline prints or other light- or heat-sensitive papers, such as thermal fax paper.
- Never split up or mix your records, or cull what seems to be irrelevant material.

If you are working on a consultancy project, it is the client funding the research who technically owns this archive, and you therefore have some responsibility to turn the contents of the archive over to them. This raises two thorny problems. First, who owns the intellectual property generated by your project? And second, what are the ethical responsibilities for keeping project archives accessible? In general, it is unethical for you to retain exclusive rights to information which you have been paid to collect as part of a project, unless this has been clearly identified as a necessary part of the process (for example, when Indigenous people request that information be protected as sensitive). This does not mean that any subsequent academic papers or publications written by you from your data are 'owned' by anyone else. In general, the information you collect while in the field is technically the property of whoever funded the project, while what you do with that material (i.e. your interpretations, synthesis or publications) are owned by you. In addition, while it is very easy to say that you should turn the contents of your archive over to the funding body, this may not always be the best outcome. If you are working for a small client, for example, they may not wish to be burdened with a whole lot of extra paperwork and may have no facilities for storing this appropriately. By turning it over to them, you may actually run the risk of preventing any future researchers from ever having access to these data again (even yourself!). Unfortunately, there is no central repository for this kind of primary information, and you will have to judge for yourself what is best for the long-term storage of your archive. If you are working for government departments, such as the New South Wales National Parks and Wildlife Service*, there may be an expectation on their part that you gift them with the archive, but they will usually make this clear in the project brief. Intellectual property is a very grey area, and before undertaking any fieldwork you should investigate the requirements and expectations of all concerned.

Write it down and put your name on it—Aedeen Cremin's tips for creating a proper archaeological archive

It is amazing how many records get lost or become useless over time because they are not properly labelled. It is said that when Professor R.J.C. Atkinson died, a box full of notebooks was discovered among his things. The notebooks contained meticulous measurements of stones from megalithic monuments, probably including Stonehenge, which he had excavated in the 1950s. None of the notebooks were labelled and therefore all of that work went to waste. Don't let that happen to you. Here is a checklist for you to think about:

- Label every piece of paper you handle, explaining what it is and put your name and the date on it.
- Acquire a notebook for each job—and label it, with title, your name and the date of use. The small stitched books are best, as you are not tempted to tear pages out. Yes, you'll end up with a box of half-empty notebooks, but at least you'll be able to find them when you need to. An obsolete disk or inadequate pro-forma will not give you the information you need in six months', let alone six years', time.
- Never 'lend' your notebooks to anyone. They will never be returned, published or acknowledged. If somebody wants them that badly, they can pay to photocopy them.
- Put a copyright sign on any original documents you produce. It takes 30 seconds and protects you. Of course, put your name and contact details on the document—people can't acknowledge your work if they don't know who you are.
- Fully label any sketches you make, e.g. not 'W' but 'timber-framed double-hung sash window' or 'rock-cut well', etc. Put a north arrow, scale, the date and your name on the sketch. If the drawing is not to scale, say so. Label descriptions and measurements on the sketch if you can, if not list them as a caption.
- Keep a full photographic record, with as many details as you can fit in, e.g. not 'stamper battery from S' but '1915 stamper battery viewed from the 1930s mine shaft. Distance from shaft 15m. Engine base is on right, stamper base on left; remains of amalgamation trays at centre. From SSE'. Carry a compass and always check, don't guesstimate.
- Any photographs you produce should carry as full a caption as possible—written in biro on the back of a print, or incorporated on to the image on disk. Put your name in full (e.g. 'Indiana Jones', not 'Indy') and the date (this is often crucial for excavation records).

- Anything that involves other people needs to have their names listed in full also. An image labelled 'Jo, Alex and Rob on site' is not going to be very useful to anybody else.
- If you must use initials, use three or four. You would be amazed how many people have the same two initials as you and your colleagues.
- On a long-term project, survey or excavation, keep an ongoing field diary (yes in the same notebook). There will be things you notice that may not be catered for in the pro-formas and it is good to have these on record, however casually. The sequence of work is also useful to know about later on.
- Remember that nothing is published on time, which is why you need to keep proper records. In the 1960s, I worked on an excavation where the first director had died unexpectedly, leaving the work unfinished. His successor finished the excavation but never published the research, as he had other work in train. He too died unexpectedly. Forty years later, a third person was finally commissioned to publish the full excavation report. Whether he did or not I don't know—I just hope our record keeping was OK. I certainly have no record of any sort, not even a souvenir snapshot. This sort of thing happens.
- The notebooks are your archive. If you have a career in archaeology, they will be of interest to other people later, so don't throw them away even when you think they're past their use-by date.

PLANNING YOUR FIELD KIT

Possibly one of the most important tasks in planning for fieldwork is ensuring that you have the right equipment to complete the job. Much archaeological fieldwork will not take place in the cosy confines of a city, but in the bush, where sites may not have been disturbed or destroyed by development. Before you go into the field, however, you will need to consider what equipment will be essential for you to collect your data, what other equipment might be necessary given where you are going, and anything else you might need. There are obvious essentials which should form the basics of any fieldwork kit:

- a pocket knife;
- sunscreen;
- insect repellent;
- a good hat and boots;
- a first-aid kit;
- a water bottle.

FIGURE 1.2: A typical archaeologist on fieldwork. In a group of fieldworkers, the archaeologist is always the one wearing all the gear!

Other items to consider are lightweight, long-sleeved cotton shirts, which are not only sun-sensible, but in fact have become mandatory under Occupational Health and Safety Regulations if you are working on some active mine sites. Other suggestions will depend on where you are working: in some inland areas, you may find that a fly-veil worn over your hat will save your sanity, and in spinifex country thick jeans which protect your lower legs will be a godsend. Don't embark on any fieldwork without making sure you have all the right equipment and without preparing sufficiently well—there is nothing worse than reaching a difficult and isolated site only to realise that there is no film for the camera, or that you forgot to bring the site recording forms.

Mark Staniforth's tips for protecting your field gear

Buy a Pelican case. These are high-impact-resistant plastic cases designed to protect underwater cameras, but make very suitable protection for any delicate field gear. I have a Pelican case set up with the following gear in it: a digital still camera, a digital movie camera, a standard Olympus SLR camera (for taking colour slides), a GPS, a drawing board, photo scales, a minirod, a north arrow, a hand-bearing compass, a 30 metre fibreglass tape, an 8 metre steel tape, two trowels, twelve trench corner pegs, plastic bags, string and a line level, plus assorted bits and pieces. This is enough gear to conduct basic survey work and to string out and excavate a test trench. The Pelican case is waterproof, airtight, you can stand on it and it can be locked with a padlock.

WORKING WITH THE LEGISLATION

All archaeology is governed by some form of heritage legislation. This is not intended to make your job more difficult, but to protect sites and their contents from unwelcome interference or damage. All Australian states and territories have some form of heritage legislation which needs to be followed. Unfortunately, this varies widely and is not necessarily equally effective in all states. Some states are much stricter in their requirements than others, even down to the preferred format in which you should present your report. In general, all states require you to apply for a permit before you excavate, collect or otherwise disturb a site. Before an administering authority will approve such a permit, however, it will require you to demonstrate that you have carefully thought through your fieldwork. It will ask you to submit a research design as part of your permit application, outlining your research questions, excavation/collection methods and recommendations for the conservation and curation of any artefacts removed from the site. This last point is very important as, under the provisions of all heritage legislation, all sites and their material contents (i.e. their artefacts) are the property of the Crown. This may mean that you will need to liaise with the appropriate government trustees (usually the state museum), the relevant Indigenous community and the legal administering body to ensure that requirements for the proper care and long-term custodianship of artefacts removed from a site are being met.

There is also a requirement common to all states that you provide a written report on your fieldwork and that you submit recording forms for any new sites you find to the administering body. Most states maintain some form of database or register of heritage sites. Just as it may help your fieldwork to know what other sites have already been recorded in your area (but be aware that access to site databases or records may be restricted in some states or circumstances), other researchers may also want to know about your sites. As each state has its own set of standardised recording forms, make sure you obtain copies of these before you go into the field and that you fill them in completely and accurately before you submit them. Because the precise requirements of legislation vary from state to state, make sure that you are aware of the relevant cultural heritage legislation and the requirements of the administering body in your state or territory *before* you begin fieldwork.

Don't interfere with heritage sites

In general, it is both illegal and unethical to knowingly damage a heritage site. Any form of unsanctioned alteration to, removal from, addition to or interference with the fabric of a site may be deemed damaging. Be aware that even ostensibly 'useful' activities have the potential to cause damage, such as removing invasive vegetation overgrowth from an abandoned building (its removal may physically damage parts of the building), 'tidying up' an historic site (what you perceive to be 'old junk' may in fact be important archaeological artefacts), re-erecting a collapsed official sign in a rockshelter (this may damage the sub-surface archaeological deposits in the shelter), or cleaning graffiti from a rock art surface (this may remove traces of the art). Even though it may seem counter-intuitive, sometimes the apparent 'messiness' or physical degeneration of a site is actually part of its significance. Even if it is not, you must have permission from the relevant state authority before you interfere in any way with a heritage site.

State legislation

There is a lot of legislation relating to heritage matters. In Table 1.1 on page 23, we have only listed those Acts which are applicable to the majority of archaeological field projects. Some special circumstances to be aware of are as follows:

- Queensland is the only state which requires you to have a permit to look for sites (both Indigenous and historical), as well as to excavate or disturb them. Apart from detailing how and where you intend to survey, the permit application process requires you to demonstrate that you have consulted with the relevant Indigenous people *before* you go into the field, and provides space to note their opinions. The process for applying for an excavation permit is similar and also requires you to demonstrate adequate consultation with Indigenous people before you begin fieldwork. Permission to access the Environmental Protection Authority's collection of archaeological reports also requires Indigenous permission. In Queensland, a heritage site is defined as any structure or object that is at least 30 years old. In 2003 Queensland passed new heritage legislation to protect Indigenous sites. Please contact the relevant government authority for the latest procedures.
- New South Wales has the tightest provisions for protecting cultural heritage sites. The National Parks and Wildlife Service (NPWS) has very clear guidelines for the contents and formats of archaeological consultancy reports which need to be followed. In New South Wales, a site must be over 50 years old in order to qualify as 'heritage'.
- As in Queensland, the ACT requires you to contact the relevant Indigenous organisation prior to the disturbance of any site, whether Indigenous or historical. Although there is no blanket protection for historical places, there is still an ethical responsibility to report new historical sites to the ACT Heritage Council*.
- In Victoria, a site must be at least 50 years old in order to qualify as 'heritage'.
- In South Australia, historical archaeological sites are only protected if they are already listed on the state's Heritage Register. Unfortunately, there is at present no other provision for regulating archaeological work on any other (non-listed) historical archaeological sites.
- Like those in South Australia, historical sites in Western Australia are only protected if they are already listed on the state's Register of Historic Places. Other historical

sites receive no protection unless it can be argued that they are also Indigenous (i.e. contact) sites.

- If you are working in a National Park in the Northern Territory, you will need to apply for a research permit from the Parks Service. This is simply to ensure that all research conducted within national parks is sound and conforms to their guidelines.

TABLE 1.1: The legal and ethical responsibilities of archaeologists working with state legislation

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
Qld	*Cultural Record (Landscapes Queensland and Queensland Estate) Act* 1997	Cultural Heritage Branch, Environmental Protection Agency*	✓	✓	• Must have a permit to survey/look for sites • Must have a permit to excavate, collect or otherwise disturb a site	• Must submit completed recording forms for any new sites you find to the EPA • Must submit copies of final reports (from either survey or excavation/ collection) to the EPA
Qld	*The Queensland Heritage Act* 1992–1995	Cultural Heritage Branch, Environmental Protection Agency*		✓	• Must apply through the EPA to the Queensland Heritage Council for consent to develop a site on the Queensland Heritage Register	• Must submit copies of final reports (from either survey or excavation/ collection to the EPA
NSW	*The Heritage Act* 1977	NSW Heritage Office*		✓	• Must have a permit to excavate, collect or otherwise disturb a site • Must apply to the NSW Heritage Council for	• Must submit copies of final reports (from either survey or excavation/ collection) to the Heritage Office within 12 months

TABLE 1.1: continued

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
					consent to carry out activities to an item listed on the state Heritage Register	
NSW	*National Parks and Wildlife Act* 1974	Cultural Heritage Branch Department of Environment and Conservation*	✓	✓	• Must have a permit to excavate, collect or otherwise disturb a site (NPWS Act only affects historical archaeological sites within National Parks)	• Must submit completed recording forms for any new sites you find to the Department of Environment and Conservation • Must submit copies of final reports (from either survey or excavation/colle-ction) to the DEC • The format of reports should conform to the *NPWS Standards Manual*
ACT	*Land* (*Planning and Environment*) *Act* 1991	Heritage Unit, Environment ACT*	✓	✓	• Must have a permit to excavate, collect or otherwise disturb a site listed on the Register of Heritage Places	• Must report discoveries of new Indigenous places to the minister within seven days • Must submit completed recording forms for any new sites you find to the Heritage Council • Must submit copies of final reports (from either survey or

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
						excavation/ collection) to the Heritage Council
Vic	*Heritage Act* 1995	Heritage Victoria*		✓	• Must apply through Heritage Victoria to the Heritage Council of Victoria for consent to develop a site on the Victorian Heritage Register	• Must submit completed recording forms for any new sites you find to Heritage Victoria • Must submit copies of final reports (from either survey or excavation/ collection) to Heritage Victoria within three to six months of completion
Vic	*Heritage Act* 1995	Heritage Services Branch, Aboriginal Affairs Victoria, Department of Natural Resources and Environment*	✓	✓	• Must have a permit to excavate, collect or otherwise disturb a site	• Must submit completed recording forms for any new sites you find to Aboriginal Affairs • Must submit copies of final reports (from either survey or excavation/ collection) to Aboriginal Affairs
SA	*Aboriginal Heritage Act* 1988	Department of State Aboriginal Affairs*	✓		• Must have a permit to excavate, collect or otherwise disturb a site	• Must report the discovery of any site to Department of State Aboriginal Affairs

TABLE 1.1: continued

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
						• Must submit copies of final reports (from either survey or excavation/ collection) to Department of State Aboriginal Affairs
SA	*Heritage Act* 1993	Heritage SA*, Department for Environment and Heritage		✓	• Must apply to Heritage SA to develop a site on the state Heritage Register • This includes obtaining a permit to excavate a site if it is listed on the register	• Must submit copies of final reports (from either survey or excavation/ collection) to Heritage SA
SA	*State Development Act* 1993	Development Assessment Commission*		✓	• Must submit an application to the DAC for all works that will materially affect a heritage place or its context	• Includes any activities affecting state heritage places or areas • Also enables places of local heritage value to be listed on an inventory attached to the state Heritage Register
SA	*State Historic Shipwrecks Act* 1981	Heritage SA*		✓	• Must obtain a permit to interfere with a shipwreck or to remove a relic from a shipwreck	• Must report the discovery of any shipwreck or articles associated with a shipwreck to Heritage SA

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
WA	*Heritage of Western Australia Act* 1990	Department of Planning, Employment and Training*		✓	• Must apply through the DPET to the Heritage Council of Western Australia to develop a site on the Register of Historic Places	• Must submit copies of final reports (from either survey or excavation/ collection) to Department of Planning, Employment and Training
WA	*The Aboriginal Heritage Act* 1972	Department of Indigenous Affairs*	✓	✓	• Must have a permit to excavate, collect or otherwise disturb a site	• Must submit completed recording forms to the Department of Indigenous Affairs • Must submit copies of final reports (from either survey or excavation/ collection) to the Department of Indigenous Affairs
WA	*Maritime Archaeology Act* 1973			✓		• Protects shipwrecks in state waters
NT	*Heritage Conservation Act* 1991	Heritage Conservation, Department of Infrastructure, Planning and Environment*	✓	✓	• Must have a permit to excavate, collect or otherwise disturb a site	• Covers historic, Indigenous and Macassan archaeological sites • Must report the discovery of any site to the CEO of Infrastructure, Planning and Environment

TABLE 1.1: continued

State	Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
NT	*Sacred Sites Act* 1989	Aboriginal Areas Protection Authority*	✓		• Must have an Authority Certificate if fieldwork is being conducted on a sacred site	• Can apply for an Authority Certificate from the AAPA before conducting fieldwork in case any sacred sites are located
Tas	*Aboriginal Relics Act* 1975	Department of Primary Industries, Water and Environment*	✓		• Must have a permit to excavate, collect or otherwise disturb a site	• Must report the discovery of any site to the Aboriginal Heritage Section, DPIWE • Must submit copies of final reports to the Aboriginal Heritage Section
Tas	*Historical Cultural Heritage Act* 1995	Tasmanian Heritage Council*, Department of Primary Industries, Water and Environment		✓	• Must apply to the Tasmanian Heritage Council for a permit to carry out any works in relation to a registered place or place within a heritage area	• Must report the discovery of any site to the Department of Primary Industries, Water and Environment

National legislation

In general, the state Acts provide legal protection for the physical evidence of past human occupation, while Commonwealth Acts, such as the *Aboriginal and Torres Strait Islander Heritage Protection Act* 1984, deal with heritage in a wider sense. The *Historic Shipwrecks Act* protects all wrecks in Australian waters older than 75 years, regardless of whether they are known or not (except for those in state waters, bays or rivers, which are covered by state Acts). Commonwealth Acts usually only take precedence over state Acts if there is conflict, or if the Commonwealth Government is involved in developing a site.

TABLE 1.2: The legal and ethical responsibilities of archaeologists working with federal legislation

Legislation	Administering Body	Indig. Sites	Hist. Sites	Requirements	Responsibilities
Australian Heritage Commission Act 1975	Australian Heritage Commission*	✓	✓	• This will only affect you if your work is being funded by the Commonwealth Government, or is conducted through a Commonwealth Government agency and if your project involves work on a site on the Register of the National Estate • Under the Act, all activities judged likely to have a significant impact on sites in the register must be referred to the Commission for comment	• The Australian Heritage Commission Act only applies to the activities of the Commonwealth Government and its ministers, departments, authorities and companies
Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987	Aboriginal and Torres Strait Islander Commission*	✓		• Can only be invoked by or on behalf of an Aboriginal or Torres Strait Islander organisation	
Historic Shipwrecks Act 1976–1981	Individual state bodies within each state	✓			• Protects gazetted shipwrecks and their artefacts in Commonwealth waters from disturbance • Can't enter a protected zone without authorisation • Must report historic shipwrecks or relics to the federal minister through the relevant state body (Heritage SA, Heritage Victoria, etc.)

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Orser, Charles and Fagan, Brian 1995, *Historical Archaeology*, Harper Collins College Publishers, New York.

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Vitelli, K.D. (ed.) 1996, *Archaeological Ethics*, Alta Mira Press, Walnut Creek, California.

Zimmerman, Larry J., Vitelli, Karen D. and Hollowell-Zimmer, Julie (eds) 2003, *Ethical Issues in Archaeology*, Alta Mira Press in cooperation with the Society of American Archaeology, Walnut Creek, California.

USEFUL WEBSITES

www.heritage.gov.au/govtagencies.html. This site, maintained by the Australian Heritage Commission, contains a listing of all government and non-government agencies with interests in heritage, as well as collections of key resources and links to databases of state, territory and commonwealth heritage lists and funding bodies.

The Ian Potter Foundation: www.ianpotter.org.au. This foundation provides grants for general charitable purposes in Australia. Its areas of interest are the arts, education, environment and conservation, health, social welfare, science and medical research. It also has a small travel grants program.

The Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS): www.aiatsis.gov.au. AIATSIS is a major national funding body for research in Australian Indigenous studies. It supports research into a wide range of areas, such as history (including family and community history), politics, law, public policy, health (social, cultural and environmental aspects), biological sciences, education, linguistics, social anthropology, archaeology and the arts. The annual deadline for research grant applications is 31 January. There are two rounds for international conference support: 15 March and 31 August.

The Archaeological Data Service: http://ads.ahds.ac.uk: This site promotes good practice in the use of digital data in archaeology and provides technical advice to the research community. The page on standards, http://ads.ahds.ac.uk/project/userinfo/standards.html, is particularly useful.

Australian Museums and Galleries online: www.amol.org.au/. This site is useful for background research, and contains links to Australian museums and galleries, as well as a national database of museum and gallery records.

CHAPTER TWO

NAVIGATION AND MAPPING

WHAT YOU WILL LEARN FROM THIS CHAPTER

- How to use maps to navigate to sites
- How to understand scale
- How to calculate a grid reference from a map
- The uses of different kinds of maps
- How to read bearings from a compass
- How to use a GPS
- Basic bush survival skills
- Basic bush camping skills

Navigation and mapping are two of the most important skills in archaeological fieldwork. You will need these skills to get to and from sites, to avoid getting lost, and to be able to record the location of sites accurately. The two fundamental components of these skills are being able to understand a map and extrapolate from that map to the physical features you can see around you, and knowing how to read a compass. With these two skills mastered, you will be able to perform most of the basic surveying processes you will ever need in the field.

USING MAPS

Maps are simply devices for transforming points on the curved surface of the Earth into a flat, two-dimensional plane. There are various methods for doing this, but the most common is the Universal Transverse Mercator (UTM) Grid system, which—as its name suggests—is a worldwide mapping system that divides the world into 60 equal zones from west to east. Australia covers twelve zones of this system, from 47 through to 58. These are the grid zone numbers depicted in the legend of every map. The area around Armidale, in New South Wales, for example, is designated '56J' in the UTM system. Until very recently, most maps in Australia were based on the Australian Map Grid, a UTM projection system which was the best estimate of the Earth's shape around the Australian continent (Geoscience Australia 2003). Recent updates on this system have produced the Map Grid of Australia 1994 (MGA94), which has been designed to supersede earlier AMG-derived maps. Because maps drawn at different times will have used different mathematical models of the Earth to flatten its curved surface, it is important to note the specific system used to generate each map (all maps will explain the system they use in the legend at the bottom or to one side). Because these systems do not match up, it is important to note which system you are using to calculate a grid reference, as the same grid reference under different systems will not refer to the same point in space. Likewise, it is important to note which system your GPS unit has been set to (see 'Using a Global Positioning System' below) to make the grid reference accurate.

There are several different types of map that you will become familiar with in the course of archaeological fieldwork. The most common of these are topographic maps, geological maps and orthophoto maps. All of them use the same UTM grid system—they just plot different kinds of information. Topographic maps depict all the visible natural and built surface features, whereas geological maps depict rock formations, geological zones and soil types. Orthophoto maps combine aerial photography with topographic information. They can be very useful, but their coverage is usually restricted to major towns and their immediate environs. The maritime equivalent of maps is charts, which depict the depth of the ocean rather than the height of the land.

Most maps are oriented with north to the top, south to the bottom, east to the right and west to the left. At the bottom of each map is the scale, a legend to explain the mapping conventions used to depict features and a small boxed section telling you how to read a grid reference. This box will also specify the grid zone designation for the map, which you will need to know when calculating a grid reference (see 'Using a map to calculate a grid reference' on page 36). Maps also come in a standard range of scales (although not all scales are available in all areas), from very small-scale maps which cover enormous areas (such as 1:1000 000 maps covering nearly 3000 square kilometres) to large-scale maps covering much smaller areas in greater detail (such as 1:25 000 scale maps covering only 750 square kilometres). Scale is simply the ratio of the size of a feature as it is drawn on the map to its actual size. This ratio is given as a representative fraction, so that 1:100 means that one unit of measurement on the map (whether 1 millimetre, 1 centimetre or 1 metre) represents 100 of the same units when measured on the ground. Thus 1 millimetre on the map equals 100 millimetres on the ground, 1 centimetre equals 100 centimetres and so on (see Table 2.1). To make things even easier, the representative fraction is also converted into a linear bar scale at the bottom of the map to show you this relationship graphically. As you can see in Table 2.1, at scales of 1:250 or larger, something which is 50 centimetres long is far too small to plot accurately on to a map.

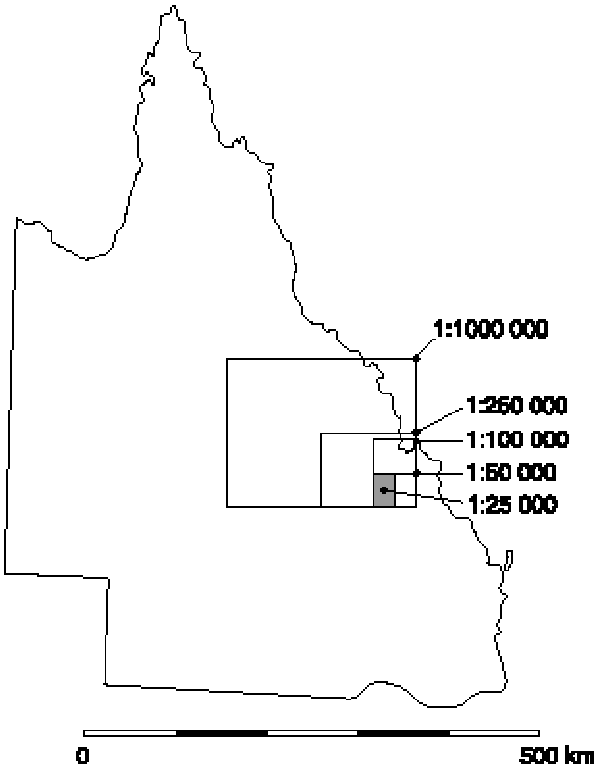
TABLE 2.1: Relationship between scale of map or plan and real distance

Scale of plan	Real measurement		Scaled measurement
	50 cm on the ground	=	2 cm on the plan
	1 m on the ground	=	4 cm on the plan
1:25	2 m on the ground	=	8 cm on the plan
(1 cm on the plan =	3 m on the ground	=	12 cm on the plan
25 cm on the ground)	5 m on the ground	=	20 cm on the plan
	10 m on the ground	=	40 cm on the plan
	50 m on the ground	=	2 m on the plan
	50 cm on the ground	=	1 cm on the plan
	1 m on the ground	=	2 cm on the plan
1:50	2 m on the ground	=	4 cm on the plan
(1 cm on the plan =	3 m on the ground	=	6 cm on the plan
50 cm on the ground)	5 m on the ground	=	10 cm on the plan
	10 m on the ground	=	20 cm on the plan
	50 m on the ground	=	1 m on the plan
	50 cm on the ground	=	0.6 cm on the plan
	1 m on the ground	=	1.2 cm on the plan
1:75	2 m on the ground	=	2.4 cm on the plan
(1 cm on the plan =	3 m on the ground	=	3.6 cm on the plan
75 cm on the ground)	5 m on the ground	=	6 cm on the plan
	10 m on the ground	=	12 cm on the plan
	50 m on the ground	=	60 cm on the plan
	50 cm on the ground	=	0.5 cm on the plan
	1 m on the ground	=	1 cm on the plan
1:100	2 m on the ground	=	2 cm on the plan
(1 cm on the plan =	3 m on the ground	=	3 cm on the plan
100 cm on the ground)	5 m on the ground	=	5 cm on the plan
	10 m on the ground	=	10 cm on the plan
	50 m on the ground	=	50 cm on the plan
	50 cm on the ground	=	0.4 cm on the plan
	1 m on the ground	=	0.8 cm on the plan

Scale of plan	Real measurement		Scaled measurement
1:125	2 m on the ground	=	1.6 cm on the plan
(1 cm on the plan =	3 m on the ground	=	2.4 cm on the plan
125 cm on the ground)	5 m on the ground	=	4 cm on the plan
	10 m on the ground	=	8 cm on the plan
	50 m on the ground	=	40 cm on the plan
	50 cm on the ground	=	0.2 cm on the plan
	1 m on the ground	=	0.4 cm on the plan
1:250	2 m on the ground	=	0.8 cm on the plan
(1 cm on the plan =	3 m on the ground	=	1.2 cm on the plan
250 cm on the ground)	5 m on the ground	=	2 cm on the plan
	10 m on the ground	=	4 cm on the plan
	50 m on the ground	=	20 cm on the plan
	1 m on the ground	=	0.2 cm on the plan
1:500	2 m on the ground	=	0.4 cm on the plan
(1 cm on the plan =	3 m on the ground	=	0.6 cm on the plan
500 cm on the ground)	5 m on the ground	=	1 cm on the plan
	10 m on the ground	=	2 cm on the plan
	50 m on the ground	=	10 cm on the plan
	1 m on the ground	=	0.13 cm on the plan
1:750	2 m on the ground	=	0.26 cm on the plan
(1 cm on the plan =	3 m on the ground	=	0.39 cm on the plan
750 cm on the ground)	5 m on the ground	=	0.65 cm on the plan
	10 m on the ground	=	1.3 cm on the plan
	50 m on the ground	=	6.5 cm on the plan
	1 m on the ground	=	0.1 cm on the plan
1:1000	2 m on the ground	=	0.2 cm on the plan
1 cm on the plan =)	3 m on the ground	=	0.3 cm on the plan
1000 cm on the ground)	5 m on the ground	=	0.5 cm on the plan
	10 m on the ground	=	1 cm on the plan
	50 m on the ground	=	5 cm on the plan

Scale will make a difference to how finely you can plot features onto a map or how accurate you need to be when measuring an area for a site plan. (See 'Drawing horizontal surfaces (plans)' on page 286). To illustrate the difference which scale can make, imagine you're plotting the location of a site by placing a 1 millimetre dot on a map from the ballpoint pen in your pocket. On a 1:25 000 scale map, the diameter of your dot will be something like 25 metres, on a 1:100 000 scale map, its diameter will have increased to 100 metres, and on a 1:1000 000 scale map, the same dot will now be covering an area of some 20 kilometres. If you were then to assign that dot a grid reference, so that the location of the site was permanently recorded, obviously the grid reference determined from the 1:25 000 scale map would provide a much more accurate fix. Generally speaking, a larger-scale map is better for survey purposes, as it will have a better resolution of surface features, making it easier and more accurate to plot sites. While most surveys can get away with plotting sites on a 1:100 000 scale map, 1:25 000 is by far the most accurate.

FIGURE 2.1: The relationship between the area of a map's coverage and its scale



USING A MAP TO CALCULATE A GRID REFERENCE

When you look at any official published map, you will see solid black lines running vertically and horizontally across the map. These are the grid lines. The lines that are drawn vertically on the map and on which the figures increase in magnitude from west to east, are known as **eastings**; the lines that are drawn horizontally across the map and on which the figures increase in magnitude from south to north are called **northings** (Biddle et al. 1974: 39). Eastings represent the distance that each line is east of the start of the map zone. Northings represent the distance each grid line is below the equator. By using eastings and northings, it is possible to describe the location of any point on a map by specifying the number of metres a point is east of the nearest vertical grid line and the number of metres it is north of the nearest horizontal grid line. This is called a **grid reference** and, depending on the degree of accuracy you want to achieve, it is possible to assign a grid reference which specifies a unique point on the surface of the Earth. To read or assign a grid reference, you must follow three simple rules:

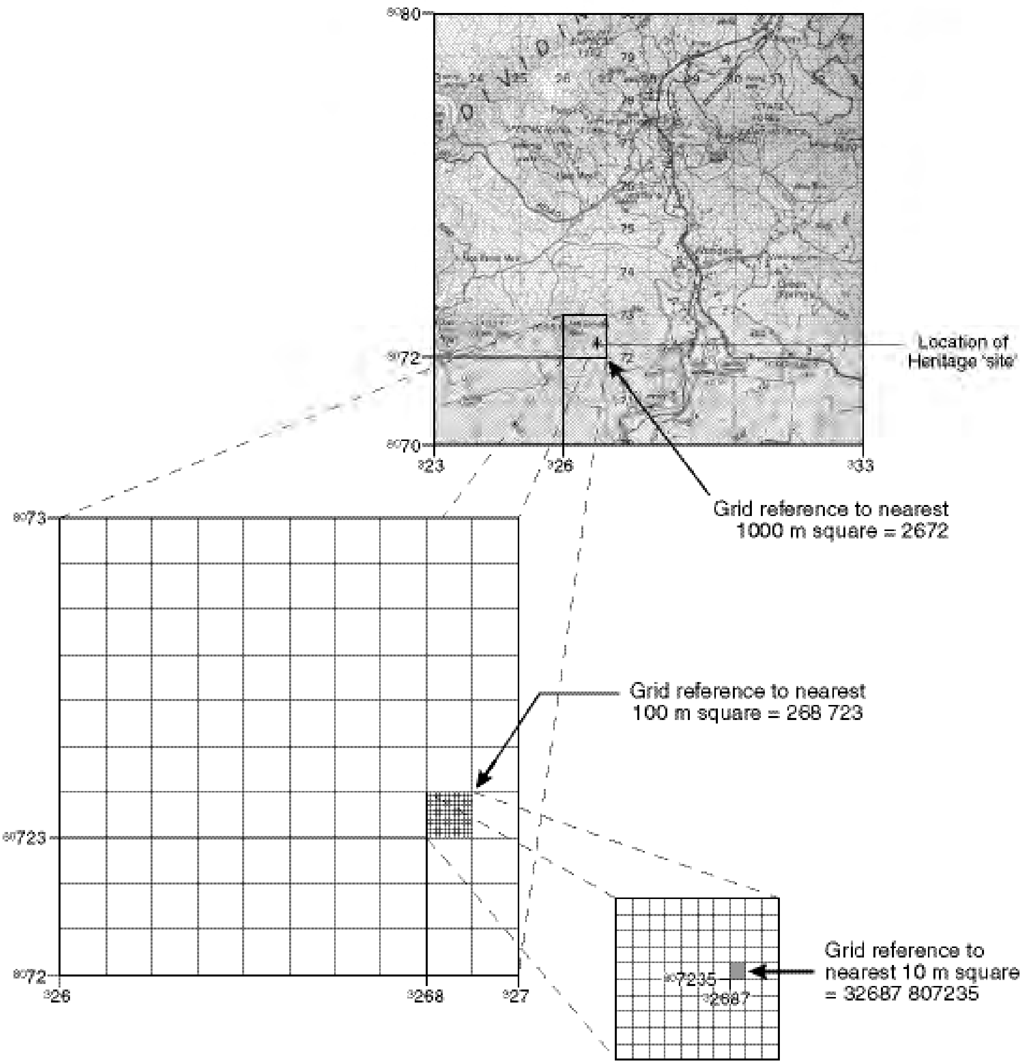
1 Always read from the bottom left hand (southwestern) corner of the relevant grid square.
2 Always read the easting (the vertical line) before the northing (the horizontal line).
3 Always read eastings from left to right and northings from bottom to top.

This means that, when you are reading a grid reference from a map, you need to read the closest easting to the left of the site (because eastings are always read from left to right) and the closest northing below the site (because northings are always read from bottom to top). Because this is the convention, if you wrote down the easting incorrectly as being the closest line to the *right* of the site, for example, you would actually be indicating to the reader that the site was to the right of that line and giving a grid reference which placed the site too far to the east.

Figure 2.2 illustrates this. The grid reference for a hypothetical heritage site on this map can be specified at various levels of precision. Because few maps are ever at a scale of 1:1 (that's the point of maps: to reduce a large area so it fits on to a relatively small sheet of paper), the degree of accuracy you will achieve in plotting a site via a grid reference will depend both on the scale of the map you are using and the order of accuracy you give to the grid reference. It is perfectly possible to plot a site on a map using only a four-figure grid reference (see Table 2.2 on page 39). This is called an **area reference** but will only be accurate to a 1000 metre square around the site (i.e. all it will tell you is that your site occurs somewhere within that 1000 metre square). In Figure 2.2, the area reference for the site is 2672.

To define a more accurate position, you need to refine the scale of the map down by dividing that 1000 metre square into successively smaller squares (see Figure 2.2 on page 38). Each of the lines separating these smaller squares will be numbered from 1 through 9, beginning in the bottom left hand corner of the square. To calculate a six-figure grid reference, you initially follow the same process as for a four-figure grid reference, adding two extra steps (see below). In Figure 2.2, the six-figure grid reference for the site is 268723. While far more accurate than an area reference, this still only positions the site within a 100 metre square. To be even more accurate, you need to locate the site to within the nearest 10 metres. To do this, follow the same basic procedure, adding a few extra steps to give an eleven-figure grid reference. In Figure 2.2, the eleven-figure grid reference for the same site is 32687 807235. If you are working with a map of large enough scale (anything from 1:4 000 to 1:25 000), you will be able to be even more accurate and pinpoint the site

FIGURE 2.2: Calculating a grid reference



to the nearest metre. This will give a full grid coordinate for the site. By including the grid zone number and section letter from the map legend, you make the full grid coordinate unique, which means that no other point on the Earth will have this same reference (Biddle et al. 1974: 40). You can use the grid zone number and letter in conjunction with the 100 000 metre square designation and any area or grid reference to give such a unique reference. In Figure 2.2, the universal grid reference for the site is 55KCA 32687 807235.

TABLE 2.2: Steps in determining grid references

To determine an area reference (a four-figure grid reference)	To determine a six-figure grid reference	To determine an eleven-figure grid reference	To determine a full grid coordinate (a universal grid reference)
• Locate the nearest vertical grid line (easting) to the left of the site • Read only the large black figures which label the line (they will be on the top and the bottom of the map, either beside or on the line itself) • Write these numbers down • Locate the nearest horizontal grid line (northing) below the site • Read only the large black figures which label the line • Write this number after the easting number • The easting and northing numbers together are your Area Reference	• Locate the nearest vertical grid line (easting) to the left of the site • Read only the large black figures which label the line (they will be on the top and the bottom of the map, either beside or on the line itself) • Write these numbers down • Divide the grid square which contains the site into ten equal vertical strips, and identify the number of the nearest tenth strip line to the left of the site • Write this number down after the large figures • Locate the nearest horizontal grid line (northing) below the site • Read only the large black figures which label the line • Write this number down after the easting numbers • Divide the square into ten equal horizontal strips and identify the number of the	• Locate the nearest vertical grid line (easting) to the left of the site • Read both the small black figures and the large black figures which label the line (they will be on the top and the bottom of the map, either beside or on the line itself) • Write these numbers down • Divide the grid square which contains the site into ten equal vertical strips, and identify the number of the nearest tenth strip line to the left of the site • Write this number down after the small and large figures • Subdivide this smaller square also into ten equal vertical strips and identify the number of the nearest tenth strip line to the left of the site • Write this number down • Locate the nearest horizontal grid line (northing) below the site • Read the small black figures and the large black figures which label the line • Write these numbers down after the easting numbers • Divide the square into ten equal horizontal strips, and identify the	• First identify the zone number and section letter of the map (this is given in the map legend as the grid zone designation) • Note the two letters which identify the 100 000 metre square in which the site occurs (this will be given beneath the grid zone designation) • Write these numbers and letters down • Locate the nearest vertical grid line (eatsing) to the left of the site • Read both the small black figure and the large black figures which label the line (they will be on the top and the bottom of the map, either beside or on the line itself) • Write these numbers down after the zone number and section letter • Divide the grid square which contains the site into ten equal vertical strips, and identify the number of the nearest tenth strip line to the left of the site • Write this number down • Subdivide this smaller square also into ten equal vertical strips and identify the number of the nearest tenth strip line to the left of the site

TABLE 2.2: continued

To determine an area reference (a four-figure grid reference)	To determine a six-figure grid reference	To determine an eleven-figure grid reference	To determine a full grid coordinate (a universal grid reference)
	nearest tenth strip line below the site • Write this number down after the large numbers • The easting and northing numbers together are your grid reference	number of the nearest tenth strip below the site • Write this number down • Subdivide this smaller square also into ten equal horizontal strips and identify the number of the nearest tenth strip line below the site • Write this number down • The easting and northing numbers together are your grid reference	• Imagine that you are subdividing this square yet again and estimate how many of these tenths there are between the second strip line and the site • Locate the nearest horizontal grid line (northing) below the site • Read the small black figures and the large black figures which label the line • Write these numbers down after the easting • Divide the square into ten equal horizontal strips, and identify the number of the nearest strip line below the site • Subdivide this smaller square also into ten equal horizontal strips and identify the number of the nearest tenth strip line below the site • Write this number down • Imagine that you are subdividing this square yet again and estimate how many of these tenths there are between the second strip line and the site • Write this number down • All of the easting and northing numbers, together with the grid zone designation and the section letter, are your universal grid reference

The choice of which kind of grid reference to use will largely be a matter of how accurate you want your grid reference to be. Obviously universal grid references are far more accurate than area references. As a general rule, it is best to aim for the highest level of precision when recording any site location, even if you are not going to publish these precise grid references (for example, some Indigenous groups may request that you use an area reference rather than a universal reference in your published report so that the exact location of sites can be concealed). Before you decide on which kind of grid reference to use, it is also worthwhile checking with the relevant government heritage authority to find out its requirements. The New South Wales National Parks and Wildlife Service, for example, requires you to use an eleven-figure grid reference on all its standard site recording forms.

If you are calculating a grid reference for a large site, you can either specify the coordinates for the corners of a square drawn around the site, or simply give a single set of grid coordinates for the centre of the site.

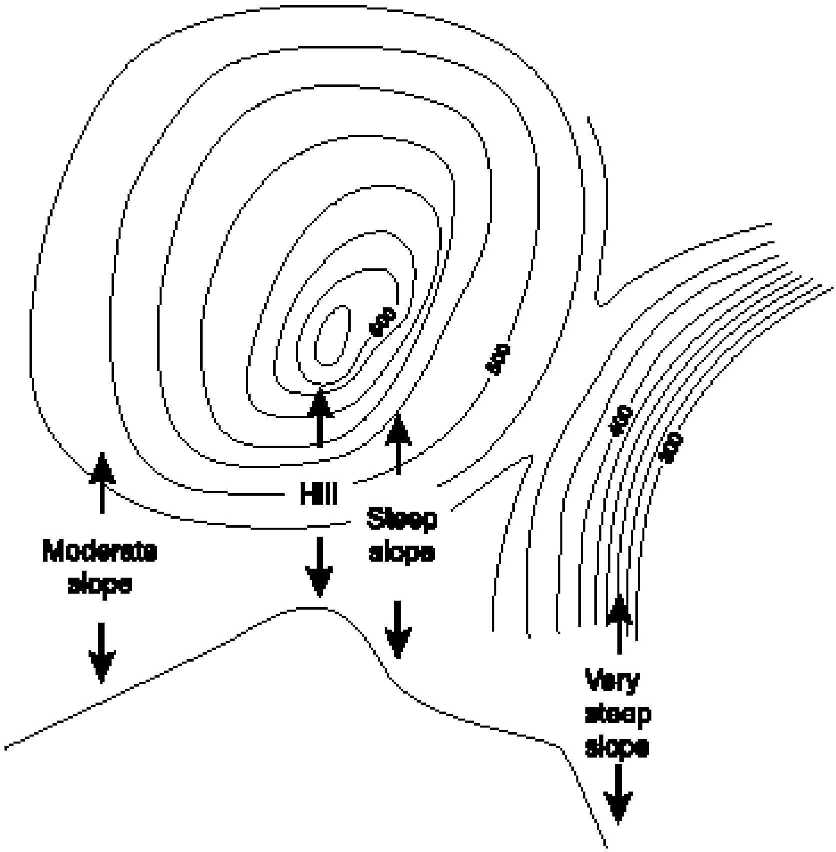
Understanding contour lines

Maps don't just contain information about the type and location of features on the ground: they also give some indication of the rise and fall of the land, or its contours. The usual way to show this on a flat map surface is by using contour lines, or imaginary lines joining places of equal height. These are the thick and thin wavy lines you can see all over the map, some of which have small numbers attached to them at various intervals. On the map, each contour line represents a particular height above sea level, and the numbers will tell you how many metres above sea level each contour line is. The most important things to remember about contour lines are that:

- when they are close together on the map they indicate steep slopes;
- when they are far apart on the map they indicate gentle slopes;
- when they are uniformly spaced on the map they indicate uniform slopes;
- when they decrease in spacing (when read from high to low), the slope is convex (outward sloping, like a hill);
- when they increase in spacing (when read from high to low), the slope is concave (inward sloping, like a valley).

Understanding contour lines will help you to plan your surveys. In the initial decision-making stage, particularly if you have to estimate how much time and money the survey

FIGURE 2.3: Contour lines and slope



is likely to cost (see 'How to prepare a tender' on page 243), it will be very useful to know whether you are going to be walking up the side of a mountain or surveying around a gorge, as opposed to walking on relatively flat ground. Each of these terrains has specific features and challenges, as well as different potential for containing sites, and being aware of the rise and fall of the land is important to planning the amount of time it will take to conduct a survey.

MAKING MUD MAPS

One other kind of map which you may see referred to in reports and field notes is a 'mud' map. Strictly speaking, these are not really maps, but rough sketches of an area which are not usually drawn to scale (i.e. they are not measured accurately). Mud maps are made in two main situations:

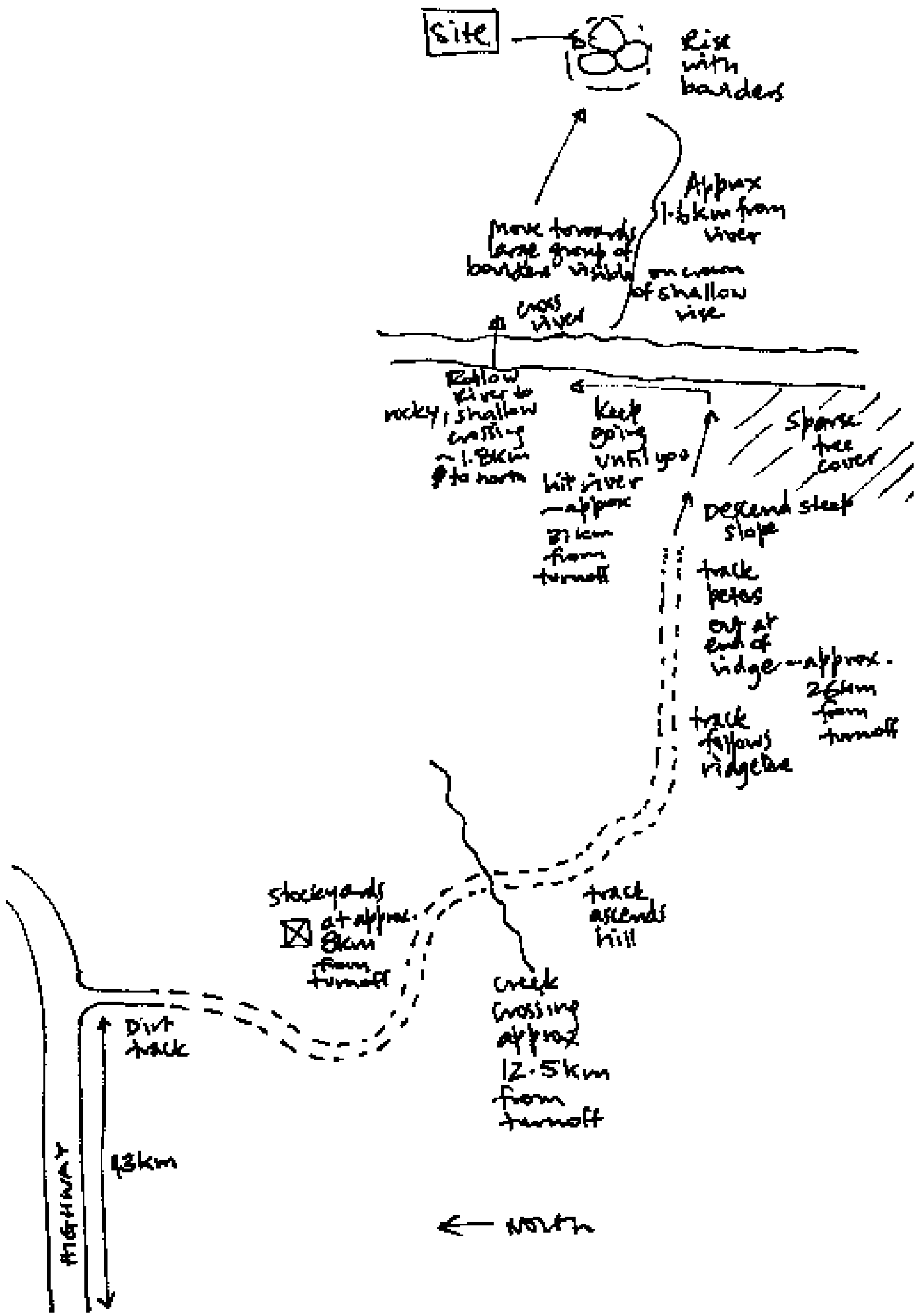
- to record the route you travelled to a site, so that you or someone else can find the site again; and
- to give a general idea of the shape and context of a site if you don't have enough time to record it properly but need to know the basic layout of the site.

Travelling mud maps are an important and relatively easy way of making sure you can relocate a site. They are made fairly quickly and only need to contain the information that is essential to finding your way back to a site. Usually, you will make these mud maps as you are driving to a site, and in this circumstance this is best done by a passenger. Travelling mud maps are something that may be used by other researchers at some stage in the future. These people will not have access to any local information that you may have in your head, so it is best if you are as explicit in your directions as possible. Some fundamental rules for making travelling mud maps are:

- Make sure that the core information relates to the decisions you make at turning points on the route. Every decision to turn should be recorded.
- While mud maps are not made to scale, some indication of distance travelled between way points is essential. You can do this by simply noting the speedometer reading in the car, or by counting the number of paces you have walked.
- Major features on the landscape should be recorded to indicate way points on the route. It is important that these features be permanent, like a house, rather than ephemeral, like 'cows in a field', or 'beer bottle in fork of tree'.
- If you are using buildings as way points, don't just identify them in terms of their owners. The house that is currently owned by A. Gorman will in all likelihood be owned by somebody else in the future.

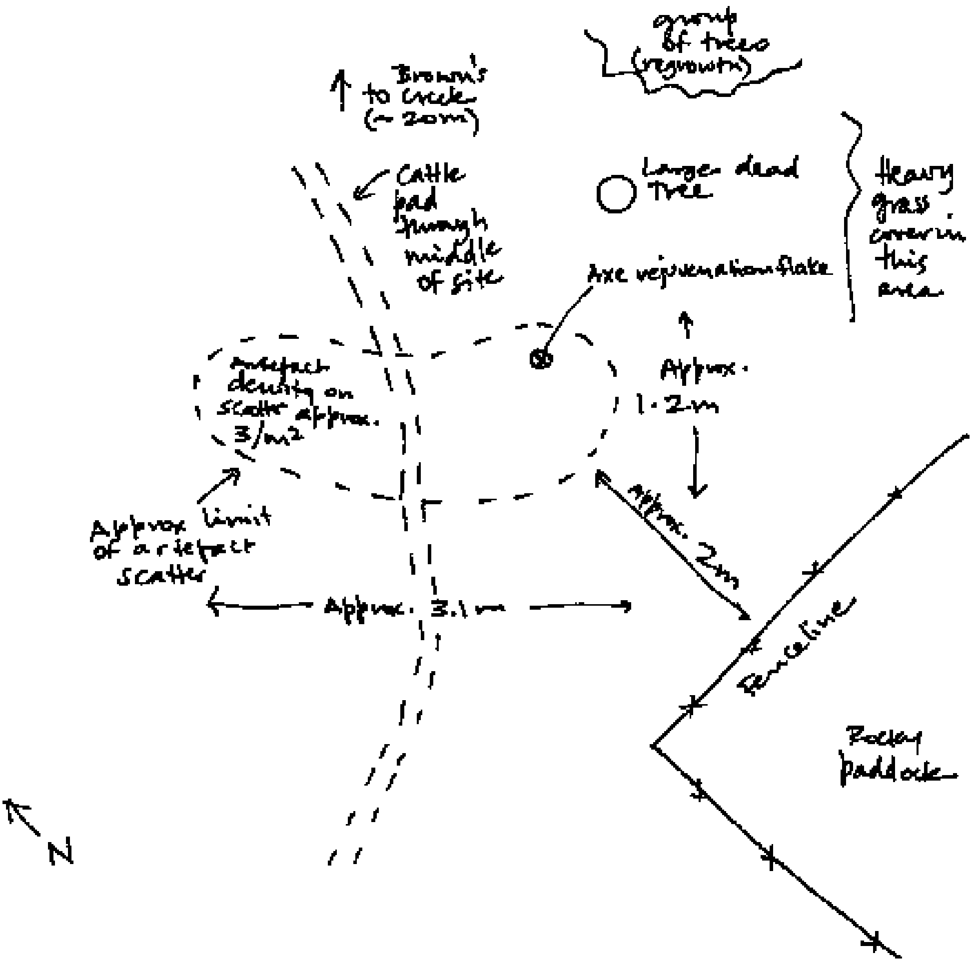
Mud maps of sites are made to give a general overview of what the site looks like. They are made when you don't have time to record the site properly but still need some basic information. Mud maps turn abstract phrases such as 'a large scatter of stone artefacts' into a concrete image of the site itself. Again, these maps are made quickly and only contain the most significant information and will not be useful for in-depth research or for making critical management decisions (such as how close to the site a road can be built). For either of these purposes you will have to return to the site and make an accurate map, drawn to scale (see Chapter 4: Site surveying). If you are working by yourself, you will probably be establishing the dimensions of the site through pacing (see 'Using the compass and pacing technique' on page 90). Some fundamental rules for making mud maps of sites are:

FIGURE 2.4: A travelling mud map



- Include at least one permanent feature on the map, and all of the major features.
- Show the approximate location of all archaeological materials, the extent of their area and any areas of damage.
- Include basic information, such as a north arrow, your name and the date on which you made the mud map.
- Dimensions can be included in approximate terms (e.g. approximately 20 × 8 metres), but it is best if you pace this out.
- Don't forget to augment the mud map with a universal grid reference, photos and notes and *never* rely on a mud map as the only recording of a site's location or its contents.

FIGURE 2.5: A mud map of a site



USING AERIAL PHOTOGRAPHS

Aerial photographs, as their name suggests, are literally photographs of a section of the Earth's surface taken from the air. While aerial photographs were originally taken in order to map major environmental features, they also form a good basis for archaeological research and interpretation. An aerial perspective can be helpful in understanding past environments, as features such as recessional beach-lines and dunes are much easier to identify from a distant perspective than close up. This data can be integral to understanding relationships between environments and people in the past, especially if you are researching Indigenous settlement patterns. For the historic period, aerial photographs can provide valuable snapshots of changing demographic and settlement patterns. In the same way that a larger-scale map is better for identifying particular sites or features, the lower the level of the aerial photograph (i.e. the lower the plane was flying when the photograph was taken), the greater the level of detail it will provide. The first aerial photographs were taken in the 1930s and, if you can obtain a sequence of photographs for the same area taken at different times, you may well be able to literally see the major changes in your area over the last 50–60 years. Unfortunately, aerial photographs are limited in their ability to show the spatial layout of sites because only large archaeological features will be visible from the air, but they are very useful for identifying general areas which may contain sites and which therefore might be useful to survey. In Australia, aerial photographs can be obtained through the state departments that deal with topographic maps.

Aerial photography can be used to:

- key into a surveying strategy for a region;
- compare regional settlement patterns through time;
- detect specific sites, such as the faint outlines of old settlements, buildings or roads;
- relate your site to the surrounding environment;
- assess relationships between sites within a region;
- assist in regional environmental analysis;
- assess a region's potential for significant sites.

At a practical level, the best approach to aerial photography is to learn how to interpret photographs taken by others. The amount and kinds of information you can deduce from an aerial photograph will depend on your knowledge, training and experience. While you don't need to be a specialist in geology or geomorphology, some experience in these fields can be helpful.

It is best not to use aerial photographs for navigational purposes, as their scale can vary substantially.

USING A COMPASS

A compass uses a magnetised needle to indicate north. Following the principle that magnetic force is supplied by the molten iron at the Earth's core, the coloured end of the needle (or the end with the letter 'N' on it) will point towards the north pole of the earth's magnetic field. To align a compass to north, you simply turn the compass dial so that North (0°) on the dial matches the direction of the north end of the compass needle. Unfortunately, the Earth's poles are constantly moving and the north pole indicated by the compass needle ('magnetic north') is not the same as the real north pole ('true north'). This compass error is called **declination** and, depending where on the Earth you are, can result in a difference of anything from a few degrees to up to 20–30° away from true north. Fortunately, on the bottom of all topographic maps there is a simple chart which indicates the yearly degree of declination away from true north in any area (see Figure 2.6 on page 48). You should bear in mind, however, that because the poles are constantly moving, this declination is also constantly changing and may be inaccurate on older maps.

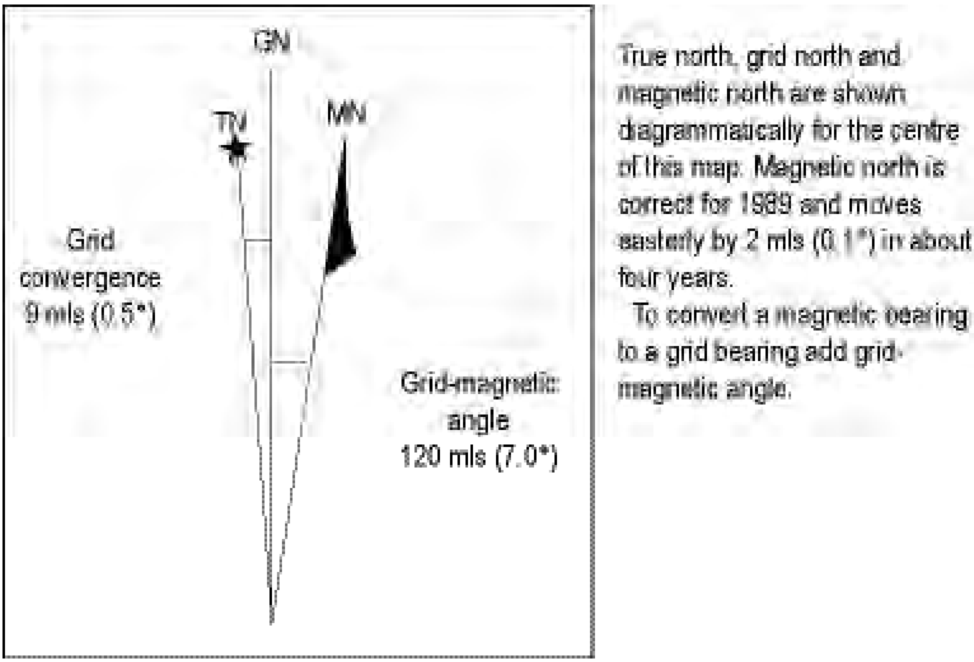
True north (TN) is the direction towards Earth's geographic north pole, magnetic north (MN) is the direction in which the compass needle points, and grid north (GN) is simply the direction of all the vertical grid lines on a map. Grid north is always used as the reference point for bearings and grid references.

> Remember that a compass will point to *anything* metallic or magnetic that is made of iron. This means that it cannot be used accurately if you are standing beside wire fence-lines or scrap metal, inside cars or under or beside electrical power lines. Even metal objects on your person can affect your compass reading.

Taking bearings

The direction in which you want to travel to get to your destination is called a **bearing**. Because there are 360 degrees in a circle, compass bearings are referred to by the number of degrees they are away from north, always counting in a clockwise direction. For example, east is one quarter of the circle away from north (which translates to 90°), south is directly opposite to north or halfway around the circle (at 180°), and west is three-quarters of the circle away from north, at 270°. The numbers on the moveable compass dial are these degrees.

FIGURE 2.6: Using a topographic map to calculate the difference between true and magnetic north

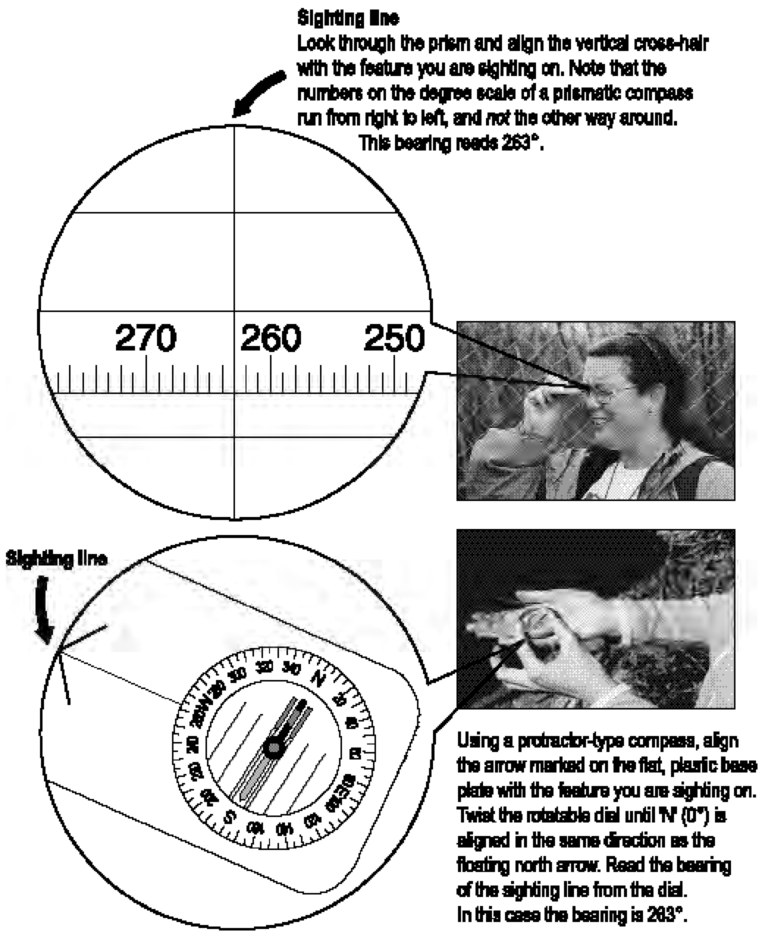


How to read a compass bearing

- Point the compass towards your destination. If you are using the compass to make a plan of a site, this will be the point to which you want to measure (see 'Using the compass and pacing technique' on page 90), otherwise it will be the direction in which you want to travel.
- Keeping the compass fixed on your destination, move the dial so that 0° is aligned to the magnetic compass needle (which will be pointing towards magnetic north).
- The bearing of the point, or the distance it is away from north, can now be read off the compass dial (remembering always to read the numbers on the dial clockwise from 0°). This will be slightly different depending on the type of compass you are using (see Figure 2.7 on page 49).
- For greater accuracy, use your arm to extend the directional arrow, or sight the compass on a ranging rod, or other highly visible feature, held at your destination.

- When you reach your destination, you should always take a **back-bearing** to your original location. This is a check on the accuracy of your original bearing. The difference between your original bearing and your back-bearing should always equal 180°, although an error of plus or minus 2° is often unavoidable. Taking and recording accurate bearings and back-bearings with a compass should allow you to plot your movements accurately and will be invaluable if you are navigating across country.

FIGURE 2.7: Taking a compass bearing. Using a prismatic compass (top) you must look through the compass to sight on your destination; using a protractor-type compass (bottom), you must sight along the compass using the arrow at the tip as a guide.



If you are using a compass to navigate your way across country, particularly if you are moving through dense vegetation, it is important to make continuous checks to ensure you have not moved away from your bearing. One way to do this is by continually checking your compass. However, by far the best way to maintain a bearing is to select a clearly visible object which lies along your path (such as a tree or a rock outcrop) and move towards it. If you can't find any obvious natural features, then send someone on ahead to act as a marker. Continue to do this for each leg of your journey. This process is called point-to-point bearing.

If you are using a map and a compass in conjunction to navigate towards a site, you will need to compensate for the declination. In other words, compass bearings taken on the ground must be converted into grid bearings before they can be plotted on to a map. Likewise, grid bearings taken from a map must be converted into compass bearings before they can be used with a compass on the ground. To convert between bearings, simply either add or subtract the degrees of magnetic variation shown on the declination chart at the bottom of the map. For example, using the chart in Figure 2.6, imagine that you have just taken a magnetic bearing from your compass towards a scarred tree. The bearing reads 50°. To convert this to a grid bearing which you could then plot on to your map, you would simply add 7 degrees (because, over time, magnetic north has moved so that it is currently 7° east of grid north). Conversely, if you had taken a grid bearing of 50° from the map and wished to use it to navigate towards the scarred tree, you would first have to convert the grid bearing to a magnetic bearing. To do this you would subtract 7 degrees, thus giving you a magnetic bearing of 43° to follow on your compass. If you are using a GPS you can set your GPS to give you directions in magnetic degrees, thus eliminating the need to worry about compensating for declination (see 'Using a Global Positioning System' on page 51).

Once you have converted your compass reading to a grid bearing, you can use a protractor to measure this bearing directly on to a map. Like a compass, the outer rim of a protractor has degrees marked around its edge (either from 0°–180° if the compass is a half circle, or from 0°–360° if the compass is a full circle or a square). To measure a bearing, draw a light pencil-line from the point where you are standing to the point to which you are navigating. Place the protractor on the map so that the centre point or hole is directly over where you are standing and the north line (or 0°) is pointing to grid north on the map (i.e. the top), parallel to the eastings. Read the degrees off the edge of the protractor where it meets your pencil line.

How to orient a map

Whenever you use a map in the field for navigation, make sure you have the map correctly oriented to start with. This means ensuring that the directions on the map correspond to the directions of the same features on the ground. The easiest way to do this is simply to look for any readily identifiable features around you and turn the map so that it and you are facing in the same direction relative to those features. If you cannot identify any surrounding features, and are still unsure how to orient the map, you can use a compass.

- Lie the map flat. Place your compass on it and adjust the vertical lines on (grid north) to match up with magnetic north on the compass (the swivelling arrow needle).
- Check the declination in the legend at the bottom of the map and make an adjustment to take into account the variation between magnetic north and grid north. For example, if the declination on your map is specified as 5°, you would need to shift the compass slightly so that its north arrow is pointing to a spot which is 5° east of grid north.
- The map will now be oriented correctly.

USING A GLOBAL POSITIONING SYSTEM (GPS)

Global Positioning Systems have greatly simplified the process of navigating to and from sites and of recording site locations. A GPS can be used either on land or on water. It calculates a grid reference for your position from orbiting satellites, and operates on the same map projection systems as official published maps. When using a GPS on land, make sure that you set the map system to match that of your maps. If your GPS readings are taken using a different map system to your printed maps, then your grid references will not plot accurately. Thus the Australian Geodetic 66 or 80 system will be most appropriate for older maps and the WGS84 (World Geodetic System) will suit more recent maps. If you are having persistent problems in plotting your GPS readings, this is one of the first things to check. When using your GPS on water, you will have to use latitude and longitude to plot location instead of eastings and northings, as this is the system employed on all charts.

Tips for using your GPS efficiently

- Most satellites orbit the equator, so when using a GPS in Australia hold the unit facing north so that your body doesn't interfere with the satellite signal.
- When using a GPS to navigate to a known grid reference, walk along until you have correctly located yourself along either the easting or the northing, and then follow that until you reach the correct position.

- When you first turn on your GPS receiver, it will 'lock on' to all available satellites, provided the receiver has a clear and uninterrupted view. It is often worth leaving the GPS on for a few minutes before using it for serious work, as sometimes the initial readings can be misleading.

The best low-end models are the Garman and Magellan units, both of which are accurate to within 10–15 metres and are easily affordable. They are also water and shock resistant, as well as light and easy to carry. Because the degree of accuracy of your GPS will depend partly on the brand, make sure you always note down the make and model of your GPS in your field notes and report.

GPS units are simple to use and can be a great asset in the field, provided you keep some basic factors in mind. Most can be set to either magnetic north (good if you are navigating using a compass) or true north (good if you are navigating using a map). Make sure you know which one you are using. Because GPS units can be used all over the world, they also have to be set to the relevant map zone to give an accurate grid reference. This means that, even if you only travel between the Northern Territory and New South Wales to use your GPS, you will have to readjust the map zone.

Since it is possible for errors to creep into any GPS reading (as a result of factors such as the number of satellites which are accessible, their geometry, atmospheric conditions or signal reflection), it is always wise to check every reading against a topographic map to be certain of your location. And because GPS units are prone to running out of battery power at the most inopportune times, or may be unable to get a fix on a sufficient number of satellites for an accurate reading (particularly if you are surveying under dense tree cover), it is always wise to know how to calculate a grid reference manually (see 'Using a map to calculate a grid reference' on page 36). If you plan to use a GPS under heavy tree cover, you should investigate buying one with an external aerial.

Stephen Sutton's tips for successful fieldwork

- Always have a good pair of boots. I recall a report at a conference in which the presenter admitted that part of the study area hadn't been surveyed 'because there were bindies and we didn't have any boots'.
- Take good care of your field assistants. It's essential to the success of fieldwork that your assistants are well fed and that their health and safety are assured.
- Plan your fieldwork. You need to be aware that the only data you have is what you collect. By this I mean that when you get back to the lab, and are working up your notes or collection to find something missing—too bad. It's almost always

impossible to reconstruct from memory (either yours or your colleagues'), or to find surrogates for the missing data. The only way to do it is to return to the scene and this is expensive and time-consuming.

- There is no 'one way' to do anything. Whilst careful attention to data collection is fundamental, it should also be appropriate. Work should be structured to ensure that the final product—the reason you're in the field in the first place—can be achieved, but after that there is a capacity to waste resources collecting data that will never be used.
- Don't rely on technology. There are digital machines for everything these days: GPS, laptop computers, EDMs, data-loggers, digital cameras and so on. They all have an amazing capacity to fail at the critical moment. There is no substitute for traditional skills like map-reading and surveying and the use of back-up materials like rag-paper survey notebooks.

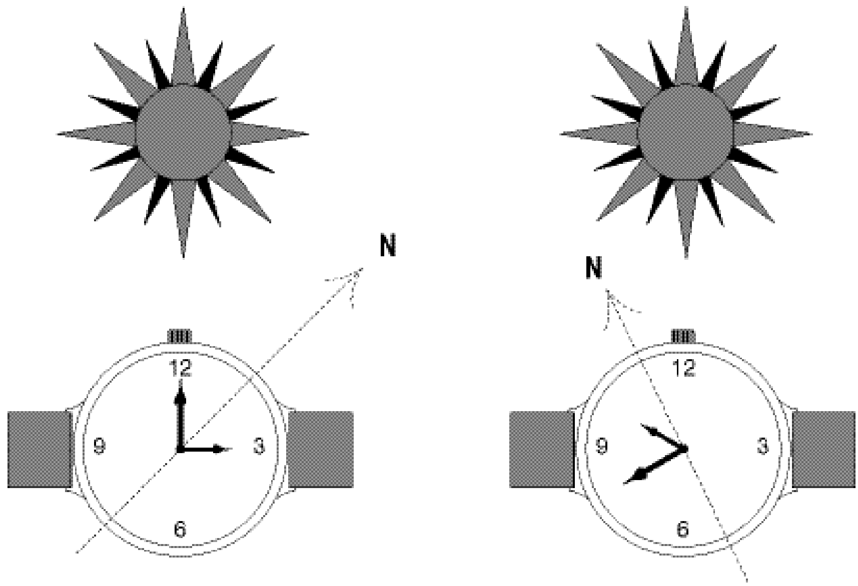
FINDING NORTH USING YOUR WATCH

In case you are ever stuck in the field without either a compass or a GPS, you can use any analogue watch to find north. This is not accurate enough to be able to map a site (see 'Using the compass and pacing technique' on page 90) or to navigate to a site, but might be enough in a pinch to prevent you from being lost. To find north using your watch, point the number 12 on your watch towards the sun. North will always lie mid-way between the hour hand and the number 12 (see Figure 2.8 on page 54). If you have only a digital watch, make a sketch of an analogue watch and draw the correct time on to it, leaving off the minute hand. Use the sketch in the same manner as a real watch to locate north.

SURVIVAL IN THE BUSH

Archaeologists often travel in remote areas on tracks, dirt roads and off-road. This can be highly dangerous, particularly if you are not prepared or are not being sufficiently careful. Never go into the bush unprepared—archaeology is not worth dying for. Most advice for working in the bush is common sense. Make sure you take enough water, particularly if you are going to be surveying large areas and doing lots of physical activity (you should always aim to drink the equivalent of between eight and ten glasses of water a day). If you are going to a remote area, ensure that you have spare tyres for your vehicle, emergency food rations and some means of reliable communication (such as a UHF radio or satellite phone, *not* just a mobile phone). Make sure that you tell someone exactly where you are going and when you expect to return.

FIGURE 2.8: Making a watch compass



Snakes are the biggest wildlife risk in the bush and Australia is home to dozens of species, including some of the most venomous in the world. When walking in the bush, wear sturdy boots that come at least as high as your ankles. Keep your eyes on where you are walking. If you see a snake, stop and remain still. If the snake is curled up and quiet, you can usually detour around it, giving it a very wide berth. If the snake is moving or looks like it intends to move, stay put. Keep quiet and do not move. Most snakes aren't aggressive and would rather flee than fight. If they feel threatened, however, they may attack a moving target, so even if the snake is moving towards you, *stay still*. When the snake has moved a safe distance away, move off slowly and quietly.

Other potentially venomous creatures are also a risk during fieldwork. When walking in the bush, wear long-sleeved shirts and long pants, tuck your pant legs into your socks or boots and tuck your shirt in as well—this will help to prevent ticks and other insects from travelling up your body inside your clothing. If you get a tick, remove it by levering it out carefully with a pair of tweezers. Do not squeeze or pull the tick and do not try to cut it out.

It is essential to drink plenty of fluids during and after strenuous field work, particularly if you're working in a hot environment. Heat exhaustion is a potentially serious condition which can arise if the body's heat regulation system becomes overwhelmed. If someone loses too much fluid through sweating, this decreases their blood volume and the blood flow to their vital organs. They develop mild shock which, if not treated promptly, can progress to heat stroke—an extremely serious and life-threatening condition. The symptoms and warning signs of heat exhaustion include:

- normal or below-normal skin temperature;
- cool, moist, pale skin, progressing to red skin;
- headache;
- nausea;
- dizziness and weakness;
- exhaustion;
- sweating;
- rapid, weak pulse.

If you think that you, or someone on fieldwork with you, might be suffering from heat exhaustion, treat it promptly. Encourage them to rest lying down in the shade with their legs slightly raised. Loosen any tight clothing and remove clothing soaked with perspiration. If they are fully conscious, give them frequent small drinks of cool water. Often a person suffering from heat exhaustion will feel better after resting in a cool place and drinking cool water. To prevent heat exhaustion from becoming heat stroke, it is very important that they be persuaded to stop all activity, as they may quickly reach the stage where they are beyond making a rational decision for themselves. If they are vomiting and unable to take any fluids, seek urgent medical attention (Australian Red Cross 1995: 190–91).

RESPONSIBLE BEHAVIOUR IN THE BUSH

- Don't walk on to or through private property without permission.
- Use a gas stove for cooking rather than dead wood, which is part of the natural ecosystem and can provide a home for animals.
- Minimise the use of soaps, shampoos and detergents. If you must use them, do so well away from streams or rivers.
- If toilets are not available, dig a small hole well away from any water source.
- Carry out everything you carry in, so that it can be recycled or disposed of properly.
- Leave the bush surroundings as they are as much as possible. Picking wildflowers reduces the chances of new plants, and is illegal in many national parks. Moving rocks can disturb animal habitats.
- Don't feed native animals, as this may cause them to become reliant on humans and unable to fend for themselves.

- If you're looking for somewhere to camp, check the area carefully for sites and artefacts first. There is nothing worse than waking up in the morning to find that you have pitched your tent and cooked your meals in the middle of an archaeological site.
- If you're making a campfire near an historical site, don't use any historical artefacts (e.g. bricks or stones from fallen structures) to make your fire.

Joe Watkins' and Jane Balme's tips for surviving a group field season in the bush

- Be aware of the climatic conditions where you'll be working and make sure you're properly equipped for them.
- Make an effort to find out about the place you're going to. Check out the local history.
- Be considerate of other people's privacy. In camp life there is rarely anything that people don't know about, but recognise that sometimes people need space.
- If you have any special needs (i.e. prescriptions) make sure you have a good supply.
- If you wear glasses, bring an extra pair.
- Find out about the living conditions well in advance. Often toilet facilities are primitive to say the least. If you need a private bathroom, bring it with you.
- If you're worried about poisonous insects or animals, find out where they live and avoid them as much as possible.
- Find out what phobias you have—and get over them.
- Be sensitive to the values of the culture you are working with. The kind of dress and appearance that may be suitable for young people in the city may not be suitable for rural communities. For example, short shorts, make-up or long hair can be inappropriate in a field situation.
- Know how to use a compass. If nothing else, practise in your own backyard.
- If you can't follow any of these tips, stick to one-person projects.

CAMPFIRE COOKING

This can be either a highlight or lowlight of archaeological fieldwork. Cooking over an open fire is a challenge, and requires slightly different techniques to using a normal kitchen. A camp oven is the standard cooking utensil and is extremely versatile. It can be used as a saucepan, a frying pan or an oven, to cook anything from roast chicken, soups and stews to cakes, damper and scones. When using it as an oven, the most difficult thing is to regulate the heat so that you don't burn the food. If you can, build your fire early and wait for it to die down before you begin to cook, using coals rather than direct flame.

Don't place the camp oven directly over the fire: this will provide too much heat and burn the food. Instead, place it near to the fire on a bed of hot coals and ash and put three times as many coals on top of the lid as underneath the oven. This will ensure even distribution of the heat, and won't burn the bottom. Bedourie ovens in particular were designed for this task because they have flat lids to hold the coals. Use a wooden spoon to stir a camp oven, and always cook with the lid on. Unless you like ashes in your food, don't tilt the lid when you remove it. When trying to assess the temperature of coals, count the number of seconds you can hold your flat hand above them.

TABLE 2.3: Assessing coal temperatures

Seconds	Heat	Temperature
6–8	Slow	250°F–350°F/120–180°C
4–5	Moderate	350°F–400°F/180–200°C
2–3	Hot	400°F–450°F/200–230°C
1 or less	Very hot	450°F–500°F/230–260°C

Before use, a camp oven will need to be 'seasoned' with oil. This means heating it slightly, rubbing in a light coating of edible oil and then heating it to a high temperature for around 30 minutes. Once it has been seasoned, it should never be scrubbed with soap. A camp oven won't rust if you season it correctly, clean it properly and keep it dry. Store the oven in a warm, dry place with the lid cracked so that air can circulate inside. A camp oven seems indestructible, but it will shatter if you drop it on to a hard surface, or crack if your pour cold water into it while it's hot.

Jane Balme's and Joe Watkins' tips for successful campfire cooking

- Be aware that you are part of a team that doesn't include your mother. Don't expect others to clean up after you.

- Know how to cook at least three different meals on a campfire made from five basic ingredients (potatoes, onions, road-kill and two others of your choosing).
- For instant popularity within the group, learn how to cook one great meal. You only have to cook on rotation, so you may only cook once or twice during the field trip. One great meal can establish your culinary skill—and you may never have to prove it again!
- If you have any special dietary needs, make sure you have a good supply of what you need.
- Let the organisers know if you have any special allergies.

Basic damper

3 large cups plain flour
2 teaspoons cream of tartar
1 teaspoon bicarb soda
1 teaspoon salt
1 dessertspoon sugar
Sufficient liquid to make a loaf (you can use water, milk, milk and cream mixed, or buttermilk)

Mix dry ingredients. Add enough liquid and mix with a knife until it forms a firm but soft dough. Place in lightly greased camp oven, cover lid of camp oven with coals and leave for about 30 minutes.

Beer damper

3 cups self-raising flour
Pinch of salt
3 tablespoons powdered milk
3 tablespoons sugar
Enough beer to make a firm dough

Mix all dry ingredients, add enough beer to make a firm dough. Place in camp oven and cook with hot coals for around half an hour.

Thai green curry

This can be made with chicken, vegetables or a combination of the two and should be served with rice. These quantities should feed eight to ten people.

2 packets green curry paste (this should be about 6 tablespoons)
2 tins coconut cream (you can add about 1 cup of water if you need more liquid)
6 tablespoons fish sauce
6 tablespoons brown sugar
Chillies (amount will vary depending on how hot you like your curries—one, deseeded, for mild, two or more for hot). If you don't have fresh, use dried but lessen the amount.
Basil—this recipe is best with fresh basil, but if you can't get it, use the chopped basil that comes in a tube in preference to dried basil.

Cook curry paste in 1–2 tablespoons oil for 2–3 minutes, add chopped chicken, cook until browned. If using vegetables, stir-fry in paste 5–8 minutes (add the hardest vegetables first so they cook the longest). Add coconut milk, fish sauce, brown sugar and chillies. Simmer, stirring regularly, for 20 minutes. Add basil, stir and serve.

Iain Davidson's recipe for chorizo and chickpeas

First, catch your chorizos.

2 chorizos—dice one and chop the other into discs
1 onion, chopped finely
Olive oil
1 tin tomatoes
1 tin (or two) chickpeas
Paprika to taste (it needs some)

Fry the chopped chorizo first (if you don't like oil), or fry the onion and chorizo together in oil (if you do like oil). When the onion is softened and transparent, add the paprika to cook for a minute or so. Add the tinned tomatoes (chopped finely and with the woody ends removed) and simmer for a few minutes. Drain the chickpeas and add them to the pot and simmer until the liquid is reduced to the consistency you prefer. Enjoy.

Pineapple upside down cake

125 grams (about 1/2 cup) butter or margarine
1/2 cup brown sugar
1 small can sliced pineapple
1 packet maraschino cherries (optional)
1 plain cake mix, including ingredients listed on pack (egg, water, butter)

Melt butter or margarine in the bottom of the camp oven. Mix in brown sugar and spread evenly across the base of the oven. Save pineapple juice for the cake mix and place pineapple rings in bottom of oven on top of the brown sugar. If you are using maraschino cherries, place one inside each pineapple ring. Substitute the pineapple juice for some or all of the water to be added to the cake mix. Add egg and mix as per instructions. Pour cake mixture over the brown sugar and pineapple. Bake as per instructions until cake is browned and a knife comes out clean.

Golden syrup dumplings

For the dumplings:
1 1/2 cups self-raising flour
1 heaped teaspoon (30 grams) butter or margarine
2 tablespoons golden syrup
Approximately 1/2 cup milk

Rub butter into flour, add golden syrup and enough milk to mix to a soft dough. Roll tablespons of dough into balls with floured hands.

For the syrup:
1 1/2 heaped tablespoons (45 grams) butter or margarine
1 cup firmly packed brown sugar
1/2 cup golden syrup
2 cups water

Combine butter, sugar, syrup and water in the camp oven, then stir over heat until sugar is dissolved. Bring mixture to boil, add dumplings to syrup, cover, return to boil and simmer for 10 minutes or until dumplings have risen to the top and are cooked through.

REFERENCES AND FURTHER READING

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Biddle, D.S., Milne, A.K. and Shortle, D.A. 1974, *The Language of Topographic Maps,* Jacaranda, Brisbane.

Geoscience Australia 2003, 'Coordinates, datums and ellipsoids', www.auslig.gov.au/geodesy/datums: accessed 7 January 2003.

USEFUL WEBSITES

www.nima.mil. This website allows you to view satellite pictures of any part of the Earth's surface. You can also download ARCview for free within the same website.

www.geoscience.gov.au/bin/mapserv36?map=/public/http/www/docs/geoportal/250/index.map This site allows you to view scanned geological maps for any area of Australia. The Geosciences website contains a wide variety of information about all aspects of Australian mapping systems.

Aerial Archive: www.univie.ac.at/Luftbildarchiv. This site is located at the Institute for Prehistory and Protohistory of the University of Vienna. Apart from archiving a large stock of vertical and oblique aerial photographs, it also uses sophisticated photogrammetrical hardware and software to map and visualise archaeological sites. This site is useful to those who are interested in aerial archaeology, taking and archiving aerial photographs, photo-interpretation or mapping and visualising sites.

The Backpacker's Field Manual is located at www.princeton.edu/~oa/manual. The site contains online excerpts from this excellent manual by Rick Curtis, Director of the Princeton University Outdoor Action Program. It contains illustrated sections on using a map and compass and taking bearings when travelling, including a series of useful real-life scenarios.

CHAPTER THREE

FINDING SITES

WHAT YOU WILL LEARN FROM THIS CHAPTER

- The advantages of a systematic surface survey
- Strategies for surveying a sample of your field area
- How your choice of strategy is likely to affect your results
- The basics of recording slope, geology, soils, transects, ground-surface visibility and vegetation
- The importance of assessing effective survey coverage
- Why you need to define a site's boundary
- The essential information to record when you find a site

Regardless of whether you are undertaking a research or consultancy project, the initial part of most archaeological fieldwork will be directed towards finding sites. Unfortunately there is no foolproof way to do this, as the likelihood of you finding sites depends on a number of factors. The ground-surface visibility conditions you encounter in the field, how much time is available, how large an area you have to survey and even the nature of the sites themselves will all affect the potential for sites to be located. In some places, such as Arnhem Land, you may not be free to conduct a survey at all, as Indigenous people may wish to control your movements around the landscape so that you do not inadvertently encounter sites to which access is restricted. In any event, it is highly unlikely that you will ever be able to find *all* of the archaeological sites that exist in an area, but in general you should ensure both that your surveying strategy is appropriate to the goals of your study (see 'Designing your research' on page 3), and that you try to discover the widest possible range of sites.

WHAT IS A SITE?

A **site** is simply a place that represents a particular focus of past human activity (Pearson and Sullivan 1999: 5). This activity may be related to past events, practices or beliefs and may or may not have left behind actual physical traces. The various landing places of Captain Cook, for example, have become important sites, even though they contain no physical evidence for these events. Likewise, many purely natural elements of the landscape are important Indigenous sites because they are the embodiment of creation ('Dreaming') stories. If you are working with Indigenous groups you will need to take such sites into account. While these sites may not be accompanied by any physical evidence for past human behaviour, knowing their location can be essential to understanding the use of the landscape in the past. It is always important to remember that an absence of material evidence is not necessarily evidence for the absence of human behaviour—such a place may be providing information about what people chose *not* to do. Some areas were actively avoided by people in the past, but are nonetheless still part of how they used and understood the landscape around them.

By contrast, an **archaeological site** is any place that still contains physical evidence of past human activity. This evidence can take an enormous variety of forms, depending on the nature of the site and who created it—from actual objects or traces of objects (e.g. posts or post holes) to the physical by-products of a past activity (such as plough furrows or scarred trees). Almost anything can be an artefact because what we might regard as insignificant today may have had all sorts of meanings for people in the past.

There are some standard 'types' of site which archaeologists in Australia commonly encounter. The two broadest categories reflect a general division into pre-contact and post-contact history: **Indigenous sites** (sometimes called prehistoric or Aboriginal sites) and non-Indigenous sites (usually referred to as European or **historical sites**). Of course, there is often considerable overlap between the two: the Indigenous people of northern Australia, for example, have had well-documented contact with non-Indigenous Macassan sailors and traders since at least AD1720, and post-contact Indigenous sites, such as outstation campsites or missions, are an important part of recent Indigenous history, although they may contain predominantly European artefacts. Likewise, using the term 'European sites' to refer to all non-Indigenous sites ignores the contributions of other groups, such as the Chinese or the Afghans, to the settlement of Australia. For simplicity's sake, in this book we use 'Indigenous sites' to refer to all Aboriginal sites, whether pre- or post-contact, and 'historical sites' to refer to all non-Indigenous sites (for some idea of the range of site types in each of these categories see Chapters 6 and 7).

The site is the basic operating unit of any field survey (Davies and Buckley 1987: 28). Generally speaking, a survey is geared towards locating and recording as many sites as possible, although there are sometimes problems with focusing exclusively on the site as the sole unit of human behaviour. It is important to bear in mind that sites are just the concentrated physical remains of past human behaviour and that, when created, none would have existed in isolation. Think of your own day-to-day behaviour: you might perform many different activities in many places, but each place, or 'site', is connected through the web of your movements and decision-making. In addition, many of your movements will leave no physical traces, and your memories of the events of the day, the places you visited and the ways that you used them are as much a part of your interactions with the landscape around you as the physical substance of the places and activities themselves. This is part of being *of* a place, rather than merely *in* it (Byrne, Brayshaw and Ireland 2001: 51). People continually construct a social landscape around them at the same time as they interact with a physical one, and the archaeological sites which are left behind are simply the physical by-products of this ongoing process.

As an archaeologist, when you record a site you are in effect only recording one 'moment' of human behaviour in space and time, so it is worthwhile bearing in mind how each site might be part of wider patterns of human behaviour on a larger scale (either across space or through time). Many of these patterns may be intangible in purely archaeological terms, although you may be able to access some of the ways in which people relate socially to the landscape around them through oral history (see 'Recording oral histories' on page 197). These wider patterns create the **cultural landscape**, or the totality of human physical and social activity in an area. In theory, the cultural landscape could be analysed at any scale, but in practice it is usually viewed at a manageable level, such as within drainage basins, or other well-defined geographic regions. This is mainly an administrative decision, taken to limit the potentially limitless idea of a cultural landscape.

Most sites are found through systematic surface survey: walking over an area of ground in such a way that you locate as many sites as possible. During a survey, you will need to record a wide range of complementary information. Because people use the landscape in a variety of ways, the location of sites will relate closely to their environment. It is for this reason that it is essential to describe the topography, vegetation, water and stone resources, ground-surface visibility conditions and the survey strategy, as well as basic information about any sites you find. You may not always be able to record the maximum amount of information, but you must ensure that, whatever the other limitations of the project, you always record a basic minimum of information (see 'What to do when you find a site' on page 80).

SYSTEMATIC SURFACE SURVEY

Without a doubt, the most effective archaeological surveys are those carried out systematically on foot, moving slowly across the ground. A surface survey is usually conducted by walking lines or corridors (**transects**) across the study area. These may be straight lines between two points or sinuous lines following the contours of the ground. The width of a transect and its spacing in relation to other transects will depend on the time available, the number of people involved and the nature of the terrain. Obviously, the more transects you walk through an area, and the closer together they are, the better your survey coverage will be. In practice, a single field-walker can effectively scan 1 metre to either side of them; thus, if you are one of ten field-walkers, it should be possible to survey a transect which is 20 metres wide in total. If, however, you are walking a transect alone, then the total width will be reduced to 2 metres.

Walking systematic transects is really only possible when the area you are surveying is relatively small, or if you have ample amounts of time in which to complete the survey. In reality, surveying for sites can be approached in a variety of ways, depending on the goals of the survey and how much time and money is available. If a systematic surface survey on foot is not practical—for example, if you are surveying a very large area, or if you have limited time or resources to devote to the task—it is possible to conduct a survey by looking for artefacts out of a slowly moving vehicle. By doing this, however, there is a much greater risk of sites being missed, so it is not generally recommended.

FIGURE 3.1: The width of a survey transect is largely determined by the number of people available to walk it

In preference, if it is not possible to undertake a complete surface survey, then you will have to limit your survey to certain parts of the landscape: a strategy which is known as **sampling**. Archaeologists are often only able to examine a portion, or sample, of the total archaeological record (either from an excavated site or the landscape) upon which they base their interpretations. This is perfectly legitimate provided the sample is **representative**, and not skewed by sampling bias in any way. This is where a sampling strategy becomes essential. Sampling strategies can be approached in a number of ways (see below), and choosing which parts of the landscape to survey is not a trivial task: the decisions you make as to which parts of the area to sample will directly affect the likelihood of you finding any sites.

Richard Fullagar's tip for successful surveying

Always be prepared to get your boots wet—even new ones. On a field trip to Papua New Guinea, I was surveying obsidian quarries with Jim Specht. I was worried about getting my new boots wet, so I walked over a ridge on Garua Island instead of around on the reef. Jim got wet on the reef and discovered a fabulous obsidian source that he refused to tell me about for over a year. Just kept it a secret. A suitable punishment, I guess, for putting clothing ahead of archaeology (which I haven't done since).

DEVELOPING A SUITABLE SAMPLING STRATEGY

The distribution of archaeological material across the landscape depends on a number of related factors, such as the preservation conditions over time, the degree to which sites are exposed through erosion or the lack of vegetation, and the actual decisions of the people creating the sites and depositing the materials in the first place. The decision about which sampling strategy to adopt will therefore centre around these kinds of factors, as well as more practical decisions based on the number of people conducting the survey, and the funds and time available for the project. A similar principle can be applied to the excavation process, since the decision about where to excavate in a site is also a sampling decision (see 'Approaches to excavation' on page 123). Samples can be either **judgment**, **random** or **systematic**.

Judgment samples

This is a sample in which the researcher exercises their own judgment as to which areas will be most productive to survey. It is sometimes referred to simply as a 'stratified' sample. This judgment is usually based on past experience of where sites are likely to be located and ethnohistoric research into how the survey area might have been used in the past (see 'Undertaking ethnohistoric research' on page 236). In a typical judgment survey the area would be divided into its various geographic zones (hill, creek, plain, gully, ridge) and the zones most likely to contain sites targeted for survey. In theory, while all zones might have an equal chance of containing sites, in practice we know that water, food and raw material sources were all important for how people used the land and therefore where people might have camped or worked. You only have to think of a map of Australia, with cities dotted around the edges, to understand this idea.

The advantage of a judgment sample is that areas which have a high likelihood of containing sites (such as those close to reliable water sources) can be given preference, and areas where it is highly unlikely that sites will be found (such as on extremely steep slopes) can be avoided. This allows time and resources to be focused on the most productive areas, and also takes the geography of the study area into consideration. Of course, this has its disadvantages too. Such a survey cannot help but be biased by the researcher's preconceived notions of what the archaeology *should be* and runs the risk of creating a self-fulfilling study (Redman 1975: 149).

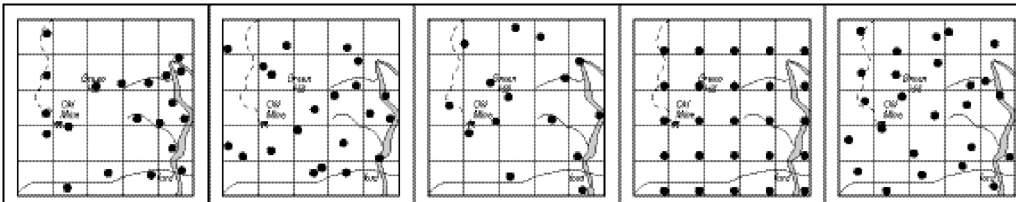
Random samples

Some studies attempt to remedy this bias by using a random sampling strategy, in which survey areas are selected by chance rather than by design. Using this strategy, no one area is given preference over any other and all areas have an equal chance of being selected. A random sample can be **simple** (where random spots on the landscape are selected for survey, usually through imposing an imaginary grid over the study area and then selecting areas to survey within that grid based on random numbers generated from a table or computer program) or **stratified** (where the study area is divided into its geographic zones and then sampled randomly within each zone, as you would for a simple random sample survey). Like a judgment sample, a stratified random sample takes into account the geography of the study area and recognises that there might be certain factors which affected the location of sites in the past. In reality, sites are unlikely to be randomly scattered about the landscape: people tend to follow behavioural patterns which relate to specific needs within the environment, such as water or shelter, and a stratified random sample recognises that they therefore tend to use the landscape in particular ways.

Systematic samples

One of the problems with a truly random sample is that some areas or sites are likely to be over-represented or missed entirely. The goal of systematic samples is to remedy this by ensuring that a portion of every area is sampled. You can do this either by **systematic random** sampling, where the first sample unit or area is selected at random and all other areas are chosen in relation to this (e.g. if you decide to place a survey square every 10 kilometres from the first, randomly chosen, survey square), or **systematic unaligned** sampling, where the total area is divided into large blocks and then one smaller block within each larger block is chosen at random (Hester et al. 1997: 30). This still maintains a random element in the selection process, but also gives relatively even coverage across the survey area.

FIGURE 3.2: The advantages and disadvantages of different sampling strategies



A. Judgment sample	B. Simple random sample	C. Stratified random sample	D. Systematic random sample	E. Systematic unaligned sample
Study area divided into geographic zones (creeklines, hill slopes, ridges, etc.) Survey areas within each zone selected according to those areas the researcher considers will be most productive *Advantages:* Those areas highly likely to contain sites (such as close to reliable water sources) can be given preference Areas where it is unlikely sites will be found can be avoided. *Disadvantages:* Will always be based on the researcher's preconceived notions of what the archaeology *should* be like.	Random locations on the landscape are selected for survey *Advantages:* Eliminates potential sources of bias. All areas have an equal chance of being selected. *Disadvantages:* Sites unlikely to be literally randomly scattered about the landscape In a truly random sample some areas or sites may be over-represented or missed entirely.	Study area divided into geographic zones (creeklines, hill slopes, ridges, etc.) Survey areas then selected randomly within each zone *Advantages:* Takes into account the geography of the area and recognises there might be factors which affected the location of sites in the past *Disadvantages:* Still a risk of personal bias.	First survey area is selected at random, and then all other areas are chosen in relation to this *Advantages:* Ensures that a portion of every area is sampled Designed to give more even survey coverage *Disadvantages:* Sites may still be missed.	One survey area within each larger block is chosen at random *Advantages:* Maintains a random element in the selection process. Gives relatively even coverage across the total survey area. *Disadvantages:* Sites may still be missed.

Regardless of which strategy you consider to be ideal, the reality is that in some situations your survey area may be decided for you. A landowner may refuse access to their property, Indigenous people may not want you walking in particular areas, or some places might simply be inaccessible. In any case, even if you are able to survey every centimetre of ground, it is likely that you will still only be able to see a portion of the total archaeology of the area (Drewett 1999: 44). Sites might be covered by vegetation, soil or leaf litter, the area might not be actively eroding so that no sites are visible, or poor light from heavily overcast conditions might cause you to miss small artefacts. The important thing is to recognise and record these and any other limitations in your field journal, so that others can recognise this bias and not assume a more thorough coverage of the landscape than you have been able to achieve.

The New South Wales National Parks and Wildlife Service (Byrne 1997) recommends adopting a three-tiered approach to archaeological survey to try to overcome this problem. Although it will not be foolproof, it will give you the best chance of finding a range of sites.

- *Phase 1:* An initial reconnaissance survey of the study area to see whether there are any obvious site types or areas of disturbance, and to get a feel for where within the study area it might be most productive to survey more intensively. During this phase you would record any obvious site types you came across (e.g. scarred or carved trees, rockshelters or quarries).
- *Phase 2:* Using these findings, choose a sample of the area for intensive survey, in which you will record all visible sites, particularly those types that were difficult to see during the reconnaissance survey (such as stone artefact scatters).
- *Phase 3:* Using these findings, choose a sub-sample of the study area where buried artefacts or sites might occur. In this phase you would undertake some form of subsurface testing to see whether soil or vegetation is currently covering sites.

RECORDING INFORMATION IN THE FIELD

Of course, there is more to fieldwork than simply looking for and finding sites. The archaeologist's job is also to record a wide variety of complementary information which is essential for understanding the context in which the research was undertaken, the physical and geographical context of any sites which were found and the limitations of the research. This might enable the archaeologist, for instance, to make sense of why sites might be located in certain places and not others, or why no sites were found at all despite the best surveying strategy. Making all facets of the fieldwork process transparent is the only way in which archaeologists can ensure that their results will be able to be compared with those of other projects, and therefore will contribute to the pool of current knowledge (see 'Archaeologists and their profession' on page 15). There are a number of complementary strands of contextual information which you should record:

- background information on the conduct of the fieldwork, the strategies which you adopted, the day-to-day operation of the project and any problems which arose, in your field journal;
- information on the survey transects which indicates how well covered the survey area was, on recording forms;
- information on the landforms, vegetation, soil, geological formations encountered in the study area, on recording forms;
- information on the water sources encountered in the study area, on recording forms;
- information on the general ground-surface visibility of the survey area, on recording forms.

Excavation requires a different set of recording forms and is dealt with in detail in Chapter 5. Some examples of forms to use for recording landform, vegetation, water sources and visibility have been included in Appendix 1.

Denis Gojak's tip for all-weather site recording

Surveyors' and miners' supply firms sell waterproof paper. This weighs in at about 80 gsm, and can be used in a photocopier to provide recording forms that let you work in the least hospitable conditions imaginable! Team it up with a Fisher Space Pen, which writes upside down and on greasy surfaces, and only costs a few bucks for a refill, and you will have no excuses left for not recording in any weather.

KEEPING A FIELD JOURNAL

One of the most important aspects of any archaeological fieldwork is keeping a field journal. This is essentially a diary in which you record the day-to-day details of your fieldwork, from the sites you record or the features you excavate, right down to the weather and light conditions (which, believe it or not, can affect your ability to locate sites or identify artefacts, particularly stone artefacts), the names of the people who participate each day and any problems you encounter. It is also the place where you can record any impressions or interpretations of sites and features as they occur to you. This will be particularly important if you are one of many fieldworkers on a large project and your results are to be analysed or written up by someone else, but it will also help to jog your memory later when you come to write up your report. Your field journal will form an invaluable record of your fieldwork and, since you cannot predict what questions may interest future researchers, one day it may even provide new and unforeseen 'data'. As a formal record of your fieldwork, another archaeologist should be able to reconstruct your field program and understand the reasoning behind your decisions just by reading your notes. Remember, the more information you record in your field journal, the easier it will be for you or someone else to write up your results in the end. Don't trust your memory—write everything down. A good field journal will contain enough information for you to make some basic interpretations of what you are seeing, which can be expanded upon later when you come to write up your report.

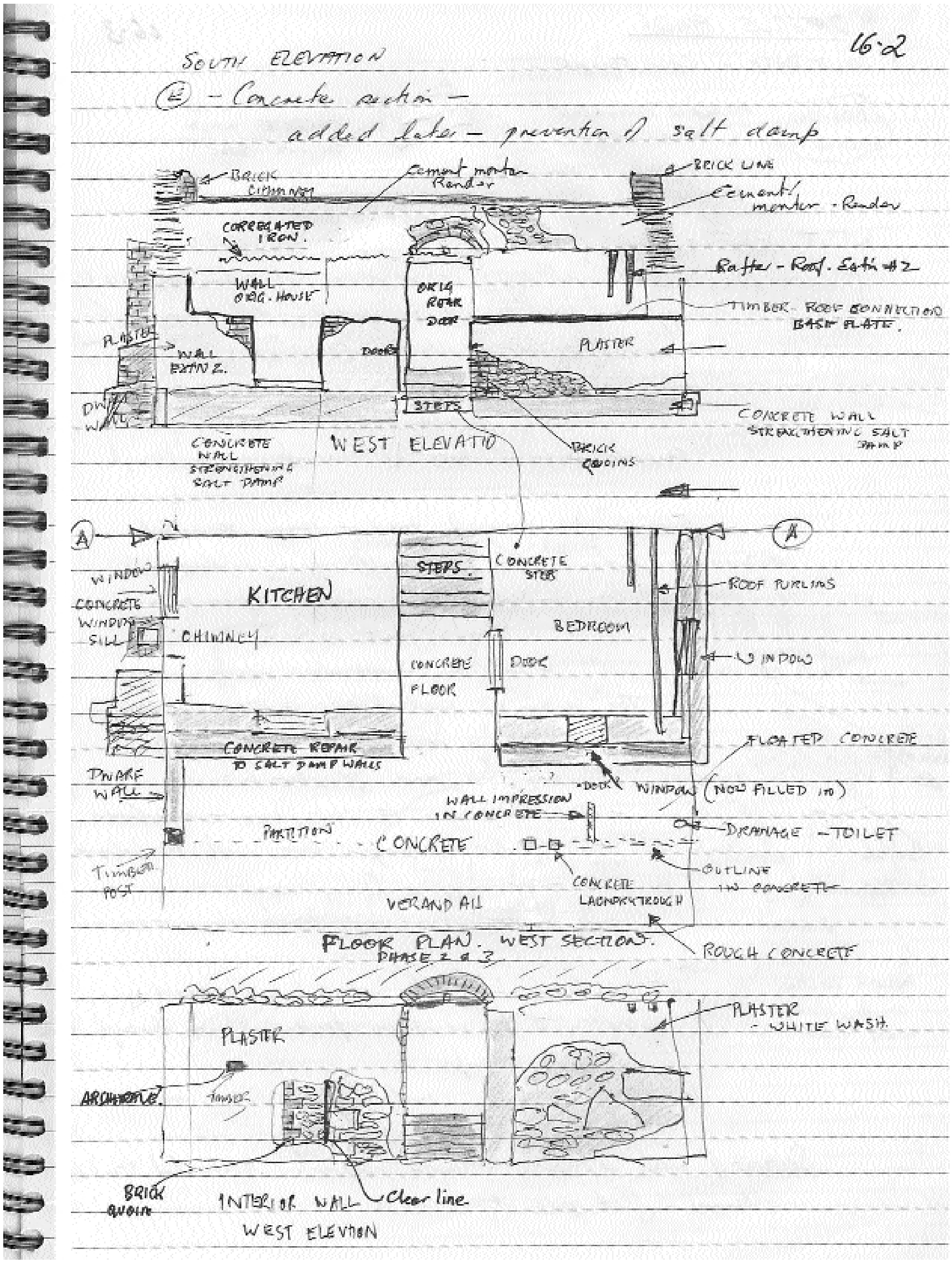
Important things to note in your field journal:

- the date, weather, light conditions and personnel;
- a summary of activities for the day, including details of the methods you used;
- progress made on the project during the course of the day;
- any problems you encountered and the solutions you adopted;
- any new research questions generated during the course of fieldwork, or interesting ideas to follow up;
- any interpretations of sites or features which occur to you during the course of fieldwork;
- the reasoning behind any changes made to your methods or any decisions which affected the course of fieldwork and its possible outcomes.

Nicky Horsfall's tip for keeping good field notes

Take a portable tape-recorder with you. I find it very difficult to write good notes while doing field surveys. Either I can't read my own writing, I've written the same thing several times, or I've been too lazy to write down things which in retrospect I realise are key matters (rain doesn't help). So I started taking a tape recorder, and just chatted away at that. Each evening I would replay the tape, with the hindsight of knowing all the events of the day, and just write down what was needed, expanding earlier comments if necessary in the light of later discoveries. I'm sure many fieldworkers do this. Problems arise on windy days (microphone noise) and you can feel a right fool talking to yourself, but it worked for me.

FIGURE 3.3: A page from archaeologist Robert Stone's field journal



RECORDING TRANSECTS

So that someone else reading or assessing your report can reconstruct your survey strategy, you need to be clear about the details of your survey transects. You will need to outline:

- where your transects were located (this is best done by plotting your transects on to a map so that the area you have covered, and by extension the area that you ignored, is immediately apparent to the reader);
- how many transects you walked;
- how long each transect was;
- how wide each transect was (i.e. how many people were involved, and roughly how far apart each person walked);
- the vegetation and soil conditions which you noticed within each transect. This last set of information will be crucial for determining the effectiveness of your survey strategy (i.e. how likely it is that you could have missed or not been able to locate sites) (see 'Determining effective survey coverage' on page 78).

RECORDING LANDFORM, VEGETATION AND SLOPE

Landforms are simply the topographic units of the landscape, such as creek-lines, hill slopes, ridge-lines, plains or river valleys. It is important that you note the various landforms across which your survey transects pass, because different landforms will be associated with different erosional or depositional processes, as well as different types of vegetation, ground cover and water sources, not to mention different uses in the past. For this reason, in theory you should assess the length of your transects within each landform unit (i.e. when you enter a new landform unit, you should end one transect and begin another) and then assess the percentages of ground-surface exposure and ground-surface visibility that occur within each, although this may not always be possible (see 'Determining effective survey coverage' on page 78).

Archaeologists commonly assess **vegetation** in terms of two factors: as a guide to the range of plant resources which would have been available to Indigenous peoples in the past; and for what it implies about current and past land use, which has the potential both to indicate the possible existence of historical archaeological sites, and to affect survey conditions such as ground-surface visibility, access and disturbance. Indigenous peoples used plant resources for both food and medicine, as well as to manufacture objects such as nets, string bags, shields, baskets and canoes. When recording vegetation, you should take note of:

- the vegetational structure (how tall the tallest trees are, what constitutes the understorey, and the groundcover);
- the dominant species;
- other prominent species you can see, including native and non-native species, because the presence or absence of non-native species may be an indication of how intensively the land has been modified by Europeans;
- the approximate size of the largest trees, which is principally a guide to how old and well-established they might be. If you are in Victoria conducting a survey for Indigenous sites, for example, and are on the lookout for scarred or carved trees, there is no point in examining young trees which have only grown up in the last 50–100 years.

Because the distribution of different vegetation types depends on other environmental factors, such as soil type, aspect, micro-climate and the availability of water and nutrients, you will also need to record these complementary sets of information (see 'Recording water sources' on page 75 and 'Recording soils and geological formations' on page 76).

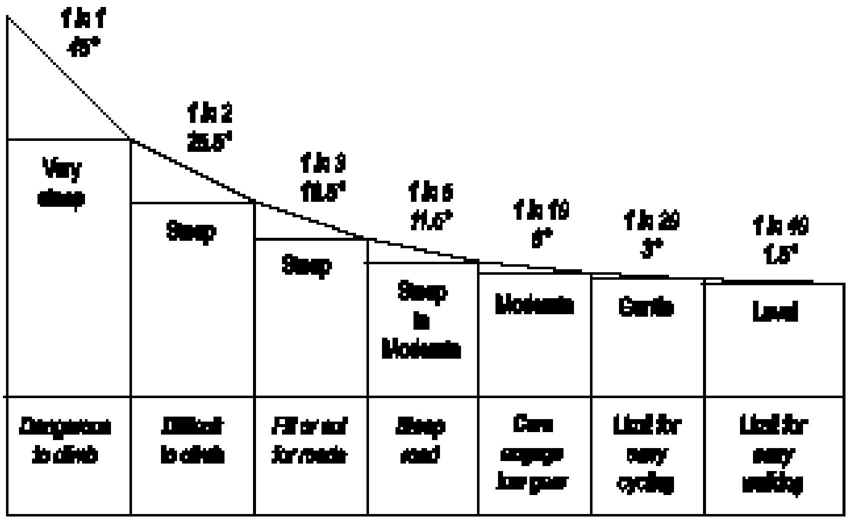
Archaeologists record **slope** as a guide to the **integrity**, or the degree of intactness, of a site. Any artefact which is still in the same position as when it was discarded is called ***in situ***. Archaeologists look specifically for *in situ* artefacts, because these have the most potential for revealing unambiguous information about human behaviour in the past. This is why assessing the integrity of a site is so important. If a site is largely undisturbed (if its integrity is good), then the artefacts within it are likely to be *in situ* (in the same positions as when they were last used). If a site has been damaged or disturbed in any way, however (i.e. if its integrity is poor), then there is less likelihood of the same high level of reliable information being retrievable.

In terms of recording slope, artefacts on a steep slope are more likely to have been disturbed as a result of gravity than artefacts on a flat area. This can also be a useful guide when assessing the boundaries of the site. Take the example of a stone artefact scatter extending several hundred metres with, say, 30 artefacts distributed randomly along it. If the site is located on flat ground, or on only a slight slope, you might conclude that the artefacts are part of one, long continuous site. If the site has a steep slope, however, it might be reasonable to conclude that the artefacts could be the result of a number of events, and that they should therefore be recorded as individual sites. In making such interpretations, slope should only be used in conjunction with other evidence. In this scenario, it would also be important to assess whether the artefacts occurred in discrete clusters, or if they had a relatively continuous distribution.

Slope is recorded in degrees, either using a clinometer or estimated according to eye (see Figure 3.4 on page 75). Using a clinometer is similar to taking a bearing with a compass. You sight through the clinometer along the angle of the slope and, depending on whether you are sighting uphill or downhill, you can read the degrees of elevation or depression. Sighting along flat ground (a horizontal plane), for example, will give you a reading in the 0–2° range. Tilting your head (and thus the clinometer) above the horizontal plane will give you a reading in degrees of elevation. The higher the number, the greater the slope. A mid-slope is in the 5–10° range and steep areas will have a value of greater than 10°. Conversely, if you are standing at the top of the slope looking down, then tilting your head and the clinometer below the horizontal plane will give you a reading in degrees of depression.

If you are searching for archaeological sites, the most fruitful areas will be those with a gradient of 10° or less. You are unlikely to find sites on slopes with a gradient higher than 10°, mainly because people in the past will have preferred level or gently sloping ground for pathways and campsites, or because gravity may have caused the material to move to lower ground.

FIGURE 3.4: A guide to estimating slope by eye. When estimating slope, bear in mind that the eye tends to exaggerate slope



RECORDING WATER SOURCES

One of the major environmental factors affecting human behaviour is water. People need to drink often and usually will not range far from reliable water sources. In those circumstances where they do, this is in itself an indication of a particular behaviour (such as obtaining rare or prized resources). This is less true for historic sites than for Indigenous sites, but still holds as a general rule. The main types of water sources are:

- permanent water, such as rivers and soaks;
- semi-permanent water sources, such as large streams, some swamps and billabongs;
- ephemeral water sources, such as small streams or creeks;
- underground (artesian) water sources.

Proximity to water influences not only the number of sites likely to be found, but also the artefact density at those sites. Though sites can be located quite a distance from water sources, most are located in reasonably close proximity. In fact, the vast majority of Indigenous archaeological sites are likely to occur within 500 metres of a water source (Byrne 1993: 18) and, in general, sites located a long way from water will tend to be smaller and contain relatively few artefacts. Sites located immediately near a water source are often situated on ground which is reasonably elevated above that source rather than on the flats immediately adjoining it, since these are likely to have been subject to periodic flooding. Water sources also provide potential access to specific site types which will not exist anywhere else, such as axe-grinding grooves or native wells. When assessing the relationships between sites and water sources, it is important to remember that the Australian continent has undergone massive environmental changes during the 50 000 years that people have lived here, and that **Pleistocene** sites (i.e. sites which are older than 10 000 years) would have been located in relation to Pleistocene water sources which may not necessarily still exist today.

When conducting a survey for Indigenous sites, you must record the location of all water sources in the proximity. As part of all site recordings, make sure that you note:

- the distance to the nearest available water source (which may be an ephemeral creek);
- the distance to the nearest *reliable* water source; and
- the type of source in both cases.

RECORDING SOILS AND GEOLOGICAL FORMATIONS

The geological makeup of a region will affect the patterning of archaeological evidence in two ways. The availability of particular types and quantities of stone resources will have affected Indigenous people's access to the raw materials needed to make stone artefacts, and local soil types and conditions may have influenced the availability of particular plants and animals in the past, as well as the ultimate preservation of archaeological sites in the present. Knowing the location of rock outcrops suitable for making stone artefacts is invaluable to the field archaeologist, as it is likely that Indigenous quarry sites, and the production of stone artefacts associated with them, will occur in the immediate vicinity. As a general rule Indigenous people tended to make stone artefacts from very fine-grained types of stone, as these produced the sharpest edge. Chert, mudstone, silcrete, chalcedony and quartzite are all common sources for stone artefacts throughout Australia, although not all stone artefacts are intended for cutting. Sandstone was a common material for making grindstones, and granite—a hard volcanic rock—a common material for stone axes and adzes. When recording sites in the field, you should always record the location and nature of any available stone artefact raw material sources in the area.

Sometimes on a survey you will encounter large areas of natural rock outcrop which may well be the kind of stone that Indigenous people favoured for stone artefacts, but which may not actually have been used for this purpose. In some cases, this background material may be sufficiently similar to real artefacts to be confusing. Silcrete, for example, can be fractured by the heat of the sun or by bushfire to resemble artefacts which have been heated in a campfire. While the spalling on the surface of the stone may be identical to that on deliberately heat-fractured stone, it is a natural product. Such confusing material is often referred to as **background 'noise'**, and is one of the many things that can interfere with your ability to identify artefacts correctly.

Recognising stone artefacts in the field

The trick to recognising stone artefacts in the field is 'getting your eye in', or training yourself to recognise things that are out of place. Because they are usually chosen for their particularly fine grain, most stone artefact raw materials are visually distinctive and stand out from the local soil and other natural stones around them. When you're surveying, keep a lookout for anything which is of an unusual colour compared with the background material, or anything which is particularly smooth or cryptocrystalline (i.e. the grain of the stone is too fine to see with the naked eye). If you find something which is suspiciously artefact-like, but is not something you can be completely sure about, examine the surrounding area very carefully. Always pay particular attention to areas close to water.

If you think you have found a stone artefact, look carefully for any of the telltale signs that mean it is a deliberate humanly made product, rather than an accidentally or naturally fractured piece of stone (see 'How to identify a flaked stone artefact' on page 209).

Soil type is important to archaeological fieldwork in two ways. First, the ability of a particular type of soil to support plant and animal resources which may have been used by Indigenous peoples or non-Indigenous settlers is crucial to the potential for finding archaeological sites. Second, the local soil conditions—in particular, whether soils are **aggrading** (i.e. accumulating, such as when a river valley silts up) or **eroding** (i.e. being removed)—have a great bearing on archaeological visibility. For example, small artefacts may be covered by redeposited soils in an aggrading environment, but exposed in an eroding environment. Unfortunately, geological maps cannot provide this crucial information, although topographic maps will give some general guides, such as whether areas are likely to be flat (and therefore possibly aggrading) or steep (and possibly eroding). The only way to record this information accurately is to take constant note of the conditions you can see around you during the survey, paying particular attention to the size, frequency and cause of eroded areas (see 'Determining effective survey coverage: what reveals, what conceals' below).

RECORDING DISTURBANCE

There are many different factors which can disturb an archaeological site over time, from accidental or deliberate human activity (ploughing, construction, demolition, removal, scavenging) to the activities of animals (grazing, trampling, burrowing, digging), insects (nesting, burrowing, eating) and plants (tree roots, vegetation overgrowth). Even the elements can disturb a site's integrity through erosion, deposition, scouring or natural collapse. In reality, no site is likely to remain totally unaffected by some type of disturbance process. The collective name which archaeologists give to these activities is **taphonomic processes**; any source of such a process is called a **taphonomic agent**. An assessment of the range of taphonomic processes which might have affected a site through time is principally your assessment of the integrity of a site, not only in terms of how disturbed you think it may be, but also in terms of what might have caused, or be causing, this disturbance. For this reason you need to record any potential sources of damage to a site, and assess whether you think the site is in excellent, good, fair or poor condition.

A good understanding of taphonomic processes and their effects will also be essential for interpreting the results from any surface survey or excavation, since one of the principal aims of the analysis will be to try to isolate which artefactual patterns are a result of human behaviour and which are simply reflecting the results of various taphonomic agents.

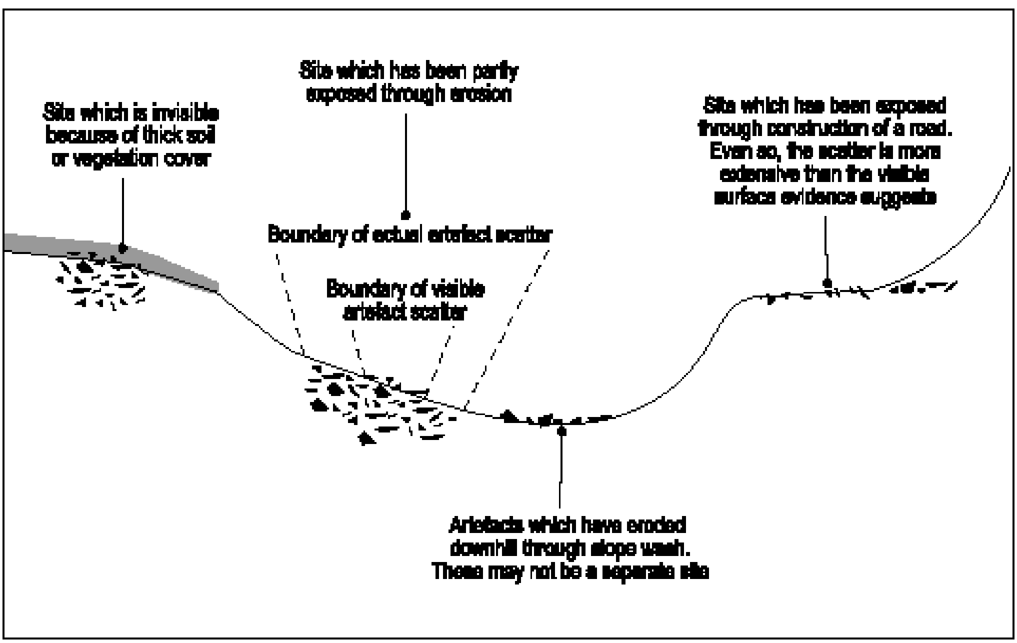
DETERMINING EFFECTIVE SURVEY COVERAGE: WHAT REVEALS, WHAT CONCEALS

Effective survey coverage is not just how much of the survey area you have physically covered, but how favourable the conditions were for you to locate artefacts and sites. Some sites are highly visible (such as buildings, scarred trees or rock shelters), while others (such as isolated artefacts) can be more difficult to locate and may even go unrecorded if vegetation or soil obscures them. As a result, there are two closely related factors which can skew the results of any archaeological survey:

- ground-surface visibility (i.e. how much of the surface is visible to you and what other factors—like vegetation, introduced gravel or leaf litter—might limit the detection of artefacts across this surface);
- ground-surface exposure (i.e. what are the prevailing sedimentation conditions? Is the ground-surface aggrading, eroding or stable and what kind of exposures are apparent as a result?).

If you are surveying in an actively eroding area such as a creek gully, there is a greater likelihood that artefacts will be exposed, but if you are walking through a relatively stable and heavily grassed paddock there may well be artefacts present which you simply cannot see. This is why you need to make careful note of the changing vegetation conditions and degree of ground cover across the survey area, as well as the type and size of any exposed areas that you encounter. Information about what has caused or contributed to the disturbance will also allow you to estimate how well preserved the site is or how seriously it has been affected.

FIGURE 3.5: The relationship between visibility, surface conditions and the likelihood of finding archaeological sites



To do this properly, you really need to make some estimate of how much of the ground surface is visible to you during a survey, and how much of this visible area has been eroded or disturbed, and is therefore more likely to reveal archaeological material. To do this, you need to take note of the approximate percentage of the survey area which is visible as bare ground, and the approximate percentage which is exposed through erosion (see Table 3.1). This does not mean that you should only focus your survey on exposed areas and ignore anything with less visibility. It is perfectly possible to find sites in areas which technically have no visibility, provided the artefacts are conspicuous enough.

These measures are usually represented as a percentage—either of the total survey area if it is small, or within each transect or landform unit if the survey area is large. In general it is accepted that the outcomes of any archaeological surface survey can only be representative of the *visible*, rather than the *existing*, archaeological record.

TABLE 3.1: Recording visibility and exposure: two critical factors in being able to locate archaeological sites

Recording what reveals (exposure areas)	Recording what conceals (visibility)
Note the types of exposures which you can see (e.g. gully erosion, vehicle tracks, animal pads, areas of patchy grass cover)	Note the type of ground cover which is evident (grass, shrubs, leaf litter, gravel)
Note the causes contributing to this disturbance (e.g. recent rains, grazing animals, uprooted trees, ants' nests)	Note the approximate percentage of ground cover*
Note the approximate percentage of the ground surface which is exposed*	Note the presence of any distracting effects, such as gravel or naturally heat-fractured stones, which may make the identification of artefacts more difficult
Note the approximate dimensions of the exposed areas	Note any other factors which may prevent you from seeing artefacts (such as dumped soil or gravel, soil slumping)
You should also note the sedimentation conditions across the study area—which parts are actively eroding? Which aggrading? Which are stable?	

* You could assess this for the survey area as a whole, but it is more meaningful if you estimate it for each transect which you walk, or for each landform unit through which your transect passes.

WHAT TO DO WHEN YOU FIND A SITE

Recording a site is a selective process. On some fieldwork projects you will have ample opportunity to record every last detail, while on others you will have limited time and a lot of work to get through. Regardless of which situation you find yourself in, there are basic minimum requirements for recording any Indigenous or historical site. Recording *at least* these aspects will ensure that, even if no further research is ever done on that site—or, in a worst case scenario, if it is destroyed before further research can be undertaken—at least there will be a sufficient record of it.

Basic locational information

- Record a grid reference for the site, either taken using a GPS, or plotted by hand from a topographic map (of at least 1:100 000 scale) (see 'Using a map to calculate a grid reference' on page 36).
- Include a description of how to get to the site. Imagine someone else trying to relocate the site from your instructions—how would you tell them to find it again?
- Make a mud map of how to get to the site which can complement your written description. Include major landmarks or features and approximate distances along the route.

Basic descriptive information

- Include a brief description of the nature of the site, including its type, size and environmental context.
- Make a brief list of the major features of the site and its contents, including an assessment of whether further research at the site is warranted.
- Include a brief assessment of the condition of the site and its contents (i.e. Is it well preserved? Has it been damaged in any way? How much has been damaged? Is it in danger of being damaged in the future?).
- A sketch plan of the site should also be made. This does not have to be measured accurately, but on the plan you should include an arrow indicating the direction of north, and some idea of the scale (otherwise the plan will be meaningless) (see 'Making mud maps' on page 42).
- Take photographs of the site and its contents illustrating significant features (see Chapter 9: Photography and illustration).

For management purposes (see Pearson and Sullivan 1999: 116), you should also note:

- the name of the landowner and their attitudes to the site;
- the ownership status of the land (if known). Is it freehold? Leasehold? Crown Land?

Once you've found a site, there are various obligations to notify the relevant heritage authority within a certain timeframe (see 'Working with the legislation' on page 20).

You may also have to fill out a recording form for your site and submit this to the same authority. Check with the relevant government department to find this out.

In addition to this basic information, you may also need to collect specific information relating to your research questions. A formalised recording form is the most efficient way of gathering your information consistently, particularly if you are recording the same variables at many different sites. A good form can act as a checklist, standardise terms and parameters and greatly speed up the recording process. Some examples of recording forms are included in Appendix 1. Other examples can be found in Flood, Johnson and Sullivan (1989) and Davies and Buckley (1987).

DEFINING A SITE BOUNDARY

Obviously some sites will have clearly defined physical boundaries (such as a rockshelter, or a stone arrangement), while others will be much harder to determine unless the visibility is excellent. One definition of an open 'site', in fact, is that it is only a unit of current human observation and not necessarily a unit of past human behaviour. This means that a 'site' may simply be a small 'window' in the landscape where artefacts are exposed on the ground surface—as a result of erosion for instance—and not necessarily an accurate reflection of the full extent of the site (see Figure 3.4 on page 75 and 'Defining the boundaries of an open artefact scatter' on page 219).

If you find a site simply because of better ground-visibility in a particular place, it is possible that the site is more extensive than you can see (i.e. there may be more artefacts in the soil beneath those you can see or hidden by the ground cover around those you can see). Open sites in particular often tend to be larger in size than what is visible on the surface. This can often make it difficult to decide on the site's boundary: is it simply the limit of visible artefacts? Is it the limit of the eroded area (if this is what has allowed you to see the artefacts in the first place)? If you have defined a site as a concentration of artefacts which is noticeably greater than the background scatter, do you draw the boundary at the limit of the concentration? You may even decide to use an arbitrary boundary, such as a fenceline or vehicle track to define a site. It is really up to you how you define a site's boundary—just make sure that you note clearly what criteria you used to reach this decision and record it in your field journal and report.

The information from your survey must always be interpreted with care. Remember, the absence of artefacts does not necessarily mean the absence of archaeology on that spot (simply that you cannot see it), just as the presence of artefacts does not necessarily imply that the human activity from which they arose occurred precisely on that spot (they may have been moved there as a result of erosion, downslope movement or ploughing, for example). You need to record as much information about the context of sites or artefacts as possible when you are in the field and take this into account when you draw your conclusions.

WHAT NOT TO DO AT A SITE

In the event of finding a site there are some simple rules to follow. Most of the advice about what not to do at a site is not only good ethical practice, but simple common sense:

- Don't interfere with the site in any way. Signing your name, chalking in engravings at art sites, or digging or collecting artefacts without permission are not only irresponsible but also illegal.
- Don't collect 'souvenirs', even to verify to state authorities that you have found a site. There might be some exceptional circumstances in which you should collect material from a site—such as when it is at risk of imminent destruction—but this would be highly unusual.
- Don't leave rubbish behind—take it with you when you go.
- Don't make details of the site public without obtaining the proper permissions first. Indigenous people in particular may wish to protect sites by keeping their details secret. In Queensland, making the details of a site public is illegal without state permission.

A NOTE ON CLASSIFICATION SYSTEMS

When you locate a site, or record a series of sites, you will have to label these sites with some shorthand title to be able to refer to them in a meaningful way. 'The long narrow site in the bend of the river closest to the homestead' may be a good physical description, but it will be an unwieldy mouthful if you need to constantly refer to it in a report. Likewise, 'Site 1' may seem a logical description at the time, but does little to tie the site into your particular research program or its geographic area. Many archaeologists label sites with a meaningful alphabetical prefix (such as the first letter of the name of the property on which it is found or the consultancy project which generated the survey) and then a sequential number for each site found. Indigenous sites located during a power line survey for Transgrid Pty Ltd in Armidale, New South Wales for example, were labelled 'TG1', 'TG2', 'TG3', etc. Other systems superimpose an imaginary grid over the research area and label each site according to its location within any square of this grid. Sites recorded in the Selwyn Ranges in northwest Queensland as part of an ongoing research program, for example, have designations such as 'LzBe1' which, although unpronounceable, ensured that each site name was unique to that research program. While it is entirely up to you how you code your sites, try to make your site designations meaningful and always think in the long term, particularly if your data are going to end up in a computer database which centralises information from hundreds of different archaeological site reports (such as any government site register). How many site 'S1s' are there likely to be? If your field journal or site report ever became separated from your site photographs, how likely would it be that someone else could identify those sites as belonging to your research alone?

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USEFUL WEBSITES

http://archnet.asu.edu/archnet/uconn_extras/theory/sampling/sampling.html.

Covers the different kinds of sampling strategies and lets you click on samples to see the results of a hypothetical survey.

http://arts.anu.edu.au/arcworld/resources/paa/arcrock.htm.

Peter Hiscock's site for stone artefact research in Australia contains links to other stone artefact sites and information.

CHAPTER FOUR
SITE SURVEYING

WHAT YOU WILL LEARN FROM THIS CHAPTER

- The basic principles of a chain survey
- How to produce quick and accurate site plans
- How to keep your errors to a minimum
- How to set up and use an automatic ('dumpy') level
- How to record survey information in your field notebook and on recording forms

The basic surveying toolkit

At least two 25 metre, 30 metre or 50 metre tape measures (larger sizes are best)
At least two 5 metre, 8 metre or 10 metre retractable tape measures (larger sizes are best)
Compass
Nylon builder's line/string
Plastic clothes pegs (for fixing a tape measure to a string baseline)
Tent pegs, or wooden stakes (for fixing the ends of a baseline)
Mallet
Plumb-bob
Ranging rod
Drawing equipment (see Chapter 9)

Optional
Levelling instrument (automatic level, EDM, theodolite, total station)
Tripod
Stadia rod or prism staff
Walkie-talkies

THE BASICS

A site plan is the simplest and most effective way to record spatial information about a site. Even if there is only enough time to draw a sketch plan, you can still use this to convey the basics of the extent, form and main features of the site. A clear and accurate site plan is an essential part of any site recording (see 'What to do when you find a site' on page 80).

Making your survey as accurate as possible

Obviously you can't just go and make a series of totally unconnected measurements at a site and then expect to be able to use them to draw up a coherent site plan. It is no use knowing that the barn is 5.8 metres from the fence if you have no idea where the fence is in relation to anything else. Or knowing that the fence and the barn are 5.8 metres apart if you didn't measure how long the fence was or where, precisely along its length, the barn was located. Even if you made sure to measure the position and dimensions of every feature by moving systematically around the site ('the house is 12 × 8 metres, the fence is 3 metres from the southeast corner of the house and is 25 metres long, the barn is 5.8 metres from the ninth fencepost from the northern end'), if you have made one mistake at any point in this sequence, then every other subsequent feature which you measure in relation to this will also be out of position. At the end of the exercise you will still not be able to create an accurate site plan and all your time will have been wasted.

The most important element in an accurate survey is to ensure that the location of all features can be tied together in such a way that there are no 'floating' measurements and the sources of error can be kept to a minimum. This can only be done through the use of a fixed reference point from which each feature is measured, and therefore to which the location of each feature can be securely tied (this is called a **site datum**). The datum may be a wooden peg which you hammer into the ground, or some other fixed feature of the site. This datum is often related to an arbitrary line that you establish through your site for the purposes of survey. Such an arbitrary line is called a **baseline**, and if possible one end of this baseline should be fixed to the datum point. Any measurement from a baseline to a feature is called an **offset**.

Your baseline may be a long tape measure (this is certainly simplest, because the distance along the baseline is easy to read off the tape), or a string-line of known length which you have fixed to pegs in the ground. Where you place it will depend on the size and shape of your site; because it is an arbitrary line which you are using for convenience, it doesn't matter where in the site it is located, as long as you can plot most or all of the features from it. If you are recording a stone arrangement, for example, you might choose to fix the baseline through the centre of the arrangement so that you could conveniently plot all of the stones on either side of it. Similarly, if you are recording a collection of farm buildings, you may be able to use a fixed fenceline (provided you have measured it first) as your baseline.

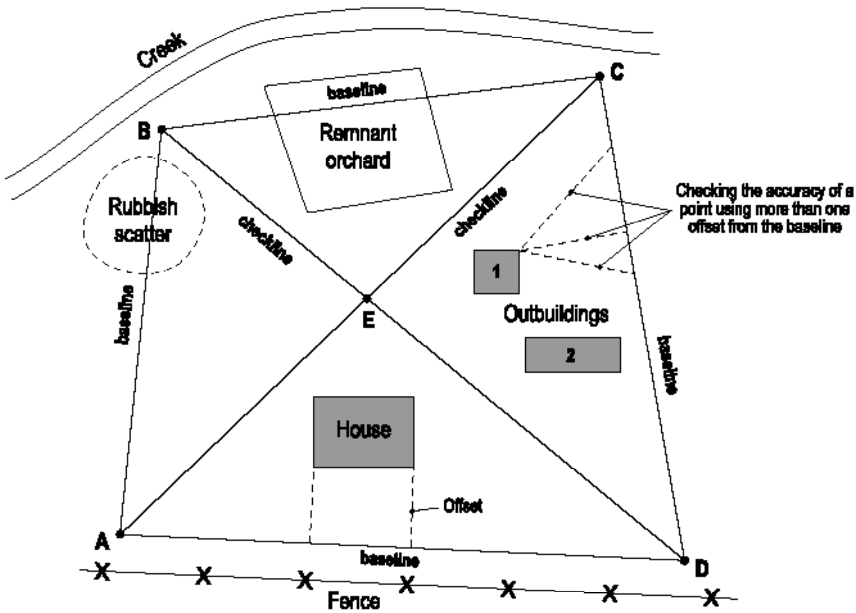
If your site is particularly large or spread out, you may need to establish more than one baseline to be able to reach all features. In this case, you could use the position of the first baseline to establish the position of the second and so on, but bear in mind here that if you have made any errors in establishing the position of the second baseline, then any subsequent baselines will also be out and there is a real likelihood that your errors will be compounded. To try to control this process of cumulative error, the most reliable means of surveying an area is to set up a series of baselines around the perimeter to form a **framework** which encases the site (see Figure 4.1 on page 88). This uses all the same principles of measurement as a single baseline, simply repeated around each side of the framework until all the details have been plotted in.

When establishing a framework, you need to keep a few basic rules in mind:

- Use as few lines as possible to keep your errors to a minimum (any form of quadrilateral is ideal).
- Make sure that the framework is 'rigid'—in other words, that your starting point is also your end point.
- Make sure that you check the accuracy of your framework before you begin detailed measurement by not only measuring the length of the outside perimeter, but also the diagonals between points. This is why surveyors commonly divide an area to be surveyed into triangles, then measure all of the sides (Hobbs 1983: 44–45). These diagonals are essential checklines which will help to keep your framework rigid.
- Try to keep the angles of the triangles in your framework between 30° and 120°. If your angles are greater than 120°, it is easy for errors to creep in.

By establishing a framework first, you give yourself a method for keeping a constant check on the accuracy of your plan without running the risk of getting bogged down in the details. A good framework will use the key elements of a site to establish the main spatial relationships between features. Once you have established this, you will easily be able to check how accurately you have positioned the details in relation to these features

FIGURE 4.1: A framework of baselines, the essential elements of any site plan



and in this way your errors should be kept to a minimum. This is what surveyors mean when they use the maxim: **Always survey from the whole to the part**. This simply means establishing your baseline or framework first and only then measuring in the detail of particular features (see Figure 4.1).

When establishing any baseline, either alone or in a framework, there are several rules to bear in mind:

- All measurements along a baseline should begin from the same point (i.e. the same end of the baseline). This will be less problematic if you use a tape measure as a baseline, because all measurements will begin at 'zero'.
- Always measure along the baseline first and only then to the feature, and always record your measurements in the same order.
- Do not move or disturb the baseline until all measurements from it are complete, including any last-minute checks you need for accuracy.

Keeping your errors to a minimum

The biggest problem with all forms of survey is the potential for error to creep into even the most careful measurements. When you are making a series of measurements, it is very easy for one measurement to be slightly out, thus making the next slightly out, and so on. If these errors are allowed to accumulate, you could end up with serious problems. This is why the other basic premise of all surveying is to constantly be on the alert for potential errors, and to keep these to a minimum wherever possible. This may be something as simple as making sure that all sides of your framework can be placed in areas which are free of excessive vegetation or other obstacles, making sure that everyone is familiar with the tape measures you will be using so that no mistakes will be made in calling out measurements, or making sure that all measurements are recorded consistently in a log book. You will have to accept that some margin of error will be inevitable in all surveys (unless you are lucky enough to be using state-of-the-art electronic surveying equipment), but always aim to keep this within acceptable limits (see Table 4.1 on page 113). The only way to achieve this is to **make independent checks on your measurements as often as possible**. Remembering the tendency of surveyors to divide their survey areas into triangles, the simplest way to make an independent check on your framework is to not only measure the sides of your framework, but also to measure and plot the diagonal checklines between corner points (see Figure 4.1 on page 88). Obviously this will not always be possible, particularly if there is vegetation in the way or if you are plotting a site from a central baseline only (see 'Using the baseline/offset technique' on page 96). In this case, you can make independent checks on the position of key features by plotting them from more than one point along the baseline (see Figure 4.1 on page 88). You should do this for all major features of your site anyway, and for any features which are particularly important to your research goals and thus which need to be plotted accurately.

TECHNIQUES FOR CONSTRUCTING A SITE PLAN

The simpler forms of site plan use basic orienteering skills which anyone can master; the more complex require particular items of equipment which may not always be available. The two simplest and least technical methods for constructing a site plan are:

- compass and pacing;
- baseline and offset.

The advantage of these techniques is that they require little in the way of equipment and can be used in any situation. If you have to carry your equipment a long way to reach a site, there are obvious advantages in using simple techniques requiring basic equipment. There are disadvantages, too, in that these methods will not give the same accuracy as more sophisticated survey equipment, such as an automatic level or a total station/EDM.

The choice of which method to use will once again come down to time and resources. Probably the best way to deal with this dilemma is to decide how detailed your plan needs to be. If you were mapping a site which was going to be destroyed, then you would want to record everything in minute detail, as this may well be the only recording which will ever be made of this site. In this case it would be best to use some form of electronic distance-measuring device, such as a total station, as this would give you a highly accurate and detailed result. If, on the other hand, you simply wanted to produce a plan showing the main physical features of a site as part of public record or for publication (bearing in mind that most plans are greatly reduced in size for publication and that, as the scale becomes smaller, the ability to depict finer units of measurement decreases—for more information see 'Using maps' in Chapter 2 on page 33 and 'Drawing horizontal surfaces (plans)' on page 286), then it is probably more effective to use a simpler and less time-consuming technique. Whichever method you choose, make sure that you include an accurate description of it when writing up the methods in your report (for more information, see Chapter 10: Getting your results out there).

If at all possible, it is best to plot your results into a site plan while you are in the field (i.e. at the same time that you are taking measurements). This way you will be able to catch any mistakes as they arise and will be able to check on compass readings or particular measurements immediately. If you leave the site and then wait for a few days before you try to turn your measurements into a site plan, you run the risk of lumbering yourself with mistakes which you may not be able to correct. Of course, this may not always be practical (particularly if you are recording a site by yourself), but try to draw up your plan as soon as possible while it is still fresh in your memory.

USING THE COMPASS AND PACING TECHNIQUE

This technique uses the length of your own stride to measure distance and a compass to plot direction. Its great advantage is that it enables one person to create a reasonably accurate plan of a small area relatively quickly. Before you can employ this technique in the field, however, you need to calculate the length of your stride, or your **pacing unit**. This is the average length of a single step and varies from person to person. It also varies for the same individual, depending on whether you are walking uphill (when your pace will be shorter) or downhill (when your pace will be longer). It may even vary at the beginning and the end of each day according to how tired you are.

The compass and pacing technique is really only accurate for small areas, although the basic principles (i.e. taking a bearing with a compass to give direction and then pacing the distance to give a measurement in metres) can also be useful when navigating (to keep track of where and how far you have walked) or to give you the rough dimensions and spatial relationships of a site when drawing a mud map. Your pacing unit will be useful any time you need to make quick approximate measurements.

How to calculate your pacing unit

To do this, you will need an area of relatively flat ground. Measure out a length of 25, 50 or 100 metres (you are actually going to calculate your pacing unit as an average of 100 metres, but if you can't find that much room lay out a smaller length and multiply it accordingly later) and walk this distance at least ten times. Because your unit will be an average, the more times you do this, the more accurate your final pacing unit will be. Note the number of paces it takes you to walk this distance each time. Add these up and divide by the number of times you walked the distance to average the number (if you have used a smaller measured length of 25 or 50 metres, you will need to then multiply the average by four or two to arrive at a figure per 100 metres). Divide 100 by this average to give you your pacing unit. For example, if you've walked a length of 100 metres twenty times and the sum of your paces came to 2500 then, divided by 20, this would give you an average of 125 paces per 100 metres. Divide 100 by this average to equal a pacing unit of 0.80, or 80 centimetres. To use your pace as a unit of measurement, simply pace out the dimensions of whatever you are measuring and multiply by your pacing unit to arrive at a figure in metres. If your pacing unit was 0.80, for example, then a feature which you measured to be 6.5 paces in length would be in reality 5.2 metres long.

Remember to maintain a comfortable walking pace as you pace out your measured length and whenever you use your pacing unit to measure features at a site. If you exaggerate your steps, you will never obtain an accurate or replicable measure of your pace. You should also perform this exercise on sloping ground (on around a 15–20 per cent slope) to give you a unit for measuring up or down hills.

How to plot an area using the compass and pacing technique

- Work out a framework for your survey, such as the outer boundaries of the site, so that you can plot in all of the detailed features from this framework. Use as few lines as possible, but make sure that your framework is rigid—in other words, that the starting and end points are the same. If you leave your framework open, you will have no way to check on the accuracy of your measurements. Each side of this framework is called a **traverse**.
- Beginning at the starting point (Point A), take a compass bearing (see 'Taking bearings' on page 47) to the second point (Point B) on the framework by aligning the compass either on a feature (if this is what you have used as a point), or on a ranging rod held

at the point. In surveying terms, such a bearing is often referred to as a **foresight**. Note down the bearing and count the number of paces it takes you to walk to that point. Make sure you walk in a straight line, noting the distance along the line of any features which cross it and the nature of these features. When you reach the second point you need to take a back-bearing (in surveying terms, a **backsight**) to the starting point as an independent check. Remember that the difference between your foresight and your backsight should equal 180° (see 'Using a compass' on page 47), although an error of plus or minus 2° is perfectly acceptable. If the difference is greater or less than 180° you will have to check your bearings and possibly take them again. It's important that you get this part of the exercise right, otherwise your plan will not be accurate. If you are still having trouble, look around for any sources of magnetic interference which might be present, such as power lines or fences.

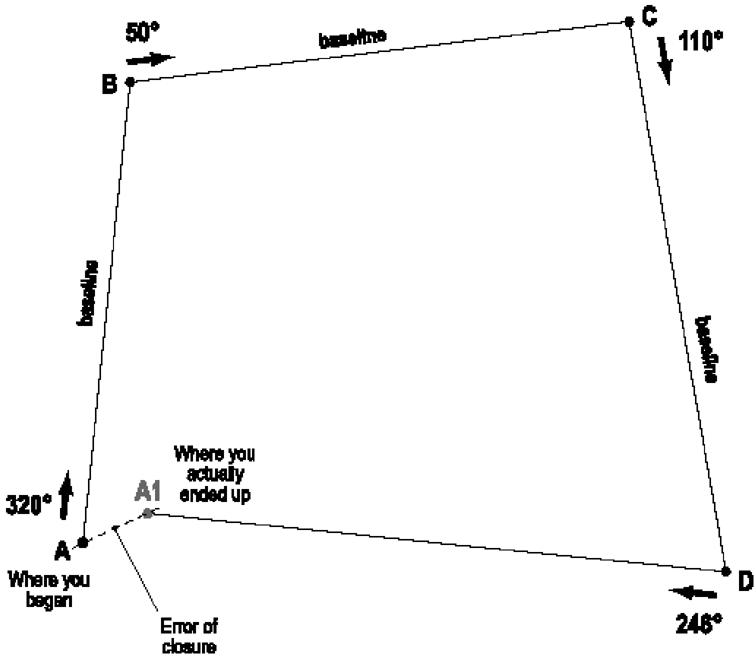
- Continue around the framework taking bearings to each new point, noting the distance and nature of features along each bearing and taking back-bearings (see Figure 4.2 on page 93), until you arrive back at your starting point (Point A again). This is called **closing** the traverse. Once you have completed your traverse, you can take bearings and measurements to any additional features located inside or outside the framework from any of the points on the framework.
- Plot your plan on to graph paper. Using a scale rule, work out a suitable scale so that you can fit all of the features on to the paper (you may need to roughly sketch in the dimensions and shape of your framework by hand to make sure that it fits on the page), aligning magnetic north to the vertical lines on the graph paper.
- Beginning at your starting point (Point A), use a protractor to plot your first compass bearing on to the graph paper (see 'Taking bearings' on page 47). Convert the number of paces to metres by multiplying the number of paces by your pacing unit and measure this distance onto the page along the protractor bearing. Continue this process for all of the points around the framework. Because inaccuracies are inevitable in both the compass readings and the pacing measurements, it is unlikely that your traverse will close (i.e. that your starting and end points will plot on to the graph paper in the same location). Because of this, we will call the end point (which is really the same as the starting point) Point A^1. The distance between your original starting point (Point A) and end point (Point A^1) is called the **error of closure** (see Figure 4.3 on page 94).

The best level of accuracy that can be achieved by a compass and pacing survey is approximately 1:300, or an error of 1 metre in every 300 metres. The error of closure should not exceed 1:100 (Davies and Buckley 1987: 141). This means that, if the total length of your survey framework was 500 metres, an error of closure of 5 metres is the maximum acceptable error. Anything less than this is better of course, though it is unlikely that your error of closure would be less than 1.6 metres.

FIGURE 4.2: When recording the information from a compass and pacing survey, it is standard practice to start at the foot of the page and proceed upwards, making sure that the figures for bearings and distances cannot be confused. A line is drawn across the page to signify the end of each leg, and details of features on either side of the route entered to the right or left of the central column of measurements depending on their location.

301° (BB) 121° (B)	Open paddock Clump of trees extends Grazing land	800 back to point A 200 (clump of trees) D (0 paces)	Open paddock Shed Grazing land
30° (BB) 206° (B)	Grazing land Creek	600 to point D 350 (crossing creek again) C (0 paces)	House and grazing land Creek
152° (BB) 330° (B)	Creek Open paddock	1000 to point C 400 (crossing creek) B (0 paces)	Creek Open paddock
252° (BB) 70° (B)	Open paddock	500 to point B 300 (following fenceline) A (0 paces)	Large fig tree
Bearings and back bearings	***Features visible to the left***	***Paces walked & features encountered***	***Features visible to the right***

FIGURE 4.3: Plotting a compass and pacing survey

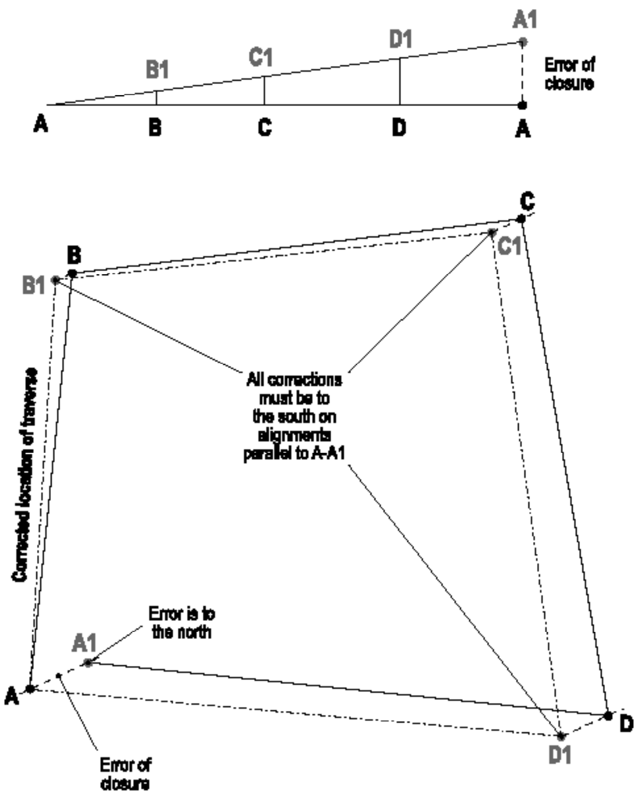


- Before you can correct this error, much less start plotting details on to your survey plan, you need to make sure that the error of closure for your traverse is within the acceptable limit. Add up the total length of your traverse (i.e. add the distances for each leg of your framework). Divide this number by your error of closure distance (i.e. the distance between Point A and Point A^1 as plotted on the graph paper). If you arrive at a figure between 100 and 300 you are within the acceptable limits.
- To correct for an error of closure, first draw a line on your plan between Point A and Point A^1 (remembering that they should actually be the same point) and measure the distance between the two. Using a set square, draw lines parallel to this line through each point on your framework (you will need these lines later to correct the positions for each point) (see Figure 4.3).
- Now you need to construct a special linear scale to illustrate the error of closure between your starting point and your end point. To do this, draw a straight line which is equal to the total length of your traverse. Obviously, because you are drawing this on to a sheet of graph paper, you will have to use a suitable scale to fit this line on the paper. The scale will have to be much smaller than that used for plotting the framework and will really have to be smaller than 1:1500 to work properly. A total traverse

length of 300 metres, for example, could be drawn at a scale of 1:1000 (or 1 centimetre = 10 metres) as a line which is 30 centimetres in length. The left-hand end of this line represents your starting point (Point A), the right-hand end your end point (Point A^1) (Figure 4.4). Make sure you mark off the position of each point in your traverse along this line.

- On the right had side of this line, draw a perpendicular line equal to the length of your error of closure distance (remember to reduce it to the same scale you used to represent the total traverse length). In the example above, for instance, say the error of closure distance was 5 metres. To equal this distance at a scale of 1:1000, you would draw a perpendicular line 5 millimetres long at the right-hand end of your scale.
- Join the top of this vertical line back to the starting point (so that you have a triangle) and, working from the left-hand side, draw vertical lines marking off the position of each point in your traverse. The top of these lines will become points B^1, C^1, D^1, etc. These distances represent the corrections necessary to adjust the error of closure at each of these points.

FIGURE 4.4: Correcting the error of closure



- You will notice that the length of the vertical lines increase as you move towards the right-hand end of the scale; this is because they indicate the cumulative error which increases for each leg of your survey. The length of these lines also indicates the distance of each plotted framework point from its correct location—simply use the length of each line to measure the correct location for each point on your plan. On the traverse map, draw lines through B, C and D, etc. that are parallel to the line you have already drawn through A and A^1. Use the corrections established above to determine the positions of B^1, C^1, D^1. Remember always to plot the corrected position for each point in the same relationship as that for your starting-point and end-point. In other words, if your end-point plotted to the southwest of your starting point (meaning that the correct location is really to the northeast), make sure that you plot the corrected position for every other point to the northeast also. Join A to B^1, C^1, D^1 and then back again to A. Your traverse should now close (see Figure 4.4 on page 95). If not, you have serious problems and may have to start again.
- You can now plot in the details of your plan, remembering always to include the names of the people who made the map, the date, site, a scale, a north arrow and a legend if you have used symbols (such as shading or cross-hatching) to depict detail. Because your compass readings will indicate magnetic north only, you should also use the degree of declination from a topographic map (see 'Using a compass' on page 47) to indicate true north.

USING THE BASELINE/OFFSET TECHNIQUE

This technique uses the same principles as a compass and pacing survey (i.e. measuring the location of features from an established baseline) and requires little more in the way of equipment than a couple of long and short tape measures. Because it requires measuring to and from the baseline, however, it requires the labour of more than one person.

- First lay out a baseline. A long tape measure is best for this, as the distance along the baseline can easily be read off the tape as the survey progresses. Give careful consideration to where you lay out your baseline—it should be aligned in such a way that most (if not all) of the features can be measured from it without having to lay out another one. If you are plotting the ruins of a building, for instance, the baseline would be best laid out through the centre and running down the long axis of the building, so that walls and other features on both sides can be measured from it. You can lay out the baseline on or above the ground (i.e. fixed to free-standing pegs for instance), but it must be kept straight and as horizontal as possible. Laying the baseline flat on the ground is simplest, because raised baselines tend to stretch and sag, although a perfectly horizontal baseline is not always possible. Once again, the decision of precisely how much variation from the horizontal is permissible comes down to how accurate you need your survey plan to be—obviously every deviation from the horizontal introduces an element of error, so try to keep this to a minimum. If you are drawing a plan of a rockshelter, for example, the floor may be quite undulating and you may need to locate the baseline some way from the floor of the shelter to keep it horizontal.

- Remember, once the baseline is fixed, don't move it until all of your measurements are complete.
- Take a compass reading along your baseline (it doesn't matter in which direction, but for consistency's sake from the 0 metre point on the baseline is best) and note down the reading in your field notes. This will allow you to indicate the direction of magnetic north on the finished plan.
- You can now begin to measure offsets from the baseline to the various features of the site.
- The most important thing to remember about a baseline/offset survey is that **all features must be measured at right angles to the baseline**. You must keep all offsets at 90° to the baseline to ensure that you are measuring the shortest distance between the baseline and the feature. If your angle varies above or below 90°, then the distance you are measuring will also increase or decrease, giving you an inaccurate measurement.
- Because they have the baseline extending to either side of them, the person standing at the baseline is the one most able to judge accurately when an offset is at the correct angle. For anything over 3 metres, you will have to use a different technique. There are three ways you can do this, all of which use basic principles of geometry to establish a right angle:

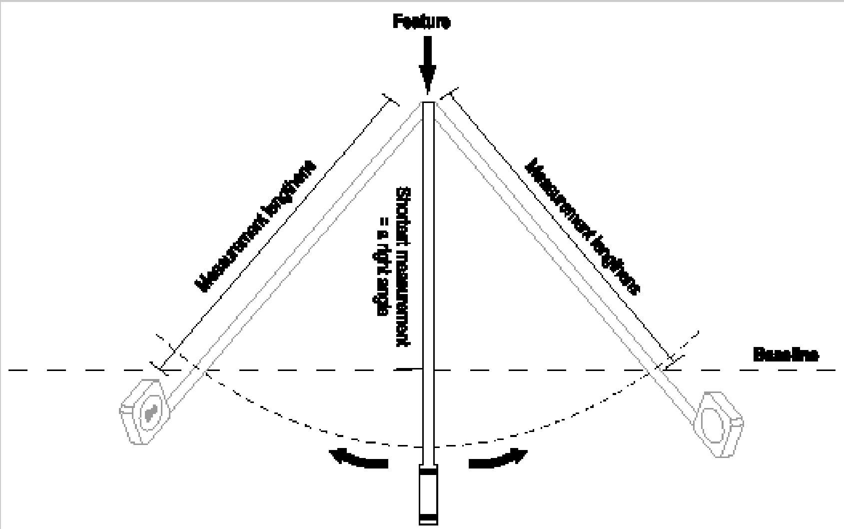
1. bisecting an arc;
2. 3–4–5 triangle;
3. triangulation.

FIGURE 4.5: Over a short distance (less than 3 metres), you can estimate a right angle for an offset reasonably accurately by eye, but *only* from the position of the baseline

METHODS FOR MEASURING RIGHT-ANGLED OFFSETS

1: Bisecting an arc

FIGURE 4.6: Bisecting an arc

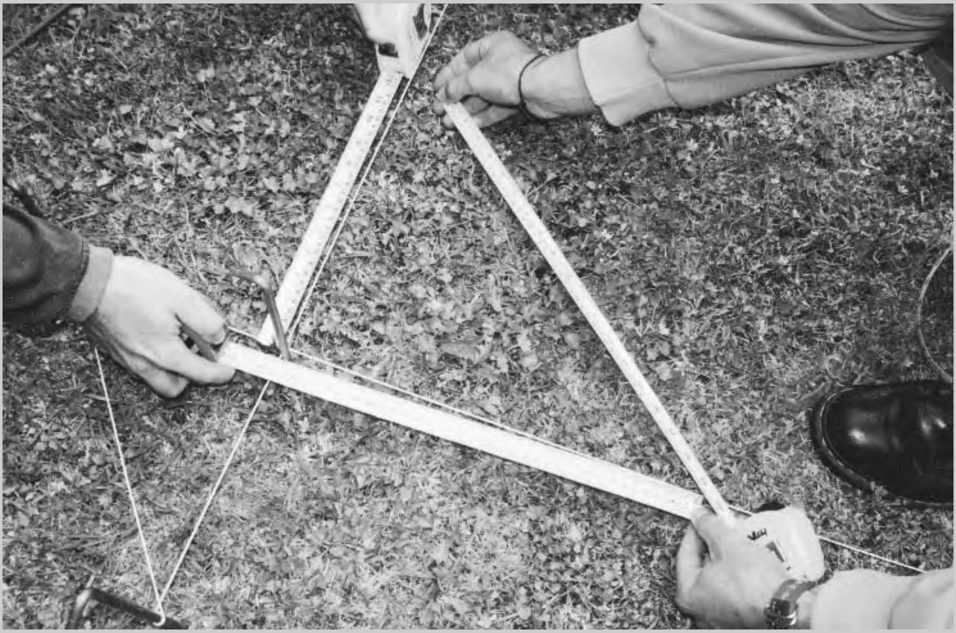


To use this method, get one person to hold the end of a tape measure firmly on the point which is being measured, while you stand at the baseline and swing the other end of the tape measure over it in a short arc. As you swing the tape measure over the baseline, you will notice that the distance increases as the tape reaches either end of the arc, but lessens towards the centre of the arc. It is this shortest distance which you are looking for, because this will indicate when the tape measure is at a right angle to the baseline. If you are not confident that you can work this out by eye, then mark each end of the arc where it crosses the baseline, measure the length of this distance on the baseline and then divide it in half. This halfway point marks the corner of the right angle.

2: 3–4–5 triangle

This method relies on the 3–4–5 ratio of a right-angled triangle (see Figure 4.7). Basically if the measurements for each side of a triangle are always kept in units of 3, 4 and 5, or any multiple of these (for example 30 cm–40 cm–50 cm, 60 cm–80 cm–100 cm), then the angle between the two perpendicular sides of the triangle will always be 90°. For example, you want to lie out a second baseline perpendicular to your first. At the

FIGURE 4.7: 3–4–5 triangle

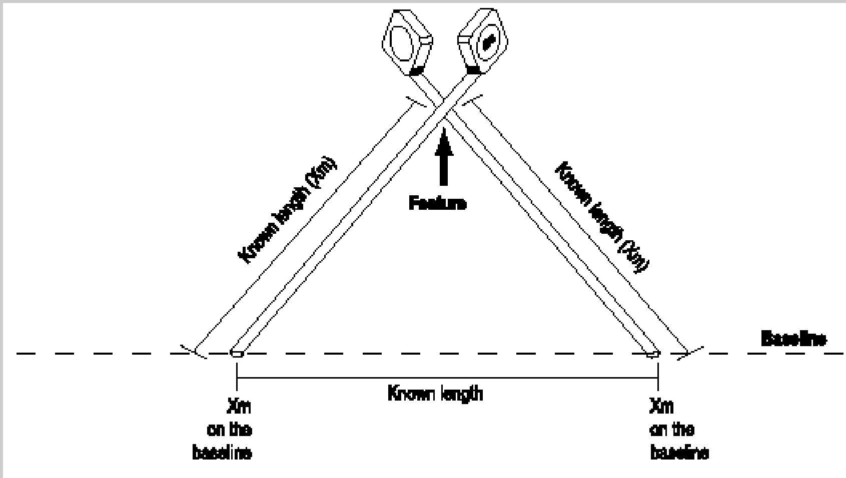


offset point on the first baseline (where the second baseline will begin), you fix the end of one tape measure. You measure along the first baseline for a distance of 1 metre. This will be the base of the right-angled triangle. Holding the end of a second tape measure over this point, you give the ends of both tape measures to another person who moves away from the baseline until they are standing at roughly 90° to the offset point. You already know that for the triangle to be a right-angle these two measurements must equal 60 and 80 centimetres respectively, so keep adjusting both tape measures until you have them at the correct length. The point where they cross at the correct lengths is the other end of your right-angled offset.

3: Triangulation

As its name suggests, this method uses triangles to plot the location of features. This is best done using two tape measures. Measure a known length on the baseline and hold or peg a tape measure at each point. Cross the other ends of the tape measures over the point you are measuring to and note down the length of all three sides of the triangle, as well as its position on the baseline. Because you know the length of all

FIGURE 4.8: Triangulation



three sides, as well as its precise location along the baseline, you will be able to plot this triangle accurately on to your survey plan. This method is best used to plot features which are a long way off the baseline, but ideally the angle at the apex of the triangle (i.e. at the measured point) should be kept as close as possible to 90°. It should definitely be no smaller than 40° and no larger than 140° (Hobbs 1983: 46).

You may, of course, use more than one of these methods at the same site (for instance, for short measurements you might estimate by eye, for longer measurements you might prefer to use triangulation). It doesn't matter: just make sure that you record each measurement in your field notes for when you come to draw up your site plan. Make absolutely sure that you always record your measurements in the same order—that is, reading along the baseline first, and then along the offset to the feature. If you confuse the order of these readings at any time, you will not be plotting features in their correct locations.

It is much easier to draw up a baseline and offset survey as you go along—in other words, to have two people measuring (one always at the baseline and one always at the features) while a third person simultaneously plots the position of each feature on to graph paper and constructs the plan. Obviously the draftsperson will need to work out a suitable scale for the plan before any measuring begins, and will also be the person responsible for literally 'joining the dots' or making the plan come together. As the draftsperson, you have the responsibility of keeping a sharp eye on how the plan is progressing—you are in the best position to notice if distances seem wrong or if features don't plot where they should. **Don't just blindly trust the measurements being given to you.** The measurers have no overall scheme in front of them to see the relationships between each point, but you do. Evaluate each measurement in the context of the plan as it is progressing on paper and don't be afraid to ask for measurements to be repeated or for extra measurements to be taken. In this sense, it is really the draftsperson who directs the survey, not the other way around.

If your site is large or very complex and can't be measured using a single baseline, you may need to establish a survey framework which is, in effect, a series of four baselines with the diagonals measured in to make the framework rigid (see 'The basics' on page 86).

FIGURE 4.9: Using a plumb-bob to establish your position on the baseline

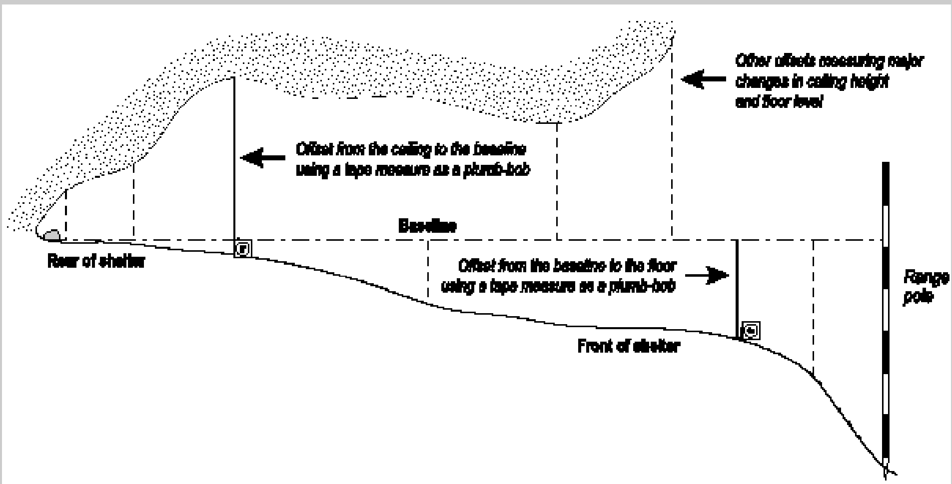
The baseline and offset technique is most accurate on level ground, but if there is any slope you will need to take care to keep your baselines horizontal. You will also have to take care with your offset measurements, because if any features are located considerably above or below the horizontal plane of the baseline (i.e. if they are on parts of the site that slope away from the baseline), you will not be able to simply measure along the ground to these points. If you did, you would be measuring up or down the length of the slope which would give you a longer measurement than would a properly horizontal offset. In this case you will need to hold the offset tape measure above the baseline so that it is roughly horizontal with the location of the feature being measured and use a plumb-bob dropped below the tape to find your exact position on the baseline (see Figure 4.9).

USING THE BASELINE AND OFFSET TECHNIQUE TO RECORD VERTICAL SURFACES

The baseline and offset technique is also useful if you are recording standing structures or other vertical archaeological features, or if you need to create a cross-section through a site such as a rockshelter (see 'Recording rockshelters' on page 221). In these cases, instead of your offsets being measured from a baseline across to a feature, your offsets will be measured above or below the baseline. Once again, you will need to give careful thought as to where you place your baseline to ensure that all of the major measurements can be made from it. You also need to make sure that your baseline is kept horizontal and that all measurements above or below it are kept as close to vertical as possible.

A case study in recording a cross-section through a rockshelter

FIGURE 4.10: Hypothetical use of the baseline and offset technique to create a cross-section of a rockshelter

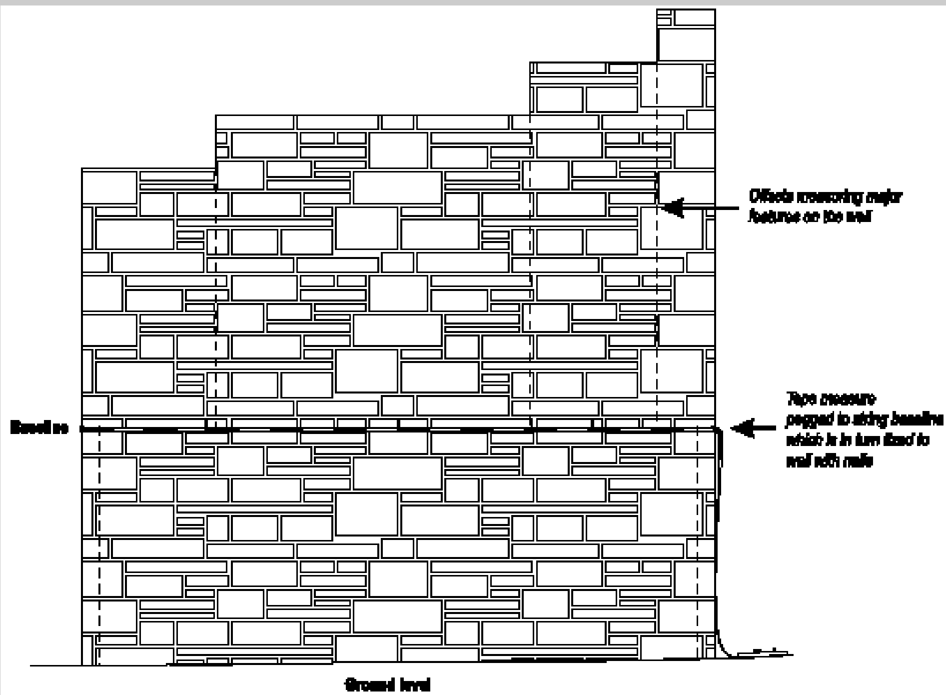


The aim here was to produce a cross-section through the shelter to show the changes in the height of the ceiling and the slope of the floor of the rock shelter from front to back. This is important for looking at how people have used the spaces within the shelter and will help to make sense of the features recorded in the site plan. First, a horizontal baseline was laid out from the front to the back of the shelter. The front of the shelter was about 35 centimetres below the level at the rear of the shelter, so the baseline needed to be fixed to a ranging rod located outside the shelter. Because there were artefacts scattered across the floor of the shelter, the ranging rod had to be placed well outside the front of the shelter so as not to disturb any potential sub-surface deposits. The end of the tape measure at the rear of the shelter was simply weighted down with a large rock (checked out first to make sure it was not an artefact). A series of measurements was made above and below the baseline to record the changing levels in the roof and floor. For measurements of ceiling height, a retractable tape-measure was used as a plumb-bob (the end held up at the point on the ceiling being measured) and the other end simply dropped down immediately beside the baseline to obtain a reading of height. The same technique was used to record the slope of the floor at the front of the shelter.

A case study in recording the wall of a ruined building

The aim here was to record the details of the construction techniques used in the wall and the extent of damage. A string baseline was established across the width of the wall about 80 centimetres above the level of the ground. Because the wall is only 1.5 metres high, this was simply a convenient height from which to measure. The baseline was fixed to the wall using nails inserted firmly into the mortar (making sure not to damage the wall in the process), and a tape measure pegged along the string. Measurements were made both above and below this baseline to the various features on the wall.

FIGURE 4.11: Hypothetical use of the baseline and offset technique to create a vertical 'plan' (or elevation) of a wall

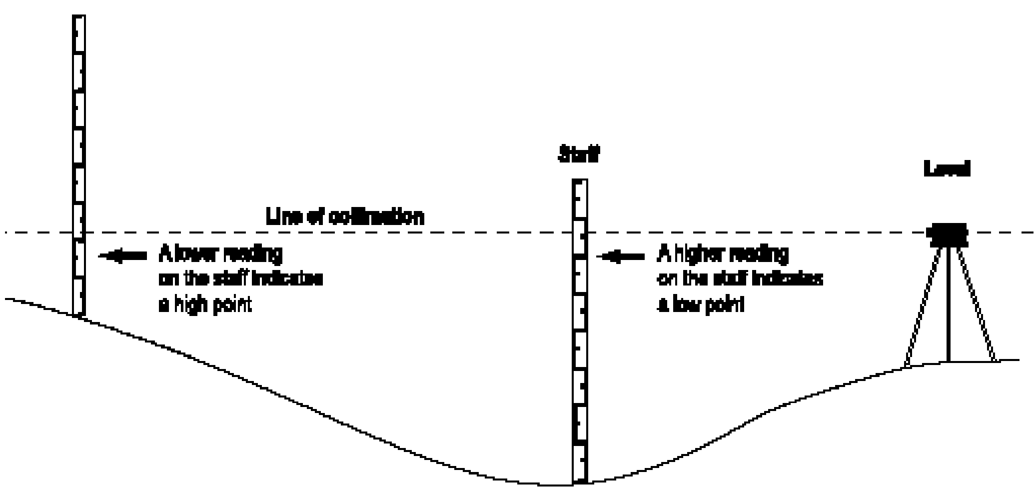


BASIC PRINCIPLES OF LEVELLING

Using the baseline and offset technique to measure changes in the height of a rockshelter is a form of **levelling**, or surveying rise and fall. It is only useful over small areas, however, and indicates a major problem with the basic methods of site surveying. They can only provide you with a reasonably accurate plan of the horizontal layout of a site; none of them can give you an accurate indication of how the land rises or falls, or how steep or flat the area containing the site is. To document this, you will need to be able to record levels: the changing height of the ground across the site (Drewett 1999: 66).

The principle of levelling is very simple. It involves projecting an imaginary horizontal plane across the site and measuring the height of the ground above or below this. Surveyors refer to this as the **line of collimation**, and it is exactly the same in principle as the horizontal baseline you use when drawing vertical surfaces (see 'Using the baseline and offset technique to record vertical surfaces' on page 101). It can only be measured with the proper equipment, however—such as an automatic level (often called a 'dumpy' level), theodolite or Electronic Distance Measuring device (EDM). You will have seen surveyors using these and similar equipment—they are designed to be set level on a solid tripod, and the height at various points across the site read off a stadia rod (a telescopic staff with units of height marked in alternate red and black segments) through the telescopic lens of the level. If you look through the telescope, you will see one vertical and one major horizontal cross-hair. The horizontal cross-hair represents the line of collimation and, by reading the changing height of the staff along this line, you are reading whether the ground is rising or falling.

FIGURE 4.12: Surveying the changing height of the ground across a site



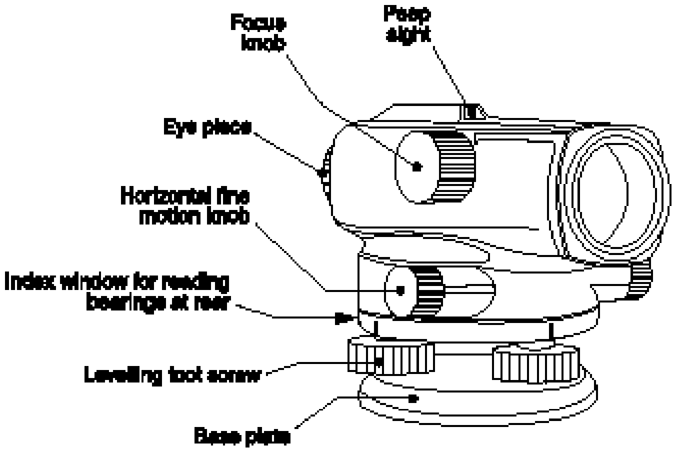
How to set up an automatic or 'dumpy' level

- *Step 1: Establish the location of the instrument.* This is important, because ideally you want to be able to take as many readings as possible without having to move the instrument. Try to find a centralised spot from which all parts of the site are visible. Once you have decided on this, set up the level. First erect the **tripod** (the telescopic legs which form the base). If you are working as part of a large group, you should erect the tripod to the height of the shortest user. In any case, make sure the tripod is at a comfortable height for constant use, and lightly but firmly tamp the legs into the ground. Don't make them immovable yet, however, because the next step will be to make sure that the instrument itself is perfectly level. Make sure that the head of the tripod (where you will be shortly attaching the instrument) is roughly level and doesn't have an obvious tilt in any direction.

  Now attach the instrument. The level will have a base plate (see Figure 4.13 on page 106) that can be screwed into the top of the tripod. Don't screw this in tightly yet, but make sure that the level is firmly fixed to the tripod and can't slide off. Now you have to level the instrument. As long as you have only lightly screwed the instrument in place, the slightly convex surface that is the head of the tripod will allow you to slide it around in a tight circle. Note the effect this has on the levelling bubble (Figure 4.13) and see if you can get the instrument close to horizontal. All surveying equipment will have such a visual means for you to judge how level they are—usually a centrally located air bubble inside a marked ring on the circular base of the instrument. You need to get the dumpy at least close to being level at this stage (i.e. the bubble needs to be almost within the circle if not completely inside it), then tighten the screw holding the level in place. This probably will change the level of the instrument slightly, but don't worry as you can adjust this next. If you can't get the instrument anywhere near level at this stage you will have to rethink the positioning of the tripod legs and check whether any need lengthening or shortening. One of the ways to adjust the gross level of the instrument is to tamp the individual legs of the tripod more firmly into the ground. Keep an eye on the levelling bubble as you do this.

  Most automatic levels use a combination of three large foot screws (Figure 4.13) at the base of the instrument to make them perfectly level, although some may have an internal levelling mechanism. These foot screws are designed to be used in pairs (imagine a triangle underneath the instrument that can be raised or lowered slightly on each side). Align the telescope so that it lies parallel with one pair of foot screws and, using both hands, turn these two screws *outwards* (i.e. in opposite directions towards the edges of the instrument). Note the movement of the bubble as you do so. If you had the instrument approximately level in the first stage, you will eventually succeed in getting the air bubble exactly in the centre of the bull's-eye circle. Sometimes this process is deceptively quick and simple, sometimes it seems as if you'll never get it

FIGURE 4.13: The major components of an automatic level

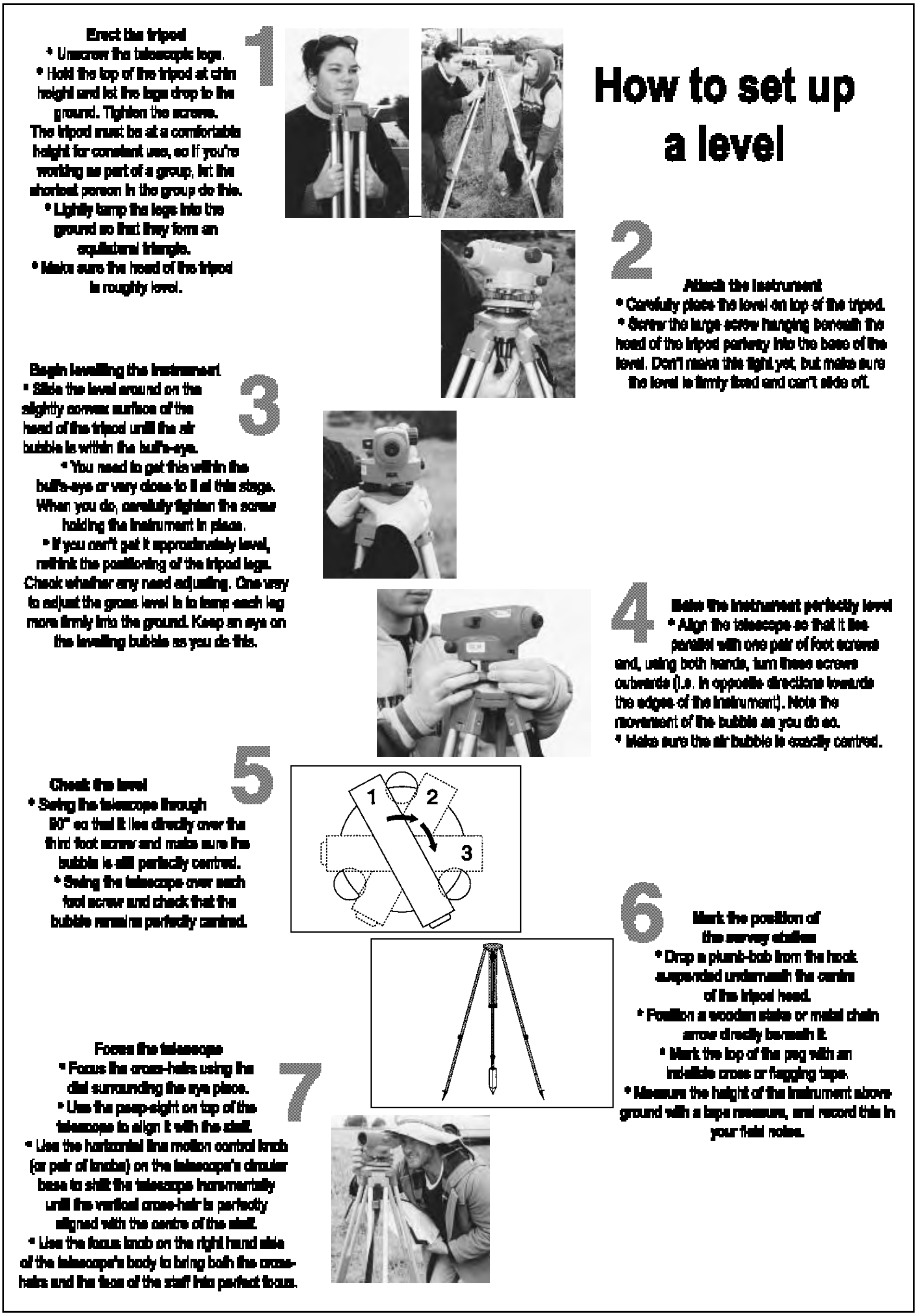


right, but you must persevere. Swing the telescope through 90° so that it lies directly over the third foot screw and make sure the bubble is still perfectly centred. Swing the telescope over each foot screw and check that the bubble remains centred.

- *Step 2: Once the instrument is steady and level, mark the location with a permanent fixture such as a wooden peg.* This must be located directly beneath the instrument, so you will need to tie a plumb-bob to the hook underneath the centre of the tripod head and position the peg directly underneath it. Mark the top of this peg with an indelible cross. This is your first **survey station**.
- *Step 3: Measure the height of the instrument* above ground with a tape measure, and record this in your field notes.
- *Step 4: Begin taking readings.* The first thing to do is to make sure the telescope is focused correctly. In most models, the eyepiece will be surrounded by a rotatable dial that focuses the cross-hairs (Figure 4.13). Use this to make sure the cross-hairs are sharply defined. Use the peep-sight along the top of the telescope to approximately align it with the staff and sight on the staff through the eye piece. The horizontal fine motion control knob (or pair of knobs) on the telescope's circular base will allow you to shift the telescope incrementally left or right until it is perfectly aligned with the staff (Figure 4.13). Use the focusing knob on the right-hand side of the telescope's body to bring both the cross-hairs and the face of the staff into perfect focus (Figure 4.13).

The first reading you will have to take *must* be a **backsight (BS)** to the site datum to establish the height of the line of collimation. Hold the staff at the datum, take the reading at the central horizontal cross-hair and then add it to the known height of the datum. If the site datum has a value of 60 metres above sea level for instance, and the reading gives a height of 1.4 metres for the staff, then the height of the line of

FIGURE 4.14: How to set up a level



collimation is 61.4 metres. If you don't know the precise height above sea level of your datum then you will have to assign an arbitrary height to it (for instance, 100 metres. Don't make it zero or you'll end up with negative numbers). The sum of the first reading and the datum height is the value for the line of collimation (otherwise known as the **height of the instrument [HOI]**).

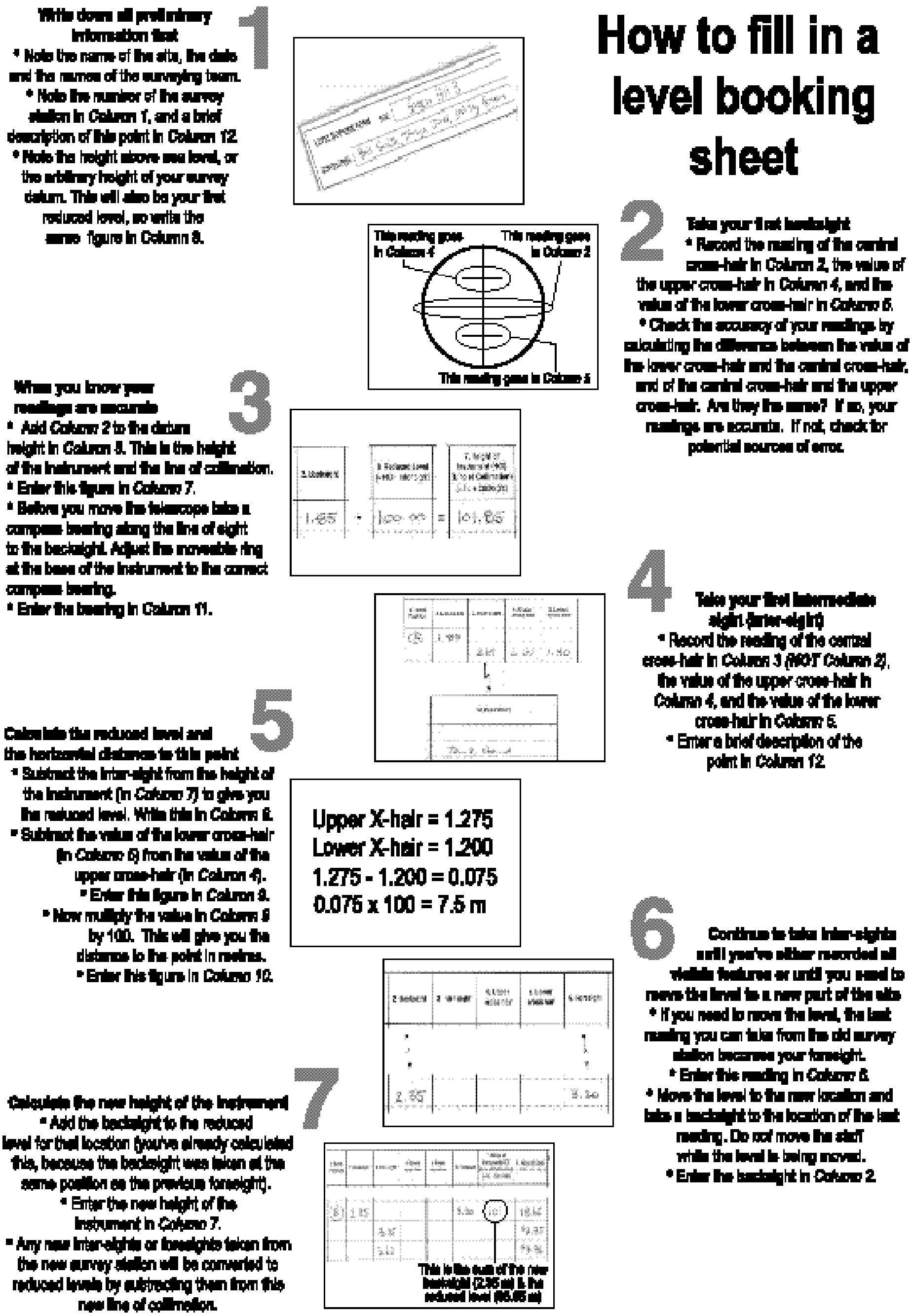
An automatic level also has the facility to read degrees from north so that each reading can be aligned to a particular compass bearing. As part of your first backsight, and *before* you move the telescope for the next reading, take a compass reading on the staff along the same axis as the telescope to determine a bearing for the backsight. For example, this might be 270°. Rotate the large circular dial at the base of the instrument so that its reading in degrees aligns with your compass bearing (i.e. so that you can read 270° through the index window underneath the eye piece) (Figure 4.13 on page 106). When you've realigned the telescope for the next reading, you'll be able to read the bearing for that position by simply reading the degrees shown in the index window.

Once you have taken your backsight, all subsequent readings (to various features on the site) are called **intermediate sights**, or **inter-sights (IS)**. For each inter-sight, subtract the reading at the central cross-hair from the height of the instrument to give you the **reduced level (RL)** for that spot. You can also use an automatic level to measure distance as well as height and so give you a plan of a site. Inside the dumpy's telescope you will see two smaller cross-hairs above and below the major cross-hair denoting the line of collimation. If you subtract the height of the staff at the lowest cross-hair from the height at the highest cross-hair and multiply by 100, this will give you the distance from the level to the staff in metres.

If you find that it is impossible to cover the entire site from one position (e.g. if there is heavy vegetation cover, or the site rises or falls too steeply for it all to be equally visible), then you will have to move the level to a new location. This follows the same setting-up principles as before, with one additional step. The last reading you were able to take from the present survey station will become your first **foresight (FS)**. *Don't* move the staff from this location while the level is being moved. The rule is that the staff must remain stationary while the level is being moved and the level must remain stationary while the staff is being moved (Casey 1972: 15).

Move the level to the new survey station (obviously you will have chosen this carefully so that you can see new parts of the site from the new location, but are still within sight of the last foresight). Set it up again following steps 1–3 and then take a backsight to the location of the last foresight. If you don't take this reading you will be unable to tie the different parts of your survey together in the final plan. Calculate the new line of collimation for the second survey station by adding the reading for the backsight to the reduced level for that spot (which you calculated from the previous foresight reading). Continue your survey.

FIGURE 4.15: How to fill in a level booking sheet



How to fill in a level booking sheet

This is relatively straightforward and lets you keep track of your readings as you go along. It is also the source data that you will use to plot your survey as a plan, so it is important that you do it correctly. A sample level booking sheet is included in Appendix 1. The first column on the sheet is a description of the location of the dumpy level (these are your survey stations). This assumes that you may have to move the instrument, so the various positions it is set up in can simply be designated 1-100 or A-Z. Note the height above sea level of your survey area (if you know it) in Column 8. If you don't know this, choose an arbitrary level of 100 metres (so you don't end up in negative numbers as the ground falls). This will be your first reduced level.

Remembering that the first reading after setting up a survey station will *always* be a backsight (either to the site datum or to the point of the last foresight), this is entered in Column 2. There will only be one backsight per survey station, so *don't* enter any further readings in this column unless you have just moved the level. Don't make the common mistake of writing the foresights in this column—this will only confuse things later. The backsight will establish the line of collimation (i.e. how high the instrument is), which you calculate by adding it to the reduced level (in this case the site datum) to get a height in metres. Place this figure in Column 7. Align the dumpy to the correct compass bearing for the backsight (see 'How to set up an automatic or "dumpy" level' on page 105) and note the bearing in Column 11.

The next readings you will take will all be inter-sights to the various features of the site you wish to plot. Place the staff on a feature and take a reading on the central (major) horizontal cross-hair. Place this figure in Column 3. The difference between this figure and the height of the instrument in Column 5 will give you the reduced level for that location. Record this figure in Column 8. Enter the value for the upper cross-hair in Column 4 and for the lower cross-hair in Column 5. Enter the bearing in Column 11.

> You can use the upper and lower cross-hairs visible through the dumpy's telescope to check the accuracy of your survey readings. The difference between the value of the lower cross-hair and the centre cross-hair should be the same as the difference between the value of the centre cross-hair and the upper cross-hair. For example, if the reading at the centre cross-hair is 1.275, and at the lower cross-hair 1.240, then the reading at the upper cross-hair should be 1.310. Each is 0.035 metresdistant from the centre cross-hair and they need to agrees to within 0.005 metres or better. If you can't get your readings to agree, you'll have to take them again and check for potential sources of error. Is the staff vertical? Are you reading the staff correctly? If you are new to using a dumpy level you should check your readings regularly to minimise errors.

Calculate the horizontal distance to that spot, so that you will be able to plot it on to your plan later (subtract the value of the lower cross-hair from the value of the upper cross-hair and multiply by 100). Place this figure in Column 10. To check the accuracy of your survey, subtract the sum of the foresights from the sum of the backsights. Then subtract the last reduced level from the first. The answers should be the same. If you're taking many readings and using several pages of the booking form, you can check each page separately by making sure that each begins with a backsight and ends with a foresight. If an inter-sight comes at the end of a page, enter it as a foresight on that page and as a backsight on the next (Hobbs 1983: 53).

Tips for successful levelling

- The most important point is to make sure that the instrument is properly level before you use it. If it isn't, then none of your readings will be accurate.
- Once you have levelled the instrument, don't kick or disturb the tripod. If you do, you'll have to re-level the instrument before you continue, including taking a new backsight to the site datum and calculating a new line of collimation.
- If you are holding the staff, then you have several responsibilities. First, you need to make sure that you are holding it upright. By looking through the telescope, the surveyor at the dumpy level will be able to see if you have tilted it to the right or left and can indicate to you in which direction you should move it. They won't know whether you have tilted it forwards or backwards, however. To compensate for this (it can be very difficult to know whether the staff is truly upright when you are holding it), you can rock it slightly backwards and forwards so that the person at the dumpy can take the highest reading (which will be the horizontal). You can also use a small carpenter's line level, held against the back of the staff to judge when it is upright (see

FIGURE 4.16: Using a spirit level to check whether the stadia rod (levelling staff) is vertical

Figure 4.16 on page 111). Staffs for EDMs and total stations have a built-in air bubble so you can make sure they are level. Second, you will have to ensure that you have not rotated the face of the staff away from the telescope. Watch the direction in which the staff is facing and be prepared to adjust it if the surveyor can't read it clearly.

- If the surveyor can't see you or the staff at all (say, if there is screening vegetation in the way) then you will have to move the staff slightly in one direction or the other until it becomes visible. This is where walkie-talkies are invaluable. Sometimes only a slight adjustment will be necessary, but take care that, as you move the staff, you keep it upright and vertical. This is most easily done by moving the staff in small steps (sometimes only centimetres) in a given direction until the surveyor tells you to stop.
- To produce a contour plan, you need to grid the site and take spot height readings at each point on the grid. You then need to decide on the contour interval (the distance between contours) and join points of equal height across the site.

With the advent of more sophisticated forms of surveying equipment such as Electronic Distance Measurement (EDM) instruments, it is possible to create extremely accurate site plans. An EDM uses a built-in transmitter to send out a laser beam towards a reflecting prism attached to a staff held at the position which is being plotted. The length of time taken for the beam to reach the prism and return to the EDM forms the basis for the calculation of distance. These measurements are all recorded digitally for later download into a computer. A total station has both a theodolite (to measure levels) and an EDM (to measure distance) as part of the one instrument. It can therefore give you both horizontal and vertical measurements as part of the same plan.

As a final word, no survey will ever be perfect. You will need to decide on the level of accuracy you require before you begin—a decision which will largely depend on why you are recording the site in the first place and what it is you want to know. For any site survey, there are acceptable levels of error which you should take note of (see Table 4.1 on page 113). For a plan plotted at a scale of 1:100, for instance, it is perfectly acceptable for measurements to be taken to only the nearest 50 millimetres; for a plan at 1:1000, measurements need only be to the nearest 500 millimetres. As the scale becomes larger, the level of accuracy increases, so at 1:10 you should try to keep your measurements to the nearest 5 millimetres, for example.

The levels of accuracy shown in Table 4.1 also will have a bearing on the final scale at which you can draw your site plan. Remember, if you are recording a large site, the entire plan of which will end up being drawn on a single A4 page, there is little point in recording things to the nearest millimetre. The relationship between the scale of your drawing and the smallest measurement you can literally draw is different from the standards for accurate measurement in Table 4.1. Even though a plan drawn at 1:100 scale should be

TABLE 4.1: Acceptable levels of accuracy for site plans

Scale of final plan	Acceptable error
1:5	2 mm
1:10	5 mm
1:25	10 mm
1:50	20 mm
1:100	50 mm
1:250	100 mm
1:500	200 mm
1:1000	500 mm

measured to the nearest 50 millimetres, anything which is this small will only end up being 0.5 millimetres on your final plan. Given the difficulty of drawing something which is half a millimetre long, the standards for plotting are somewhat broader (see 'Drawing horizontal surfaces (plans)' on page 286 and Table 9.2 on page 287).

If you draw the plan by hand, it is important to remember that you should never ink in original pencil drawings, as these form an essential element of the primary site archive (Drewett 1999: 177). Instead, you should use drafting film (not tracing paper) to redraw the plan (for more information see Chapter 9: Photography and illustration), or scan it and redraw it using a computer graphics program.

REFERENCES AND FURTHER READING

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Drewett, Peter 1999, *Field Archaeology: An Introduction*, UCL Press, London.

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USEFUL WEBSITES

The Land Surveyor Reference Page, www.lsrp.com, contains a range of online resources, including links to professional publications on the topic.

For Electronic Total Station Resources, http://geomechanics.geol.pdx.edu/Courses/TotalStation/. This site contains information on using Total Stations, including instructions for surveying procedures, as well as field sheets and software.

The Virtual Museum of Surveying, www.surveyhistory.org contains some interesting historical information on the history of surveying and its technology.

www.sli.unimelb.edu.au/planesurvey/prot contains an introduction to the basic principles of surveying and the main features of automatic levels, theodolites and EDMs. Online activities let you practise reading a staff, and take you through the process of setting up a level.

CHAPTER FIVE
BASIC EXCAVATION TECHNIQUES

WHAT YOU WILL LEARN FROM THIS CHAPTER

- How archaeologists excavate
- Why careful control of the excavation process is important
- How to dig
- Standards for describing soil
- How to use a Harris matrix to interpret stratification
- Basic procedures for sieving, recording, bagging and labelling
- Basic procedures for collecting on-site samples
- Basic conservation measures for protecting excavated finds
- Tips for surviving an excavation

The basic excavation toolkit

10–12 centimetre drop forged pointing trowel. Make sure that the neck and blade are cast in one piece, otherwise it will break
Hand-shovel or dustpan
Plastic buckets
Secateurs
Dental picks/plasterer's tools

Fine, soft paintbrushes (in a range of sizes for cleaning large areas and for reaching into small cavities)
Hand-brush or whisk, for cleaning hard surfaces and brushing-up soil
Spring balance (for weighing buckets)
Carpenter's string level (for making sure baselines are horizontal)
Nested mesh sieves (in a range of sieve sizes—10, 5 and 2 millimetres are the most common)
Plastic sheeting, to cover the site or lay out deposits
Knee pads (or foam squares) to make excavation more comfortable
Soil pH test kit
Munsell soil colour chart
Recording forms
Clipboard
Artefact tags (aluminium or polyethylene)
Nails (for securing tags to the walls of trenches if necessary)
String and line level (for marking the edges of trenches and for establishing base lines for drawing sections)
Spikes or tent pegs or chaining arrows, for marking out the trenches
Mattock, pick or shovel (for removing turf or for backfilling)
Drawing equipment (see Chapter 9)
Photographic equipment (see Chapter 9)
Tape measures, in a range of sizes
Ziplock® plastic bags, in various sizes

Optional
Wheelbarrows
A stepladder (you may need to stand on this to photograph trenches from above)
A hand sprayer (you may want to wet the walls of the trenches to observe differences in soil colour)
Artefact processing equipment (plastic basins, drying trays, toothbrushes)
General site equipment (chairs, folding tables, canvas or shade cover)

THE BASICS

The aim of any archaeological excavation is to try to understand what may have happened at a site in the past by carefully excavating the various material remains which make up that site. Excavating requires both care and patience since, to be able to understand the sequence of activities at a site, archaeologists must slowly strip away each soil layer in succession. The basic principle on most excavations is that each new soil layer is removed completely before proceeding on to the next—in other words, excavation proceeds horizontally first (i.e. by removing all traces of one soil layer first), and vertically second (when excavation of the next soil layer is begun). This kind of careful 'layer-cake' excavation is called the **stratigraphic** or **context** system of excavation. Although not all digs will adopt this process, it is the most common system followed by archaeologists (for more information, see 'The principles of excavation' on page 121).

A **context** is any discrete archaeological entity on a site, such as a post-hole, a depositional layer, a rubbish pit or an erosion event (Drewett 1999: 107), and is the same thing as a 'layer', a 'feature' or a 'stratigraphic unit'. Under the context system, the goal of any excavation is not to dig as deeply as possible as quickly as possible, but rather to be sure that all of the information from each soil layer, or stratum, is kept together so that it may be analysed later as a discrete entity. If you think of a site which has had many successive activities performed on it over hundreds of years, all of these activities may have left separate and distinct evidence behind them, trapped in different layers of the soil. If archaeologists were to simply mix up all of these layers, they would be unable to separate the information from each activity, unable to date the sequence of activities and thus unable to reconstruct exactly what had happened there in the past.

One of the most important things to realise is that, while all excavation aims to retrieve as much information as possible, in the process it literally destroys the site forever. No excavated site can ever be put back: once excavated, it is gone forever and only exists in your recording forms, field notes, reports, photographs, publications and archives. For this reason, you must ensure that your excavations are always conducted according to the highest possible standards. As soon as you begin an excavation, it is your ethical responsibility to ensure that it is done professionally, up to and including the standards you adopt for analysis, reporting, archiving, conservation and curation. In the end, it is better to go for less done well, rather than more done badly: 'At the end of the day a well excavated, well recorded, fully published 1 x 1 m unit does considerably less harm than a huge, badly controlled, unpublished . . . excavation.' (Drewett 1999: 97)

Almost everyone recognises an archaeologist as someone who excavates. All excavation or any other form of collecting artefacts, however, is inherently destructive and can never be repeated. It is for this reason that **an excavation permit *must* be obtained before excavation or collection can commence.** Excavation should be a last resort—if you can get all the answers you want through non-destructive recording techniques, then DON'T excavate.

It is a primary ethical responsibility of all archaeologists that excavation is only undertaken by professionals (or under professional supervision), and never without proper research and planning. It is for this reason that excavation, or the collection of artifacts, is the one aspect of archaeology which is regulated in all states and territories by legislation governing who may undertake such activities and how they should be conducted.

Removing artefacts from their location in a site or the landscape without the proper legal permissions is, in most cases, both unnecessary and harmful. While there may be some instances where it is unavoidable (such as when the place is in imminent danger of being destroyed, or when Indigenous custodians insist on collecting items from sites in their country), in general it is both illegal and unethical to remove artefacts. If you find a particularly interesting or unusual artefact, by all means sketch it or photograph it (or both), but leave it where you found it.

Professional recording standards require that an archaeologist be able to control the excavation process as much as possible. Not all archaeological evidence is in the form of three-dimensional artefacts. Much evidence for past human behaviour will be subtle and perhaps not even instantly recognisable (such as stained soil from decomposed timber posts indicating the original location of buildings, or slightly darker layers of soil indicating the presence of charcoal from cooking fires). This evidence will be lost if care is not exercised during the excavation process, particularly with regard to changes in soil colour, type or texture as the excavation progresses (see 'The principles of excavation' on page 121). Any change in the physical characteristics of the soil could be of great importance, so you should never under-estimate what's happening under your trowel (see 'Using a trowel and brush' on page 141).

The main aspect of this control is to enable the archaeologist to pinpoint where each and every piece of evidence comes from. Archaeologists must be sure of the exact location of each artefact within the site (see 'Recording in three dimensions' on page 130). The positioning of artefacts horizontally across the site can tell archaeologists how different parts of the site were used and what activities were performed there; the positioning of artefacts vertically through the site can tell archaeologists what happened when and the order of events in the past. This need to be absolutely sure of the **provenance** of all artefacts is what drives archaeologists to keep all the evidence from a particular context together throughout the digging, sieving, sorting, bagging, cleaning and analysis process (see Figure 5.1 on page 120). It is also why archaeologists tend to excavate carefully selected portions of a site in such a way that the boundaries of each trench are very specific. Usually they do this by adopting a standard grid system and stringing out their excavation trenches to exact dimensions (See 'Laying out a site grid' on page 125). Trenches are usually laid out in multiples of 1 metre, and sometimes divided into smaller squares of 25 or 50 centimetres within each metre square; these are called **quadrats**.

A consistent and logical numbering system is also imperative for each trench and for each context or layer within each trench (see 'Laying out a site grid' on page 125), so that all the contents of a particular context can be recorded and labelled consistently. This numbering system is like a library catalogue: it is what ties the archaeological features and structures, the artefacts, their locations and the physical descriptions of the various soil strata together so that, in the end, the site may be analysed in a meaningful way (see 'Labelling trenches' on page 127 and 'Labelling finds and samples' on page 150). You should give considerable thought to the numbering/labelling system of your site before you begin excavating to ensure that numbers are not repeated and that all trenches and contexts are numbered consistently and logically.

Public health and safety on an excavation are also your responsibility. If you're excavating in a public place, you may have to erect mesh fencing or some other form of barricade to protect the public from any accidents and, for the same reason, backfilling the site after the completion of excavation is also your job. The location of your excavation trenches and their ultimate depth may also be a health and safety issue. In New South Wales, for example, occupational health and safety regulations require that any excavation over 1 metre in depth must be shored, and there may also be regulations for how closely you can excavate to a standing structure (in South Australia, this is no closer than 2 metres). You will need to refer to the occupational health and safety legislation in your state when planning archaeological fieldwork.

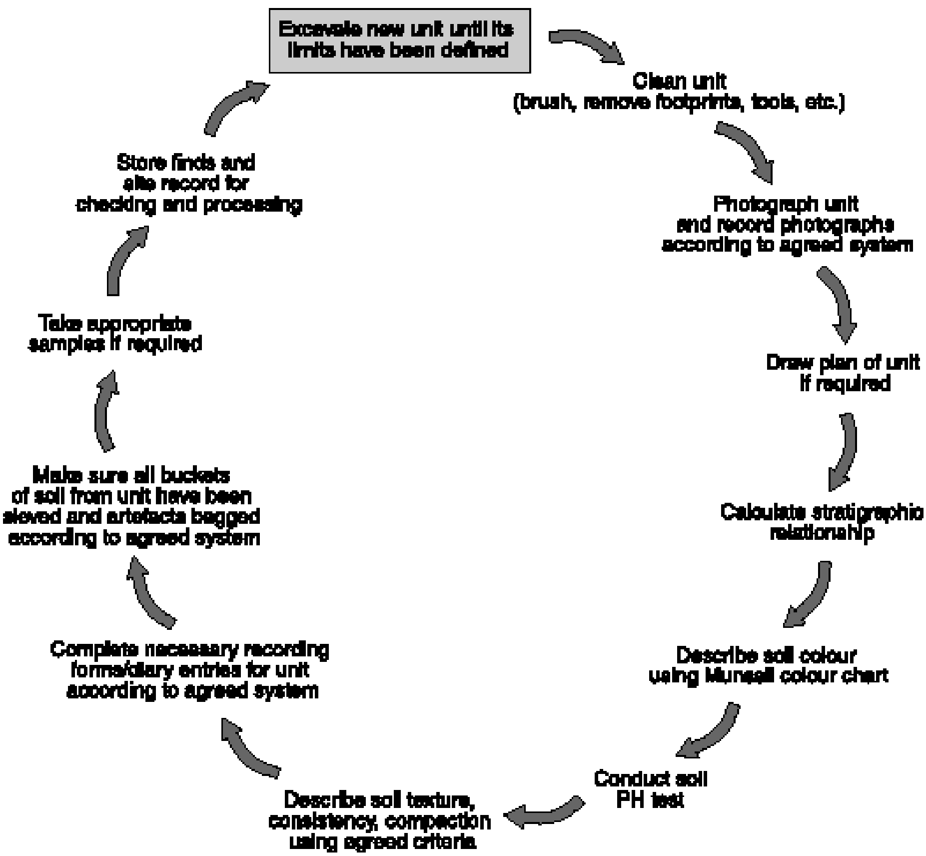
To avoid the dangers of deep, narrow trenches, you can cut the sides back in a series of steps, although this may create problems for recording. If you are going to be excavating on a deep or difficult site, you may need to consult with a civil engineer. You are also responsible for backfilling the trenches and returning the area to some semblance of its former appearance once the excavation is completed (i.e. ensuring that no open holes are left behind and removing your rubbish). Before you backfill, it is common practice to place plastic or weed mat on the bottom of the trench so that future archaeologists will know the mixed material put back into the trenches is the result of a past archaeological excavation, and not some bizarre ritual practice of past people! Plastic or weed mat will also indicate clearly where your excavation ended, in case you or another archaeologist should decide to re-open your trenches. Archaeologists sometimes include readily dateable items (such as coins with the current year) in the base of the trench before they backfill as a hint to future archaeologists.

In essence, all excavation requires careful planning (see 'Designing your research' on page 3). Think about what aspects are important to the success of your project and make sure you seek out and record those aspects during excavation. One of the key things to realise is the importance of maintaining flexibility in your methods. Every site is different, so you will need to carefully weigh up the pros and cons and tailor the excavation methods to suit your particular research questions, the time available and the individual nature of the site.

Once you have carefully thought through your research aims and worked out how excavation can best serve them, all excavation follows a fairly standard process:

- Lay out trenches.
- Photograph entire site before commencing (see 'Photographing excavations' on page 279).
- Excavate (this is in reality a complex series of steps in its own right—see Figure 5.1).
- Photograph entire site upon completion.
- Backfill.
- Analysis.
- Reporting.
- Conservation/curation of recovered artefacts.

FIGURE 5.1: A flowchart to follow when recording an excavation unit, or context. This sequence should be repeated for all units



THE PRINCIPLES OF EXCAVATION

Sites can be created over long or short periods of time—they can even be the remains of a single event—but excavation assumes that the order in which the different parts of the site have been laid down will reflect the sequence of events which occurred at that site in the past. This is known as the **Principle of Superposition**, and it simply assumes that more recent deposits will be laid down on top of older ones. While this is not always straightforward, it is the fundamental basis for using **stratification**, or the way in which the structure of the soil is divided into different layers or **deposits**, to interpret what happened at a site. You should note the distinction between stratification (the process of sedimentary layering and its observed result) and **stratigraphy** (the archaeologist's interpretation of the stratified layers, in words or drawings).

There are often complicating factors to this, of course, such as when various natural processes deposit or remove material from a site (such as wind depositing silt or water eroding the site, or rodent burrows churning and mixing up the soil), or when later events remove or alter evidence of previous events. There are three other fundamental principles which describe these possibilities:

- The **Principle of Association**, which presumes that items found together in the same deposit are of essentially the same age. This must be applied with caution, however, as some items may be looked after for a long time before they are finally thrown away (such as a treasured tool or family heirloom), making them much older than the other materials associated with them.
- The **Principle of Reversal**, which allows for those rare cases when deposits have been removed from the site and re-deposited in reverse order. This usually takes place as a result of major construction activity or digging, when large quantities of earth are removed and then redeposited upside down.
- The **Principle of Intrusion**, which states that an intrusion must be more recent than the deposits through which it cuts (Barber 1994: 85). A rubbish-pit dug into the ground or an underground oven are both intrusions cutting into the older deposits around them.

All archaeological excavation is based around these three simple principles. Together they imply that, through the careful removal of the layers which make up a site, and a detailed description of their texture, colour and contents, an archaeologist can reconstruct the sequence of events (both human and natural) which took place at that site in the past. Put simply, by analysing the stratification of a site, it is possible to work out the whole story of human and natural processes that the site has to tell.

Because stratification is so important, most excavation proceeds by carefully stripping each stratigraphic layer from a site in turn. This is why, when you are excavating, it is important to describe and take note of any changes in soil colour, texture or appearance as you dig. It is also why you should not hurry. Stratigraphy is closely linked to the process of excavation itself in that, as you remove each layer, you form opinions about how the different strata in a site were laid down and how they relate to each other:

> The archaeologist's golden rule is to excavate one layer at a time—and nothing in that layer should escape his or her detection. It isn't possible to read significance into a layer or level until you know how it lies, how it was formed, what its composition is, and what its relationship is to the layers above and below it. (Joukowsky 1980: 171–72)

For this reason, excavation should proceed horizontally first and vertically second. In other words, you should finish excavating one unit or layer completely before you begin the next.

A site which has distinct layers or contexts is said to be stratified. Not all sites are like this, however, and therefore not all excavation proceeds according to the stratigraphic system. Some sites have no visible stratification, while at others the more significant cultural layers might be covered by large quantities of later, less significant, debris, or the entire site may have resulted from a single event of a known date (such as a load of rubbish being dumped). In such cases, excavating according to stratigraphic levels would be fruitless. Even if you choose not to excavate the site according to stratigraphic layers, you still need to be able to control the removal of soil from the site if you want to draw any meaningful conclusions about the vertical or horizontal location of artefacts. In this case, a site is often dug in arbitrary levels which can still provide sufficient vertical and horizontal control. These levels are sometimes referred to as **spits**, or **units**, and can be of any thickness depending on the overall depth of the site and the degree of resolution you want to achieve in locating the artefacts. Keep in mind that whatever arbitrary depth you choose as the standard for your levels, this will be the finest degree of resolution that you will be able to achieve in your analysis and results. If several different activities at a site have only left behind them 2 centimetre layers or deposits, which you choose to excavate in 5 centimetre spits, then any one of these spits is likely to contain information from at least two different activities. Because you have chosen to group them together in one arbitrary spit, you will not be able to separate these in your excavation or in your subsequent analysis or conclusions. Once again, flexibility is the key: some sites may require a combination of arbitrary and stratigraphic excavation, such as if you find thick homogenous layers within an otherwise stratified site (generally at the beginning or end of the excavation) which can be removed by arbitrary levels.

APPROACHES TO EXCAVATION

Once you have decided on the most appropriate method of excavating your site, the next important decision to make is which parts of the site you are going to excavate. This is essentially a sampling decision, similar in principle to deciding how you are going to selectively survey an area (see 'Developing a suitable sampling strategy' on page 66). As with a surface survey, if you can't dig the entire site, you will have to make some meaningful decisions about which part or parts of the site are most likely to give you the information necessary to answer your research questions. There is an ethical element to this decision as well, of course, in that some archaeologists argue you should always leave part of a site intact so that future generations of archaeologists, who may bring with them new and better methods, will still be able to retrieve some *in situ* information. There are two aspects to this decision:

- deciding how much of the area to excavate;
- deciding where to place your excavation trenches.

How much?

There are two ways to approach the excavation of any site, which depend on how much of the site you wish to excavate: the **trench system** or the **open-area system**. The trench system is concerned with obtaining a cross-section through the site and tends to excavate relatively narrow portions of the site to sufficient depth (it is often referred to disparagingly as the 'telephone box' approach). Because it aims to dig deeply, it is well suited to answering chronological questions, such as the sequence of dates or the dates for earliest occupation, and for indicating the richness of the deposits and revealing the stratification of the site, since the walls of the trench preserve the stratigraphic profile of the excavation unit until the very end of the excavation. Because the trench system excavates narrow vertical slices through a site, however, it cannot expose spatial information across the site. The open-area system was developed in response to this need for horizontal information and exposes large expanses of the site, often to only a relatively shallow depth. It is thus quite successful at revealing information about activity areas or site structure, although it may not be so successful for establishing a sequence of dates (although it may be, if you dig deeply enough). Each system has different pros and cons, and it is important to realise that each is designed to recover different types of information. They can, of course, be used in tandem to complement each other, or be combined with other methods such as mechanical excavation or surface stripping to answer many different kinds of question. The choice of which to employ will depend on the time and resources available to you and the particular set of research questions you are asking.

Where?

Intra-site sampling is the choice of where to excavate within a site. Remembering that vertical trenches are designed to recover chronological information and horizontal, open-area excavations are designed to recover information about spatial activity areas, obviously the selection of excavation areas and the methods of excavation you adopt will influence the kind of data you can collect from a site. If you are investigating a rock-shelter which has been inhabited by people for several thousands of years, for example, you might want to know about the chronology of the site (i.e. the sequence of its occupation over time), or about the use of space within the site (i.e. were people using different parts of the site for sleeping, eating, cooking, etc.?). Excavating the site through a system of vertical trenches is usually the best means of obtaining enough stratigraphic information to determine chronology, but it is unable to tell you anything meaningful about how space was used across the rockshelter (because you haven't excavated enough of it). If you think of the rockshelter as analogous to your house, how representative would a shallow vertical 'slice' through your house be for reconstructing all of your day-to-day activities? Similarly, a shallower, open-area excavation will be better suited to recovering just this kind of spatial information, but may not necessarily give you enough depth to obtain an adequate chronology. In reality, of course, obtaining information about chronology and the sequence of occupation is just as important as finding out about the patterning of activities across space, so in deciding where to place your excavations and how much of the area you are going to excavate you will need to think carefully about what it is you want to know and how best you will be able to find this out:

- What kind of data do you want to recover?
- What sampling approach best fits this goal?
- What sample size will best answer your questions (i.e. how much information will you need)?

In reality, you will only be able to decide where to excavate after you have completed an intensive surface-survey of the area in question. Careful surface-survey may reveal discrete activity areas or clusters of certain elements or features, or the patterning of artefacts across the ground surface may be able to tell you about differential erosional/depositional patterns across the site. Any indication that there might be more archaeological evidence below the ground surface will be a useful guide as to where to place your trenches. You may also wish to excavate a seemingly bare area of ground to test whether what you observe on the ground surface is really a good indication of what exists below the surface. Examining the ground carefully before you dig can also tell you what kind of tools you will need to do the job properly (Joukowsky 1980: 172). Researching the recent history of your site may also give you some idea of what took place in the recent past at least, and therefore the kind of deposits you might encounter.

Sub-surface sampling

In making these decisions, the archaeologist is effectively trying to assess what might lie below the ground surface. There are more scientific ways of doing this than simply guessing, of course, all of which can be employed to help you decide on where it would be best to dig. This is called **sub-surface sampling**. Sometimes small-scale subsurface sampling will be necessary to determine the horizontal extent of a site. Soil cores, auger holes or shovel-test pits can be dug at intervals across the site to obtain broad stratigraphic or spatial information. Soil cores are commonly 3–5 centimetres in diameter, with auger holes slightly larger at 10–15 centimetres in diameter. Shovel-test pits are usually slightly larger than the width of a shovel blade (i.e. between 25 and 50 square centimetres) and have the distinct advantage of allowing you to examine the stratigraphy in the sides of the pit, something which is not possible for auger holes or cores. Comparison between different methods of subsurface sampling suggests that shovel-test pits are the most effective means for 'seeing' beneath the ground surface, although they are quite labour-intensive (Hester, Schafer and Feder 1997: 57–59). As with any form of sampling, the best results can only be obtained after careful forethought—you will not only have to consider where you are going to place your test pits, but also how close together they should be. Bear in mind, however, that any form of subsurface sampling will destroy a small portion of the site as it is dug, so it is always wise to limit the effects of this, particularly if you are going to conduct a larger-scale excavation later. Because all forms of subsurface testing will destroy a portion of the archaeological deposit, they must also be conducted under the auspices of an excavation permit.

Other forms of sub-surface testing, such as magnetometry or the use of ground-penetrating radar, have the advantage of being non-invasive, but can only be conducted by specialist operators with appropriate equipment.

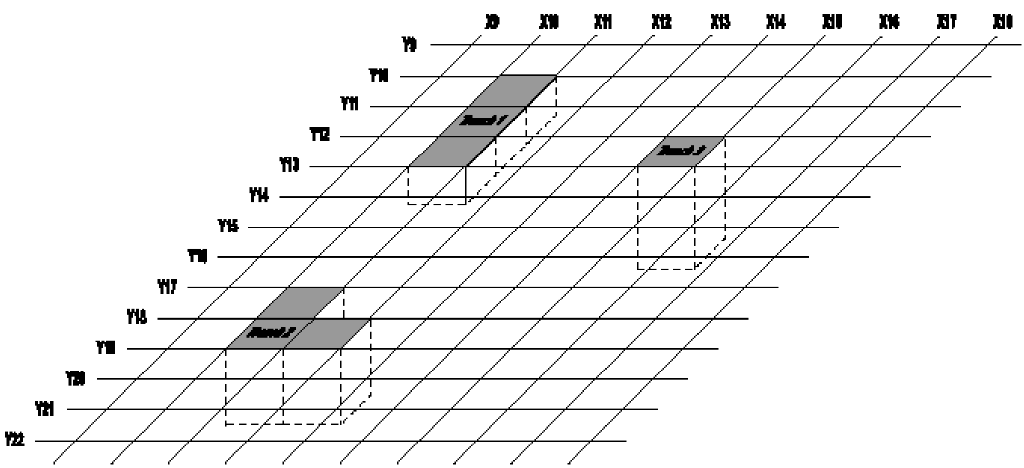
LAYING OUT A SITE GRID

Once you have made your decision about where to excavate, the next step is to lay out your excavation trenches. This may seem pedantic, but is important in terms of being able to maintain control over the positioning of artefacts and features across the site. Archaeologists often use a grid which, for convenience, divides the site into 1 metre grid units (often called 'squares'). An excavation trench can be any multiple or fraction of these grid units, which are related to each other through a universal numbering system (see Figure 5.2). The two axes of the grid are labelled the 'X' and the 'Y' axis. Note that it is standard practice to begin numbering coordinates along these axes at a relatively high number, such as ten, to allow for the possibility of extending a trench if necessary but to avoid going into negative numbers when doing so.

You don't actually need to string out every grid unit across the site; however, to avoid having to measure them again, you should mark the ends of the X and Y axes with stable and relatively permanent pegs. If you want to excavate a trench that is larger than 1 square metre, but don't wish to string out the boundary of every 1 metre grid unit within it, it is simplest to mark the corners of each unit along the edges of the trench with masking tape attached to the trench string.

You do have to formally string out each excavation trench within your site, however. The string outline of the trench serves as a constant reference point for measuring depth and for ensuring that the sides of the trench are kept straight. You must ensure that all of your excavation trenches are kept square (meaning horizontally rectilinear and vertically straight-walled), because it is this which allows you to control the excavation process. As a first step, establish where the edge of your trench will be, measure its length and then mark the two corner points with pegs hammered lightly but firmly into the ground.

FIGURE 5.2: A hypothetical grid across an excavated site. Any of the squares in between the already excavated trenches can be opened and assigned X and Y coordinates from the established grid.



Because trenches are usually laid out in multiples of 1 metre with 90° corners, the next step is to mark the opposite corners.

Establish a right angle from one established peg to a third corner peg using triangulation (see 'Using the baseline and offset technique' on page 96). Install a fourth corner peg by the same method and then measure all four sides *and* the diagonals to be sure that the trench is square. Table 5.1 provides diagonal measurements for excavation trenches up to 15 metres square, on the principal that the diagonal of a square will always measure 1.414 times the length of the sides. This is related to Pythagoras' theorem, which states that in a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the opposite sides. In practice, even though you have carefully measured the first side of the trench, and then triangulated the opposite two corners from this, a trench will rarely be perfectly rectilinear on the first go. Inevitably you will have to keep adjusting the positions of your pegs until the trench is actually square. The only way to do this is to keep measuring the sides and the diagonals until you have them right (see Figure 5.3 on page 129).

Once you have strung out your trench, make sure you don't trip over the string or pegs during excavation. For this reason, you may wish to tie flagging tape or some other brightly coloured material to the pegs to make them easy to see (and avoid). Remember that the corners will be your permanent reference points for excavating and measuring, so it is very important not to disturb them.

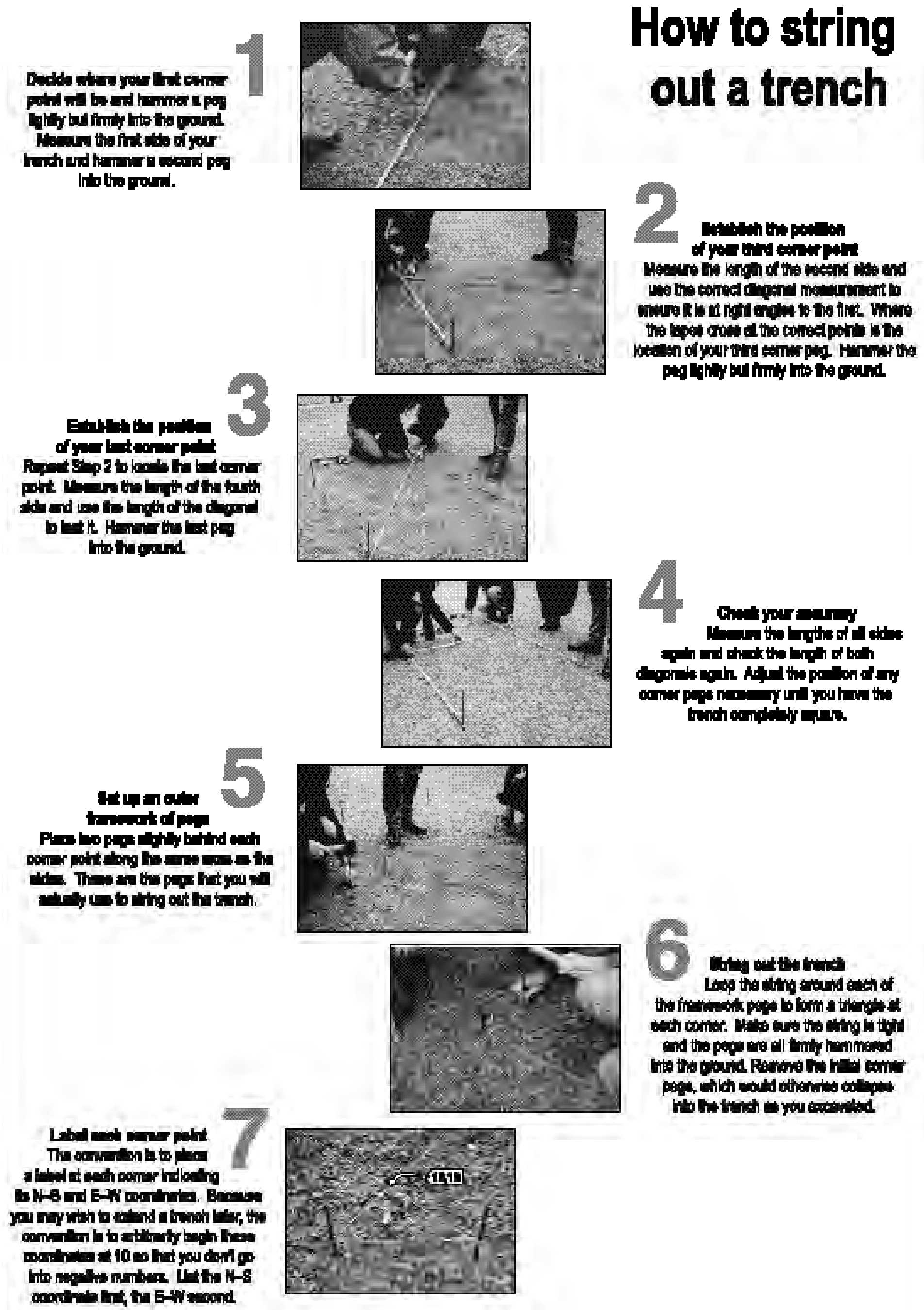
LABELLING TRENCHES

All excavation trenches within the grid of your site must be numbered logically so that all finds and descriptions of deposits can be tied securely to their place of origin. There must be no confusion about this, so deciding on a logical labelling system is a first priority. Every artefact or sample which comes out of a trench, and every description of a layer or a feature, must be able to be described so that you know precisely where it came from, otherwise it will be impossible to draw any meaningful conclusions about your site. Even though you have X and Y coordinates for every grid unit, these would be very time-consuming to transcribe on to every bag or recording form, so it is best to simplify the system by assigning a number to each trench. At the very least, a labelling system should contain a site prefix or code for the site (such as two or three letters which denote its name), a unique number or letter for each trench, and a consecutive and unique number for each context or layer. Individual artefacts or samples within each context can also be numbered if required. This string of letters and numbers will be the code that is written on every bag containing an artefact or sample (see 'Labelling finds and samples' on page 150), and on every recording form.

TABLE.1: Diagonal measurements for archaeological trenches

Width (m)	Length (m)														
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1	1.414	2.236	3.162	4.123	5.099	6.083	7.071	8.062	9.055	10.050	11.045	12.042	13.038	14.036	15.033
2		2.828	3.606	4.472	5.385	6.325	7.280	8.246	9.220	10.198	11.180	12.166	13.153	14.142	15.133
3			4.243	5.000	5.831	6.708	7.616	8.544	9.487	10.440	11.402	12.369	13.342	14.318	15.297
4				5.657	6.403	7.211	8.062	8.944	9.849	10.770	11.705	12.649	13.601	14.560	15.524
5					7.071	7.810	8.602	9.434	10.269	11.180	12.083	13.000	13.928	14.866	15.811
6						8.485	9.219	10.000	10.817	11.622	12.530	13.416	14.318	15.232	16.155
7							9.899	10.630	11.402	12.207	13.038	13.892	14.765	15.652	16.553
8								11.314	12.042	12.806	13.601	14.422	15.264	16.125	17.000
9									12.728	13.454	14.213	15.000	15.811	16.643	17.493
10										14.142	14.866	15.620	16.401	17.205	18.028
11											15.556	16.279	17.029	17.804	18.601
12												16.970	17.692	18.439	19.209
13													18.385	19.105	19.849
14														19.799	20.518
15															21.213

FIGURE 5.3: The sequence for laying out an excavation square



Stephen Sutton's tip for stringing out an excavation trench

Even after you've strung out your trench, it's possible for the string to move (or, more likely, for some unfortunate person to trip over it or kick the pegs out of alignment). To make it easier to reconstruct the precise location of your original corners, mark the place where the strings cross with a permanent, easily visible pen line. In this way, if the string is ever moved, you'll be able to see its original position easily and replace it accordingly.

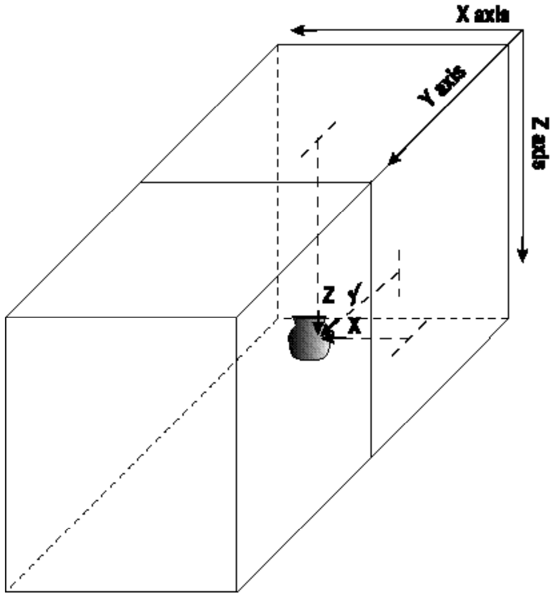
RECORDING IN THREE DIMENSIONS

Because archaeologists want to know the exact location of artefacts and features, both horizontally and vertically, they record these things according to their position both along the length and the width of the trench (their position on the X and Y axes of the site), but also their position through the depth of the deposit. This is called the Z axis (see Figure 5.4 on page 131).

The most accurate way to measure depth is to use a dumpy level or EDM to plot individual finds, although this technology is not always easy to come by. If you don't have access to it, you will have to use an old-fashioned tape measure. If you use this low-tech solution, make sure that you always measure from a fixed horizontal baseline (the string of the trench is fine provided you use a carpenter's string level to make sure it really is horizontal and hasn't been disturbed during excavation). Any alteration or movement in this baseline will affect all your subsequent measurements.

On many sites, recording the precise position of every individual artefact in three dimensions is not always practical and is not necessarily going to provide you with more accurate or 'better' archaeological information, unless there is good evidence that the artefacts are still in their area of primary use or discard (Drewett 1999: 143). Recent research (Balme and Beck 2002) suggests that simply plotting artefacts to within a 25 or 50 centimetre quadrat (i.e. this artefact was recovered from Trench 1/context 10/quadrat a) will provide sufficient spatial resolution to answer most questions about

FIGURE 5.4: Using X, Y and Z coordinates to plot the location of an excavated artefact



activity areas at a site. Any special or unique finds can still be plotted individually if necessary.

Whether you are more concerned with chronological or spatial questions will largely be determined by the type of site you are excavating. Historical sites, for example, are usually formed over a relatively short period of time, and may be well documented; therefore, detailed information about chronological change is not always important. The emphasis in these sites may be more on spatial questions—changes in patterning horizontally, across space—rather than chronological issues.

RECORDING THE EXCAVATION PROCESS

Just as with a surface survey, there are several complementary aspects to an excavation which must be recorded consistently and in detail as the excavation progresses. These will be essential pieces of information in the final jigsaw puzzle which will be your archaeological analysis. The core aspects to record throughout any excavation are:

- the soil or deposits (for each context or spit);
- any features encountered;
- the process of excavation itself.

DESCRIBING DEPOSITS

The four main elements to record when describing soils are:

- colour;
- texture;
- consistency;
- coarse components or composition.

It is important that you standardise such descriptive information as much as possible, so that other people reading your report will know precisely what you mean. If you let everyone describe a variable such as colour in their own way, for example, you will end up with as many descriptions as there were workers. In reality, of course, none of these attributes can be assessed in the field with any kind of scientific accuracy, and the standards employed by soil scientists and archaeologists vary considerably. Your goal should simply be to try to record as much descriptive information in as standard a fashion as possible.

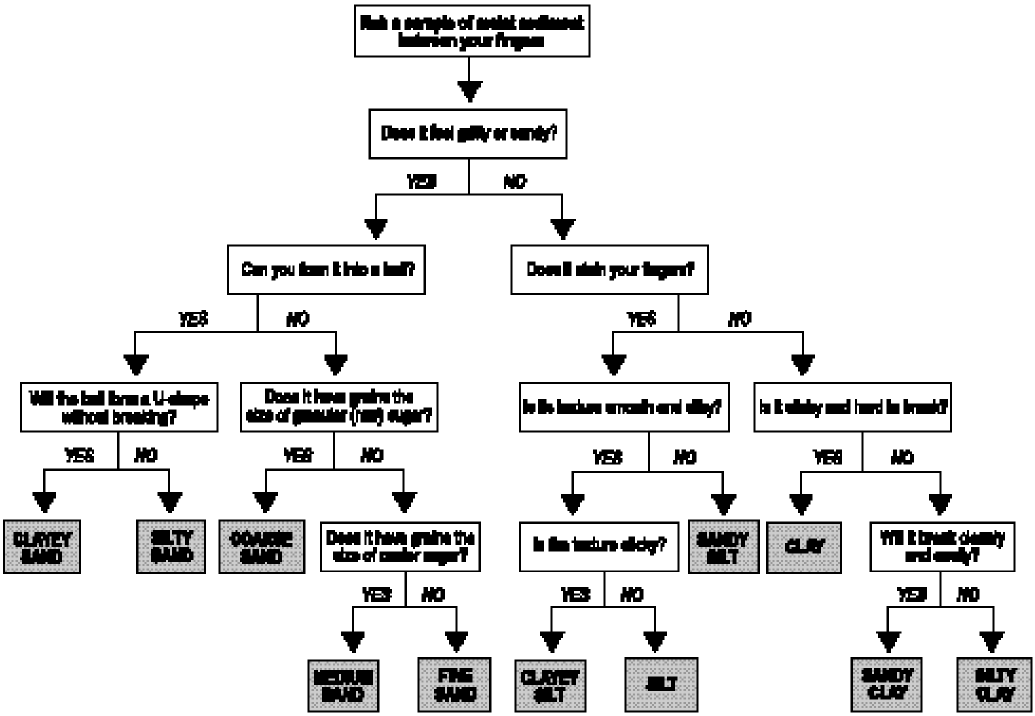
Colour should be recorded using a Munsell Soil Colour Chart, which provides an internationally recognised standard against which to assess soil colour and makes the process far more objective than would otherwise be possible.

The basic divisions of soil **texture** are sand, silt and clay, defined in terms of the size of their mineral particles (sand = 0.06–2 millimetres; silt = 0.002–0.06 millimetres; clay = less than 0.002 millimetres). For on-site purposes, however, it is best to use a more general measure which can be estimated by hand-texturing, such as whether or not the soil will hold its shape when damp. The overall rule of thumb is that clay coheres, silt adheres and sand does neither. Thus clay will be sticky and plastic, silt will have particles that are invisible to the naked eye, and sand will have a visible gritty feel when moistened (Roskams 2001: 178). A general test which you can apply to all types of soil is to roll it into a ball and test its malleability (Figure 5.5 on page 133). If the soil can be rolled into a sausage shape that still holds its shape when bent into a ring, then it is largely clay; if it breaks when bent into a ring, it is largely silt. Sand, of course, cannot be rolled into any shape.

Consistency measures the degree of compaction of the soil and whether or not it holds together. Variations in compaction across a deposit can be important, as different activities on the site will have affected the consistency of the soil in different ways. To assess consistency, take a slightly moist cube of soil and try to crush it between your thumb and forefinger:

- If it cannot be moulded into a cube at all, it is a **loose** soil.
- If it crushes easily (if there is no resistance), it is a **weak** soil.
- If low pressure is required to crush it, it is a **friable** soil.

FIGURE 5.5: Sediment composition flow chart (after Museum of London 1990)



- If greater pressure is required to crush it, it is a **firm** soil.
- If it cannot be crushed at all, it is a **compact**, or **hard** soil.
- If it is bound together with a substance other than clay, it is a **cemented** soil. (Roskams 2001: 180)

The assessment of the **coarse component** is an estimate of the size of visible particles within the soil and of the proportion of different grain sizes in the deposit. When assessing the size of the visible particles, use the general guide in Table 5.2 on page 134 (Museum of London 1990).

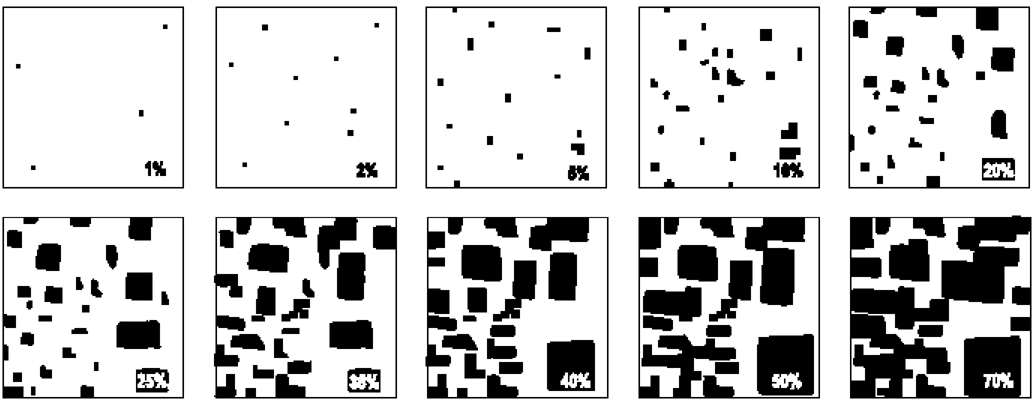
When assessing the proportion of different grain sizes (composition), you can estimate the percentage of inclusions and their approximate grade size using the chart in Figure 5.6 on page 134.

If possible, you should also estimate the degree of sorting that is visible in the deposit. This is an assessment of the frequency with which particles of the same size occur and will give you some idea of how the deposit was laid down. A deposit in which all of the

TABLE 5.2: A guide to estimating the size of visible particles

Description	Particle size
Clay/silt	Not visible to the naked eye
Fine sand	0.02 mm–0.06 mm
Medium sand	0.06 mm–0.20 mm
Coarse sand	0.20 mm–2.00 mm
Fine pebbles	2 mm–6 mm
Medium pebbles	6 mm–20 mm
Coarse pebbles	20 mm–60 mm
Cobbles	60 mm–100 mm

FIGURE 5.6: Estimating the percentage of inclusions (after Museum of London 1990)

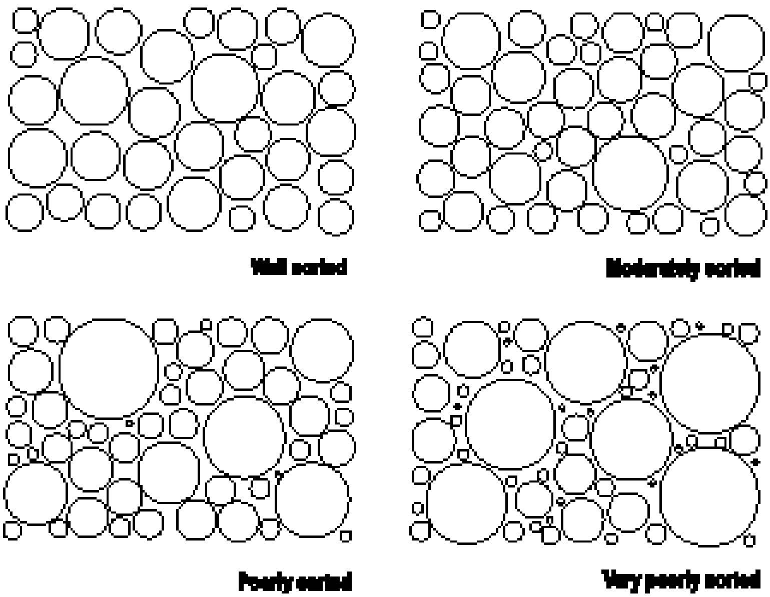


particles are of very similar size, for example, indicates that it has been well sorted prior to deposition (by water or wind, for instance).

DESCRIBING CULTURAL FEATURES

Obviously you also have to record any cultural features (i.e. the artefacts) you encounter during excavation. For example, the presence or absence of stone artefacts or charcoal within a rock shelter deposit is clearly an essential component. In historical archaeology, when you describe other features in the excavation (such as walls, timbers, or various materials), it is important to outline their methods of construction using standard terminology so that others will understand precisely what you mean. Detailed standards

FIGURE 5.7: Estimating the degree of sorting (after Museum of London 1990)



for describing timber, brick and other remains are contained in 'Describing structural components' on page 178.

DESCRIBING THE EXCAVATION PROCESS

An excavation is described essentially by the information you record in your field notes, detailing the day-to-day running of the dig and any problems or successes (see 'Keeping a field journal' on page 70). Your details of the sequence of events for the day and the decision-making process can be invaluable for sorting out problems in later analysis, or for clearing up any unwitting mistakes made on recording forms or artefact bags.

RECORDING SECTIONS

One of other main ways in which archaeologists record stratigraphic information from a site is by drawing and photographing the vertical walls of their trenches. These walls are called **sections** or **profiles**, and the aim is to represent both the visible soil layers and the discernible archaeological features as informatively as possible. Stratification is what allows the archaeologist to place events at a site into chronological order. Because the Principle of Superposition rests on the assumption that the deposits at a site are laid down in sequence over time, it is also the basis for relative dating (see 'The principles of excavation' on page 121). This is the process of putting things into order from earliest to latest, but without assigning any specific dates to the things themselves. Absolute dating, on the other hand, uses a particular technique or process to assign a specific date to something (such as when radiocarbon dating is used to date a piece of bone). Both forms of dating are essential to archaeological research for obvious reasons. Without some knowledge of when things happened, it is impossible to properly interpret a site. For this reason, it is important that your photographs and section drawings represent the vertical sequence of layers or contexts visible in the wall of the trench as accurately as possible (see 'Photographing excavations' on page 279 and 'Drawing vertical surface (sections)' on page 289).

The principle of drawing a section is exactly the same as that for drawing a site plan: using baselines with offset measurements to plot features (see 'Using the baseline and offset technique' in Chapter 4 and 'Drawing horizontal surfaces (plans) in Chapter 9 on page 286). Remember that the scale at which you draw the section will determine how much detail you can include in it. The hardest part of drawing a section is deciding where one layer or context ends and the next begins. Sometimes, lightly wetting the profile with water from a hand sprayer will bring out distinctions in soil colour, but another way around this problem is to use different symbols to identify a distinct boundary as opposed to an indistinct or uncertain one.

You can draw a section either cumulatively—that is, as each context is excavated—or at the end once all excavation is complete. If you draw your section cumulatively, make sure that you include all the necessary coordinates to allow the individual drawings to be fitted back together later. If you draw your sections at the end, you will probably have to refer back to your excavation notes to know which contexts you are seeing and drawing in the profiles. A certain amount of annotation will be necessary to make your section drawings intelligible to someone else, but try not to reproduce all of the information from the context or excavation recording sheets. For more information on how to draw a section, see 'Drawing vertical surfaces (sections)' on page 289.

INTERPRETING STRATIGRAPHY

Current archaeological analysis does not rely solely on drawn sections for interpretation. A Harris matrix is probably the most commonly used means of making sense of archaeological stratigraphy, although there are debated alternatives. Harris matrices work best for the kind of deposits for which they were developed (i.e. complex historical archaeological sites with structures). They are not necessarily very useful for pre-contact Indigenous sites, as these tend not to have the same kinds of deposits.

A Harris matrix makes it possible to represent a complete three-dimensional stratigraphic sequence for a site in a single two-dimensional diagram. Its great virtue is that it enables all contexts excavated at a site to be shown simultaneously, not just those contexts which appear in the section (recent research has indicated that up to 40 per cent of recorded contexts will not show up in any section [Bibbey 1993: 108]). According to Harris, there are only three stratigraphic events which are possible on a site (Brown and Harris 1993: 10):

- deposits (the context or layer, which can be either natural or cultural, horizontal or vertical [i.e. a structure such as a wall]). This is the result of any event which acted to place evidence at a site, such as layers of debris or the construction of a wall;
- interfaces between one layer and the next (i.e. the surface of the context);
- cuts, such as pits, wells, graves, etc., which are dug through earlier layers and which can be defined as stratigraphic units in their own right. A 'cut' is essentially something which has happened on the site to remove evidence, rather than to deposit it. It is therefore a 'negative' feature, but it is important to record it in the same way as you would a 'positive' feature.

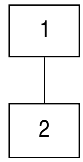
At the time of excavation, a decision must be made as to the nature of each context: is it a cut or a cultural or natural deposit?

There is no room here to include all of the interpretive information which can be encoded into a Harris matrix, or to explore the various alternative schemas which have been developed in response to its perceived flaws. We have simply included the basic principles of the Harris matrix as one means of attempting to define relationships between different strata on an archaeological site. A Harris matrix is best produced as excavation progresses and each context must be added to the matrix at the time of its excavation. This is the *only* time that inconsistencies or unclear relationships between contexts can be sorted out through further excavation/investigation if necessary. Interpreting stratigraphy is rarely straightforward, and you should never assume that you will be able to remember stratigraphic relationships between units. If you are working on a large site you may only be excavating a small part of the total sequence anyway, so your observations of how contexts relate to each other will be vital to the overall understanding of the site.

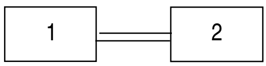
The essential basis of the matrix is very simple: a number, always written or drawn inside a consistent rectangular box, is assigned to each context or unit. Horizontal and vertical relationships between contexts are represented by horizontal or vertical lines drawn between boxes to represent the sequence. There are only three possible chronological relationships between any two contexts (see Figure 5.8 on page 138).

FIGURE 5.8: The stratigraphic relationships of a Harris matrix

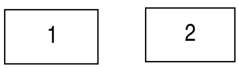
- *Relationship A:* 1 is later in date than 2 (in other words, 1 overlies 2)



- *Relationship B:* 1 and 2 are identical in date



- *Relationship C:* 1 and 2 have no direct temporal relationship

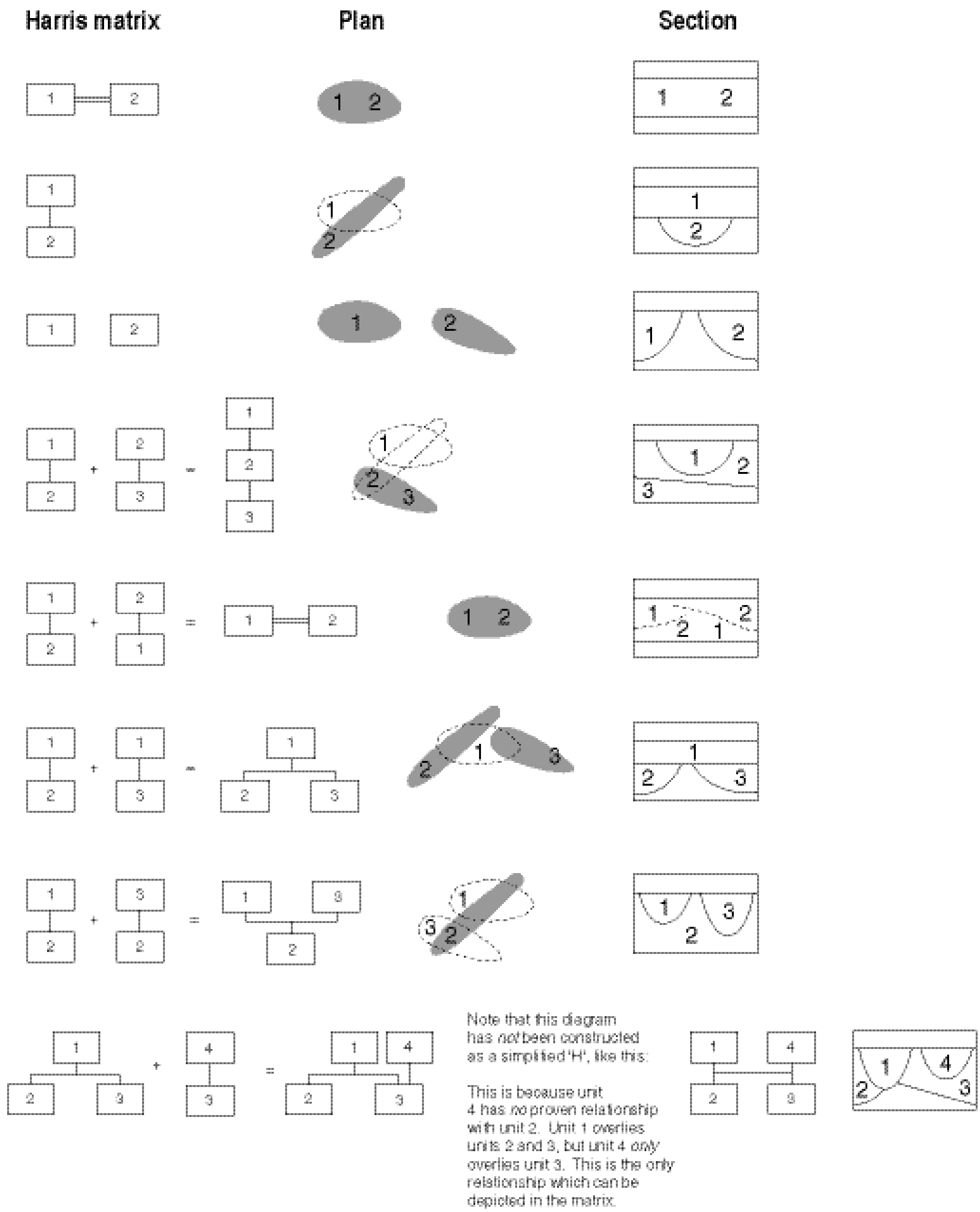


The elegance of the Harris matrix is that it reduces all possible forms of stratigraphic connections to one of these three relationships and then uses these relationships to build a complete chronological sequence for the site. You can combine these three stratigraphic relationships in a variety of ways (see Figure 5.9 on page 139).

Constructing a Harris matrix requires the excavator to think logically about the relationships between contexts and ensures that all contexts, regardless of size or supposed importance, are included in the final analysis (Bibbey 1993: 106–7). When establishing matrix sequences:

- First, look for correlations *across* the sequence (i.e. horizontal correlations). This means looking for deposits which are of the same date, or for deposits which may once have been part of a single continuous unit, but which have since been cut by later intrusions (Relationship B). This last is quite difficult to do and direct correlations between units must be inferred with care. It is for this reason that Harris matrices can only be produced as excavation progresses, as decisions about where each context fits within the overall sequence will often be based on similarities or dissimilarities between physical characteristics (colour, texture, inclusions, etc.), surface level, or the nature or date of recovered artefacts. The physical characteristics of the units in question will probably be the best guide as to whether or not two units are linked. This is one of the key reasons that it is imperative to record all descriptive information about excavation units using consistent terminology (see 'Describing deposits' on page 132).
- Second, decide on the associations of successive units (i.e. vertical correlations). This means deciding on the sequence of deposition for the site—what is above or below each context (Relationship A) ?

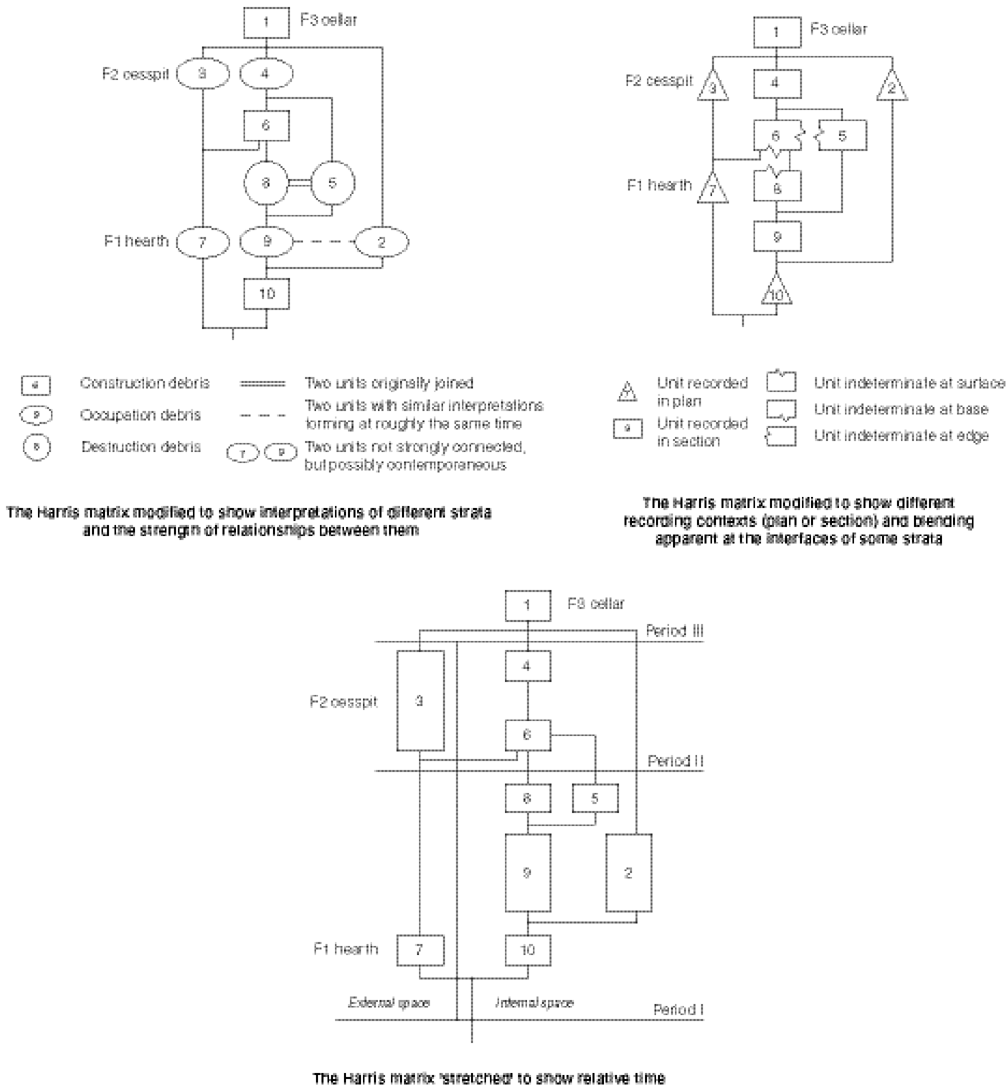
FIGURE 5.9: Representing stratigraphic relationships in a Harris matrix (after Brown and Harris 1993)



Where a stratigraphic sequence exists, it makes sense to interpret it from the earliest elements upwards in the same order in which it has developed (Roskams 2001: 247).

Constant use by archaeologists has amended the basic Harris matrix in many ways to depict a wide range of complementary information. By altering the form of the lines

FIGURE 5.10: The basic principles of the Harris matrix can be adapted to record a wide variety of complementary information (after Brown and Harris 1993)



between boxes, the shape of the boxes or their relative positions, a matrix can be made to depict the strengths of linkages between strata, different types of debris resulting from different activities, relative or absolute periods of time, and even construction sequences for standing structures (see 'Recording standing structures' on page 176).

USING A TROWEL AND BRUSH

You use a trowel both to define the extent of a deposit and to remove it to expose the underlying layers. The nature of the deposit (its texture and consistency) will determine the most appropriate trowelling techniques. The main decision you will have to make is whether to use the point or the edge of the trowel to remove the soil. This will really depend on the depth of the layer, how compacted the soil is and how large or fragile the artefacts contained within it are. If the deposit is loose or sandy, for example, then it is probably easier to scrape the soil away with the edge of the trowel; if it is hard and compacted, then the only option may be to try and break it up carefully with the point of the trowel. On the other hand, if you are excavating a site containing relatively large and fragile artefacts (such as mollusc shells), then removing the deposit in 'chunks' rather than scraping it away and risking slicing through the fragile organics may be your only option.

If you are scraping, always use your trowel with the edge of the blade parallel to the ground and pull it towards you. You will probably need to keep your weight over the trowel to do this effectively, which may prevent you from sitting down as you dig. If you adopt this method you will have to work so that you pull the excavated material towards you on to the unexcavated portion in front of you, rather than pushing it away on to the already exposed surface. On some sites with fragile artefacts, you may be better off to loosen a small area of soil in a corner of the square closest to you with the trowel first, and then use the vertical face of this pit to open up the remainder of the grid unit. In this case, you can use the tip of the trowel both to loosen the dirt and at the same time to turn it over, and you will work away from yourself. For either technique, remember to always keep your dustpan and bucket handy so that you can continually remove the excavated soil from your unit as you dig. Once you have filled up your bucket, you will probably have to sieve the contents. As the sieves may be located some distance from the actual trenches, make sure that you do not make the buckets too heavy to carry (see 'Sieving and sorting' on page 146).

Archaeologists use brushes to clean the soil from delicate or fragile finds and to tidy up the base of each soil layer after it has been excavated and before it is photographed (see 'Photographing excavations' on page 279). Small brushes and excavation tools (such as dental picks or plasterer's tools) are best for excavating in small cavities. If you come

FIGURE 5.11: Use the edge of the trowel to pull sediment towards you and onto the dustpan. Any fragile or delicate artefacts will require careful brushing to avoid damage.

across a discolouration in the soil or other unusual feature, it may be best to brush this down with a hand-held brush until you can determine what it might be, rather than to keep trowelling and run the risk of damaging it. Soft, hair-bristle brushes (like those used for typical household cleaning) are best for sweeping up loose dirt.

Whatever technique you adopt, you must always ensure that you work slowly and carefully, and take careful note of any apparent changes in the texture, colour or nature of the deposit. The goal of all stratigraphic excavation is to define as far as possible the limits of each stratigraphic layer as it is being removed and to remove each separately and in its entirety before beginning work on the next. As the excavator, it is your job to ensure that underlying strata are not cut into prematurely, thus destroying any opportunity for you or anyone else to observe vital relationships between layers. **In essence, you are only removing the uppermost layer until something different appears.** This is simple to say, but not always easy to do. Some differences between stratigraphic contexts will be very subtle (such as when one area of soil has a different texture or particle size to other areas around it); others will be readily apparent (such as a layer of fill which is a different colour to that underneath it); There is no easy answer here, and being able to distinguish between different layers will largely be a matter of experience. Sometimes you can literally 'feel' the difference as you dig when one area is harder or easier to dig than those around it. **As a general rule, whenever you encounter any noticeable change in the soil (colour, texture, hardness, inclusions), stop and assess the situation carefully before you proceed.**

If you find you've made a mistake (and cut too deeply for example, or removed a layer which you thought was uppermost but which turned out to underlie another adjacent layer) the best response is to stop and record the situation fully (with drawings and notes) before you proceed. The most important thing to remember when excavating is always to work systematically. The best advice is to go slowly and methodically, and always ask for advice if you are unsure.

You should already be aware by now of the necessity for archaeologists to control the excavation process. One of the many ways in which they do this is by trying to dig their trenches as squarely as possible—that is, by trying to remove the soil within their trenches in careful blocks. This is because they wish to know precisely where every artefact and feature comes from within the site: obviously if the wall of a trench has been **undercut** (i.e. if it slopes away from the excavator, into the adjoining area), then any artefacts which are recovered from that undercut zone by rights come from the next square. One of the main aims of good excavation, therefore, is to keep the sides of your trench vertical and the walls and floor square (unless you are digging according to the context system, in which case the base of each context will be following a stratigraphic layer which is highly unlikely to be square). If you are excavating many small contexts, you don't need to be too pedantic in keeping your walls absolutely vertical; they can be trimmed in a single operation before photographing the trench at the end of each context. Remember to keep the soil from the trimmings and any artefacts it contains separate from the other contexts. You have no way of knowing whether that soil and those artefacts came from the top of the trench, the middle or the base—all you know is that they came from the trench wall.

FIGURE 5.12: The best way to ensure that the sides of your trench are kept vertical is to stand or kneel directly above them and trim from the top down. It is easy to undercut the walls if you try and trim them with the wall in front of you since you can't see whether you are cutting truly vertically or not.

In the end, the degree of accuracy which is necessary in your excavation technique will depend on the research questions that are being asked: if your research absolutely depends on knowing exact stratigraphic divisions between layers (such as if you are investigating activity areas, or precise changes in use over time), then you will have to proceed with great care; if you are only interested in broad divisions of use or chronology, then a less precise excavation strategy may be adopted—sometimes even extending to excavating the site using arbitrary layers (see 'The principles of excavation' on page 121).

Excavation etiquette

- Never undercut a trench wall, even if you can see an interesting artefact in the wall of the trench.
- Never pull an artefact, stone or other feature out of the wall of the trench.
- Never pull an object out of the ground. Excavate around it until you have reached its base and then remove it in one piece.
- If an object or unusual feature is uncovered, a good rule is to leave it in place (*in situ*) until the area is completely excavated and the object can be removed carefully in its proper stratigraphic context.
- When working in a rockshelter, avoid wearing boots with big tread as the tread can disturb small artefacts and the fine silty deposits built up in these places. Tennis shoes or some other sturdy footwear with fine tread is best, although at some sites you may be asked to dig bare foot.
- Don't walk on newly excavated areas (particularly someone else's!) unless it is absolutely unavoidable (i.e. if you need to clean up that area prior to photographing or drawing it).
- When you are excavating, always move backwards across the trench to avoid kneeling on the freshly excavated surface.
- If weeds or roots are present, cut them with secateurs—don't pull them.
- Don't trip over the string or the pegs or disturb them in any way during excavation.
- Never step too close to the edge of a trench as you may run the risk of collapsing the wall and becoming the most unpopular person on the dig. If you are excavating in a deep trench, get someone to help you in and out, so that neither of you puts your full weight on the edge of the trench.
- Never sit on the edge of a trench (for the same reason).
- Be willing to take your turn at a variety of tasks. Excavation requires sieving, sorting, cleaning and backfilling as well as actual digging, and no one wants to be restricted to one task all the time.
- Bear in mind that tempers get frazzled, particularly on long or arduous digs, and you may have to maintain goodwill even in the face of seemingly overwhelming obstacles.

It does not help anyone if you sulk, and a temper tantrum can destroy everyone's morale for the whole day.

- Different people have different physical tolerances and may work at different paces, so be patient if someone works more slowly than you do, or needs more guidance.
- If you are a trench or site supervisor, be supportive in the way you provide advice to people who are learning to excavate. Try to remember that people aren't born with excavation skills and that some people will need more specific instructions than others.
- If you're supervising other workers make sure that you brief them as fully as possible before the dig begins. Make clear what your aims are and what you want to know. This will help them to understand the importance of following particular procedures and guide them in terms of what to look for. Update these briefings regularly so that no one feels lost.
- If you are camping with other workers during the dig, remember to be tolerant of others, particularly after a hard day's work. Don't hog the shower and do your fair share of the household tasks (like cooking or cleaning). Believe it or not, the main sources of irritation on archaeological fieldwork expeditions is who gets priority for the showers and who should be doing the cooking!
- Most importantly, fieldwork is a job, not a holiday, so make sure you are always on time and promptly back at work after breaks.

Val Attenbrow's tips for excavating shell middens

- *Identify stratification and excavate accordingly.* Shell middens vary widely in size, composition and complexity. They range from deposits which are homogeneous throughout to deposits which are finely stratified and may contain, for example, hearths, lenses of specific shell species and/or tool manufacturing events, as well as animal bones and stone artefacts. Excavation should proceed in a manner that ensures any stratification is identified so that excavation units can reflect stratigraphic boundaries.

  Where a midden appears to be homogeneous, excavators still need to take account of how the deposits may have accumulated—for instance, whether there is a slope in the particular areas being excavated. If the surface of the midden (or an exposed face) suggests materials accumulated on a sloping surface, then the orientation of excavation units should not be horizontal but on a slope that approximates the way the deposits accumulated. This will prevent excavation units from cross-cutting any 'layers', even if they are not visible during excavation.

- *Choose the most appropriate sieve mesh size.* If the midden is composed mostly of whole shells, then a 5 millimetre mesh may be sufficient, unless numerous small (less than 5 millimetre) species are also present. Where stone artefacts are present and fish bones are abundant, then nested 5 and 2 millimetre sieves are recommended, although the shell analysis to identify species composition may be based on materials retained in only the 5 millimetre sieve. In deposits where fish bone is present but sparse, the addition of a sieve with 1 millimetre mesh may be necessary to recover the bones. Depending on the species, the addition of a 1 millimetre sieve where fish bones are abundant may enable more bone to be recovered (i.e. more fragments, greater weight), but it may not necessarily enable a greater number of species to be identified.
- *Look for shell tools and manufacturing debris.* It is often the case that only samples of the shell component of middens are analysed to determine the species composition; sometimes 'excess' shell is discarded in the field. In such situations, these deposits should be inspected prior to discard for any shells that may have been used as tools or for shell that is the debris from the manufacture of shell tools. Both bivalves and gastropods were used as scrapers and cutting implements—for example, in processing plant foods—and were also used as adzes to make wooden artefacts. In addition, along the eastern coast of Australia, shell fish-hooks were made from oval pieces cut from *Turbo* shells. These 'blanks' may also be present, along with whole and/or broken hooks.
- *Make a reference collection.* Make a collection of whole shells of all visible species, large and small, from the shoreline adjacent to the excavated midden. This can be used as a reference collection to aid in the identification of midden species. Collect several specimens of each species, particularly gastropods, so that some can be broken up to examine the internal surfaces and shape of the column. If an analysis of meat weights and so on is to be carried out, collect live specimens. Bivalves and gastropods will stay alive for some weeks or can be put into preservative to keep them longer.

SIEVING AND SORTING

Most artefacts from sites are not recovered during the process of digging, but in the subsequent process of sieving the excavated soil. In the interests of stratigraphic control, it is important to sieve each excavated soil layer separately and to keep all artefacts and samples from each layer distinct through careful labelling and bagging. Never allow your bucket of excavated soil to become mixed with buckets from another grid unit or another layer—and never allow the artefacts you recover from your bucket to become mixed with others unless they all come from the same context and will be bagged together anyway.

Most sieving is done by hand (i.e. by emptying your bucket into a hand-held sieve, shaking it to remove the loose soil, and then sorting through the material trapped in the sieve for artefacts). This is one of the most time-consuming jobs on site, and is usually where a backlog will build up if there are not enough sieves. For this reason, make sure that you have enough sieves (and enough sievers!) to keep the process moving. On some large sites, it may be possible to use mechanical sieves to speed the sieving process, although you will still need the same amount of time to sort through the sieved material for artefacts. Hand-held sieves come in a variety of mesh sizes (2, 3, 4 or 10 millimetres are all standard), and can be 'nested' together (i.e. with one fitted over another) so that you can sieve through two mesh sizes simultaneously. When using nested sieves, always remember that the larger mesh size fits over the smaller one. The decision of which mesh sizes to use will depend on the nature of your site and what questions you want answered. A small mesh size will obviously make a big difference to excavating a shell midden which may contain many small and delicate fish bones, but may be redundant on an historical site containing relatively large fragments of glass and ceramics.

On sites with clay soils, wet sieving may be the only way to retrieve artefacts. Immersing hand sieves containing excavated material into large containers of water can sometimes be effective, although at some sites a pressurised stream of water may be necessary to break down the soil and reveal artefacts. Wet sieving is a much more labour-intensive process than dry sieving and can damage artefacts, particularly if you have to push the soil through the sieve to break it down. All artefacts removed during wet sieving will have to be allowed to dry before they are bagged.

FIGURE 5.13: Sorting through sieved material for artefacts

The other major decision in relation to sieving is where to sieve. This may sound trivial but, as all of the soil that goes through the sieves will ultimately have to be put back into the trenches, you should consider very carefully where to place it. Sieve piles can become very large very rapidly, and have a habit of spreading widely at the base, particularly if people continually walk on them. When deciding where to place your spoil heaps:

- Use flat ground not too far from the trenches. (Think how far you can expect people to regularly carry heavy buckets full of soil. Making sure that the spoil heaps are as near as possible to the trenches will also help you when you have to backfill.)
- Think about whether or not you will have to clear the ground surface of vegetation first to ensure that you don't lose any soil.
- Think carefully about where you're likely to excavate, particularly in terms of allowing yourself the option of extending trenches. In other words, don't place your spoil heaps where you may later want to dig a trench!

Once you have removed all the artefacts from the sieve, they will have to be bagged and labelled to keep track of them. The precise system for tracking and labelling artefacts will depend on the preferences of the excavator or site supervisor, but as a general principle all artefacts will be grouped together by context/stratigraphic unit and placed in clearly labelled finds trays or bags. Any special finds which require immediate **conservation** should be bagged and labelled separately, and treated immediately (see 'Conserving finds on site' and 'Labelling finds and samples' on page 150). For detailed information on recommended conservation treatments for excavated materials, see Museum of London (1990) and Watkinson and Neal (1998).

Mike Morwood's tips for protecting rock art when excavating

Because dust is highly abrasive, it can be extremely damaging to painted rock art panels, particularly in the confined space of a rock shelter. To reduce dust during the excavation process:

- Place a screen or curtain (calico is suitable) between the excavation area and the art surface and leave a gap of at least 30 centimetres between the screen and the rock art surface to allow the air to circulate.
- 'Carpet' the ground surface of the shelter or place wooden planks parallel to the edges of the excavation area to reduce dust stirred by traffic.
- Because sieving is the greatest generator of dust, place the sieves on plastic sheeting and contain the spoil heaps on this sheeting.
- Sieve downwind of the rock shelter, erect a screen between the sieving area and the general excavation area, and place calico 'skirts' around the base of the sieves.
- During backfilling, place the spoil into hessian or plastic bags and stack the bags in the trenches. Complete the backfilling by placing a layer of dirt over the bags. (Morwood 1994: 10–12)

Sometimes artefacts will be sorted into different classes on site (e.g. glass, ceramics, bone, metal, etc.) before being bagged but, once again, the complexity of this process will depend on the size of the site and the preferences of the excavator. If you can, get as much as possible of the basic processing (cleaning, washing, gross sorting) done on site. Remember that for every day you spend in the field, whether surveying or excavating, you should ideally allow three days in the lab or office to process or write up the results—longer if both are necessary (i.e. if you first have to analyse the artefacts and then write up the report).

When cleaning artefacts, it is always best to take a gentle approach. Ceramics, glass and stone artefacts can be cleaned with a soft toothbrush and water (Drewett 1999: 145). Other materials, such as metal, bone or shell, are often highly friable and shouldn't be washed unless it is obvious they won't be damaged. Most metals are not stable and will deteriorate rapidly when exposed to air. You should use only a dry brush to clean these kinds of fragile materials. Bear in mind, when excavating stone artefacts, that washing will remove any potential residues from the surface of the artefact (see 'Recovering artefacts with residues and use-wear' on page 219). If you are worried about damaging any fragile or unusual artefacts, then store them responsibly (see 'Conserving finds on site' on page 150) and seek professional advice before you clean them. When cleaning, make sure you keep the overall dig recording system intact. In other words, clean each bag of artefacts separately and make sure that every artefact goes back into the labelled bag from which it came. Never separate the contents of any bag from its label or context identifier.

Anita Smith's tips for a successful excavation

- Carry your own little kit of the following essentials (and have your name on them!): tweezers, pencil, soft brush, photo scale, magnifying glass, compass, line level, clinometer, baby torch, note pad—it all fits into a bum bag.
- Sitting on the sieves may not seem glamorous, but it's where you learn heaps from the more experienced people around you.
- If you are unsure—ask, ask, ask and keep asking! There's nothing worse than realising you've discarded the only fragment of non-local stone in the entire site because you didn't think it was important.
- Fieldwork is part of the process, not simply a means to an end. It offers insights into the archaeological material that can never be gained from lab analysis alone.
- Take notes, notes and more notes—everyone is diligent on the first day but after that they tend to taper off. Keep writing them regardless of the conditions; they are invaluable when you come to analyse material months or even years later.

CONSERVING FINDS ON SITE

You don't have to be specially trained as a conservator in order to care for excavated finds. A general rule of thumb is that organic materials should be stored in an environment similar to the one in which they were found: e.g. finds from a damp environment are best kept damp; those from a waterlogged environment are best kept wet; and those from a desiccated environment are best kept dry. Even ordinary soils will hold some moisture content, however, which means that artefacts may have to be dried out before they can be bagged. For this reason avoid placing metal or fragile organic materials directly into sealed plastic bags because the moisture cannot escape and the resulting 'sweat' may cause the finds to deteriorate. Instead store them in hard polythene boxes with silica gel to keep the interior of the box dry (Drewett 1999: 146) or in perforated polythene bags to allow moisture to escape. Alternatively you can thoroughly air-dry objects before storage. If you are dealing with a compound object (i.e. one that is made up of more than one type of material, such as a shoe or a hafted tool) then do not separate the components. If you are trying to reassemble broken artefacts (such as ceramic vessels), make sure that any chemical compounds used to hold the pieces together will not damage the artefacts and that the process is reversible. Basically, common sense will always be the best on-site guide—if an artefact is fragile or friable, don't wash it; handle and store it carefully. Seek professional curatorial advice before doing anything you are unsure of (see 'Managing archaeological collections' on page 156).

LABELLING FINDS AND SAMPLES

This may seem trivial, but in fact the labels which you attach to artefacts or samples need to be durable and legible for a very long time: archaeological artefacts are of little value if there is no record of their origin. The most durable labels are made from plastic and aluminium. Because they deteriorate easily, paper and card labels are not widely recommended. When you write on these labels you should use permanent markers (such as Artline 70 pens) so that the writing is as durable as the labels themselves. You can also use basic black ballpoint biros because, although their ink is less permanent, writing with the pen will make an indelible impression in the surface of the label which can still be read even if the ink has faded. When labelling a find or a sample, be sure to include on the label:

- the name of the site, or the site prefix;
- the excavation trench from which the object came;
- the context or layer from which the object came;
- the date;
- a basic description of the contents (e.g. glass, metal, soil sample).

Jane Balme's tips for excavating bone

Observing small differences in the appearance of bones during excavation can pay enormous dividends in the quality of information gathered during excavation. The presence of clusters and alignments of bones can tell you about post-depositional processes. Articulated bones indicate a lack of disturbance and hence provide information about the spatial distribution of activities.

- Observations aren't worth having unless you communicate them to other members of the team and write them down.
- A sample of animal bones is useless without labels containing information about their source. This includes their location within the site (square and excavation unit) as well as the mesh size of the sieve from which they were taken. The best way to make sure that you don't forget some information is to be consistent in your labelling. Write down the information in the same order each time.
- Label the sample immediately and never leave any samples lying around unlabelled.
- Condensation in plastic bags will cause paper labels to disintegrate. You can reduce condensation by putting a few pin pricks in the bag, but you will need other labels too. Permanent marker on the outside of the plastic bag is good but, because this can scratch off, make sure that you pack the bags in boxes to reduce this problem.
- Patience is definitely a virtue when dealing with archaeological bones. You will need patience to pick each bone individually from the samples and lots more when you do the identifications in the laboratory.

COLLECTING SAMPLES IN THE FIELD

Archaeologists often collect samples of materials found during excavation for analysis in the laboratory. This may include samples of charcoal, wood or bone to use for radiocarbon dating, soil for extracting pollen or seed samples, or even small flakes of ochre from rock art for dating or determining the source of the ochre. It is not enough, of course, that you just collect anything that you like in any way that you like. The best samples are those which are found *in situ*, are properly described and recorded, and which can be linked to archaeologically meaningful features (such as living floors, hearths, specific occupational periods, etc.) (Hester, Shafer and Feder 1997: 323). When collecting samples, you must follow certain procedures to ensure that your samples don't become useless for later analysis. In particular, you must be aware of:

- the proper methods for collecting different kinds of samples to avoid contamination;
- the different quantities of each kind of material which will be sufficient for proper analysis.

Collecting to avoid contamination

The major kinds of samples collected by archaeologists are:

- soils with a high proportion of silica, such as sands, or other suitable minerals, such as quartz, feldspar or zircon, for **thermoluminescence (TL) dating**;
- artefacts, provided they have been kept from sunlight, for TL dating;
- charcoal, for **radiocarbon dating**;
- soils, for botanical analysis.

Tips for collecting soil samples for thermoluminescence dating

Samples that will be submitted for TL dating need to be kept away from sunlight. Thermoluminescence is used to date sediments that have been long buried and will give you a date for when the mineral grains within the sediment were last exposed to sunlight.

- You can collect a sample by inserting plastic piping within the wall of the excavation, but you will need to ensure the sample is not contaminated by grains which fall as the piping is inserted.
- Only do this out of direct sunlight (i.e. collect the sample at night, or shade the collection area).
- Place your sample directly into an opaque or semi-opaque, water-tight container and put the container immediately into a black plastic bag or other light-tight storage (Byrne 1997).
- Make absolutely certain that your TL samples are not exposed to any sunlight at all once they have been collected and keep their exposure to fluorescent light to a minimum (less than ten minutes) (Byrne 1997).
- If you must examine the sample, use a torch or a bulb light (Byrne 1997).
- You should aim to collect two samples from each level, making sure they are not situated close together, and that each is approximately 0.5 kilograms in weight. This would be roughly equivalent to a lump 10 centimetres across (Byrne 1997).
- It is best to collect samples for TL dating as far as possible away from the bedrock, as small grains of bedrock can work their way through the soil profile over time. This is especially important for friable soils, such as areas with sandstone outcrops.

- Make sure you only collect TL samples which are deeper than 20 centimetres below the ground surface. If they are any closer to the surface, they are likely to be inaccurate (Byrne 1997).
- The laboratory which dates your TL samples will also need to know the moisture content of the surrounding soil. You will need to provide them with details of burial conditions, location of the samples, a description of the surrounding deposits, and a rough estimate of how the average water content of the soil relates to the probable content of the samples supplied (Byrne 1997).
- If there is any information about seasonal or long-term variations in rainfall, or evidence that the water table might have been anywhere near the context of your samples, the lab will want to know that too (Byrne 1997).

When collecting samples to use for radiocarbon dating, take particular care with the handling and packaging of samples to avoid contamination. Because any form of modern carbon will contaminate an archaeological sample, don't use paper or cloth bags to hold samples and don't use cotton wool or tissues as packing materials for samples (Gillespie 1986: 5). The best storage containers are strong polythene bags, aluminium foil and small glass phials. While you are still in the field, pick out all obvious foreign matter from your samples (stones, plant roots and leaves, loose soil or sand) and make sure that you have an adequate quantity for analysis (see Table 5.4 on page 157). Any organic material can be dated with radiocarbon techniques, including:

TABLE 5.3: Some of the range of organic materials that can be radiocarbon dated

Textile	Charcoal	Wood
Shell–marine, river, estuarine	Sediments/soils/peats	Ice cores
Plant material (e.g. seeds)	Bone	Antler
Leather	Coprolites (fossilised faeces)	Paper
Pollen	Hair	Fish remains
Parchment	Coral	Insect remains
Avian eggshell	Horn	

Samples which will be submitted for botanical analysis need to be protected from contamination by modern seeds which can easily blow into a site. Once the sample has been collected, it is impossible to distinguish between contemporary pollen and aged pollen, as they look identical.

Alice Gorman's tips for collecting samples for radiocarbon dating

There are two types of radiocarbon (C14) dating: standard radiometric determinations and AMS (Accelerator Mass Spectrometry), which can be used for samples too small for standard dating. AMS costs more than standard dating, however, so contact the lab for the latest prices before you begin. You will need approximately 500 milligrams for a standard radiocarbon date, but only 5–10 milligrams for an AMS radiocarbon date. When collecting samples:

- Handle them as little as possible.
- In preference, pick them up using the point of the trowel or a pair of tweezers. You can use gloves, but be advised that some forms of disposable gloves contain a dusting of corn flour which, as an organic powder, may contaminate your samples.
- Wrap each sample in aluminium foil and clearly label it, so that it can easily be distinguished. You can place your sample directly into a plastic bag, but make sure you tell the lab what you have done.
- Remember to exclude all modern carbon from your sample, so *never* include a cardboard or paper label in the bag with your carbon sample.
- If you must use a cardboard or paper label, double-bag the sample (put the sample inside one bag, seal it, then place the sample and the label inside another sealed plastic bag).
- For advice on sample collection and packaging, don't hesitate to contact the laboratory.

Sample treatment

- Samples should be dry, as bacterial activity in wet samples can affect the final age determination. If you must dry out your sample, use a low-temperature oven which has never been used for radioisotope experiments. Cover the samples lightly with perforated foil and heat at a temperature of at least 40°C until dry.
- Record details of any treatment, such as drying, to submit with the sample.

Documentation

- It is important to have full documentation for all samples. Much of this information is routinely recorded for any archaeological procedure; however, some laboratories have specific requirements, so check with them before collection. The kinds of information needed may include:
  - —*Collection*: date, sample weight, grid references, latitude and longitude, depth of sample and stratigraphic position, stratigraphic relationship to other samples submitted. Was the sample sealed in a recognisable horizon, or sealed in a localised

feature such as a grave or pit? How secure is the stratigraphic context? Was the sample wet or dry when collected? Can any more material be collected? Did the sample came from a surface or excavated deposit?

—*Treatment and storage*: if the sample was wet, how was it dried, did you use any chemical treatments or preservatives, was the sample cleaned?

—*Estimated age*: this helps the lab to select the appropriate instrument for measurement as well as enabling them to contact you at an early stage if the estimated age seems to be significantly different from the measured age.

—*Environment*: geological, archaeological, palaeoenvironmental, associated cultural, palaeobotanical or other material; perhaps also site sketches and photographs.

—*Taphonomy*, or how the sample got to where you found it: the factors that are relevant here are other, natural, activities which may have affected the carbon content of your sample, such as visible root-penetration in the collection area, evidence of leaching or humus penetration in the soil profile, etc.

—*Contamination*: any other carbonaceous material in the horizon, such as calcium carbonate ($CaCO_3$)-bearing rocks in the catchment, potential sources of non-contemporaneous carbon, etc.

—*Nature of the sample*: for shells, for example, note whether they are marine or freshwater; note the family/genus/species if known for wood, charcoal, shell, seeds etc.; note the type of bone, e.g. femur.

Submission

- Most labs have web pages and submission forms online. If you are sending samples overseas, there may be customs regulations you have to follow.
- Make sure you keep copies of all of your submission forms, in case anything is lost or needs to be checked.
- Turn-around times vary from four to six weeks to a few months, so check before you send your samples in.
- Some sample types require additional pre-treatments to remove contamination, such as dilute acid/alkali treatment for decomposed wood and charcoal, or for peat and lake sediments. Check the website and be aware that you may need to include the cost of pre-treatments in your budget.

For other organic samples (such as bone or shell)

- When submitting shells, clean off all soil, sand and debris and air-dry the samples prior to packaging.
- Cleaning should only be done with a brass, steel or nylon brush. *Never* use animal-bristle brushes or organic-fibre brushes.

- Make sure your shell sample consists of one species only, and preferably of large, single shells rather than fragments.
- When dating shell samples, make sure that you identify the shell species to the laboratory to avoid inaccurate dates. Shell species in the ocean will absorb less C14 from the atmosphere than lacustrine or riverine species and may return widely different carbon dates.
- Shell samples should also be tested for secondary recrystallisation using x-ray diffraction (XRD), so that rogue carbons are not being dated.
- Try to avoid cleaning bone samples.

All samples must be properly recorded before collection—it is essential that basic information about possible associations, any evidence of disturbance, the method of collection, the handling and storage procedures you followed, the depth and position of the sample within the excavation unit, and the condition of the sample when collected are all noted at the time of collection. For example, if you handle a charcoal sample with your fingers, you will need to inform the laboratory of this, as the oil on your skin can contaminate the sample. You will need to give details of all the collecting and bagging procedures to the laboratory when you submit your samples, as you may not get accurate dates without this information.

Appropriate quantities for samples

This will vary according to how well preserved the material is and the particular technique that is going to be used to analyse it. The best rule is to collect as much of a sample as possible, and to collect more than one sample of material from the same layer so that the results can be cross-checked for discrepancies or anomalies. Table 5.4 on page 157 provides a summary of appropriate quantities to collect of various materials.

MANAGING ARCHAEOLOGICAL COLLECTIONS

What happens once you have collected your artefacts or excavated your site, analysed your results and written your report? You are likely to be left with boxes of excavated material, some of which may be highly fragile or fragmentary, and a large paper and photographic archive. At this point you will have to make a decision about what to do with this material. As a professional, it is your responsibility to make sure this collection is taken care of for the long term, either by turning it over to a recognised authority (a state or local museum or keeping place) or by returning it for reburial on site. Before you do anything

TABLE 5.4: Suggested sample quantities

Material	Minimum weight (g) for standard dating	Optimum weight (g) for standard dating	Roughly equivalent to	Equivalent quantity for AMS dating
Charcoal (clean)	2–5	20–30	A handful	5 mg (min); 50 mg (recommended)
Charcoal (dirty)	3–5	2–50	Two handfuls	
Charcoal which is grey-brown, either hard (mineralised) or soft and smeary (leached) with no defined wood structure	5–10	50–100	1/2 bag*—four handfuls or more	
Charcoal which is finely spread throughout the deposit (but which 'smears' on excavation, rather than being seen as definite lumps)		1000	5 full bags*	
Wood	5–7	30–100	A piece approx. 30cm long × 2 cm wide × 2 cm thick	5 mg (min); 100 mg (recommended)
Cloth or paper	3–5	30–100	A 30 cm × 30 cm piece	
Shell	5–40	100–200	Varies with the type of shell	15 mg (min); 100 mg (recommended)
Bone	20–100	100–200		1 mg (min); 30 mg (recommended)
Charred bone	200–500	1500–3000		
Collagen	100–300	800–3000		
Organic (sediment) soil	500	1500–2000	2 medium sized bags*	10 mg (recommended)
Seeds	7–10	100		
Grass/leaves	5	35–50		
Flesh, skin or hair	5	45		
Peat	15	100	1/4–1/2 bag*	
Dung	7	30		

* 'Bag' = 15 cm × 30 cm plastic bag

with a collection, however, you will have to weigh up your ethical responsibilities (see 'Archaeologists and their profession' in Chapter 1 on page 15) and make sure that you are aware of your legal obligations under state legislation (which may require you to turn the collection over to a state repository). You will also have to consult with the relevant authorities and other interested parties. While it would be ideal to turn all excavated collections over to an official repository for permanent care, in reality no museum is likely to want a collection of broken glass, fragments of domestic ceramics and miscellaneous rusted metal. You need to find out what the repository's collection policy is *before* you begin excavating, because if they agree to accept the collection, they will probably require you to follow particular methods when documenting and storing the archive.

Richard Robins' tips on the proper care and management of excavated collections

If you intend to collect and store any archaeological material, the management of the collection begins at the inception of your research project. As archaeological excavations or surface collections are essentially destructive activities, it is incumbent on you to ensure that the material is preserved in the best possible way. From a research perspective, these collections serve the important function of providing a check on the work of the original collector. From a site-management perspective, well-made and managed collections may reduce the necessity to undertake further collection or excavation on a site. There are three essential elements to proper collection management: organisation, conservation and storage.

Collection planning (organisation)
As a first step, consult with staff at the repository where your collection will eventually be housed. Most state museums now have strict depositional requirements and they will be able to tell you the necessary procedures and requirements for the deposition of material. If a museum has a computerised database, use it. It will be a useful tool to coordinate and track the collected material, including the paper archive, and if you use the museum's official registration system from the outset, you will avoid unnecessary duplication and minimise handling of the artefacts. One of the golden rules of collection management is always to consult with museum staff and conservators before you begin fieldwork. The other is to make sure you obtain some preliminary estimates of the time and costs required to manage and store your collection so that the final figure doesn't come as a nasty shock.

Conservation
Conservation is the most under-rated aspect of any archaeological excavation, so

you should devise a plan to manage your archive prior to undertaking a collection or excavation. You will need to work out some preliminary costs for conservation, particularly in terms of estimating the time that will be needed to process the material. Prior to collecting any material, you should consult with someone with conservation expertise. They will give you an idea of what you can and can't do. The following are some of the basic rules that should be followed:

- Immediately following excavation, maintain an environment around the artefact which is as similar to its burial conditions as possible.
- The less done to an object the better, so keep handling to a minimum.
- Ensure that techniques, particularly those using chemicals, are reversible. It is also helpful to know in advance the kind of laboratory tests you might use and any implications these may have for the way in which you collect or store your samples. The wrong treatment during excavation may make your artefacts or samples useless for analysis.
- Document *everything* done to the artefacts.
- Anticipate field conditions and plan accordingly—prepare a field kit with the correct storage materials.

Storage

Storage is not only an organisational issue, but also a conservation one. It is essential to use materials that will not decay or damage artefacts or aspects of them, such as blood residues or starch.

Do not *use:*

- matchboxes;
- plastic bags with twist ties;
- coloured plastic containers;
- plastics with PVC;
- acidic paper or cardboard;
- high-acid tissue;
- paper towels;
- newspaper;
- glass containers;
- rubber bands;
- pressure-sensitive tapes.

Do use:

- clear Ziplock® plastic bags;
- clear plastic containers;

- acid-free cardboard boxes;
- acid-free tissue paper;
- polythene or polyether foam;
- Gortex®;
- unbleached muslin;
- bubble pack without PVC;
- silica gel;
- natural fibre cloth bags.

Martha Joukowsky's tips for excellent excavating

- Don't hurry. Excavation requires a calm and purposeful approach.
- Remember that all excavation proceeds horizontally first and vertically second.
- Be systematic. When a new layer or anything unusual is encountered, *stop*. Clean off the remaining soil so that none of the material from one layer will be mixed with the one below it.
- All grid units should be excavated in the same direction.
- Ideally, excavation should proceed from the uphill side of the trench to the downhill side, so that newly excavated areas won't be trampled.
- For the same reasons, always clean higher surfaces before lower ones.
- Always keep the trench wall swept clean so that the area being excavated is not contaminated by falling dirt or debris.
- Always clean the top of the trench by moving the dirt back from its edges, so that the dirt doesn't fall into the trench and contaminate other layers.
- Always keep the trench walls vertical by cutting sharp right-angled corners at the bottom and by regularly trimming the walls as you go along to ensure they are kept straight.
- Don't wait until the earth dries out before you trim the walls, as there is greater risk of a cave-in when the earth is dry.
- Keep the wall trimmings separate to the material excavated from the body of the trench.
- Always be on the lookout for soil discolourations around features. This could be an important clue to interpreting those features.
- Make sure you record sterile layers in the same way as other layers.
- Make sure you record all descriptive information as objectively as possible.
- Don't swing tools (such as picks, mattocks or shovels) higher than your shoulder.

Don't cut too deeply with them either, as you may damage buried artefacts.
- Only fill buckets two-thirds full with soil. Soil, particularly if it has a high clay content, can be very heavy. (Joukowsky 1980: 172–75)

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USEFUL WEBSITES

For details of pre-treatment for different classes of excavated material see: www.c14dating.com/pret.html.
Free digital checkers for Munsell soil charts are available at: www.munsell.com/.
A history of the Harris matrix and various publications on its uses can be found at: www.harrismatrix.com/history.htm.
The Australian Institute for the Conservation of Cultural Material Inc (AICCM) maintains a state-by-state listing of professional conservators at www.aiccm.org.au/aiccm/people.

CHAPTER SIX
RECORDING HISTORICAL SITES

WHAT YOU WILL LEARN FROM THIS CHAPTER

- The diversity of historical archaeological sites found in Australia
- Basic documentary research techniques
- The difference between primary and secondary sources
- The essential questions to ask when recording standing structures
- How to date standing structures from their components
- The main classes of historical archaeological artefacts and how to record them
- Oral history interviewing techniques

WHAT ARE HISTORICAL SITES?

Historical archaeology studies the colonial past of Australia—the places and artefacts that have been left behind by over two centuries of non-Indigenous activity. While most of these sites are limited to within the last 200 years, some sites are older than this, such as the sites created by the annual visits of Macassan fishermen to the north coast of Australia since at least 1720, and the many shipwreck sites which predate the First Fleet. 'Contact' sites (places where Indigenous and non-Indigenous activities overlap, such as missions or station camps) are also deemed to be historical sites because they fall within the colonial time period.

Historical sites thus represent a great diversity of activities, all part of the many ways in which Europeans and other settler groups have attempted to explore and exploit the Australian continent. The main categories of historical site often reflect the different kinds of industries which have been established over the last two centuries, such as mining, pastoralism, agriculture, commerce, whaling, or timber-getting. These kinds of explicitly work-related categories, however, tend to exclude the historical contributions of those other than adult males and ignore common site types such as houses, schools, hospitals or cemeteries. In reality, there are as many different types of historical site as there are different types of human behaviour, and in a sense there is little point in trying to separate them according to function. One distinction we have drawn in this chapter is between standing structures (i.e. any built feature which exists substantially above the ground) and sites which have been reduced to surface or sub-surface traces only. This reflects the slightly different recording methods necessary for each, rather than any hard-and-fast distinction in site use (for more information, see 'Recording standing structures' on page 176). The other useful distinction lies literally at the water's edge: between maritime (underwater) historical archaeological sites and land-based sites. Although many of the techniques for recording and excavation are the same, underwater archaeology presents its own particular challenges.

THE BASICS

Investigating historical sites is similar to investigating any other type of archaeological site in Australia, in the sense that archaeologists still set out to answer a similar range of questions:

- What activities were people doing here and why?
- When were they doing it?
- Did they succeed?
- When and why did the activities cease?

The chief difference between historical and other kinds of archaeology lies in the alternative sources of information about past human behaviour that historical archaeology can employ. Because historical archaeological sites have been created within the last few hundred years, they fall within the period of written records. This means that there is often a wide variety of documentary records which can be used to complement any archaeological study. Historical archaeology therefore is as much about researching the documentary evidence for sites and artefacts as it is about recording and analysing the archaeological evidence (See 'Using historical documents' on page 167).

FIGURE 6.1: The range of historical sites in Australia

Old houses and domestic sites. A site doesn't have to be below ground to be considered archaeological

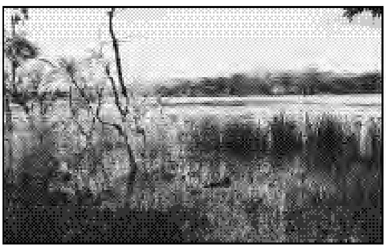
Cemeteries and burial sites

Wayne Johnson, SHFA

Urban sites. Many historical archaeological sites are located beneath the landscapes of present towns and cities

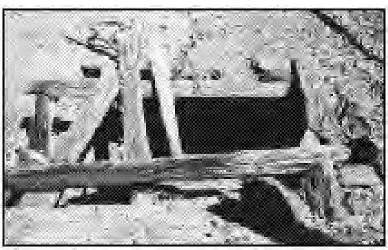
Mark Staniforth

Maritime sites. Whaling, shipping and related activities have left many physical remains underwater and around the coastline

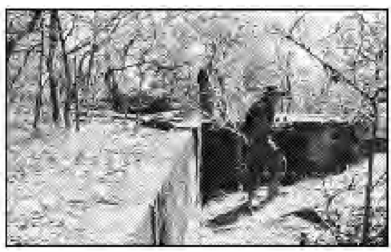


Many past practices left lasting traces on the landscape such as this dam near Mt Garnet in north Qld created in the wake of tin mining dredges operating along the creeks in the 1950s

Transportation routes are just as important as the sites alongside them, like this dray track which once serviced the Palmer River goldfield in far north Queensland



Many old mines are only visible through their workings, the equipment long since carted away



Some historical sites are relatively recent, such as this concrete slit trench on Horn Island in Torres Strait dating from World War II

Despite having access to sometimes quite detailed written evidence of past events or behaviours, historical archaeology still aims to be more than just 'history with artefacts'. One of the main reasons for consulting historical records before carrying out archaeological research is to make sure that what you want to know can't just be discovered from the archives. The primary emphasis of historical archaeology is always on relating the documents to material (archaeological) evidence, and understanding just what the limitations of this process might be. Documents are always created for a purpose and are not necessarily objective, and all of them have their own inherent biases. They are also fragile things which often do not survive and are, in any case, not created around every facet of human life. Most of the ordinary people who settled Australia were either unable or disinclined to write down the daily details of their lives, leaving enormous gaps in our understanding of the past. The material (archaeological) record goes some way towards filling these gaps: it is far more durable and was created by all kinds of people. Historical archaeology is a search for the many aspects of human behaviour which we could never know from the documents alone.

Most recording of historical sites follows the standard pattern for any site—completing recording forms, compiling survey plans, and photographing the site and its contents—and no specialist skills or methods are required. The exceptions to this will be if you are recording underwater sites, or when you are required to record standing structures, to date historical artefacts, or when you need to use documentary or oral sources to complement the archaeology. Buildings, in particular, are a particular type of archaeological artefact which require their own system of recording.

FINDING HISTORICAL SITES

Although the methods used to find historical sites are identical to those used to find Indigenous sites (see Chapter 3: Finding sites), there are some strategies peculiar to historical archaeology that you can employ. The first and most obvious is to look for telltale signs of old habitations or other site types, particularly remnant vegetation such as trees and garden plantings, many of which long outlast the garden itself. Disturbed areas (perhaps the site of a former building) may also have different patterns of regrowth, and often include high densities of introduced weed species. Stinging nettles in particular often invade such areas, providing a good indication of some form of past human activity. Remnant fencing is also an indication of European alteration of the landscape, although this does not necessarily mean that there is (or was) a habitation nearby.

Domestic artefact scatters are often easily visible as a result of the quantities of durable domestic rubbish (such as glass and ceramics) commonly discarded. You should always be on the lookout for rubbish dumps or other potentially stratified deposits which may be useful for excavation purposes. Obviously, if you want to excavate you need to find deposits with some depth to them. Pit toilets and wells in particular are usually extremely rich sources of historical archaeological information, as it was common to use them as convenient rubbish dumps. They can thus contain all sorts of debris, from food remains to broken ceramic vessels and used glass bottles. If you can find such deposits they will provide the best chance of substantial and well-dateable archaeological remains relating to the occupation of a site.

Old maps are particularly useful and can be a mine of information, quite literally showing you the locations of sites, although you may encounter problems with the scale of them. Some maps simply note a scale in 'chains'—the original steel bands used by surveyors to measure distance. For conversion purposes, 1 chain is 66 feet, or 19.8 metres. Maps of townships will show allotments and sometimes structures, parish maps will show land allocations and the name of the first buyer or grantee, as well as tracks and roads, but usually not much else. Surveyor's plans are sometimes quite detailed and may even contain notes describing the structures included on the plan. For mining sites, the original mine records will often contain surveyor's plans noting surface features, although the level of detail varied considerably from surveyor to surveyor.

You can also try interviewing local landholders, particularly if they maintain an interest in local history, or if their families have lived in the area for a long time. Obviously, you cannot simply barge in and demand to know where sites are located, but even an informal oral history interview can be a very rewarding and productive experience (see 'Recording oral histories' on page 197).

In any case, you should always investigate the history of an area before you go into the field, as this will give you the best guide as to what to expect (see 'Using historical documents' below). Once you have found a site, there are three ways to collect information about it:

- documentary research;
- field study;
- collecting oral histories and other community information.

USING HISTORICAL DOCUMENTS

This is the first and most obvious point of call for historical archaeologists. You will need to look at libraries, archives and museums for:

- archival and other document collections;
- maps and plans;

- photos and pictures;
- books, articles, reports.

Historical documents come in many forms, from company reports and accounts, birth, death and marriage certificates, wills and probate inventories, and maps and plans, to diaries, letters and photographs or newspaper articles and advertisements. It is not always possible to search exhaustively for every piece of documentation that relates to a site, and many documents may be of little use in answering archaeological questions. In practice, you will probably have to target particular types of documents that are more likely to provide you with useful information.

One major distinction you need to be aware of is between **primary** and **secondary sources** and their respective uses. Primary sources are first-hand accounts prepared at the time of an event (such as surveyor's plans, newspaper reports, government correspondence or diary entries), whereas secondary sources (such as regional histories) are usually compiled at a much later date. Although secondary sources may well be based on primary sources, they are an interpretation of selected parts of them, and are therefore considered less reliable. They are often a good place to start, however, as they can provide overviews of places or events and may contain useful information which can then be cross-checked or followed up in more detail from primary sources. When researching an area or a site, start with the secondary sources to find out where the major industries were located, or where the original settlements were established, and follow this up with selected primary source research for more specific guidelines as to where to survey and what to look for.

Of course, it is equally possible for both primary and secondary sources to be wrong, and as a researcher you must keep an open mind when examining any historical document. Just as you should be aware of your own biases, you should also be aware that all documents are prepared for a reason and that this reason is not necessarily objective. Whatever documentary material you are using, you need to question the source of the information, and try to verify it by cross-checking with other sources wherever possible (Sagazio et al. 1992: 7). Remember also that the availability of different forms of documents will vary widely from place to place and from time period to time period.

Some of the major places where primary documents can be found include the following:

- Federal repositories such as the National Library*, the National Archives* or the Australian War Memorial* contain a range of nineteenth century records and Commonwealth government material and reports (National Archives), as well as extensive collections of Australiana, photographs, oral histories and pictures (National Library). The Australian War Memorial holds collections relating to all aspects of Australian involvement in military campaigns from the nineteenth and twentieth centuries, including over 200 000 online photographs. The Australian Institute of Aboriginal and Torres Strait Islander Studies* maintains an excellent collection of archival and library resources, also linked to an online database, related to Indigenous people both pre- and post-contact.

- State repositories such as the State* and Mitchell Libraries* in Sydney, the John Oxley Library* within the State Library of Queensland, the State* and Battye* Libraries in Western Australia, or the State* and Mortlock* Libraries in South Australia hold invaluable statewide collections of material, including personal correspondence and extensive pictorial and photographic collections.
- State archives* also hold official correspondence and records, but relating to state government functions only. These may still cover a range of useful information including maps and plans, newspapers and government gazettes, official correspondence, reports and census information.
- In addition, some government departments maintain their own special archives, such as the Mapping Museum attached to the Department of Natural Resources in Brisbane*, the Justice and Police Museum* in Sydney, or the archives of the New South Wales Department of Mineral Resources*.
- Private or university archives may hold special collections of information relating to specific areas, such as university or company histories.
- Local repositories, such as historical societies or heritage centres, often contain a wealth of rare local information, although this is not always easily accessible. For any historical archaeological study you undertake, it is well worth visiting the local historical society to evaluate their material.

Most larger collections maintain up-to-date catalogues of their precise contents and search engines for many collections are now available online. When searching for photographs or historical illustrations, the most useful online catalogues are those maintained by the National Library of Australia, the Australian War Memorial and the National Archives. The major state libraries also have searchable online databases of their collections. If you are unable to visit a collection, some repositories (such as the National Archives) will conduct research for you for a fee, although the waiting period for such research can be quite lengthy.

The other important factor to bear in mind when conducting primary documentary research is to ensure that you always cite primary resources adequately. This is not as easy as it sounds. How do you reference a probate inventory? A private letter? Or an undated and unattributed newspaper clipping? While there are no hard-and-fast rules, the key to citing a primary document is to make sure that you provide enough detail to enable another researcher to find the same item. To ensure this, you must remember to include:

- a description of the document, including the author and the title (if there is one). If there is no formal title, you can refer to it in terms of the type of document (e.g. 'marriage certificate'). If the document is a letter, it is usual to include the name of the recipient as well.
- the date of the document or document bundle (if known). If you don't know the precise date, a date range will suffice, usually indicated by the use of 'c' for 'circa' written before the date, indicating that it falls within a range of ten years either side. If you don't know this or can't work it out, you will have to note down 'n.d.' for 'not dated' as part of your reference. In this way, you signal to the reader that it is the document which is at fault, not your scholarship.
- the location of the document, including the name of the collection, the precise reference numbers allocated by the repository (if any) and the place where the document may be consulted. This will be a relatively simple task if the document is held in a formal collection, but may be more challenging if it is held by a local historical society, or a private individual.

As a guide to the kind of information to include, here are some hypothetical examples:

- Baptismal Register of the Church of England for the Parish of Beresfield, 1871–1898. Held at the church, Martindale.
- Correspondence and papers relating to the Easthope settlement 1883–1926, 2/8179.3. NSW Archives Authority, Sydney.
- Davis and Bolton family papers 1911–1946. Held by Mrs Jennifer Jackson, Atherton.
- Mason, Arthur 1898, Survey Notebook, No. 9. Unpublished ms in Tasmanian State Archives.
- Easton and District Historical Society, n.d. Carina Provincial School, 12-page typescript in the Easton and District Historical Society Collection, Browns Plains.
- Register of burials at the Fairmont cemetery. List compiled by the Marshall Historical Society and held by the secretary.

Carlotta Kellaway's tips for researching the history of a building

The key to successfully researching a building is to make sure you go armed with as much information about its location as possible, including its street address, the location of any neighbouring buildings and landmarks (such as churches, police stations) and cross-streets. If possible, find out the allotment and section number for the block on which the building sits as well.

The three best sources for information are:

- post office directories and almanacs;
- rate books;
- Titles Office records.

Researching all three follows the same basic procedure: find a recent volume in which your building appears, and then work backwards methodically, following the site through its various owners and occupants as far as you can.

Directories can be found in state library and state archive collections. When working through directories, make sure that you stay on the track of the right building. The numbering system changed often throughout the nineteenth century, as did the names of streets and houses (not to mention the creation of new streets following subdivisions). The best way to combat this is to continually note down the names of landholders on either side of your building and to keep matching the pattern of occupiers to be sure you are documenting the right property.

Rate books are also found in state archive and state library collections and sometimes also in local or municipal council collections. Coverage for Queensland is very sparse, however, and in Tasmania they are termed assessment or valuation rolls. Rate books will often describe a property, as well as give you information on who was occupying it and how much the place was worth to the council in rates. Look for changes in the description of a building or set of buildings, the name of the owner or occupier and any changes in the value of the property. In archaeological terms, marked changes in the value of a property can indicate that a building has been constructed or enlarged, or that some other improvements have been carried out.

Titles Office records are held in government repositories in each state. Titles will give you a sequence of ownership for the land and sometimes information on the purchase price, any subdivision of the land and mortgages taken out by the owner. To search for these records, you will need the Crown allotment number for the property, as well as the section number and the name of the Parish and County. One thing you should be aware of is that the title system has changed, from the Old System which operated until 1862, to the present Torrens System. Under the Old System, title documents are called Deeds; under the Torrens system they are called Certificates of Title. Before conversion to Torrens title, the Old System recorded all successive transactions for an allotment, from the name and date of the first purchaser. Often, the record of a mortgage having been taken out on a particular piece of land will indicate the construction of a building on that site and the size of the mortgage will provide a fairly reliable guide to the size and construction material of the building. Note that in South Australia, you will need written permission from the owner of the property to access title records relating to their property. (Kellaway 1991)

RECORDING INDUSTRIAL SITES

As a specific class of historical archaeological site, industrial sites also require a particular approach to research and recording. An industrial site can be anything resulting from large- or small-scale extractive, manufacturing or processing activities, and will cover a gamut of sites from mining, whaling, shipping and milling to factories or railways. The study of any industrial site requires some familiarity with the technology and processes used there. To record it adequately, you will need to know how the site operated—that is, what industrial processes went on there, what equipment may have been on site, how different parts of the site may have been used for separate aspects of the overall process, or how the technology or the process changed over time. This will help you to understand both what occurred there in the past, and the location and nature of the archaeological remains which you can see in the present. This information can sometimes be found by researching the specific history of the site, although for smaller, less well-known sites there may be little or no specific documentation remaining. Try the State or Australian Archives for this kind of information, or archival collections maintained by government departments (such as the New South Wales Department of Mineral Resources). When working on any industrial site, you should make yourself aware of the potential occupational health and safety issues of contamination from industrial by-products and take the necessary steps to minimise exposure for you and others working for you.

How safe is your soil? Wayne Johnson's occupational health and safety tips for working on historical archaeological sites

You should never assume that the soil on your site is non-toxic. Soil contamination can take many forms, from heavy metals and chemical residues to bacteria and other harmful residues. Many of these potential toxins are the result of chemical processes developed since the advent of the Industrial Revolution and are more common than you might think.

Industrial sites can be particularly toxic. For five millennia, industrial activities have involved the processing of metal ores which usually leave residues in the soil. Arsenic and lead mines are in themselves hazardous owing to the nature of the material extracted, let alone processed. The secondary stage of metal-working, making alloys or using chemicals as flux, will also produce toxic residues which may have been casually disposed of—usually buried as fill or in disposal pits on site. Gold mining has long used arsenic as part of the process of separating the metal from quartz. The toxic residue was then washed away, to settle either in the surrounding soil or more usually down a waterway.

In harbour cities, many industries were clustered around harbour sites with ready port access. On such sites, oils, diesel and other liquid fuel spills seep into the soil where they remain as residues. Remediation of such sites is expensive and may not necessarily have cleared the site of all hazardous substances. In addition, seemingly innocuous metal-working industries, such as blacksmiths and iron or brass foundries, may have used fuels such as coal with a high tar content containing toxic trace elements.

Potential health hazards can occur even on ordinary domestic sites. Sheets of asbestos insulation, or 'lagging', were commonly wound around pipes leading from machinery such as steam boilers. Over the years, this 'lagging' degrades, releasing fibres into the air which also settle on the ground in confined spaces. Between the 1910s and the end of the twentieth century, asbestos fibrous-cement sheeting ('fibro') was used extensively in the domestic building industry. Although relatively stable in sheet form, if broken it too will release fibres into the air. Lead-based paints were commonly used on domestic houses throughout the twentieth century. Wherever there has been a regime of scraping off flaking paint prior to repainting, there is a danger of high lead levels in the surrounding soils and building interiors. Likewise, for most of the twentieth century, lead-based petroleum was used to fuel cars, escaping into the atmosphere via exhaust systems. Since lead is relatively heavy, it does not tend to spread far from the source of the emission, and tested levels are found to increase closer to busy roads or in the roof spaces of buildings located close to busy roads.

Pest control within domestic structures has attracted the use of chemical poisons for at least the past two centuries. Rodents were particularly targeted with baits laid beneath floors in an attempt to eradicate the nuisance. Nineteenth century city dwellings are often characterised by the extensive archaeological deposits that accumulate beneath floorboards, often attributed to the purposeful sweeping of refuse into the void beneath. Sampling of soil samples from the Cumberland Street site in Sydney's Rocks district, for example, indicated high arsenic levels in at least one sub-floor deposit dating to the mid-nineteenth century. Owing to their porosity, animal bones were particularly susceptible to absorbing this poison. Because arsenic can be absorbed through the skin, rubber gloves had to be worn by archaeologists working with the artefacts recovered from these deposits.

Even organic fertilisers can contribute to toxicity in the soil. At the 1994 Cumberland Street excavations, tens of thousands of animal bones were recovered from a large area that had served as a butchery from 1809–29. The discarded limbs, horns and skulls were used as part of fill layers to build up soils above the rocky outcrops that gave the area its name. As a result, the soils in the vicinity are particularly high in phosphates. The butcher responsible for this activity, George Cribb, was inadvertently poisoning his own well, located amidst the buried detritus. Even today, more than 170 years after the event, water pooling on this part of the site, including in the re-excavated well, is quickly covered with blooms of blue-green algae (*Cyanobacteria*). The water becomes dangerous to drink, the algae producing neurotoxins and hepato-toxins which can cause paralysis, liver malfunction and death. It may have been for this reason that Cribb filled in his well around 1818 and dug another on higher ground to the southwest. On other parts of the site, with low phosphate levels, the algal blooms do not develop.

As an archaeologist you need to be aware of such health hazards and, if necessary, take steps to minimise direct contact or prolonged exposure. In particular, you should be aware of the recent history of your site to minimise potential threats to your own and other people's health. Wherever possible, make sure you investigate the history of your site in detail *before* you begin fieldwork to assess what potential toxins might be lurking in your soil.

Nineteenth and early twentieth century technical manuals or engineering works written for the industry are another invaluable source of information, which are unparalleled for details of equipment and processes. Any of the major state libraries will have good collections of such manuals which should be readily available. You could also try comparing the industrial archaeology of your site to archaeological reports for similar sites elsewhere, although this will involve tracking down repositories of unpublished archaeological reports. The administering bodies in each state and territory will maintain collections of archaeological reports, although you may need special permission to access these.

In addition, specialist journals were published for almost every major profession and trade throughout the nineteenth and twentieth centuries. The range and type of specialist information you can extract from these is unparalleled, as even the advertisements will contain pertinent information. For the mining industry, for example, the *Australian Mining Standard* (1888–), the *Australian Mining and Engineering Review* ([1908–17] afterwards known as the *Chemical Engineering and Mining Review* [1918–60]), and the *Engineering and Mining Journal* (1869–), all provide first-hand descriptive and technical information about many aspects of the general industry as well as specific sites. Examples for other industries include the *Australian Storekeepers' and Traders' Journal* (1895–1936), the *Australian Brewers' Journal* (1882–1921), the *Australasian Coachbuilder and Saddler and Liveryman's Journal* (1892–1901), or the *Australasian Ironmonger, Builder, Engineer and Metal Worker* (1886–90), afterwards called the *Australasian Ironmonger, Engineer and Metal Worker* . It is well worthwhile investigating what collections are available in your nearest major library.

RECORDING MARITIME SITES

Maritime archaeological sites are more than just shipwrecks; they also include many land-based activities associated with maritime industry and trade, such as whaling stations, docks, jetties and shipyards. As such, the same basic techniques for site recording (e.g. surveying, mapping, photography and drawing) are used on land-based maritime sites. As with any other kind of industrial activity, you need to be familiar with the way the industry operated to be able to record a land-based maritime site adequately. This means understanding how the whaling industry operated and how whales were processed after killing, for example; or how dry-docks or slips worked; or how ships were built. The underwater component of maritime archaeology also uses the same basic techniques, albeit with certain modifications to cope with the underwater environment. Underwater surveys of shipwrecks use the grid system for recording and excavation, the baseline and offset technique for drawing site plans, and scales for all underwater photography.

In terms of historical documents, shipping records will give you information on ship movements which may be useful if you are tracing the voyages of a particular ship. Often these won't provide all the information you will be seeking: they may only indicate the date a ship left a particular port and the date it returned, so you will need to read between the lines to understand what this might mean. For example, if the ship was known as a whaling vessel, the time period which it was away from port may give you some indication of how far it went, and the season during which it was absent may be a clue as to whether or not it was engaged in whaling.

Mark Staniforth's tips for people interested in maritime archaeology

Consider joining the Australian Institute for Maritime Archaeology (AIMA) and/or your local Maritime Archaeology Association (MAA)—there is a local MAA or equivalent in most Australian states. You can contact AIMA through its website at http://aima.iinet.net.au. AIMA publishes two newsletters a year and a journal: *The Bulletin of the Australian Institute for Maritime Archaeology*. AIMA/NAS training in the techniques used in maritime archaeology is also available through AIMA and the local MAAs. This should give you the opportunity to become involved in local maritime archaeology field projects. There is no substitute for practical experience in any kind of archaeological field methods—get out there and be involved.

Jennifer Rodrigues' tips for research and survey in maritime archaeology

- While you will use archives, the web and archaeological literature to target survey areas, remember that a lot of information is kept by local maritime museums or societies.
- The Australian national shipwreck database is a great resource which can be accessed through the Western Australian Museum website (www.museum.wa.gov.au). This website also lists some useful unpublished maritime reports.
- A program for 3-D maritime survey is the 'Web for Windows' program developed by Nick Rule for the *Mary Rose* excavation project. This Direct Survey Method (DSM) is basically a technique used for mapping the x, y and z coordinates of various points at a site. For a ship, this may involve placing around 60 datum points in the hull structure. As the term implies, a 'web' is created from the surveyed measurements. For an online example, see the site for the Centre for Maritime Archaeology, Southampton University (http://cma.soton.ac.uk/Research/Kravel/record.htm).

RECORDING STANDING STRUCTURES

Not all archaeologists excavate. Many sites have no subsurface deposits to excavate, or only have their surface remains recorded owing to time and money constraints. The study of standing structures is one example of how detailed archaeological information can be obtained without excavation. A 'standing structure' may be anything from a building, such as a house, a barn or a church, to a feature such as a kiln, a jetty or a bridge—in short, anything originally created to serve some human need in a relatively permanent location which now exists substantially above the ground (cf. Davies and Buckley 1986: 86). When recording any standing structure, your goal should be more than to simply describe it. A proper recording should provide enough information to recreate the sequence of construction and the history of the building's use and, from this, to reconstruct in some measure the changing lives of the occupants.

Recording standing structures follows a similar process to recording any other type of archaeological 'site' in that you need to ask the same range of questions. When and how was it constructed? What material was used and where did it come from? How may the structure have been altered through time? To do this, you need to record four sets of complementary information:

- the nature of the individual elements that make up the structure (i.e. the walls, the floor, the roof);
- how the elements are put together (i.e. their construction and manufacture);

- details of any surface treatments (on the walls, the floor, etc.);
- the overall condition of the structure and its individual parts.

The two least altered parts of a building will usually be the space in the roof and under the floor, so make an effort to investigate these areas whenever possible. Details of how these areas have been constructed will often give you an excellent guide to the construction sequence of a building, even if all of the internal elements have been made to look contemporary (see Figure 6.2 on page 179). Sometimes not all elements of a structure will remain *in situ*. In this case, it may be equally important to know what *might* have been there (if there is any physical or documentary evidence of the element's existence) and what could have happened to it. Questions to ask of each set of information are included in Table 6.1 (which is by no means an exhaustive list).

TABLE 6.1: Elements to consider when recording a standing structure

Individual elements	How the elements are put together	Surface treatments	Condition
• What are the walls made from? The roof? The floor? The ceiling? • Are there any original fittings or evidence for them (e.g. windows, shutters, skirting boards, fire surrounds, rim locks, etc.)? • Have there been any obvious alterations or additions? • Were the various elements manufactured by machine or by hand? • Is there evidence for any particularly skilled or unskilled craftsmanship in this?	• What methods have been used in construction? • What technology did these methods require? • How successfully have the various elements been put together? • Is there evidence for any particularly skilled or unskilled craftsmanship in this? • How well suited is the building or the parts of the building to its purpose?	• Have the internal or external surfaces been treated in any way (e.g. with sealants, caulking, coverings)? • Have the internal or external surfaces been finished in any way (e.g. adzed, tuck pointed, scored)? • Is there evidence for any decorative finishes (such as paint, wallpaper, mortar or plaster)? • What decorative features are there (e.g. dados, curtains, cornices, ceiling roses)? • Is there evidence for any particularly skilled or unskilled craftsmanship to the	• Are any elements in particularly good condition? • Are any elements in particularly poor condition? • Is there any evidence for use–wear patterns? (i.e. is there physical evidence of function or the extent of use?) • Are all elements of the structure present? • What is missing? • Have any attempts been made to repair the structure? • Is there any evidence of what might have caused the deterioration of elements?

TABLE 6.1: continued

Individual elements	How the elements are put together	Surface treatments	Condition
• Is there any evidence for elements having been altered or recycled from somewhere else? • Are there any trademarks or other manufacturing information, such as a patent or design number—even a brand name? • Do the elements have any other distinctive attributes?		finishes or the features?	• Is there danger of further deterioration to the structure? • Is the structure under any immediate threats?

One of the main things to be continually aware of when you are recording a building is how much the structure and its components may have been affected by later activities. This is an assessment of the integrity of the place and will be particularly important if you are also assessing its cultural heritage significance (see 'How to assess cultural heritage significance' on page 251). As you record the individual components of a building and how they have been put together, look for signs of how the structure might have evolved or been altered over time, or for signs of the re-use of materials from older structures.

Describing structural components

As with all archaeological recording, consistency is the watchword when describing the physical components of a building. Always aim to use standard terminology, particularly when describing construction techniques and methods. We have only included the basics here, drawn largely from the Museum of London's descriptive standards for timber and masonry construction. More detailed descriptions of architectural features can be found in Apperly, Irving and Reynolds (1989) and Stapleton (1983).

FIGURE 6.2: Two roof timbers from the same building. The timber at the top is earlier in date and shows the characteristic irregular zig-zag marks made by a hand-operated pit-saw. The timber at the bottom is still *in situ* and shows the semi-circular marks characteristic of a circular saw, indicating that it can only have been manufactured after the introduction of steam-driven saw milling technology.

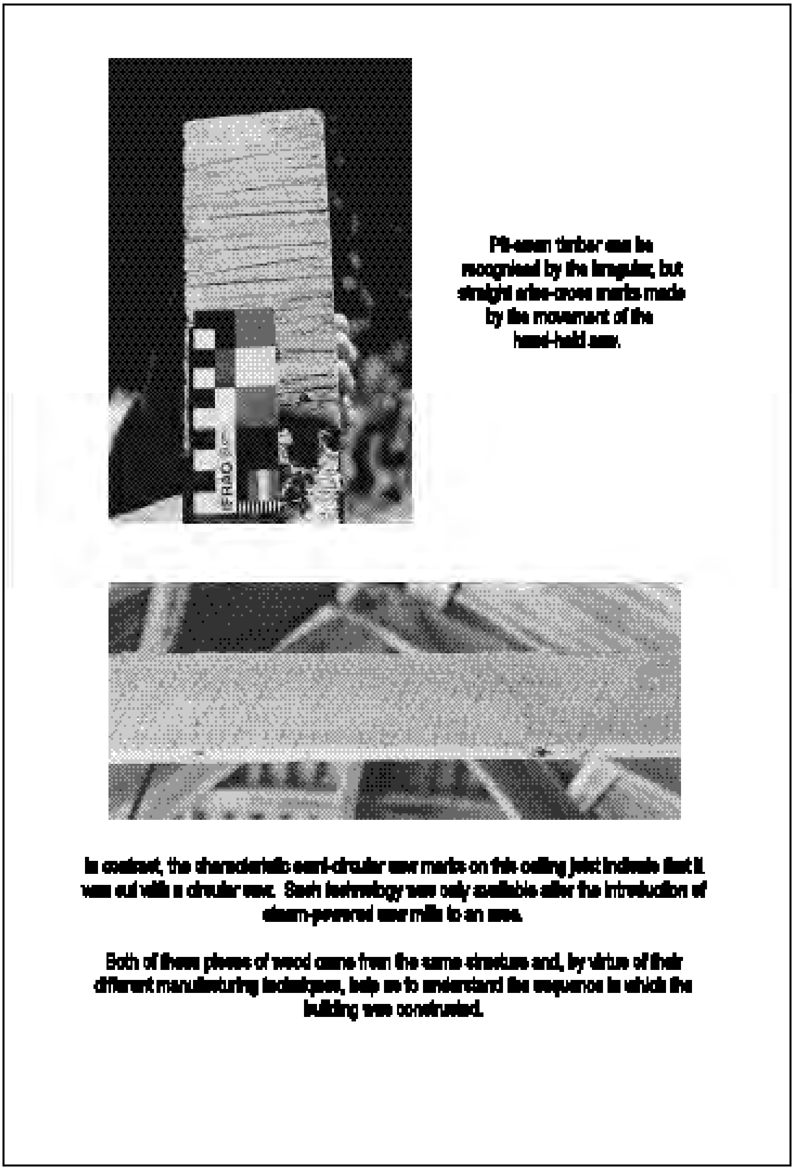


FIGURE 6.3: The basic elements of a building (after Coutts 1977)

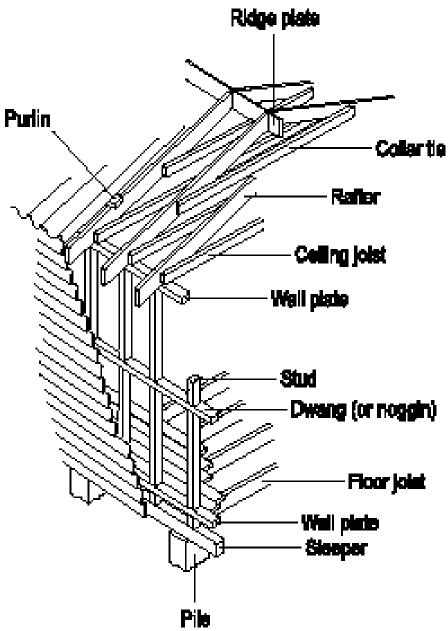


FIGURE 6.4: Common carpentry joints (after the Museum of London 1990)

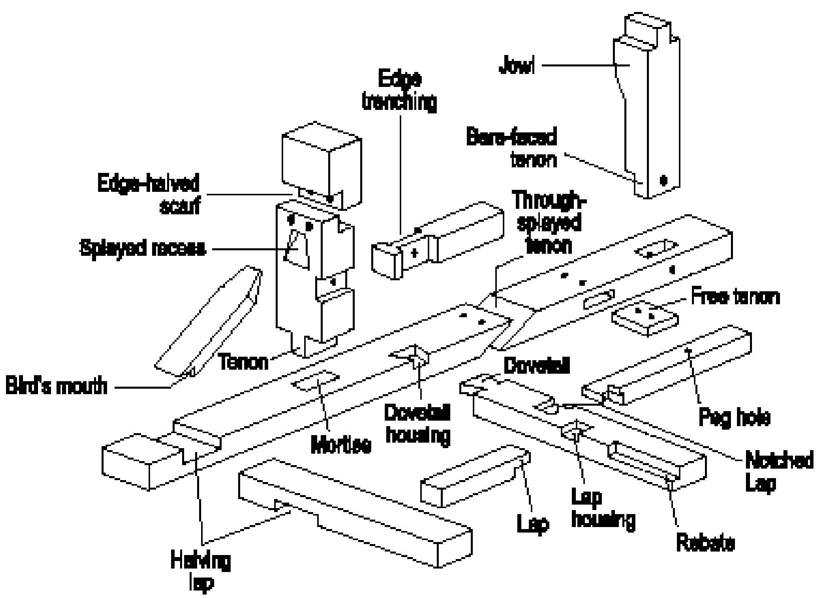


FIGURE 6.5: Brick bonds and forms (after the Museum of London 1990)

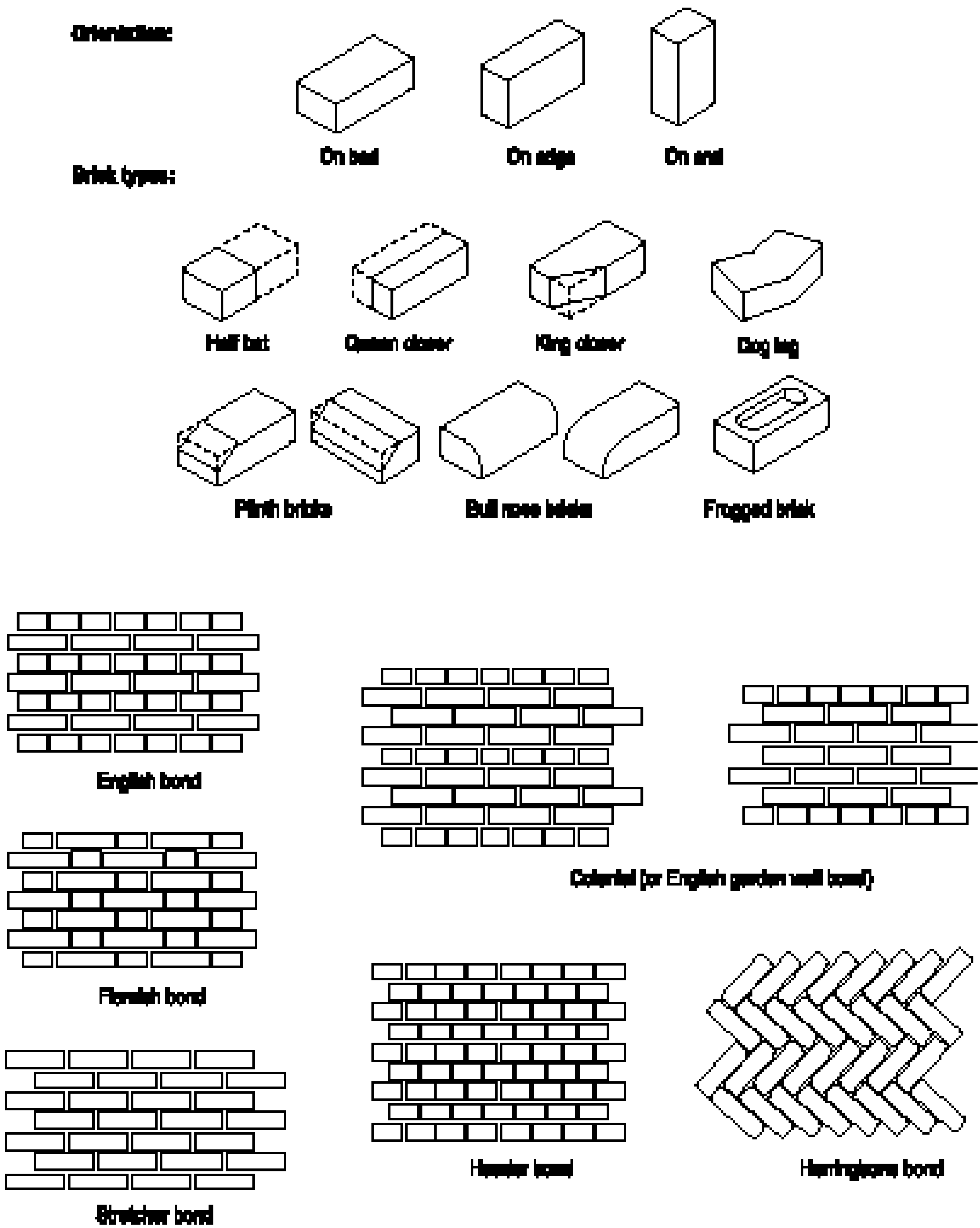
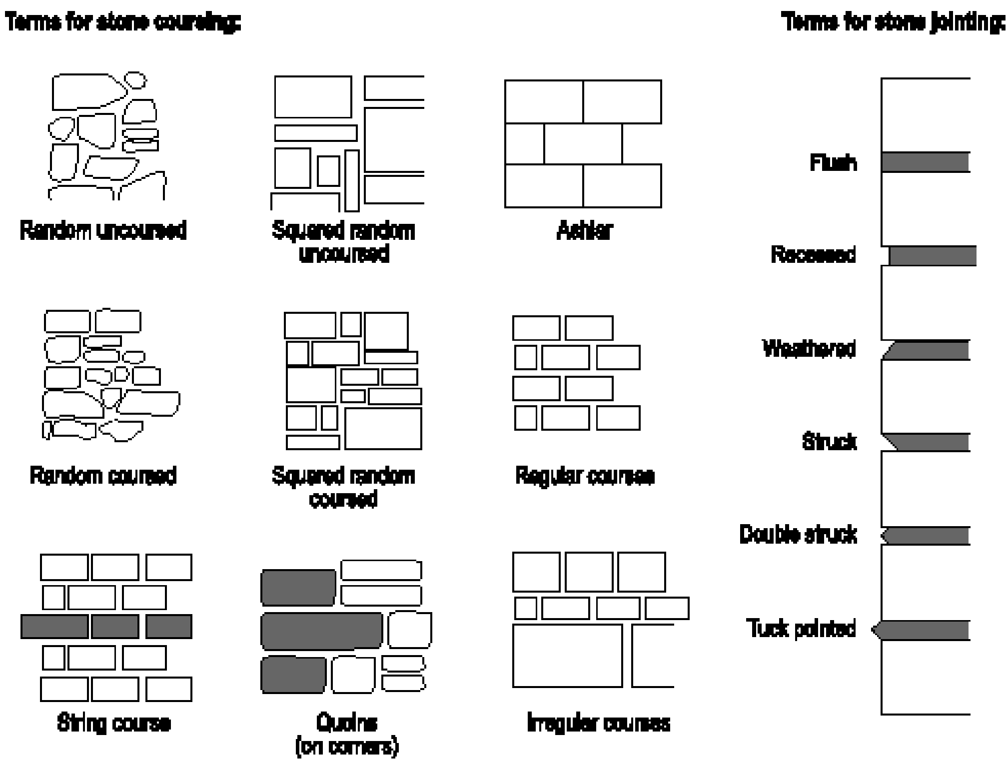


FIGURE 6.6: Stone courses, finishes and jointing (after the Museum of London 1990)



Denis Gojak's tips for recording standing structures

- An orienteering compass provides a quick and easy way of drawing a complex (i.e. non-right angled) structure with all the walls correctly oriented. Simply lay the side of the compass along the wall or alignment to be measured, then turn the graduated compass circle so that the inscribed mapping lines correspond with the north arrow. Lay the compass on the drawing page with the same bearing relative to north at the top of the page—that is, so that the north arrow again lines up with the inscribed mapping lines. I have found this useful in drawing quite accurate floor plans of defence structures with complicated designs. If you want to be doubly clever, align the north arrow to an offset bearing that is equal to the difference between magnetic and true north.

- People surveying old buildings should arm themselves with an inexpensive flat metal 150 millimetre steel rule, with imperial/metric divisions. These are ideal for getting exact measurements of timber (the 3 X 4 inch that is really 68 X 110 millimetres) and for checking whether floorboards are butt-boarded or tongue and groove. If a floor is butt-boarded, the ruler will slide straight through. If it stops about 5 millimetres in along a sample of boards, then they are tongue and groove. Also, a steel rule (if properly sharpened) is perfect for scraping paint, gouging divots from walls to examine what's underneath, cleaning fingernails and lifting lino to read the old newspapers.

Dating structures from their components

In general, dating a structure from its components alone is very difficult. Even if you can find evidence of a manufacturer's mark, trademark or patent number (the most 'dateable' information), materials may have been stored for a considerable time before use, they may have been recycled from an older structure, or they may simply have been manufactured over a long period of time. At best, you will probably only be able to narrow down construction to a date range, or to before or after a certain period.

Table 6.2 contains a rough guide to some major changes in building materials and construction techniques used throughout the nineteenth and twentieth centuries. This is not intended as a list of all the 'fashionable' changes in various materials, but only as a guide to those inventions or technical developments which may be useful for assigning a rough date range to a building. Bear in mind that these dates are mainly 'firsts' and won't be exact for all areas (innovations will have taken longer to reach regional areas, for example). If you can find them, trademarks or manufacturer's marks may provide a finer resolution of date.

Many construction materials are less helpful in this respect than you might think. For example, there was no standardised size for bricks throughout the nineteenth century, so changes in brick dimensions are not particularly useful for dating purposes. Prior to the 1850s, bricks were manufactured exclusively by hand and tended to be slightly smaller in size, measuring 21.5 × 10 × 6 centimetres (Jeans 1983: 103). After the introduction of the first machine for mass producing bricks in the 1850s, their shape became more regular and their size slightly larger until, by the 1870s/1880s, all bricks were machine made (Freeland 1988: 188). Freeland (1988: 146) suggests a standardisation in size to 22.5 × 12.5 × 7.5 centimetres after 1900, but brick size can also vary considerably even between bricks made from the same mould, as a result of differential shrinkage in the kiln.

Once you have decided on the sequence of construction for a building, you can

represent it using the concepts of the Harris matrix, by assigning a context number to each element and then plotting them into a matrix path (see 'Interpreting stratigraphy' on page 136). This is a sophisticated means of presenting both your data and your analysis together in a single diagram (see Figure 6.7 on page 186).

RECORDING HISTORICAL ARTEFACTS

In all cases the recording of historical artefacts follows much the same process as recording any other type of artefact, asking a similar range of questions: What is it? What is it made from? How and when was it made? How was it used? To do this you must look for and record those particular aspects that can most clearly show how and when the artefact was made and for what it was used. These are called **diagnostic features**, and are the most useful for identification and dating purposes. For many artefacts, you may find this information lacking entirely—for example, a small 1 × 2 centimetre fragment of dark brown glass from the body of a bottle is unlikely to give you much information about the specific contents of the bottle or its date of manufacture. In this case, you should not spend too much time recording this artefact, but instead focus on searching for and recording more informative pieces of evidence.

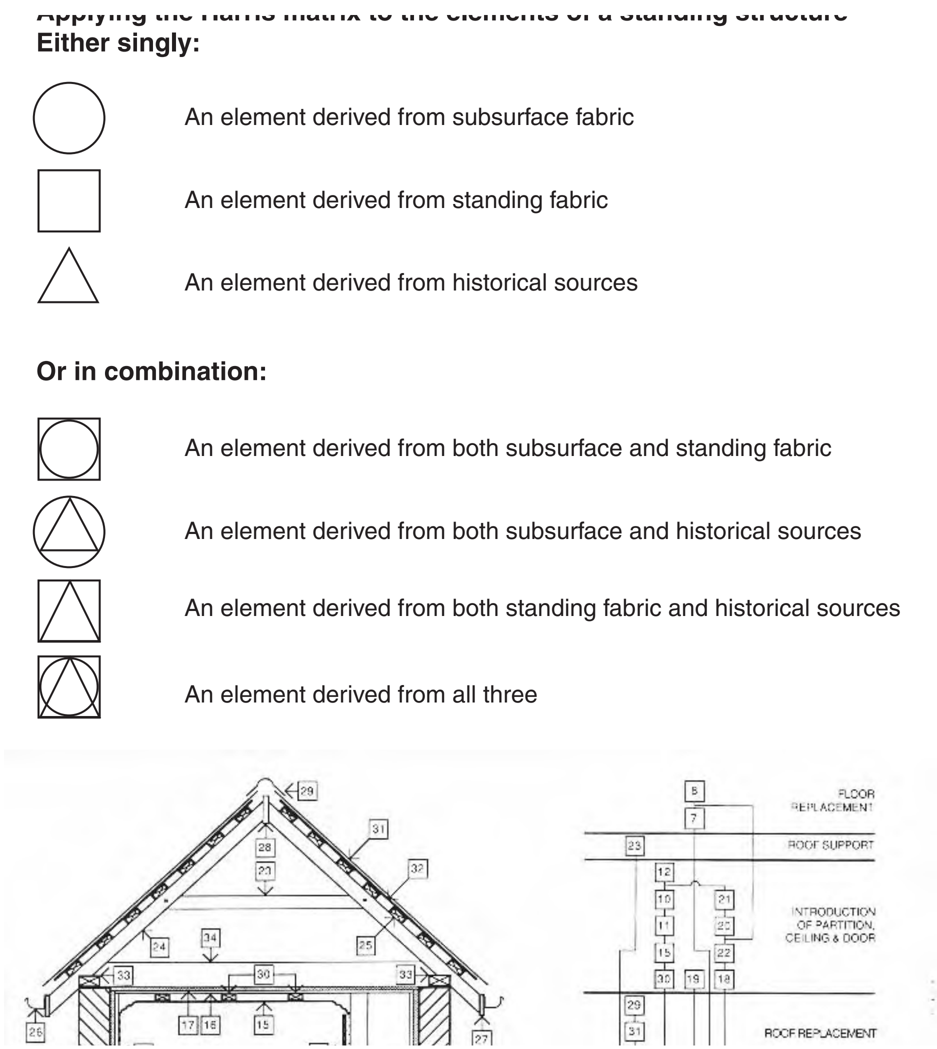
The context in which an artefact is found—in terms of whether or not the artefact has been disturbed since it was discarded—is particularly important to record. This is an assessment of the integrity of the site, which will be useful to your later analysis (see 'Recording landform, vegetation and slope' on page 73). If you think that an artefact is in its original location (*in situ*), you need to pay particular attention to where it was found and what was associated with it.

You must also make sure that you use consistent terms when describing any artefact so that other researchers can understand precisely what you mean. The following sections contain basic identification information and standard terminology for several common categories of historical artefact.

RECORDING BOTTLES AND BOTTLE GLASS

As the most common containers used in colonial society, bottles are a ubiquitous find on historical archaeological sites. Indigenous people after contact also sometimes used bottle glass to make flaked artefacts, so recording bottle glass can form a component of Indigenous site recording as well (see 'Recording contact sites' on page 234). The basic components of a bottle are the body, shoulder, neck, rim, finish, base, push-up and heel (see Figure 6.8).

FIGURE 6.8: The parts of a bottle



There is enormous variation in the shape and style of bottles which can tell you when the bottle was manufactured and the purpose for which it was used. The diagnostic features to look for and record for bottle glass are:

- shape;
- base;
- mould marks;
- mouth;
- seal/closure;
- trademark;
- decoration;
- colour.

Recording shape

The shape of some bottles will be relatively easy to describe; for others it can be very complex. To accurately convey the shape of the vessel, you may have to describe it in three planes:

- as viewed with the body **horizontal** (i.e. a description of the cross section of the bottle if it was cut in half through its mid-section) (see Figure 6.9 on page 189);
- as viewed with the body **vertical** (i.e. a description of the cross section of the bottle if it was cut in half down its length) (see Figure 6.10 on page 190);
- its **three-dimensional** body shape. 'Cylindrical' may be a much simpler way of describing the general shape of a bottle, as opposed to 'straight/vertical, circular/horizontal'.

Recording mould marks

Changes in glass manufacturing technology have resulted in several distinctive criteria which can be used to date bottles (see Appendix 3: Guides to dating common historical artefacts). Machine-made bottles have very well-defined mould seams, so make sure you take note of the number of mould seams which are visible and their placement on the body of the bottle.

Recording closures

This is essentially a recording of the shape and form of the neck and mouth of the bottle. Methods for sealing in the contents of a bottle have changed over time, particularly since the rapid technological changes of the Industrial Revolution. Make sure you take note of

FIGURE 6.9: Describing the shape of a bottle in the horizontal plane

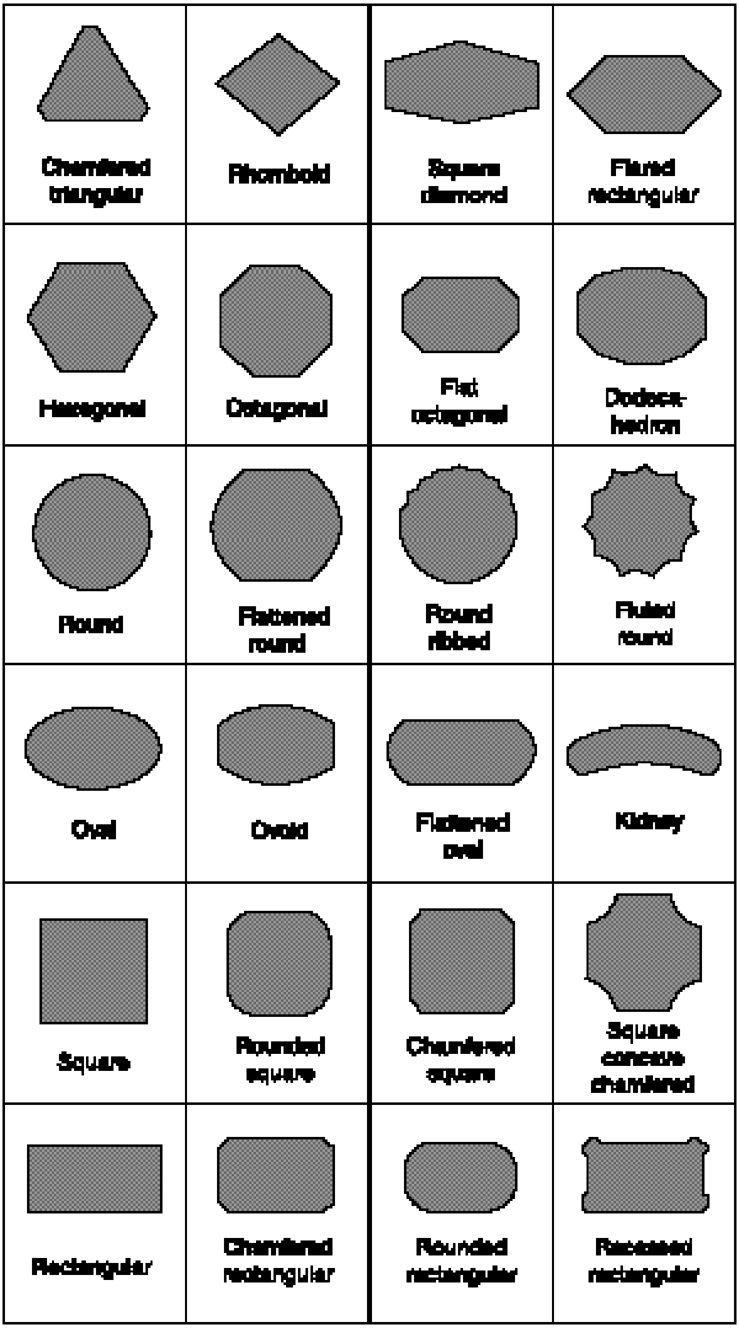
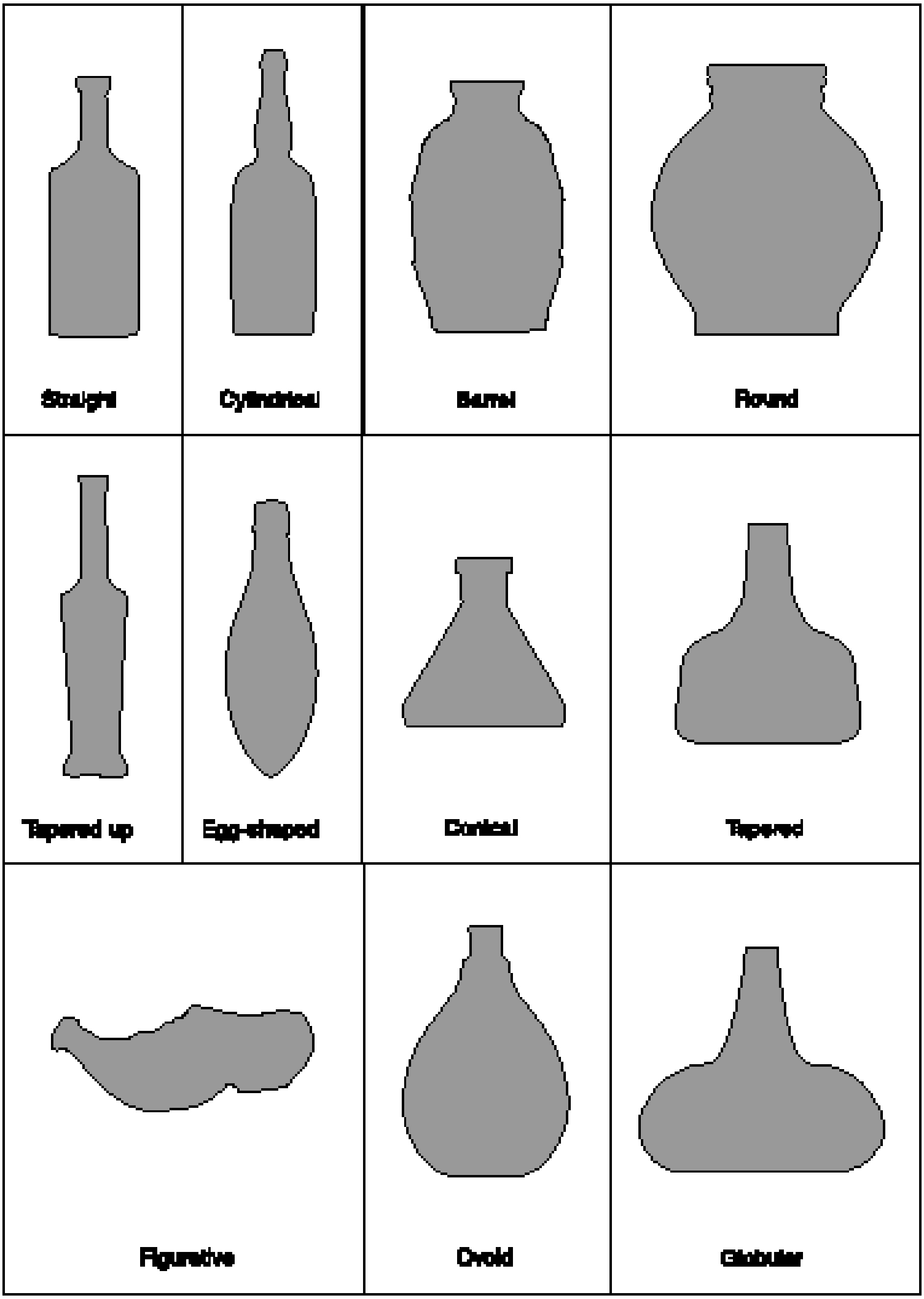


FIGURE 6.10: Describing the shape of a bottle in the vertical plane



the way the lip and string rim of the bottle are formed, and any other evidence for how the bottle was originally sealed.

Recording trademarks, decoration and colour

Make sure you record all trademarks and their placement. Even the most inconspicuous letters and numbers can sometimes be a guide to the company which made the bottle, the contents of the bottle, its date or its place of manufacture. Embossed letters and numbers on a bottle base may refer to a mould number, the manufacturer and sometimes also the place of manufacture. When recording such decorative information, make sure you record both its form and placement on the bottle.

Colour is another important aspect of bottle manufacture which you should take note of. When describing the colour of a bottle, be careful to distinguish between 'clear' bottle glass, which has an aqua tint, and completely colourless glass. So-called 'clear' bottle glass naturally has an aqua tint, and can only be made completely colourless by adding a bleaching agent, some of which are useful for dating purposes. The distinctive colour of amethyst bottle glass, for instance, results from the use of manganese to produce clear glass; when exposed to sunlight, this is apt to discolour to purple. This practice was limited to the period between 1890 and 1916 (Hutchinson 1981: 22) (see Appendix 3: Guides to dating common historical artefacts). After World War II most bottles in Australia were coloured or aqua-tinted rather than truly colourless.

Dark green bottle glass, commonly referred to as 'black' glass because its colour is so dark, was the most common material for alcohol bottles in the nineteenth century. Before local manufacture commenced, most early imports came from Britain, where rigid laws and excise controls caused clear 'flint' glass to be taxed highly, thus causing the cheaper, dark green bottles to be imported in large quantities (Boow 1991: 113).

Recording other types of glass

Not all glass on an archaeological site is bottle glass. Decorative glass bowls, cups, vases and ornaments were also common on domestic sites, made from cut and pressed (or moulded) glass. Cut glass is made by hand and has always been much more expensive than pressed glass. Most pressed glass on Australian sites dates to between c1860 and 1870 when there was an expansion in British production (Boow 1991: 88). It is relatively easy to distinguish between pressed and cut glass because of their different manufacturing methods (see Table 6.3 on page 192). Be sure not to confuse mould-blown glass (popular for only a very short time between 1820 and 1850) with pressed glass. While superfically they appear similar, mould-blown glassware may still have traces of a pontil mark on the base—where the pontil or handling rod was attached—and will be thinner and lighter.

TABLE 6.3: Distinguishing between cut glass and pressed glass (Boow 1991: 85–86)

Characteristics of cut glass	Characteristics of pressed or moulded glass
Will not have any mould seams	Will have a mould seam at the upper, outer lip, although this was sometimes deliberately blended into the design making it hard to see
Will be flat sided and appear to have sharp edges	Will have a smooth internally tapered surface (i.e. it will flare outwards at the top)
Its surface is often polished, smooth and glossy	May have a 'disturbed' surface texture, sometimes disguised by an overall stippled design
Design edges will be sharp and distinct	Design edges will tend to be rounded (Jones and Sullivan 1989: 34–35)
Designs are usually geometric (mostly panels, flutes and mitres)	Designs will occur in a greater variety of patterns, including lacy, stippled and naturalistic patterns

Window glass is another form of glass that occurs at many historical sites. Because of the limitations of glass blowing technology, it was impossible to make large, flat sheets of glass until after 1896 (Freeland 1988: 80). Window panes made before this date were all made by hand and tended to be relatively small. The earliest were made using a technique called 'crown glass' in which flat panes were literally spun from a molten bubble of blown glass, and only measured around 25 centimetres square. From the 1830s onwards, window panes were made from a flattened glass cylinder and could measure anything from 60 × 45 centimetres up to 1.5 metres × 90 centimetres (Freeland 1988: 6, 79). The introduction of machine technology to Australia in 1932 finally resulted in glass panes which were of uniform thickness and size. When you find window glass at an archaeological site, you must always record its thickness and whether or not it is hand- or machine-made.

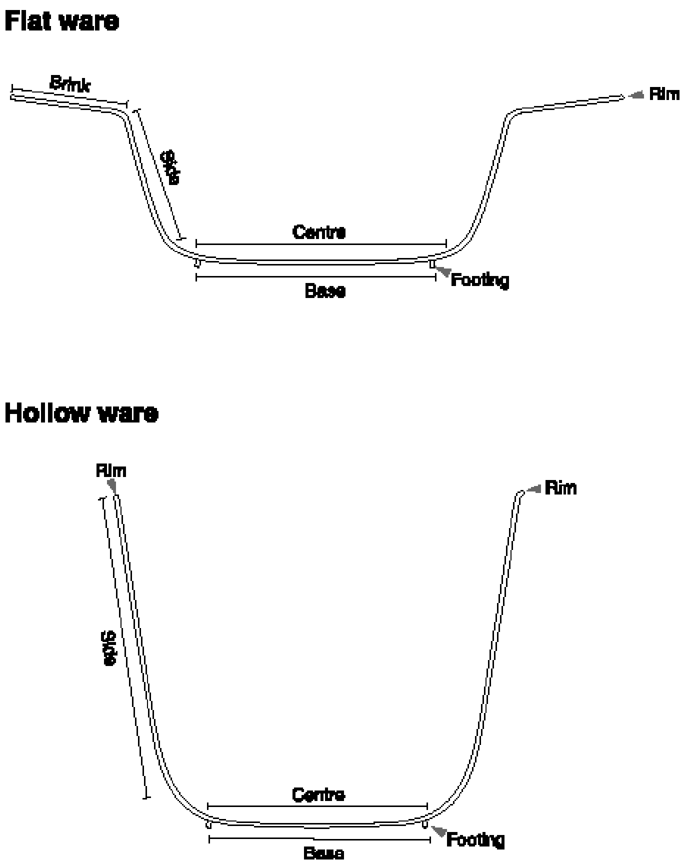
TABLE 6.4: The changing thickness of window glass throughout the nineteenth century (Boow 1991: 111)

Type of pane	Period	Thickness
Crown panes	to c1870	less than 2.8 mm
Cylinder panes	to c1910	3–4 mm
Rolled sheet	after 1890	greater than 4.5 mm
Drawn sheet	after 1920	up to 6 mm

RECORDING CERAMICS

Ceramic production originated in Japan during the Jomon period, c12 000–11 000 bp. Most of the ceramics found on historical sites in Australia, however, will be either English or local Australian manufactures, although fragments of Chinese domestic ceramics are also relatively common, particularly in old mining camps. Ceramics can be either handmade (such as coil pots), thrown (on a potter's wheel) or moulded (also sometimes referred to as 'pressed'). Avoid using the meaningless word 'china' to describe ceramics; this was simply a generic term used by seventeenth century European merchants to describe porcelain vessels exported from China. As with any kind of artefact, make sure you describe the various parts of a ceramic vessel using consistent terminology.

FIGURE 6.11: The parts of a ceramic vessel



Historical archaeologists draw many distinctions between different types of ceramic vessels based on a whole range of features. The difference between flat ware (plate, platters, saucers, etc.) and hollow ware (bowls, cups, tureens, etc.) refers to the shape of the vessel; other distinctions are drawn according to the purpose of the vessel, or its method of manufacture. Archaeologists will often describe a ceramic vessel according to its use: for example, vessels used to cook, mix or store foodstuffs are called 'kitchenware', while vessels used in serving and consuming meals or beverages are called 'tableware'. All of these categories are more descriptive than classificatory—in other words they tell you something about the gross general categories to which a vessel might belong ('bowl' versus 'plate', or 'mixing bowl' versus 'soup bowl'), but tell you little about the specifics of that particular piece. When recording ceramics from an archaeological site, it is better to distinguish between manufacturing methods—are they porcelain, stoneware or earthenware?—each of which had a different range of uses. Other important features to record are:

- the colour of the paste (i.e. the colour of the clay used to make the vessel). This is one of the characteristics which will allow you to distinguish between stoneware and earthenware, for example. Look at the edge of a broken ceramic fragment (you may have to clean it first) to see the paste colour;
- the decorative technique employed;
- the colour of the decoration;
- any visible trademarks;
- the vessel type (if you can tell).

Recording ware type

A piece of ceramic will be porcelain, stoneware or earthenware, depending on how highly it was fired and what use it was intended for.

Porcelain is made from a mix of clay and stone fired to a very high temperature so that it becomes impervious to liquids. It is translucent, which means that if you hold it up to the light you will be able to see light through it. Porcelain was invented and perfected in China and was initially very expensive. Although its price decreased through time as English manufacturers produced it locally, it was still always more expensive than other wares. Hard paste porcelain is distinguishable by virtue of an abrupt boundary between the body of the vessel and the glaze; on soft paste porcelain, the glaze and the body blend together. Porcelain was used for all forms of table ware, as well as a variety of non-table ware items, such as dolls, marbles, figurines and buttons.

Bone china or **ironstone** was developed by manufacturers trying to find a cheaper, more durable alternative to porcelain. Experiments with the extremely expensive hard paste porcelain resulted in the development of bone china, which was manufactured by adding bone ash to the refined clay body. This produced a white ceramic of good translucency at reasonable cost. Other techniques added finely powdered stone and iron slag to the clay to produce 'ironstone china', first patented in 1813. Like bone china, this new material was favoured for its cheapness and durability and was variously referred to as 'ironstone china', 'stone china' or 'opaque porcelain'. Except for the highest quality services, bone and ironstone china replaced porcelain in popularity during the nineteenth century.

Stoneware is halfway between porcelain and earthenware. It is made from coarse to refined clay and fired to a point where partial vitrification renders it impervious to liquids. Stoneware commonly has a grey, tan or brown fabric (i.e. the colour of the actual clay itself). Even though non-porous, it is always glazed—either with a self-glaze produced by salt-glazing (literally throwing salt into the furnace to change the colour of the outside of the pot) or with an applied glaze. Stoneware was very common during the early to mid-nineteenth century and was used to make a number of specialised vessels, such as crocks, jam and pickle jars, ink bottles and ginger beer and ale bottles. Its use for manufacturing table ware was limited to c1720–1805.

Earthenware is not fired to the point where vitrification occurs, and is therefore light and porous unless it has been glazed. Earthenware came in both common and refined forms. Common earthenware was of lower quality and was used to make a range of industrial products such as flower pots, tiles and sewerage pipes, as well as tobacco smoking pipes. Only in the seventeenth and eighteenth centuries was it used to make table wares. Refined earthenware was made from better quality clay and, as a cheap alternative to porcelain, was used to make a range of different table wares. It commonly has a white, buff, yellow or brown fabric. Refined and decorated white earthenware table wares were extremely popular from the 1870s/1880s until the turn of the century and are the most common domestic ceramics found on Australian colonial sites. Plain white refined earthenware was often used commercially and is sometimes called 'hotel ware', because it was thick, durable and inexpensive, and therefore popular for hotel dinner settings. Marked hotel wares are generally dated to after 1870.

Recording decorative technique

Take note of the type of decoration and how it has been applied to the vessel. The main types of decoration are:

- **Embossing.** This is a raised or moulded decoration with no colour. Typical examples are scalloped rims on the edge of plates. Moulding was particularly popular between 1850 and 1890 on clear-glazed white ironstone vessels (Wetherbee 1985).

- **Glazing.** A glaze is a glassy coating over the inside or outside of the vessel. A slip is a fine clay that has been diluted to a cream-like consistency with water. Vessels are dipped into this liquid clay to give them a smooth, glassy outer surface. If you find a sherd with a complex glaze or slip, record the exterior or primary glaze first, followed by the interior or secondary glaze. The most common forms of this technique are (AHAPN Draft Historical Archaeological Materials Cataloguing Guidelines 1998):
  —*Albany slip:* a lustrous brown slip that coats the entire vessel.
  —*Bristol slip:* an opaque white slip containing zinc oxide. It is often found in combination with an Albany slip on stoneware bottles.
  —*Clear glaze:* this was usually applied to white earthenware vessels, although variations of it include *creamware*, which has a cream-coloured tint to it, and *pearlware* which has a bluish tint.
  —*Rockingham:* this is a dark brown, mottled glaze, that looks as if it has been 'dripped' on to the vessel and was particularly popular between 1830 and 1870.
  —*Salt glaze:* this is a glaze used on stoneware that results from throwing handfuls of salt into the furnace during firing. The salt combines with the silica in the clay to form a shiny outer coating that often has a slightly pitted surface, like orange peel.
- **Colour decoration.** There are many ways of decorating a vessel with colour, including transfer printing, hand painting, lustre, edge banding, lithographic decals, hand-stamping, hair-lining, gilding and coloured pastes or glazes.
  —*Transfer printing* is produced from an inked design engraved on to a copper plate. Most transfer prints used only a single colour and were common on table wares in the 1820s. Intricate dark blue to purple transfer prints were especially common in the mid-nineteenth century. A technique called flow blue, where chemicals added to the kiln during firing caused the transfer print colour on the vessels to run or flow, was introduced to the transfer printing process in the 1820s. Flow blue was popular throughout the nineteenth century for everyday place settings. Reproduction transfer print designs were introduced after 1900 and are still marketed in limited quantities. (AHAPN Draft Historical Archaeological Materials Cataloguing Guidelines 1998).
  —*Hand-painting* refers to colours that have been applied using a brush or the fingers.

When you record a transfer print, take note of whether it has been applied underneath or over the top of the clear glaze. The earliest transfer prints were applied over the top of the glaze which means that they will scratch or wash off. These are called **overglaze** patterns. Later prints were applied underneath the glaze, which means they will not come off. They are called **underglaze**.

—*Lustre* uses either a metallic oxide lustre or an iridescent lustre and was particularly popular in the 1920s.

—*Edge-banding* is a thin band of colour applied by brush to the rim of the vessel. The width of this band can vary from 2–6 millimetres.

—*Lithographic decals* were supplied on paper-backed sheets and simply pressed on to the vessel over the top of the glaze after firing. Introduced in the 1860s, they were cheaper and faster to apply than transfer prints, but not widely manufactured until the 1900s. Decals are usually polychrome (many coloured) with the individual colours precise and distinct (AHAPN Draft Historical Archaeological Materials Cataloguing Guidelines 1998).

—*Hair-lining* is a thin line of contrasting colour printed over or under the glaze. It is usually only 1–1.5 millimetres in width and often placed inside the rim of a cup or around the rim of saucers and small bowls.

—*Gilding* is the application of liquid gold or silver to the rim of a vessel with a fine brush. It was in use in the United States from 1894.

—*Coloured pastes* are when the clay itself is coloured and then covered with a clear glaze. The colour of a ceramic body, or paste, refers to the fired colour of the clay. To determine a paste colour, you need to examine a clean or freshly broken edge, not just the exterior glaze.

—*Shell edging* is a shell-edged design pressed into the rim of an earthenware vessel. After firing, the edge was often trimmed with blue or green (see also Sussman 2000). Inexpensive edge-decorated table ware was produced by British potteries from about 1770 to 1850 (Noel Hume 1969: 394).

—*Spongeware* and *spatterware*: Spongeware was a distinctive form of decoration applied with a sponge. The result was a mottled blue, red, yellow or green pattern. Spatterware was most popular between the 1830s and 1840s and was applied by tapping a paintbrush dipped in pigment as the vessel was turned on a wheel (AHAPN Draft Historical Archaeological Materials Cataloguing Guidelines 1998; Robacker and Robacker 1978: 32).

RECORDING ORAL HISTORIES

> The very fact that . . . remembrances exist only in memory means that they are a nonrenewable resource . . . When a generation dies, it is like burning down an archive full of unique and nonretrievable information. (Orser and Fagan 1995: 150).

Archaeology involves working with people. If you are working in the historic period or with Indigenous cultural material, interviewing people can give you many insights into how artefacts were used in the past, as well as the complexities of their social significance (see also 'Recording Indigenous histories' on page 235). Oral histories can be as valuable as written documents, particularly in relation to those aspects of daily life which don't translate directly into archaeological artefacts, such as personal beliefs, feelings, reactions or kinship networks. The most important thing to bear in mind when recording an oral history is that it should be treated as a collaborative process between you, as the interviewer, and the interviewee. It is not a process of 'extracting' information from an 'informant', but building a shared understanding of what a site or artefact meant to the people who used it in the past. You should also be aware that all university-based research involving oral histories will need clearance through the university ethics committee before you can begin.

When recording an oral history, don't just target important or historic events. These are singular, one-off occurrences which, while interesting, provide little information about ordinary people and their day-to-day life. The minutiae of many common daily activities (such as certain types of food preparation) would be lost to us without oral history. When conducting an interview, you will have to strike a balance between letting people follow their own memory trails (which may provide you with information you haven't anticipated) and keeping them on track so that you get some minimum amount of information which is useful to you. For best results, interview people in an environment where they feel comfortable (such as their own home) or take them into the field to visit the site to identify specific features and try to prompt their memories with visual cues. If you cannot take people into the field, take some photographs of the site to show them during the interview and perhaps prompt them that way.

Wherever possible, ask open questions—that is, questions which require more than a simple 'yes' or 'no' answer—because these will elicit the most information. If you don't think your question has elicited enough information, try following up with exploratory queries such as: Tell me more about . . . , Explain what you mean by . . . , Give me an example of . . . , or What date/year did that happen? For the same reason, don't ask leading questions ('The house was painted red, wasn't it?'). These essentially tell people the answer, or supply a potential answer for them rather than allowing them to explore their own memories of the event. Once you have asked a question, wait and listen to the response. Even if the urge to interrupt—either to clarify a point or to ask another question—is great, don't. Make a note of the point and follow it up later.

In all interview situations, you will have to make some judgments about the reliability of the information and not simply accept everything at face value. People sometimes tend to repeat other (usually written) histories. Make sure the stories you are being told are not simply being rehashed from someone else's already published history or, if they are, that you trace them back to their original source.

The ethics of good practice are particularly important when conducting an oral history interview (see 'Archaeologists and ethics' in on page 11). The interviewee is providing you with information, but you must be sensitive to the effects it may have on them or others. If a memory is painful or difficult to recall, or simply embarrassing, don't press the issue. Keep a close watch on the body language of the person being interviewed, as this will tell you how comfortable they are with the whole process.

At the beginning of the interview, you must be very clear about the nature of the project, the purpose of the interview and how you intend to use the information. Identify yourself and the interviewee by name at the beginning of the tape or at the beginning of your notes, and also note down basic particulars about the person you are interviewing. How old are they? Where were they born? Without knowing at least how old they are, you will not be able to correlate information about events that happened to them at certain stages of their lives to calendar dates/years.

At the end of the interview, you must ask the interviewee for their permission before you reproduce any part of it, or make it available in any kind of public document. This process is called 'informed consent' and is particularly important when you are interviewing Indigenous people. When obtaining informed consent, you need to give an outline of your project and make sure people understand that their participation is voluntary and that they can change their mind at any time about participating. Sometimes you may need to obtain a signed consent from your interviewees. This will be essential if you are seeking funding for Indigenous research from bodies such as the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS*).

It is also important that you minimise any potential harm to participants. This includes physical harm, subjecting people to undue stress, or undermining their self-esteem. While archaeology seems pretty innocuous on the surface, our job is actually writing the story of other people's pasts and some of these stories have the potential to hurt people. For example, in the past some archaeological research has been used to support racist and hurtful stereotypes of Indigenous people. You need to ask yourself what kinds of precautions have been taken to keep risk to a minimum: does your study involve particularly vulnerable subjects who may require special consideration?

Finally, if you are interviewing people you will need to give them the option of being anonymous and you may need to take special measures to ensure their privacy. This is particularly so if you are working with Indigenous people, who are often very cautious about how they will be portrayed by researchers. Some Indigenous groups will not consent to research being undertaken unless they have a certain amount of control over the process and the publications that will arise from the research.

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USEFUL WEBSITES

Excellent searchable online sources for historical documents and pictures are available from:

- The National Library of Australia, which maintains: www.pictureaustralia.org/ (a collection of online picture resources held in various libraries across Australia), www.nla.gov.au/catalogue/ (its own online catalogue) and www.nla.gov.au/oz/histsite.html (a page detailing sources of Australian history available online). It also has a register of Australian Archives and Manuscripts held in non-government collections available at: www.nla.gov.au/raam/.
- The Australian War Memorial: piction1.awm.gov.au
- The National Archives of Australia: www.naa.gov.au/the_collection/recordsearch.html and www.naa.gov.au/the_collection/photosearch.html. You can view some documents, request documents to be scanned for viewing and request hard copies of documents on the internet.
- www.archivenet.gov.au/archives.html, a general listing of websites for all archival collections maintained around Australia, including some international archive links.
- The Directory of Archives in Australia at www.archivists.org.au/directory/asa_dir.htm. This site is a database of 475 archival repositories across Australia, many with links to their respective web pages.

www.bl.uk/services/information/patents/history.html is a site maintained by the British Library with information for people searching for British patent numbers to identify artefacts. This site also includes a link to the US patent office.

The Internet Library of Early Journals is at www.bodley.ox.ac.uk/ilej. This contains a selection of scanned eighteenth and nineteenth century journals, such as *The Builder* and *Blackwoods Magazine*.

CHAPTER SEVEN

RECORDING INDIGENOUS SITES

WHAT YOU WILL LEARN FROM THIS CHAPTER

- The range of Indigenous site types across Australia
- The essential features to record for each site type
- How to identify a flaked stone artefact
- How to tell a humanly scarred tree from a naturally scarred tree
- The limitations of ethnohistoric research
- How to identify an Indigenous burial

WHAT IS AN INDIGENOUS SITE?

The Indigenous occupation of Australia dates back at least 40 000 years and may be considerably older. The many different ways in which Indigenous people have interacted with the land and with each other over this long time period have left behind many physical traces. There are many different kinds of Indigenous sites, ranging from stone artefact scatters or open sites, shell middens, rock art, and carved and scarred trees, to quarries, burials and stone arrangements, as well as many post-contact sites.

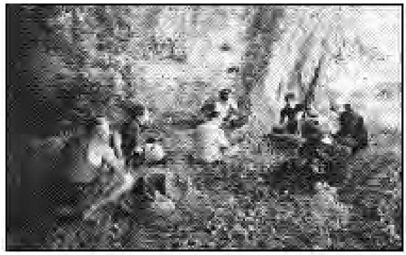
Stone artefact scatters

This is the most common type of site across Australia—groups of stone artefacts found scattered on the ground surface. To differentiate them from sites which occur within the

FIGURE 7.1: The range of Indigenous sites in Australia

June Ross

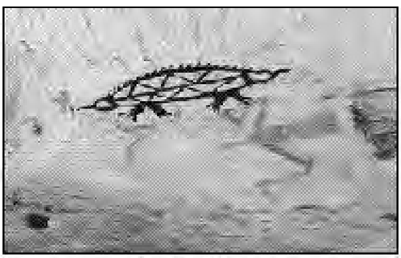
Axe grinding grooves. The edges of stone axes had to be ground regularly to keep them sharp.



Rockshelters. These habitation sites can contain evidence for a wide range of activities.

Dreaming sites. Many natural features of the landscape are invested with meaning by Indigenous people.

Regular burning is just one of the ways in which Indigenous people made the natural environment into a cultural landscape.



Rock art sites.

Ceremonial sites. Activities at these places may leave few physical traces but they are still important sites.

Contact sites cover all forms of interaction between Indigenous and non-Indigenous people. This site marks the location of Colebrook Home, SA, which housed children of the stolen generations. It is a memorial to all mothers who lost children to policies of enforced removal.

Scarred and carved trees.

protection of a rockshelter, such scatters are often referred to simply as '**open sites**'. You should remember, however, that there are other types of open sites, such as middens and grinding grooves. Indigenous people used different kinds of stone artefacts for many day-to-day purposes—such as skinning and butchering animals, grinding seeds and nuts, manufacturing wooden artefacts—and for hafting as axes, adzes, knives or spear points.

Artefact scatters can range in size from a few artefacts to a high-density scatter containing a wide range of different artefact types (for more information on defining a site and its boundaries, see 'Defining the boundaries of an open artefact scatter' on page 219). Stone artefact scatters occur both as surface concentrations of material and as stratified deposits which may be dateable, and they may or may not be associated with other cultural remains such as ochre, charcoal, shell or bone. Archaeological information from open sites can be used to infer a wide range of behaviour, such as population movement, customary exchange systems, and even activity areas if there is a sufficiently wide range of complementary material. An artefact scatter does not necessarily imply that people actually camped on a site, but may indicate only that some type of activity was performed there (such as the manufacture of stone 'tools') or that people passed through the region (Hiscock 1988: 19).

Isolated stone artefacts

As the name implies, this refers to individual stone artefacts found by themselves in no obvious association with any other artefacts. Whether such artefacts were accidental or purposeful discards, they should still be recorded. Although an isolated stone artefact is not strictly a 'site' (the definition for which varies from state to state), it is often what the archaeologist will encounter. Of course, it is possible that there were once other artefacts there that have since been removed, or simply that the visibility conditions prevent you from seeing them (see 'Determining effective survey coverage: What reveals, what conceals' on page 78). If you find such a site, make sure you search the area around it carefully to ensure that it is, indeed, an isolated artefact.

Shell middens or midden scatters

A midden is literally a refuse dump left behind after people have eaten a meal. In shell middens, marine or freshwater shells are the dominant component. A deposit with only a handful of scattered shells on its surface, or an excavated deposit which contains only a few sparsely distributed shells, does *not* count as a midden (Val Attenbrow pers. comm.). Shell middens can occur along coastlines, around estuaries, along coastal and inland river floodplains and around the shores of coastal or inland lakes. They can also occur as deposits within rockshelters and can range in size from a small, low-density surface scatter of shellfish remains to a high-density midden containing a variety of shellfish species, as well as stone artefacts and other archaeological remains. The presence of a shell midden or midden scatter does not necessarily imply that people actually camped at a place, but may indicate only that they passed through the area.

Scarred trees

These are trees from which bark has been removed for the manufacture of everyday items such as containers, canoes or medicines. Bark could be removed either as sheets (for making shaped artefacts such as coolamons, shields and canoes) or as fibre for making twine. Scarring can also occur from the making of toe-holds used to climb a tree or from the removal of possums, honey or grubs from the heartwood of a tree. Such scars can vary in size and can often be distinguished from natural scarring by the regularity of their shape, their size and their location on the tree, as well as the presence of axe scars on margins of the exposed wood. Many different kinds of trees can be scarred.

Carved trees

These are trees which have had designs carved into the bark or heartwood and in some areas may have been used to mark burial or initiation sites (e.g. McBryde 1974). The most common carving technique involved the removal of the outer bark and sapwood from a portion of the trunk, so that designs could be carved into the inner wood of the cleared panel.

Quarries

Quarry sites are locations from which Indigenous people have extracted stone for making stone artefacts, or ochre for use in painting. Stone artefact quarry-sources ranged from easily acquired loose river cobbles to large outcrops which had to be actively quarried.

Stone arrangements

These can range from cairns (piles of rocks) to extremely elaborate arrangements covering large areas. Some stone arrangements were used in ceremonial activities (e.g. to mark sacred or totemic sites), whilst others were constructed for more secular purposes (e.g. to act as route markers, hut walls or fish traps).

Rock art sites

Rock art is divided into two basic types: paintings and engravings. Rock art is produced either through the addition of colour, by painting, stencilling or drawing, or the removal of parts of the rock surface by pecking, grinding, abrading or engraving. In areas of northern Australia, it is also produced by the addition of beeswax to the rock surface (see Table 7.1 on page 223). Rock art is of great interest to archaeologists because it encodes many levels of social information about the people who made it. It is also very useful for archaeological analyses because, unlike many other artefacts, it is securely tied to place. You can be sure that the rock art was made for—and meant for—the place where you find it. The great weakness of rock art study is that it is very difficult to date. While there have been enormous developments in rock art dating over the last decade or so, it is still only a job for specialists and requires expensive laboratory processes. The good news is that, should you need this expertise, you can apply for funding for rock art dates from AINSE (the Australian Institute of Nuclear Science and Engineering*) and from AIATSIS (The Australian Institute of Aboriginal and Torres Strait Islander Studies*).

In many parts of Australia, rock art occurs on surfaces that appear to be inaccessible without the use of scaffolding or ropes. In some regions, the location of paintings in such inaccessible places is cited by Indigenous people as proof that the paintings were made by Mimi spirits, rather than people. Overall, however, rock art is restricted in its distribution to regions where suitable rock surfaces occur. There is no rock art in northeast Arnhem Land, for example, because there are no suitable surfaces in this region. In other areas, rock surfaces are unstable and therefore will not preserve art in the long term.

Indigenous special places and other significant sites

These can be either modified sites/features or natural features of the landscape (such as rock outcrops or water sources) which possess special significance because of their role in Indigenous belief systems. These sites may be part of creation stories, or associated with important life events and ceremonies. Some may be unmodified features of the environment, in which case there may be few, if any, tangible features peculiar to these sites which indicate to non-Indigenous people that the place is of special significance. Independent information from Indigenous communities is essential for the identification of all such places.

Burials

Treatment of the dead by Indigenous people occurred in both historical/contact contexts (i.e. on campsites and missions) and in archaeological contexts (in deposits which may be exposed by erosion, development or excavation). Such sites hold great significance for Indigenous people, and the disturbance of burials, or burial places is a very sensitive issue (for more information see 'What to do if human remains are encountered' on page 237).

Contact sites

Contact sites are places with evidence for contact between Indigenous Australians and other groups of people. Sometimes these sites are called Indigenous historical sites, but this implies that the only group that Indigenous people had contact with were Europeans. However, Australia has multicultural origins, many of which are not highlighted in the history presented today. In northern Australia, there is extensive evidence of contact between Indigenous peoples and Macassan fishermen from Indonesia, and throughout the 1800s and 1900s there was extensive contact and intermarriage between Indigenous peoples and the Chinese. In fact, there were periods during the nineteenth century when the population of northern Australia included more Chinese than people of British origin or descent. Similarly, there was contact between Indigenous Australians and various French and Dutch mariners as early as the 1600s, and with Afghans in central Australia throughout the 1800s, as well as with other groups.

THE BASICS

The checklists for site recording in this section only refer to the specific elements peculiar to each type of site. All site recordings are conducted with two complementary purposes in mind: to record information about the contents, form and spatial arrangement of the site; and to record information about preservation conditions and other management issues. For all sites, you should always record a description of its physical location, the owner of the property on which it is found, a grid reference and a plan of the site, as well as taking photographs (see 'What to do when you find a site' on page 80). For all Indigenous sites, you should also record:

- the location of any Indigenous plant resources nearby;
- the proximity of the site to the nearest reliable water source and its type (e.g. lake or river);
- the proximity of the site to the nearest water source and its type, regardless of its reliability (e.g. ephemeral creek);
- the proximity of the site to major Dreaming sites (if known).

Most administering authorities have official site recording forms for each type of site (i.e. one form for rockshelters, one for stone arrangements, one for rock art sites, etc.) which reflect the specific information it is important to collect about each. It is well worth having a supply of these to take with you into the field in the event that you locate any sites.

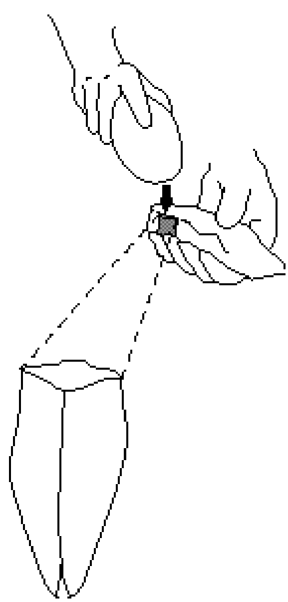
RECORDING STONE ARTEFACTS

Indigenous people made and used a variety of stone artefacts. Some were flaked from larger pieces of stone; in other cases stone was ground to produce a particular type of artefact such as a grindstone or an axe.

Recording flaked stone artefacts

Flaked stone artefacts are made by hitting one stone (called a **core**) with another (called a **hammerstone)**. This process is called **knapping**. Artefacts made by knapping have a number of things in common and it is these things which an archaeologist looks for when identifying a piece of stone as a flaked artefact (see 'How to identify a flaked stone artefact' on page 209).

FIGURE 7.2: Knapping, the process of making a flaked stone artefact



There are many systems for recording these stone artefacts in the field. Some attributes are more reliable than others, and the recording system you choose may depend on the questions you wish to answer. In recognition of this, we have not tried to establish a set of rules to follow. Nor have we tried to provide guidelines for detailed analysis, as there are several debates surrounding which characteristics are considered the most useful to record and why. All we intend here is simply an outline of some of the basic parameters which can provide you with quick and useful information in the field. For more detailed information on recording stone artefacts, see Hiscock (1989).

The first step is obviously to be able to recognise a flaked stone artefact when you see one. Archaeologists classify flaked artefacts according to four basic technological divisions:

- **flakes**: the piece of stone which is struck off the core;
- **cores**: the piece of stone from which flakes have been removed;
- **retouched flakes**: sometimes people will use a flake as a core and knap it to remove other, smaller flakes from along the edge. These twice-knapped artefacts are called retouched flakes. The appearance of retouch may also be created by using the flake;
- **flaked pieces**: artefacts which cannot be clearly identified as a flake, core or retouched flake. This is a category for artefacts which are clearly artefacts but which have lost their defining features, or become detached because the core has shattered in the process of knapping.

How to identify a flaked stone artefact

How to identify a flake

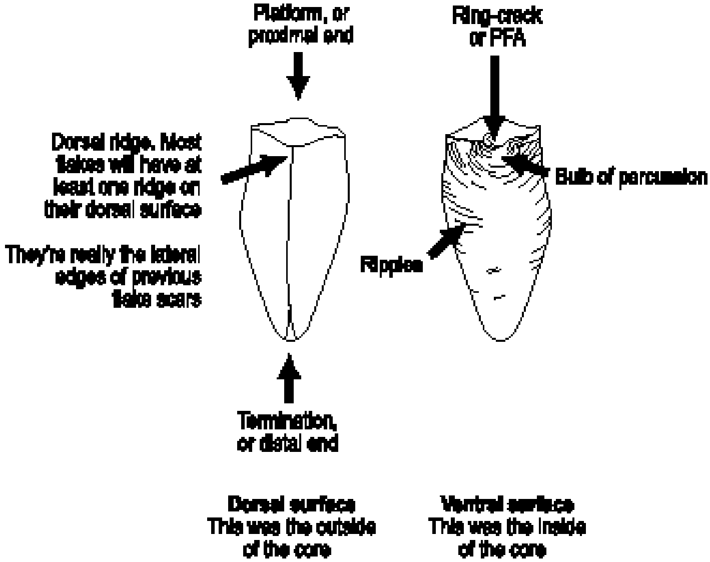
The basic morphology is as follows (also see Figure 7.3):

- The 'back' of the artefact (the side that was part of the outside of the core) is called the dorsal surface.
- The 'front' of the artefact (the side that was once part of the interior of the core) is called the ventral surface.
- The 'top' of the artefact (the part that the knapper hit to remove it from the core) is called the platform or proximal end.
- The 'bottom' of the artefact (the end opposite the platform) is called the termination, or distal end.

When trying to decide whether a piece of stone is a flake look for these important features:

- When a flake is removed from a core, there is often a distinctive circular mark where

FIGURE 7.3: How to identify a flake



the hammerstone has hit the core. This is called a **ring crack**. Because the ring crack occurs in the precise spot where the hammerstone has hit the core, it is also sometimes called the **point of force application** (or PFA).

- The ventral surface may have a **bulb of percussion**, or a rounded bulge where the force from the hammerstone has radiated through the stone and split it from the core.
- The ventral surface may also have other features on it, like concentric **ripples** or waves which spread out from the ring crack.

To successfully produce a flake, the knapper must hit the core in the right spot with just the right amount of force (see Figure 7.4 on page 211).

How to identify a core

The key to identifying a core is to look for the opposite, but complementary, characteristics to those you look for in a flake. One of the key characteristics of a flake is the rounded bulb of percussion on the ventral surface. One of the key characteristics of a core, therefore, is the negative imprint of this bulb—a rounded hollow where the flake was split off from the core. This is called a **negative flake scar** (see Figure 7.5 on page 211).

It is important to remember that even flakes may have negative flake scars—anything that has been removed from the core after the beginning of the knapping process is likely

FIGURE 7.4: Physical constraints of knapping

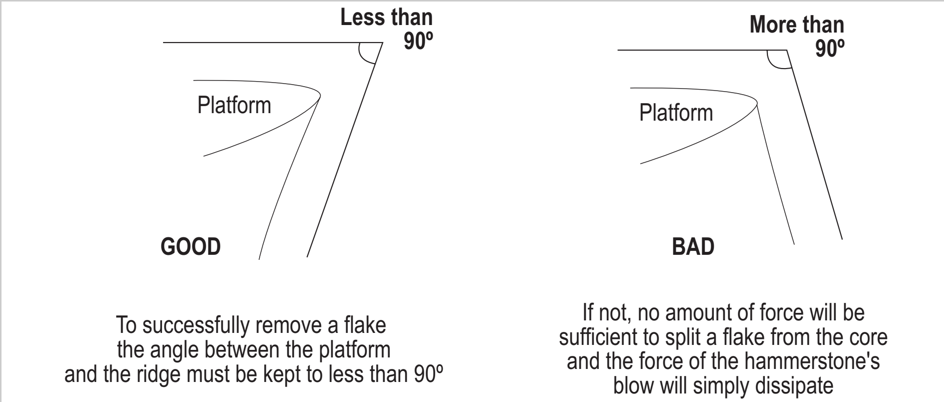
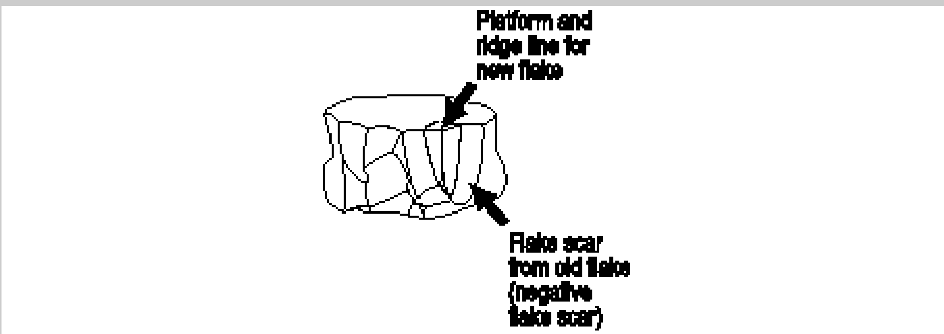


FIGURE 7.5: A negative flake scar



to carry away with it the negative imprint of earlier flakes. The crucial distinction in telling a flake from a core, however, is that **a flake must always have the positive attributes** of the knapping process (a bulb of percussion), whereas **a core will only have the negative attributes** (flake scars). The only exception to this will be if a flake has been used as a core, in which case you may see both kinds of attributes.

How to identify a flaked piece

This is actually quite difficult, and your success at identifying such items will depend to a large extent on your experience. Because this category was created explicitly for all those definite artefacts which have no defining attributes, if you are unsure about what is or is not a 'definite' artefact, then this category will be highly problematic for you. Artefacts which are highly weathered or which have been shattered in a fire might fall into this category, but so might artefacts which were detached as part of the knapping process (Hiscock 1989: 26). It is important to remember that this category is not a catch-all 'too hard' basket for all those things that you think might be artefacts—if you are unsure seek a second opinion. The easiest way to identify a flaked piece is to look for ventral or dorsal features. If you can define any of these, such as ring cracks, negative dorsal scars, undulations, etc., then the artefact is a broken flake. If you cannot, but are sure the piece derives from knapping, then it is a flaked piece.

Recording other important classes of stone artefact

- **Manuports.** This is a category for pieces of stone which are obviously not found locally in the area and therefore could only have been carried in by people. It doesn't necessarily have to be knapped (although it may be)—just exotic to the local area. You will only be able to tell whether a piece of rock is exotic by familiarising yourself with the local geology.
- **Grinding stones.** Unlike flakes, which are customarily made from fine-grained, sharp-edged, raw materials, grinding stones are made from coarse-grained and abrasive materials such as sandstone. They were used by Indigenous people to grind seeds, roots tubers or ochre and consist of two parts: a flattened 'dish' in which the material rested and a rounded stone which was held in the hand and used as a pestle or muller. Look for relatively flat, dish-shaped (concave) stones, and smaller rounded stones of the same material (but note that you might not find them together). One surface of each stone (and possibly more than one surface of the muller) is likely to be smoother and possibly polished as a result of repeated grinding.
- **Edge-ground axes.** These were commonly made of volcanic raw materials, such as basalt, because they are extremely hard. To make an axe, a 'blank' (an axe-shaped piece of stone) is knapped, and one edge of this knapped further to create a chopping angle. This edge of the axe was then ground smooth until it was sharp and the axe head attached to a wooden haft with twine and gum. An entire axe will be easy to identify because it will have these ground edges and because it will be made from hard volcanic material. If, after use, the edge of an axe became dull, Indigenous people would often knap some further flakes from the axe's cutting edge and regrind it (see 'Grinding grooves' on page 213). These waste flakes are called 'edge sharpening flakes' and will also be relatively easy to spot because of their distinctive raw material and because they may have polish on some margins.
- **Potlids.** These are small circular pieces of stone which have literally 'popped off' the surface of the artefact as a result of exposure to extreme heat. Sometimes people deliberately heated certain kinds of raw material (such as silcrete) to make it easier to knap; sometimes artefacts were simply thrown into cooking fires after use. Bushfires, of course, can also cause potlids on open sites. If you find a potlid on an

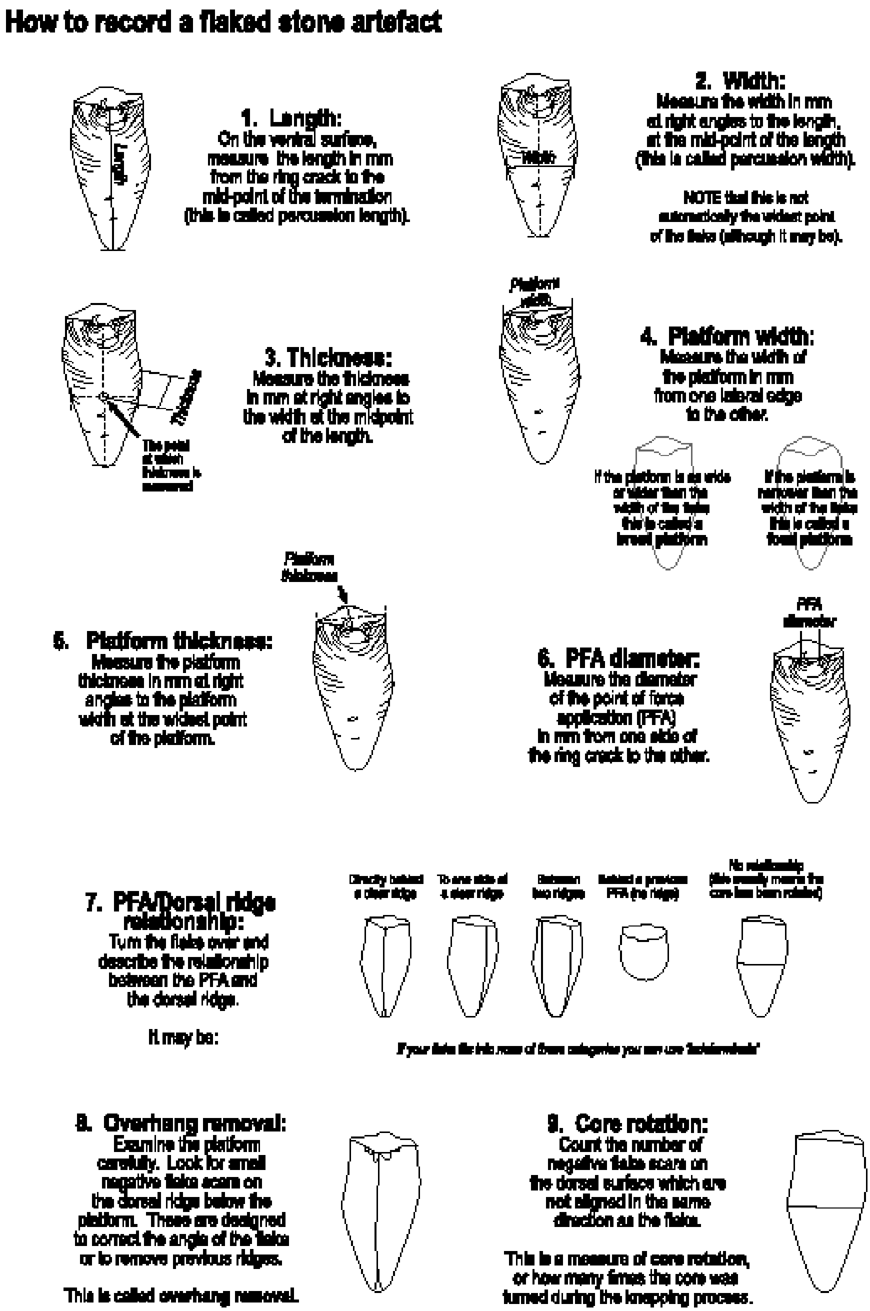
artefact, you will need to decide whether it has been caused by natural or cultural processes. Look for whether the incidence of potlids is spread evenly across the site and across different types of raw material (this may indicate the passing of a bushfire) or whether they are highly localised, or only occur on one type of raw material.

- **Grinding grooves.** These are a by-product of the manufacture of ground stone axes or adzes. The highly polished surfaces and sharp edges of such artefacts arise from grinding them against a permanent rock surface. Such surfaces are usually horizontal and are located near water, which is an essential lubricant for the grinding process. The grooves that result from this process have their own patina, are narrow, relatively short (think of the length of an arm-swing) and deeper in the middle section than at either end (see Figure 7.1 on page 203). To record these, first count the number of visible grooves and note their orientations. You should then measure the length, width and depth of each groove and estimate the quality and extent of patina present. (Is the entire groove highly patinated? Is there little or no patina?)

To produce a particular kind of artefact, a knapper will sometimes remove many flakes from a core until he or she has precisely the right ones. When a person sits down in a particular spot to knap an artefact, the place is called a **knapping floor**. At sites that were knapping floors, archaeologists can sometimes literally put the artefacts back together. In some cases, this allows them to see the original shape of the core and to work out how the person went about reducing the core to make a particular collection of stone artefacts. Many of the artefacts an archaeologist finds in the field are the waste products from this process rather than the desired end product, because this was usually taken away for use elsewhere. In recording such a group of stone artefacts, archaeologists try to distinguish between those flakes that were removed at the beginning of the process and those that were removed from the core towards the end of the process. One way of doing this is to measure the amount of **cortex**, or the original, weathered, outside surface of the core which is visible on each flake. Cortex can be pebble cortex, from a water-rolled pebble, or outcrop, from an exposure of stone. Either way, it will appear on the dorsal surface only. If you can see cortex on the dorsal surface of the artefact, this means it has come from the outside of the core and was removed at the beginning of the process. If, however, the artefact has no cortex, it has obviously come from the interior of the core and was removed towards the end of the process. Archaeologists use the relative amount of cortex on an artefact to distinguish between three types of flake, according to when they were struck off the core:

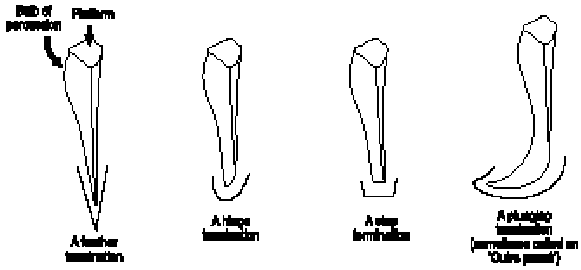
- **primary**—where the entire dorsal surface is covered with cortex. This means the flake was one of the first to be struck off the core;

FIGURE 7.6: How to measure and record the key attributes of a stone artefact



10. Termination:
Describe the shape of the flake's termination.

This will be one of four distinct kinds:



The form of the termination reflects the way in which the force from the hammerstone travelled through the core. A feather termination is what the knapper is trying to achieve, because it increases the length of the useable edge. In a plunging termination the knapper hit the core too hard and actually broke off the bottom of the core along with the flake. In both step and hinge terminations the flakes have split off prematurely leaving behind an inwardly curved or right-angled ledge. When the knapper tries to remove subsequent flakes, they, too, are likely to be step or hinge terminations, making the core more difficult to knap. Hinging sometimes leads to cores being abandoned completely.

11. Negative flake scars:
Count the number of negative flake scars on the flake's dorsal surface. Don't worry about those less than 5 mm long.

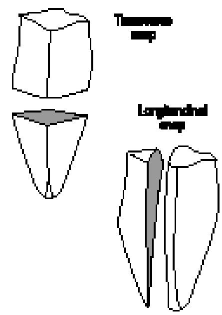
12. Describe the shape of the terminations for the negative flake scars on the dorsal surface.

You counted these in Step 11. Now count how many were feather, hinge, step or plunging terminations.

13. Breakage:
Note whether the flake has been broken since it was made. Flakes are often snapped in half or have their ends broken off—either transversely (across the flake) or longitudinally (along the flake).

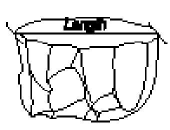
Trampling (by either people or animals) is one of the main causes of broken flakes.

Note where the flake has been broken—at the proximal end, distal end, on one side (lateral) or through the middle (medial).

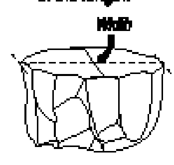


Recording cores:

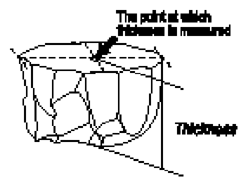
1. Measure the length in mm along the widest dimension of the core.



2. Measure the width in mm at right angles to the mid-point of the length.



3. Measure the thickness in mm at right angles to the width.



4. Count the number of platforms from which flakes have been struck (all directions).

5. Note whether any of the platforms have been specially treated by the knapper as part of the process. Look for overhang removal or grinding on any of the platform edges.

6. Estimate the percentage of the core that still retains cortex.

7. Count the number of distinct cortical surfaces. Note that this will depend on being able to distinguish a change in plan. For a pebble there may be only one because the surface is round.

8. Count the number of negative feather terminations.

9. Count the number of negative step and hinge terminations.

- **secondary**—with some cortex and some flake scars. This means the flake was not one of the first, but was still struck off early in the manufacturing process;
- **tertiary**—an artefact with no cortex. These flakes must come from the last stages in the manufacturing process.

Be careful not to confuse cortex with weathering (which results from prolonged exposure to the elements). The thing to remember is that weathering can occur on all surfaces of the artefact (including dorsal and ventral), whereas cortex will only be found on the dorsal surface.

What to record when you've found a stone artefact scatter

When you have found a scatter of stone artefacts in the field, you need to record some basic data about the artefacts and the site (a recording form is included in Appendix 1). The standard aspects of the site which you need to record are (Hiscock 1989: 21–24):

- the types of artefacts that occur. How many flakes are there? How many cores? Flaked pieces? Retouched flakes? How many of the flakes are primary, secondary or tertiary?
- the size (length and width) of each artefact, or of a representative sample of the artefacts, and their morphology (see Figure 7.2 on page 208). You need to make sure that you measure all artefacts consistently and that you write in your report exactly how you did this;
- the density of artefacts across the site and how this changes. This is a basic assessment of how many artefacts there are and is usually measured in terms of the number of artefacts per square metre. This is often phrased as 'X artefacts/square metre in the centre of the site, dropping off to X artefacts/square metre on the margins of the site';
- whether the extent of the site is defined by declining visibility or by a declining density of artefacts (see 'Defining the boundaries of an open artefact scatter' on page 219);
- the range of raw materials which occur. You need to be able to recognise how many different types of raw materials there are and what they are. You also need to take note of how many artefacts are made from each kind of raw material. What is the most common? What is the least common? If possible, you should also try and identify the sources of these raw materials. Other archaeological studies may be able to help you here, as could a knowledge of the local geology, or information provided by ethnographic sources. If you are unsure of what kinds of raw materials you can expect in your study area, research it thoroughly *before* you go into the field.

Obviously, if you have found a large site with high artefact densities, it is unlikely that you will be able to record all of this information for every single artefact. In this case you will have to make some decisions about how to sample your site (see 'Developing a suitable sampling strategy' on page 66). Some archaeologists adopt a strategy of walking transects across the site and measuring all artefacts which occur at set points along that transect (e.g. by counting all artefacts within a square metre every 5 metres along the transect); others identify different zones within the site and sample evenly within each zone (Hiscock 1989: 33, 36).

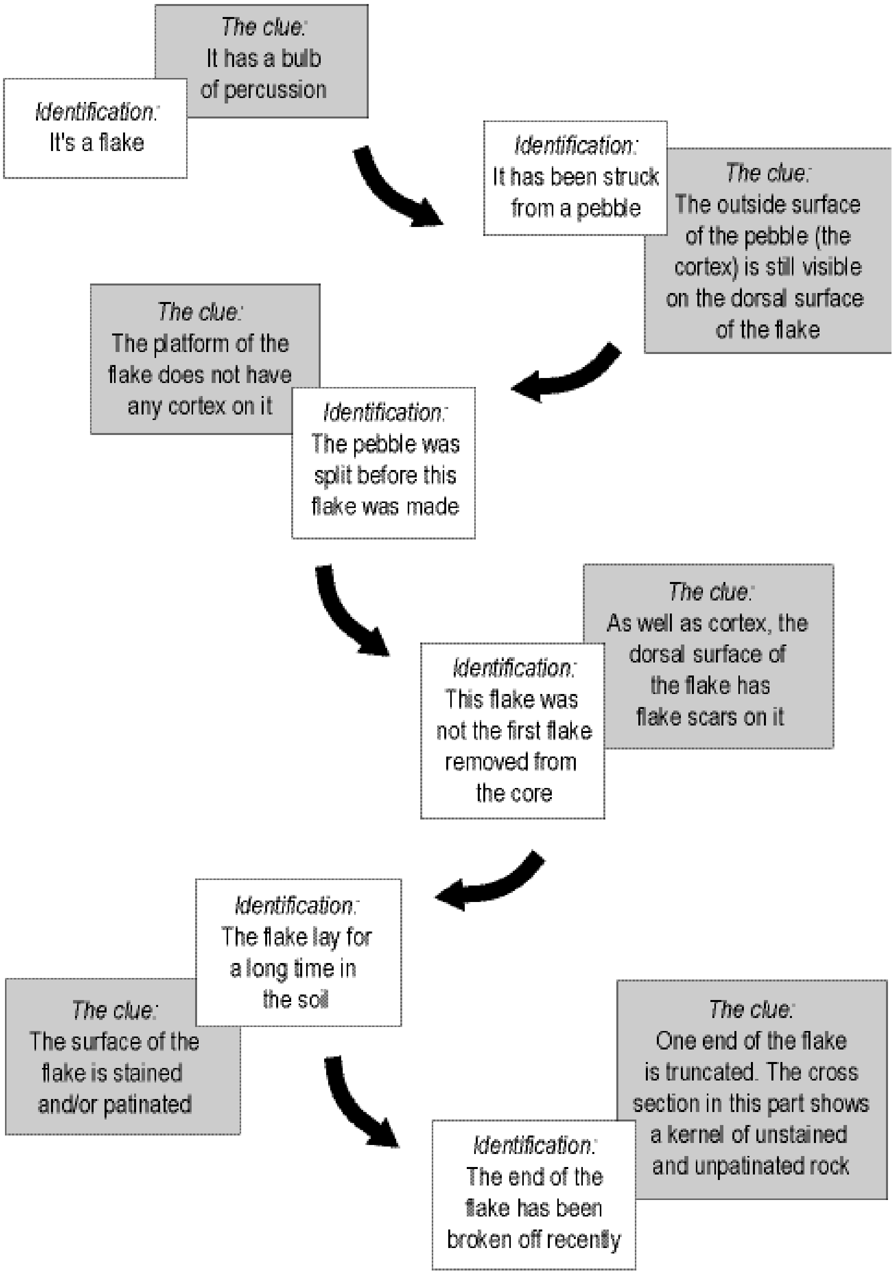
Once you have gathered this information for all or part of your site, you can begin to compare different attributes against each other—do different types of raw materials tend to occur in specific locations? Are there areas within the site with particularly high densities of artefacts (this may indicate a knapping floor)? Are there changes in the relationships between the stone artefacts and other types of artefacts or archaeological features at the site (such as middens, mounds, hearths)?

Denis Byrne's tips for recording stone artefact raw materials

- Use commonly accepted archaeological terminology for describing raw material types, but don't get too technical (unless you're a geologist).
- Describe your types in a glossary so that your meanings are clear.
- If you want to use more general terms such as 'fine-grained' or 'coarse-grained', make sure you define what these terms mean in the glossary.
- If you are unsure of types, either consult a specialist or flag your uncertainty (use '?' or 'unknown', or a very general descriptive term such as 'volcanic' if you are sure about this).
- Give the total number and, if possible, weight of each material type, plus their percentages. (Byrne 1997)

Much of the analysis of flaked stone artefacts is simply an attempt to make sense of the sequence of events that have happened to an artefact throughout its life. Beginning at the stage of obtaining the raw material from a source, this sequence will include the processes of manufacture (knapping) and use, and will end with all of the subsequent modifications that have taken place since the artefact was discarded (Wright 1983: 123). Working through this process will not only help you to understand how the particular artefact was manufactured and used, but will also give you a good idea of the archaeological context of the site and how taphonomic processes may have affected a site's contents over time. See Figure 7.7 on page 218.

FIGURE 7.7: An example of how to work through the analysis of an artefact. You need to look at many different aspects of the artefact's life history in order to analyse it properly (after Wright 1983: 123)



RECOVERING ARTEFACTS WITH RESIDUES AND USE-WEAR

Residues and use-wear are the physical traces left on the edges of stone artefacts as a result of their use in various tasks. **Residues** can include trace amounts of starch, blood, hair or woody tissue still adhering to the artefact. Some residues will last much longer than others (resin, for example), particularly those that become compacted into tiny crevices in the stone. **Use-wear** is a description of the physical changes to the edges of an artefact as a result of its use: artefacts used to cut grasses, for example, develop highly polished edges; others used to saw bone develop particular forms of edge damage (for a full listing of a range of use wear types, see Fullagar 1989: 45).

A detailed recording or analysis of residues and use wear is not really practical in the field and is best undertaken by a specialist. If you are retrieving stone artefacts for later analysis in a laboratory, however, bear in mind that the best artefacts to examine for residues will be those which have been protected from the elements and are retrieved through excavation (Fullagar 1989: 40). It *is* possible to recover residues from artefacts in surface scatters, although the most productive will still be those that have been protected in some way. When collecting stone artefacts for later analysis, follow these basic procedures to ensure that any residues are preserved (Fullagar 1989: 41):

- When you excavate the artefacts, try to leave as much of the adhering soil on them as possible.
- If you need to clean them, lightly brush them with a soft-haired paintbrush. If necessary, you can rinse artefacts in water.
- Don't scrub artefacts. If soil is impacted and difficult to remove, gently rub the artefact with a wet cotton bud or a soft-haired paintbrush.
- Try to handle the artefacts as little as possible. It is not strictly necessary to wear gloves, as many disposable types contain powdered starch which can leave a residue on the artefacts.
- Bag each artefact separately.
- *Don't* place an aluminium tag inside the bag (these will actually leave a residue on the artefact which might obscure other residues).
- *Do* submit a detailed history of excavation and handling to the analyst with the artefact.

DEFINING THE BOUNDARIES OF AN OPEN ARTEFACT SCATTER

While this might seem a straightforward task, it is actually one of the most difficult decisions of any survey. Indigenous people have lived in Australia for so long that large parts of the landscape are literally littered with artefacts. If the artefacts visible on the ground surface are only apparent as a result of erosion or visibility conditions, however (see 'Determining effective survey coverage: What reveals, what conceals' on page 78), the question of where the site really begins and ends is not straightforward. In some parts of Australia, stone artefact scatters can be found across such extensive areas that the entire landscape could be defined as one large archaeological site. It would not only be impractical to record every artefact in such a situation, but realistically, people would still have used different parts of the region in various ways for particular reasons, and no purpose would be served by defining the whole region as a single site.

In such a situation, some archaeologists would define the boundaries according to artefact density: i.e. by placing an arbitrary boundary around the areas containing the highest numbers of artefacts and simply defining the rest as 'background scatter'. This is an arbitrary decision as well as a pragmatic one, and will be decided upon as a result of the aims of your fieldwork and what questions you are trying to answer, as well as the environment in which you find yourself (Sullivan 1983: 6) (for more information, see 'Designing your research' on page 3). Most archaeologists would accept that if you find yourself in an area literally covered with artefacts, then you are more likely to define sites in terms of those places which contain the greatest density or variety of artefacts. On the other hand, if you have been surveying for six hours before you find your first isolated artefact, then that artefact will assume much greater significance.

Likewise, if the artefacts you are recording are only visible as a result of erosion, you will need to consider whether the boundary of your site is the extent of the eroded area, the limit of visible artefacts (which may or may not coincide) or some other arbitrary feature (such as a fence-line or land boundary). As a general rule, the most important thing to remember is to clearly state your definitions and assumptions in your report so that, whatever definition you adopt, it will be clear to others how this might have influenced your results. In most cases, the boundary will have to be defined according to the extent of visible artefacts, even though you may well suspect that there could be more artefacts underneath the surface. One of the major decisions you will have to make in this case is whether or not you think there are **potential archaeological deposits** (**PADs**) at the site. You should note that, because of visibility problems, some administering authorities may require sub-surface investigation to determine the full extent of a site as a matter of course. Even though it is common knowledge that open sites tend to be more extensive than they appear on the surface, you should not attempt to guess at the hidden component. If you have a strong suspicion that the site is greater in area than what is visible, simply note these suspicions down in your field notes, always explaining why you think this might be so.

Checklist for recording open artefact scatters

Note the following:

- ❑ the location of the scatter (i.e. what enabled you to see it—is it within an erosion scar? On a vehicle track? In a sparsely vegetated area? Beside a creek?);
- ❑ the visibility conditions on the scatter (i.e. how much of the ground surface is visible here?);
- ❑ the visibility conditions off the scatter (the comparison between this and the conditions on the scatter will help you to determine whether there might be more artefacts present than you can actually see);
- ❑ the length of the scatter;
- ❑ the width of the scatter;
- ❑ the approximate density of artefacts within the scatter (usually expressed as the number of artefacts per square metre);
- ❑ the different raw materials within the scatter (if you can't actually identify particular types by name, at least note down the colour range and graininess of the stone—is it fine grained? Coarse grained?) (for more information see 'Denis Byrne's tips for recording stone artefact raw materials' on page 217);
- ❑ the range of artefact 'types' within the scatter (for more information, see 'Recording stone artefacts' on page 208);
- ❑ the range of artefact sizes within the scatter;
- ❑ the presence of any other indications of human behaviour (i.e. charcoal, bone, hearths, contact materials) in the scatter;
- ❑ any potential for sub-surface/excavatable deposits;
- ❑ any potential sources of damage to the scatter (i.e. are animals disturbing it? Vehicles? People?).

RECORDING ROCKSHELTERS

Many rockshelters in Australia will have been used by Indigenous people at some point in the history of our country. Rockshelters are a place to rest, to keep out of the sun, to avoid rain, to sleep and to look out from. They are located in escarpment country, providing a safe and sheltered place with a view of the surrounding area. Those that are located near water are a favoured place for people to live. However, the fact that a rockshelter was inhabited by people in the past does not mean that there will always be archaeological evidence of such use. Surface evidence is often ephemeral. It can blow away or be disturbed by animals, or it can be covered by later deposits.

The recording of rockshelters is fundamental to Indigenous archaeology. Once again, when recording a rockshelter, the first decision you will need to make is where the site's boundaries are. It doesn't really matter at which point you decide that the shelter ends as long as you record the reasons for your decision. You may decide that a group of fallen boulders marks one end of the shelter, or that it comes in sharply at a particular point which works to define the point between inside and outside. The main thing is to record *why* you have made your decision with the aim of making it possible for another researcher to replicate your methods and verify your results.

Checklist for recording rockshelters

Record the following:

- ❑ the aspect of the shelter (i.e. what direction is it facing?);
- ❑ the degree of slope leading up to the shelter (measured with a clinometer).

Draw a plan of the rockshelter showing:

- ❑ the shape of the rear wall of the shelter;
- ❑ the shape of the front of the shelter;
- ❑ the position of the **drip line**(s), or the limit of the dry area under the rock overhang (literally the line along which the rain will drip). This is particularly important to record as it may show you the areas most intensely occupied by people and the area outside the shelter where artefacts may have been disturbed by erosion;
- ❑ the position of the limit of rock overhang (this may or may not, and usually will not, coincide with the drip line);
- ❑ the location of major features of the site, such as large boulders, major rock falls, grinding grooves, or rock art panels;
- ❑ the location of major rock art motifs;
- ❑ the location of any surface archaeological material.

Prepare a cross-section (side view) of the shelter showing:

- ❑ the height of the roof;
- ❑ the level of the floor;
- ❑ the extent of the liveable area;
- ❑ the location of any major features, rock art motifs or surface archaeological material.

If there is surface archaeological material, note:

- ❑ the range of artefact types present;
- ❑ the range of raw materials present;

- ❑ the distribution of material across the surface (i.e. are there any obvious concentrations of artefacts which might indicate places for future excavation?);
- ❑ whether there is any evidence of animals regularly using the shelter (which could have disturbed the archaeological material and its patterning).

RECORDING ROCK ART

The main challenge in recording rock art is to record the motifs accurately without damaging them. Rock paintings, in particular, are often frail and you will have to use recording methods that do not involve touching the art surface. The most effective way of recording rock art is through drawing the motifs in the field (see 'Drawing rock art' on page 302), or taking photographs and then drawing the motifs from the photographs (see 'Photographing rock art' on page 281). When photographing rock art, it is especially important to remember to include a metric scale which incorporates a colour standard (such as the one supplied by the International Federation of Rock Art Organisations* (IFRAO), as this will help you to judge the authenticity of the colour of the paintings. Make sure you note the technique(s) used in producing the art (see Table 7.1), the location of the rock art panels and any sources of potential damage.

TABLE 7.1: How to recognise different rock art techniques (after Clegg 1983: 90)

Rock art technique (How it's made)	Distinguishing characteristics (What it looks like)
Rock art made by removing material from the rock surface (engravings, petroglyphs, carvings)	
A. Friction:	
A (i). Scratched (single stroke)	A U-shaped or V-shaped groove
A(ii). Abraded (repeated friction)	A U-shaped or V-shaped groove
A(iii). Rubbed (broad surface)	A rubbed area
B. Percussion:	
B (i). Pounded (direct percussion, e.g. hammering)	A pit (round, oval, deep, shallow, etc.)
B(ii). Pecked (indirect percussion, e.g. chiselling)	A pit (round, oval, deep, shallow, etc.)
C. Rotation:	
Drilled	A pit (round, oval, deep, shallow, etc.)
Rock art made by adding material to the rock surface (coloured paintings, drawings)	
D. Mechanical:	
D (i). Stencil	Paint sprayed around the outline of an object (often a hand)

(continues)

TABLE 7.1: continued

Rock art technique (How it's made)	Distinguishing characteristics (What it looks like)
E. Delineated: E (i). Painting (materials applied when wet) E (ii). Drawing (materials applied when dry) E(iii). Beeswax (pressed on and shaped when moist)	Will look three-dimensional

Note: The symbol '/' is the shorthand for denoting that one technique is applied on top of another (superimposition)—e.g. D(i)/E(ii), or stencil superimposed on drawing.

Bruno David's tips to see the invisible

Aboriginal and Torres Strait Islander rock paintings differ from one place to the next. They also vary over time. Yet, until recently, rock art researchers across the continent have been tethered by two critical factors: the difficulties of dating rock art; and the tendency for older art in particular to fade or to otherwise disintegrate. As a consequence, until the 1980s, few archaeologists systematically incorporated rock art within regional historical studies and, even when they did, much rock art—and particularly the older pigment art—failed to be recognised due to its damaged state.

One solution is now emerging. During the 1960s, secret spy satellite programs and technologies used in space exploration missions such as the Ranger lunar space craft program (1961–65) gave birth to digital image enhancement. What is relatively new is the accessibility of this technology to the public on a large scale. The 1990 release of Adobe Photoshop for home computers made the tools for digital image enhancement commercially available, and subsequent versions of Photoshop for Windows PCs took the technology to new domestic heights.

Today, image enhancement can be undertaken using commercially available software such as Adobe Photoshop or Corel Photo Paint, and hardware that is both cost-effective and highly portable. What this means for archaeologists is the possibility of rendering previously invisible rock paintings visible again. The principles work like this:

- Different colours consist of electromagnetic waves of various lengths.
- Rock paintings can fade through time through various processes, including the action of water, dust and the like.
- The process of fading often involves the development of opaque films—whether silicate or otherwise—over pigment art.
- These grey films are unsaturated colours—that is, they are a combination of all colours.

- By asking the computer to change or enhance particular wavelengths or colours on a digital photograph—for example, by preferentially saturating the distinctive colours of paintings (and getting rid of greys), we can highlight pigment colours and thus minimise the effects of fading.

It is best to enhance images by first downloading digital photographs or digital scans of images on to the computer, and opening them as uncompressed TIFF rather than JPEG files. Once opened in an enhancement program such as Adobe Photoshop, images can be enhanced through the Image (Adjust) channels.

Apart for revealing previously hidden rock art, digital enhancement has the advantage of being able to produce results immediately and, once the basic hardware and software (laptop, camera, software) are to hand, results can be both checked against rock surfaces in the field and shown to community members, including elders who may not be able to go to the sites. These potentials are exciting and are just waiting to be fully exploited by researchers and communities wishing to document their own ancestral places across Australia.

Checklist for recording rock art

Record the following:

- ❑ the location of the panel or motifs within the shelter or rock outcrop (this should be tied to a site plan);
- ❑ a general description of the rock art and the motifs;
- ❑ detailed drawings of individual panels or motifs;
- ❑ the colours of the motifs (you can identify these by using a Munsell colour chart, or a PANTONE® swatch set—See 'Drawing rock art' on page 302);
- ❑ the time of day that you made the recording (believe it or not, the quality of light hitting the rock surface at different times of the day can affect your ability both to see motifs and to accurately describe their colours);
- ❑ photographs of the panels and motifs;
- ❑ any potential sources of damage to the art (i.e. have wasps built their nests across the art surface? Is rainfall washing across the rock surface? Have parts of the rock surface flaked or fallen off?);
- ❑ the condition of each individual motif.

June Ross's tips for recording the colour of rock art motifs

Recording the colour of art pigments is an important part of recording rock art. When you draw a motif or a panel of motifs, make sure you note the range of ochre colours on the pencil drawing. Analysing the colour of motifs can help you identify whether the same pigment has been used throughout, suggesting that the art was produced in a single episode, and can also be used to check the spatial distribution of distinctive colours.

- Remember that the consistency of pigment colour is often uneven, so 'washy' sections will appear lighter than thicker sections. Getting a repeatable reading is sometimes questionable because of this, but it may be necessary.
- Pigments are often poorly mixed, so each motif may need two or more colour readings.
- Identifying colours is a difficult task and many people don't have an eye for it, so there can be many different readings for the same motif. For this reason, try to limit the number of people recording colour so that you can maintain some control over the colour recognition process.
- Colours will look different in different lights, so readings may be different at different times of day. For this reason, you should always note the time of day you made your reading and write this on the drawing.
- Recording the colour of rock art motifs is usually done through the use of Munsell colour charts, although some rock art researchers have used PANTONE® colour swatches. The advantage of PANTONE® swatches is that the colour can be reproduced easily on your computer (although with scanning this has lost its value), and they are easy to use as you can hold the swatches right up to the pigment. Unfortunately they are also expensive to buy and the colours are often too pure and don't really match the natural earthy tones of rock art pigments very well. Munsell colour charts, on the other hand, have a much better range and grading of colours, but their format makes them difficult to use because the swatches are small and always surrounded by a distracting white border. On balance, though, unless Munsell bring out their charts in the same format as PANTONE® swatches, they are still the best way to document the colour of rock art motifs.

RECORDING SCARRED AND CARVED TREES

The most difficult aspect of recording scarred trees is positively identifying them as the result of deliberate human activity. There are many natural activities which can produce similar scarring—the fall of a large branch, bushfires, poor, rocky soil at the base of the tree which affects its natural growth pattern, or insect or animal activity. Natural scarring is much more common than Indigenous scarring. As a general rule, scars made by people removing bark tend to be regular in shape and located above ground level, and will often show axe marks or other related evidence. Natural scars are often ragged and uneven, have peaked ends, are strangely placed (i.e. they might be very high up the tree), or extend down to the ground surface. The identification of humanly scarred trees is complicated by the fact that trees continue to grow after scarring. As the bark around the scar continues to grow, the original edges of the scar close over and are no longer clearly definable and, as the tree grows in height, the height of the scar above ground may also increase. Unfortunately, the older the scar, the greater its exposure to weathering and the harder it will be to interpret (Long 1998).

Once a tree has been identified as humanly scarred, you then need to decide whether the scarring results from Indigenous or European activity. In many cases, early white settlers used bark extensively for containers, shingles or roofs, and in these situations the scars may be indistinguishable from Indigenous scarring.

Carved trees are much easier to recognise, since the patterns carved into the heartwood of the tree are unmistakably human. You should record the same type and range of information for a carved tree as a scarred one, bearing in mind that carved trees were often associated with ceremonial grounds or burial sites, so there may well be other, highly sensitive, archaeological evidence in the vicinity (a recording form is provided in Appendix 1). You should also be aware that European surveyors occasionally marked trees with a half-oval or gothic arch (a surveyor's shield), containing a broad arrow or carved figures and letters. These are immediately recognisable, but should still be recorded.

Criteria for identifying a scarred tree

- **The type of tree.** First ask yourself whether the tree species is one which is known to have been used for bark removal, or whether the nature of the bark is comparable to known species. Not surprisingly, Indigenous people used the bark of particular kinds of trees for a reason. In eastern New South Wales, for instance, box trees and river red gums were commonly used by Indigenous people because the bark could be levered off in sufficiently large sections to be useful (Bowdler 1983a: 43). By extension, it is highly unlikely that introduced species would have been scarred by Indigenous people.
- **The presence of axe marks.** Because of regrowth around the margins of the scar, normally only upper and lower axe marks on a scar will be visible. These will look like single or parallel lines at the top and base of the scar. Bear in mind that axe marks from stone axes are likely to be less sharp and clean than those from steel axes, because the angle at the point of a stone axe is less acute. Typical stone axe marks will look like broad, asymmetrical 'bludgeon' marks, with possible crushing of the underlying sapwood. Steel axes, on the other hand, will leave straight, narrow and often quite deep

incisions (Long 1998) (see Figure 7.8). Don't automatically discard the possibility of a tree being scarred by Indigenous people just because it has steel axe marks. Steel axes were highly valued by Indigenous people and were traded extensively throughout Australia long before any direct contact with Europeans. The existence of such marks therefore only dates a scar to after the initial European occupation of Sydney, rather than to the first direct incursion of Europeans into an area. Europeans also removed bark from trees for roof shingles, or as sheets to cover a lean-to. Often they removed it by making zig-zag 'herringbone' cuts at the top and the bottom of the scar, which are readily identifiable. However, you need to be aware that in some areas Indigenous people produced similar 'herringbone' patterning when removing bark for roofing material.

FIGURE 7.8: A comparison between stone and steel axe marks. Stone axes typically leave broad, asymmetrical 'bludgeon' marks, sometimes accompanied by crushing of the underlying sapwood (a). Cut marks from steel axes, on the other hand, tend to be much deeper, straighter and narrower (b).

a

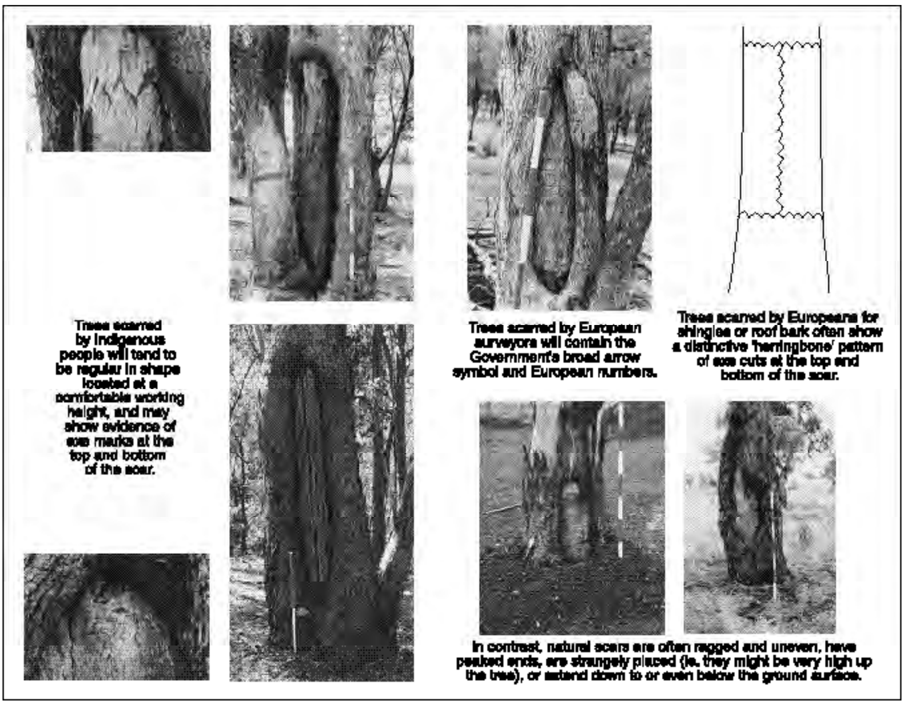
Axe marks produced by stone axes tend to be broader, shallower and asymmetrical and, because it takes numerous strikes to cut through the bark, often cause crushing of the underlying sapwood. Both sets of marks were made using a replica stone axe. *Source:* photos and orginal study by Penny McCardle

b

Because the edge of a steel axe is so sharp, the cut marks it tends to produce are typically straight, narrow and often quite deep incisions. On the left are marks produced by a modern hand steel axe; on the right are marks produced by a nineteenth century trade axe made from wagon sprig iron and dating to the late 1800s.

- **The shape of the scar.** Among other things, Indigenous people used bark both for containers and as sheets for shelters. If a scar has a regular outline consistent with a particular known artefact type (e.g. with rounded ends in the case of canoes or containers, or squared ends in the case of shelter slabs), it is likely to be authentic (Long 1998). There are a number of natural factors which can also cause scarring, but all involve the bark being ripped instead of cut off, and all consequently result in scars with jagged and sharp ends. Such natural scars will often continue to ground level.
- **The height of the scar above ground level.** Indigenous people are likely to have removed bark from trees at comfortable working heights. Bearing in mind that the scarring of trees by Indigenous people will probably not have occurred in many areas of Australia within the last 50 years, any tree with a scar with a height above ground of less than 1 metre is unlikely to be of Indigenous origin.
- **The position of the scar.** In the case of canoes and containers, bark was often removed from the convex side of the trunk or branch to give suitably upturned sides to the finished artefact (Long 1998). Some deliberate human scarring removed bark from the branches of the tree, so examine all convex surfaces, not just the trunk.

FIGURE 7.9: European and Indigenous scarring of trees versus natural scarring



Checklist for recording scarred and carved trees

Record the following:

- ❑ the number of scars on the tree;
- ❑ the location(s) of scars on the tree;
- ❑ the length of the scar (measured along the central axis);
- ❑ the width of the scar (measured along the central axis);
- ❑ the shape of the scar (are the ends pointed, or rounded? Does the scar have parallel sides? Is the scar symmetrical?);
- ❑ the degree of scarring (i.e. has only the bark been removed? Has the heartwood been removed as well?);
- ❑ the depth of the scar (i.e. the thickness of the bark at the edges of the scar);
- ❑ the extent of regrowth around the edges of the scar (you will have to estimate this);
- ❑ the presence of axe marks and whether they are from stone or steel axes;
- ❑ the height above ground of the base of the scar;
- ❑ any designs that are visible in the heartwood of the scar;
- ❑ if the tree is alive, what species it is;
- ❑ if the tree is standing, what height it is;
- ❑ if the tree is dead, whether it is still standing or fallen;
- ❑ the girth of the trunk (this may give you an indication of how old the tree is) at the middle of the scar;
- ❑ any potential sources of damage to the tree;
- ❑ the degree of preservation of the scar (this would usually be expressed as Good [i.e. >80 per cent intact], Fair [20–80 per cent intact] or Poor [<20 per cent intact]);
- ❑ if the tree is a carved tree, you must also record the type of markings (i.e. are they parallel lines? Criss-cross lines? A linear pattern?). If it is a survey tree, note the surveyor's mark.

If possible, you should also try to attribute an origin to the scar—is it definitely Indigenous? Probably? Possibly natural? If you think that the scar is natural, note down what features might have caused the scarring (e.g. a fallen branch, lightning strike, poor/rocky soil, vehicle activity, etc.).

RECORDING QUARRIES

A quarry may be anything from a rock outcrop that has been quarried once to a highly prized and carefully managed source which may have been quarried over generations and to which access was tightly controlled. In general, Indigenous people preferred particular kinds of stone when making artefacts. Very fine-grained stone not only makes the sharpest artefacts, but is also the easiest to knap successfully. Chert, mudstone, silcrete, quartzite and chalcedony were all preferred materials for stone artefacts and thus also for stone artefact quarries. A recording form for quarries or quarried stone outcrops is included in Appendix 1.

Checklist for recording stone artefact quarries

Record the following:

- ❑ the material form of the quarry (Is it a rock outcrop? River cobbles?);
- ❑ the site location (e.g. is it on a hilltop? Beside a creek or river? On a slope?);
- ❑ the particular features of the quarry (e.g. can you see pits from quarrying activity? Are there flaking or knapping floors there? Are there other imported raw materials at the site? Can you see flake removal scars on boulders?);
- ❑ if there is surface artefactual material, what the artefact density is;
- ❑ whether there are other stone artefacts present. If so, what are they? What is the percentage of cortex on these artefacts?
- ❑ if the site is an outcrop, an estimate of the percentage that is worked;
- ❑ any potential sources of damage to the site;
- ❑ if known, the distance to isolated artefacts or sites in the vicinity.

RECORDING MIDDENS

The first task when recording a shell midden is to establish whether it is indeed a humanly created midden or a natural shell bed. This is not as simple as it sounds, however, because a variety of factors—such as the diversity of the shoreline, the location of the midden in the landscape and the past land use history of the area—can affect the form and content of both natural and humanly created middens (Attenbrow 1992; Bonhomme 1999). There is no single criterion that positively identifies an Indigenous midden, but there are some generally accepted criteria which might be helpful in distinguishing a shell midden from other types of shell deposit (Attenbrow 1992; Bonhomme 1999) (see Table 7.2).

When recording a shell midden, you need to record its form, dimensions, context and the numbers and proportions of different shell species which are present, as well as any other artefacts which it contains. To understand how the midden relates to its environment, you should also take note of whether similar shellfish species are available nearby, and what the local estuary, river, rock platform or beach is like now (Sullivan 1989: 52). Shells are mainly calcium carbonate and, as they decay, they create a highly alkaline

TABLE 7.2: Characteristics for distinguishing between a humanly created shell midden and a natural shell bed (after Bowdler 1983b: 137; Bonhomme 1999)

Characteristics of an archaeological shell midden	Characteristics of a natural shell bed
Should contain greater proportions of 'edible' shell species (usually defined as larger than 15 mm*)	Should contain greater proportions of 'inedible' shell species (smaller than 15 mm)
Should contain a smaller proportion of articulated shell	Should contain a greater proportion of articulated shell
May contain artefacts (but note that many middens do not)	Will not contain artefacts
Usually located close to the resource on the first available flat ground above the high tide mark	
May contain the bones of animals used for food (but note that many middens do not)	May contain naturally incorporated fish bones
May contain a small proportion of marine life not used by Aboriginal people	Should contain a greater proportion of marine life not used by Aboriginal people, such as tube worms, coral, pumice, etc.

* Species are considered 'non-edible' if they are too small to provide a reasonable amount of flesh (Attenbrow 1992: 15)

environment which tends to preserve bone and other organic remains quite well. This means that the excavation of a shell midden can be quite productive in terms of recovering a wide range of organic remains (see 'Val Attenbrow's tips for excavating shell middens' on page 145).

Checklist for recording shell middens (after Bonhomme 1999; Sullivan 1989)

Record the following:

- ❑ the location of the midden (Is it a beach midden? Eroding from a dune? Beside a lake? On a creek or riverbank?);
- ❑ the local conditions (i.e. has it been revealed through erosion? Is the dune/riverbank/beach stable?);
- ❑ the curvature of the midden (Is it mounded? Is it flat?);
- ❑ the shape of the midden (Is it elongated? Circular?);
- ❑ the length of the midden;

- ❑ the width of the midden;
- ❑ whether it has potentially excavatable deposits;
- ❑ if it has some depth, whether this depth is even or uneven across the midden;
- ❑ the minimum and maximum depths;
- ❑ the estimated volume of the midden;
- ❑ the species of shell(s) to be found in the midden (you should try to record the full range of shells visible on the surface to species level if possible);
- ❑ the relative proportions of different species (calculated by number and/or weight);
- ❑ the size of different species and their relative proportions;
- ❑ the condition of the shells in the midden. Are they whole? Still articulated? Water worn? Broken? Burnt?
- ❑ an estimate of the rank and order of abundance of shell species (what are the dominant, rare and common species?);
- ❑ the nature of any other artefacts in the midden;
- ❑ any potential sources of damage to the midden.

RECORDING STONE ARRANGEMENTS

The methods you will use to record stone arrangements will be determined by the manner in which the stones are arranged. Some stone arrangements are linear and some are circular or oval in shape. Some are very extensive and contain tracks, circles and other linked sections. When you are recording a stone arrangement, you need to remember that the stones may not be in their original positions. Often you won't be able to tell, but sometimes removed stones will have a different pattern of weathering to the other stones in the arrangement and sometimes the displacement will be really clear, such as when a road has been bulldozed through the middle. In the latter case, you would record each part of the arrangement as a separate feature, but record in your notes your interpretation that these were once part of the one arrangement.

Checklist for recording stone arrangements

Record the following:

- ❑ a plan of the site;
- ❑ the type(s) of stones;
- ❑ the size of the stones;

- ❑ the assumed function of the arrangement (e.g. fishtrap, ceremonial, etc.). This may not always be possible to work out;
- ❑ anything unusual about the arrangement;
- ❑ its proximity to other sites;
- ❑ any sources of damage to the site.

RECORDING CONTACT SITES

The recording and analysis of contact sites is an exciting and expanding area of Australian archaeology (see, for example, Harrison and Williamson 2002; Lilley 2002). Until recently, the archaeological potential of contact sites was vastly underrated, because there was an often implicit assumption that Indigenous behaviour since contact was not 'traditional', or that Indigenous ways of life in the recent past were not intrinsically interesting. In part this may be because it can be very difficult to identify a contact site in the first place. If a scarred tree has the marks of a steel axe used to obtain bark for a traditional Indigenous container, is this a contact site? In a sense it is, but this is not usually what we mean. Normally, a contact site is defined as one with evidence for the Indigenous adaptation of materials or technology that were introduced to Australia by another people, usually the British. Thus a site containing flaked glass would be considered a contact site, as would a site which showed evidence of the re-use of iron or railway sleepers. Ironically, we do not consider a place where Europeans have used Indigenous technology or materials to be a contact site, which indicates how Eurocentric our ideas still are. As this implies, contact sites are to do with understanding Indigenous ways of thinking and living, rather than the ways of other groups.

Contact sites are best identified through reference to the history of the region and the surrounding material culture, or through interviewing Indigenous people (see 'Recording Indigenous histories' on page 235). For example, if you find a pile of cans in the middle of the bush, and are not sure whether these are the remains of a European or an Indigenous camp, you could start by looking for other types of material evidence. Are there stone artefacts or scarred trees close by? Does the site seem to be meaningfully located in relation to these? You need to remember that it is very difficult to prove a meaningful association between artefacts in a surface assemblage, as these materials could have been left behind at very different times. So the location of a pile of tin cans near a stone artefact scatter or hearth does not automatically constitute a contact site. You would then need to consider the site in terms of the history of the area. If it is near a mission, a fringe camp or a pastoral station, or located on Indigenous lands or along Indigenous travel pathways, the chances of it being a contact site would be greatly increased (although, of course, contact sites may still be found outside any of these areas).

Contact sites encompass a range of site types (rock art, middens, rockshelters, open artefact scatters, etc.), but are also likely to incorporate the material culture of other groups. Contact sites are recorded using the methods suited to that particular site type, but there are some additional factors you need to keep in mind:

- It is extremely difficult to distinguish between glass which has been flaked intentionally and glass which has flake scars from being hit by a bulldozer, or crushed by some other means. Unless you are an expert at the identification of flaked glass, this is something that needs to be assessed critically in terms of the site location (e.g. in the middle of isolated bush versus beside or on a road) and against other material that is found at the site (i.e. is there flaked stone there as well?).
- A contact site can also be indicated by the use of material in a different context to that in which it is normally found. For example, some of the churches in northern Australia have a mixture of both Christian and Indigenous imagery.

RECORDING INDIGENOUS HISTORIES

The methods used to record Indigenous histories are comparable to those used to record any oral histories (see 'Recording oral histories' on page 197). In dealing with Indigenous people or communities, there are several specifics that you should bear in mind:

- Be aware that Indigenous people often think it is rude to ask direct questions. They are therefore likely to be under more stress than non-Indigenous people when a formal interview is being conducted.
- It is important to leave room for Indigenous people to shape the interview process themselves. This can be done by allowing people to go off on tangents, or talking about the things that are important to them (but which may not be of immediate importance to you). Often, this will deepen the quality of the interview and is part of establishing trust between the interviewer and the person being interviewed.
- If people avoid answering a question, it is usually because it is not something they wish to answer. Don't harass them, and take constant note of their body language as this will give you a clue as to how comfortable they are feeling during the interview.
- Sometimes people may know the answer but will not have a right to speak on that particular topic. In this case, they may direct you to the person who does have a right to speak, by saying 'Ask Joe' or 'Mary might know about that'. This is not a refusal to

help you, but Indigenous protocol for dealing with information in a system of restricted knowledge.

UNDERTAKING ETHNOHISTORIC RESEARCH

Ethnohistoric research is an important part of most Indigenous archaeological projects and will form a part of the literature review for any good Indigenous consultancy project. **Ethnography** is the study of living peoples; **ethnohistoric research** uses historical accounts of Indigenous people written by Europeans in the early contact period to reconstruct what Indigenous culture in this period may have been like. Ethnohistoric sources can provide information on how people were moving through the landscape or using particular areas, what plant and animal resources they relied on (and, from this, where sites might be located), their language, beliefs, diet, ceremonies, dwellings, hunting techniques, and what objects they made or traded with other groups. Sources of information include explorers' journals, official reports, settlers' diaries, letters or reminiscences, accounts of early anthropologists, and any other early record left by those who came in contact with Indigenous people. You can find this material in any major or state library, and even in local historical society collections and libraries. The Australian Institute of Aboriginal and Torres Strait Islander Studies has an excellent collection linked to MURA, its searchable online database.

Archaeologists use ethnohistoric sources to reconstruct in some measure the post-contact cultural environment of Indigenous people. There are obvious problems with this, however—most notably that these sources have the same inherent problems as all written documents (see 'Using historical documents' on page 167). They were written by a particular person for a particular purpose, and will tend only to include the information that the observer thought was relevant at the time. The cultural barriers between Europeans and Indigenous people also affected the accuracy of their ethnographic observations—many accounts contain descriptive or other incidental observations of a culture which the Europeans little understood and may have had little sympathy for (Byrne 1997). There is also an expectation that the earlier the account, the more closely it will resemble the pre-contact 'truth' of how Indigenous people actually lived, but you must bear in mind that by the time even the earliest accounts were written, European observers were already witnessing a society radically changed by the contact process. Because of the extremely complex social networks linking Indigenous people throughout Australia, many groups already had access to European goods through their trading networks long before they first saw a white person. When Ludwig Leichhardt first travelled through north Queensland in 1845, for instance, some twenty years before the first settlers colonised this part of Australia, he mentioned seeing European artefacts in abandoned Indigenous camps.

Other problems with the use of ethnohistoric sources are that many observations were made of small groups of people undertaking specific, often highly seasonal, tasks only, and do not reflect the broader range of activities of the larger Indigenous group.

Finally while ethnohistoric accounts are invaluable for the insights they can provide into the immediate post-contact period, they are also tightly restricted in time and space, and cannot be applied to geographically separate groups of people or to people inhabiting the same area in even the recent, let alone the distant, pre-contact past.

WHAT TO DO IF HUMAN REMAINS ARE ENCOUNTERED

Indigenous burials can be located in many different contexts, from coastal, inland or desert sand dunes to middens, rockshelters, caves, clay lunettes on lake margins, or even in clefts in rocks (Thorne and Ross 1986: 9–10). For this reason, it is possible that you might encounter them during fieldwork. If you do encounter human remains during excavation or survey (this is possible if Indigenous burials are actively eroding), it is imperative that work ceases immediately until a positive identification of the remains (first, as definitely human—you would be surprised at how many sheep bones are initially misidentified—and second, as Indigenous) can be made.

Under no circumstances should you remove the remains or interfere with the surrounding soil matrix in which they occur.

In some cases, it may be possible to determine whether or not the remains are Indigenous by a careful but non-intrusive examination of the grave and any associated features.

Identifying Indigenous burials

The Skeleton Manual (Thorne and Ross 1986: 32–33) sets out some criteria for identifying whether or not a burial might be Indigenous:

- Is the grave small, shallow and/or oval in shape?
- Is the grave outlined by salts from contact with local ground water (indicating that it may be very old)?
- Has it been dug into hard deposits but without any evidence for metal tools having been used?
- Is it associated with other Indigenous cultural material (such as stone artefacts, ochre, animal bones or shell)?
- Does the burial occur within an ancient landscape or is it associated with a known Indigenous burial site?

- Does the grave contain bones from more than one individual?
- Are the bones in a flexed position (i.e. are the legs drawn up to the abdomen or chest, or are the arms folded against or across the chest)?
- Have the bones been made into a relatively small bundle (i.e. are the legs, arms and torso very close together)?
- Are the bones hard and mineralised, encrusted with carbonate or other salts, or discoloured from long contact with the soil?

Answering yes to any of these questions may mean that the burial is Indigenous.

If your answer is still inconclusive, however, you will need the help of a physical anthropologist to examine the bones. Remember that, if the bones are Indigenous, they will be protected by legislation and if the burial is recent it will immediately become a police matter. **Either way, any unauthorised disturbance of the skeletal remains or the burial will be illegal.** If the remains need further identification you should contact the police and the relevant government authority for Indigenous heritage matters immediately.

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USEFUL WEBSITES

http://unicorn.aiatsis.gov.au/ hosts MURA, the online library catalogue of the Australian Institute of Aboriginal and Torres Strait Islander Studies.

TRACCE, the online Rock Art Bulletin, can be found at: www.geocities.com/Athens/2996/index.html.

CHAPTER EIGHT
MANAGING CULTURAL HERITAGE

WHAT YOU WILL LEARN FROM THIS CHAPTER

- What cultural heritage significance is
- How to assess the cultural heritage significance of a site
- How to make this process as objective as possible
- Strategies for assessing the impact of development
- Why good management decisions can only be made after the assessment of significance
- How to prepare a tender for a cultural heritage consultancy project

Much archaeological fieldwork is carried out within the confines of cultural heritage management projects—the 'business' of archaeological consultancy. Cultural heritage management is the branch of archaeology that deals with assessing the effects of development or other potentially harmful human activity on heritage sites, and takes steps to either protect sites or to allow their destruction. This is no light matter—all archaeologists would accept that not every archaeological site is worth preserving indefinitely. Not only are there insufficient resources for state authorities to physically look after every site, but preserving every example of an open artefact scatter is not necessarily going to provide better information than only preserving the best and most informative examples (otherwise known as a **representative sample**). One of the main tasks of cultural heritage management, therefore, is to assess which heritage sites are significant enough to preserve and which are not. This requires an understanding of the process of assessing

cultural significance, or those aspects of a place which make it of value to society (see 'The categories of cultural significance' on page 247).

To do this, a site must have some capacity to contribute to our understanding or appreciation of the human story (Pearson and Sullivan 1999: 7), for it is only through the relationship between a site and a community that a place can be said to be significant. In other words, significance is a quality that is assigned to a place by people—it is not an inherent quality. For this reason, what is considered 'significant' can change through time, as history unfolds and communities change. To aid archaeologists and other heritage professionals in making these assessments, many of the state and federal authorities who administer cultural heritage (notably the Australian Heritage Commission* and the New South Wales NPWS*) have developed guidelines for assessing cultural significance. These are usually based on comprehensive community surveys to identify what makes places important and, based on this information, professional workshops designed to identify objective criteria against which places can be measured. Obviously, this is not—and never will be—a truly objective process: cultural heritage management is about how people value a site, something which is often highly emotive and intuitive rather than rational and logical. This does not make cultural significance any less real or any less important, however. Relating to the tangible remains of the past in some way enriches our lives and deepens our understanding of ourselves.

The process of significance assessment requires a firm understanding of the purposes and limitations of archaeology, the intent of cultural heritage legislation, the range of sites which exist across Australia, the management policies of the relevant state authorities, and the intricacies of appropriate site preservation and management measures. For this reason, the minimum qualifications which are considered adequate for undertaking a cultural heritage consultancy are an Honours degree in archaeology or a closely related field, or some other form of postgraduate qualification in archaeology, such as a diploma or Master of Letters. A Bachelor's degree alone is usually not considered sufficient. This is a by-product of the ethical responsibilities of the archaeologist (see 'Archaeologists and ethics' on page 11), in that you must be sufficiently well qualified to be able to carry out a job to acceptable professional standards. Poor-quality or ill-informed assessments damage the archaeological resources and the professional standing of the archaeological community, sometimes irretrievably.

THE BASICS

One-third of any consultancy is simple people skills: liaison, coordination and negotiation. You may have to liaise with traditional owners, land owners, historical societies, developers or engineers, grader drivers, architects or town planners, plus members of the general public, all of whom will have different questions and concerns. As a heritage practitioner, you have a primary ethical responsibility towards the proper conservation and management of the heritage resource. Nevertheless, you also must be aware of the pressures and constraints that can affect heritage projects and the range of agendas which will often exist in relation to any heritage site. If you are being contracted to undertake heritage work, you must also bear in mind the legal right of the client to have full access to information about the site (see 'Archaeologists and ethics' in Chapter 1), and your ethical responsibilities to the administering authority or other groups. The most common constraint on all cultural heritage consultancy projects is time: if you are working as a consultant, you will not have the leisure of working to a pure-research timetable. In all likelihood, you will be working to somebody else's schedule—somebody who may or may not be receptive to archaeology as a valid component of their project in the first place. This means that you will have to be highly focused in how you approach the project and how you carry it out, and also be prepared to liaise between the often arcane practices of archaeologists and the realities of construction, engineering or mining projects. You may have to make rapid assessments of areas or sites, without the leisure time to investigate every square centimetre of ground. Don't be pushed around by developers, but be prepared to be flexible if the situation warrants it.

The most common cultural heritage consultancy projects are surveys designed to locate heritage sites, record them and assess their level of significance. Many different bodies require cultural heritage management reports for a variety of purposes—private developers, local and shire councils, corporate developers, mining companies, government departments, even in some circumstances private landowners. While all the basics of fieldwork will be essential in any cultural heritage management job, you will also need to develop some extra skills. Most importantly, you will need a good understanding of the concept of cultural significance and the standards for assessing this. You will also need to know how to make management recommendations for a site or area, as this is the ultimate end-task of most consultancy projects. Remember, your role is to be as objective as possible, but you are also being employed as a heritage professional. Your first duty is to do the best job you can for the heritage values of the place; your second is to try to reconcile the varied goals of the developer or owner and any other interested parties (such as traditional owners) according to those cultural heritage values. In the main, this is what cultural heritage management is all about—treading the minefield between what should happen in a perfect world and what resolution it is best to achieve in this one. Above all, your recommendations need to be realistic and tailored to suit the individual circumstances of the job—there is no point in recommending the full-scale salvage of an area if you are working for a small client with limited funds. If you are ever worried about what recommendations to make or whether you have assessed a place adequately, don't hesitate to contact the local administering authority. Another resource is to look at similar studies by other archaeologists or assessors and to evaluate their assessments and recommendations.

HOW TO PREPARE A TENDER

This is part of the business of conducting a consultancy and is essentially a job application, so take it seriously. When preparing a tender, the key is to make sure both that you do justice to the real costs of the job so that you don't short-change yourself in the process, but also that you remain competitive. Some government departments (such as the New South Wales NPWS) will issue a detailed project brief, and will expect you to address each selection criterion in your tender. This is exactly like applying for a job—if you don't address the selection criteria properly, you won't get the job. Other jobs will be less formal, and for these the onus will be on you to find out precisely what the job will entail and therefore what it will be likely to cost. The essential first stage in preparing a tender is to get hold of a map of the area, and make sure you have a clear idea from the client about the actual scope of the project. Make sure you know how large the area is, what the terrain is like, and what the client intends to do, as this will help you to calculate just how much time (and how many people) the job will take. If you are tendering for an Indigenous archaeological consultancy, the other essential initial task is to track down and talk to the relevant traditional owners. This will establish a good working relationship with them even if you don't get the job and will alert you to any concerns or stipulations on the job which they might have.

The second stage of the tender process is to construct a fair budget for the project. Like any application for funding, don't inflate—but don't under-estimate either. If you indicate in your tender that you can do the job properly in three days, but then find out in the field that you miscalculated and it will take twice as long, the client is unlikely to be sympathetic that you made a mistake and you will have to wear the extra costs. If you're genuinely not sure precisely how long the job will take, however, indicate this clearly in the tender, including your reasons for not being able to calculate it precisely. For example, you may be being asked to survey an area for Indigenous sites and then make management recommendations based on what you find. If you suspect that you might locate highly significant or sensitive sites and that this might totally change the traditional owners' views on how the area should be managed, thus requiring more consultation time and costs, but cannot predict this with any certainty, you could indicate in your tender that this possibility is likely and provide an estimate of the additional costs should this eventuate. If you are really worried about your cost margins, it is considered acceptable to include a 10 per cent contingency to cover unforseen circumstances, such as heavy rain preventing you from accessing sites, because the client will know that you can't predict every eventuality. In some cases you may also be able to negotiate a budget variation with the client if the work turns out to be far greater than you reasonably expected, although the success of this may come down partly to your negotiation skills.

In your tender you also must price yourself fairly according to your expertise. The Australian Association of Consulting Archaeologists (AACA*) issues schedules for professional rates covering all levels of archaeological fieldwork. At the time of publication, AACA's standard hourly rate for an archaeological consultant was $95 an hour ranging down to $25 an hour for a trainee. Bear in mind, however, that you may need to balance a professional rate with the needs of the individual situation—a small client with limited funds may not necessarily be able to afford AACA's rates. You need to take this into account when you are working out the composition of your field team.

The other key in tendering successfully is to make sure that your budget is sufficient. Make sure, for example, that you remember to include fees for consultation and that you allow for the recommended three days in the office/lab for every one day you spend in the field (see 'Archaeologists and ethics' on page 11). If you are including fees for Indigenous consultants, it is wise to check their consultancy rates before you submit, because it is no good getting the job and then finding out the Indigenous community routinely charge $40 an hour instead of the $20 you budgeted for. Remember to include an amount for report production to cover the costs of copying and binding reports, buying film and developing photographs, as well as the cost of any travel to and from the site. If you intend to get feedback on a draft of your report before submitting the final version, remember to allow extra time for rewriting and extra costs for a second round of copying and binding.

One of the main ethical principles for tendering is never to undercut (i.e. to knowingly charge less than your nearest competitor to ensure you get the job), even though it can be tempting. It is also unethical to knowingly tender too low a price for a project to ensure that you get the job and then, once it is secured, to turn around and renegotiate the price with the client based on the true value of the work. These practices devalue both your work and that of others. They lead to substandard work and reflect poorly on the professionalism of the archaeological community.

The third stage of the tendering process is to write the tender document: this will usually include some relevant background research on the area, an outline of your proposed methods for fieldwork and analysis and an estimate of the total time the job is likely to take, as well as any other essential information which supports your budget. Try to show some familiarity with previous research in the area, even if it is only to show that you are aware of it. Make sure you include an updated version of your CV, outlining your relevant experience, and that you have sufficient insurance to cover yourself and anyone working for you. Some clients (such as the New South Wales NPWS) will stipulate that you have appropriate insurance cover as an essential part of the tender process and will not hire you as a contractor without it.

Checklist for tender documents

- ❑ Have you remembered to budget for travel time and costs (e.g. cents per kilometre for your vehicle, the time you will spend in travelling)?
- ❑ Have you remembered to include a component for purchasing film, developing prints and any photocopying that may be required, as well as printing and binding your report?
- ❑ If you will be away from home, have you remembered to allow for accommodation and subsistence costs?
- ❑ Have you checked the fees for Indigenous consultants to ensure they are correct?
- ❑ Have you made any allowance for contingencies, such as rain, or difficulty in tracking down the appropriate people?
- ❑ If there is a formal brief for the project, have you addressed all of the requirements?
- ❑ Even if there is only an informal brief, have you demonstrated how your tender will address the client's needs?
- ❑ Have you included the latest version of your CV, making sure the focus is on previous relevant experience?
- ❑ Have you clearly identified any potential problems or limitations that you envisage might affect the progress of the project?

ASSESSING CULTURAL SIGNIFICANCE

There is no simple 'recipe' for assessing cultural significance; it is, and always should be, a well-considered assessment of the complexities of what makes a place of value to society. Recent criticisms of the standardised nature of the cultural heritage assessment process have pointed out a lack of consistency in the ways in which people define significance, and a lack of recognition of the deeply social nature of heritage (Byrne, Brayshaw and Ireland 2001: 61–72). If we accept that cultural significance is not an inherent quality of a place, but a social outcome resulting from people's interactions with a place, then the community itself must be the most important source of significance. In trying to quantify how people value places, however, it has become apparent that there is an urgent need to broaden the definition of cultural heritage beyond purely physical traces (the sites and artefacts), to also incorporate the intangible traces of people's attachments to place:

> landscapes, with all their heritage places and remains, and also our minds with all their memories, are a form of archive of the past of our culture and of ourselves as individuals. We mobilise elements from this archive in the process of forming our identity. (Byrne, Brayshaw and Ireland 2001: 69)

Pathways used by Indigenous people to move between sites, for example, may have left no physical traces, but are no less an integral part of how people interacted with and valued that landscape (Byrne, Brayshaw and Ireland 2001: 140) (see 'What is a site?' on page 63). The central question in assessing cultural heritage significance for any site or place should always be: Who values this heritage and how do they value it? In this model, the archaeological profession is simply one sector of the community, and as such, must make a space for other, non-archaeological groups to value places in ways quite different to themselves. To do this we must understand the professional value-system we take with us into the field as supposedly 'objective' observers (Byrne, Brayshaw and Ireland 2001: 69).

> No site can be assessed in isolation—the assessment of significance is always going to be a comparative process. Whenever you undertake an assessment, you must always try to widen the assessment as much as possible. For an archaeological site, for example, you may need to measure it against other known sites in the local area, in the wider region or even across the state. Does it contain features which may have been lost from other similar sites? Does it have complementary information which may be missing from other sites? Are there no other known sites like it? Or conversely, are there many?

In reality, just about any place can be argued to have some level of cultural heritage significance, but not all places are equally worthy of preservation. We can't retain everything, so the assessment process is one of objectively establishing the *nature* of a place's significance (aesthetic, historical, etc.), the *level* of that significance (low, moderate, high) and the *degree* of that significance (local, regional, state, national or global). It is only once you've done this that it is possible to develop strategies to manage the place (remembering that 'managing' is not necessarily synonymous with 'retaining'). In all situations, the process of assessing significance must be made as credible as possible. As a result, in all of your assessments you will need to be explicit about your criteria and precisely what they mean, and to outline any limitations on your assessment which may have influenced your decisions.

Recognising how intimately people's attitudes, understandings, memories and desires are connected to the creation of cultural significance makes it no easier to assess. Over the last twenty years, there has been much effort devoted to what criteria are essential for assessing cultural heritage significance, what precisely these criteria entail, and how sites may be measured against them. One way to decide on how significant a site is, is by establishing whether or not it meets the nationally set **threshold** for cultural significance. Not all criteria have established thresholds (aesthetic significance, for example) but, for those which do, this gives you something objective against which to compare a site. These thresholds have largely been set through the work of the Australian Heritage Commission and other bodies in an attempt to lessen the subjectivity of the assessment process.

A central component to the process of assessing cultural significance is talking to the community which interacts with or values the site. Gauging the reasons why people value a place is the essence of assessing social significance, but it is also a component of the assessment of all other categories of significance as well. 'Community' can be defined in any number of ways, of course, and one of your tasks will be to decide who the community is and how its members value the place. To do this, you will have to take into account how different groups value the same place, and the scale at which these groups can be defined (are they local? regional? national?). The community which values such sites as the Sydney Opera House, for example, could be defined at a national level as the people of Australia, while the community which values the original cemetery at Mintaro, South Australia, might be limited to the people of Mintaro. You may also have to take into account the existence of varied and potentially conflicting values for the same place.

THE CATEGORIES OF CULTURAL SIGNIFICANCE

Cultural significance is customarily assessed in terms of four main categories: aesthetic significance; historical significance; scientific/research (in many cases archaeological) significance; and social significance. None of these categories is mutually exclusive, of course: a site which has historic significance can also possess aesthetic significance as part of its locale or scientific/archaeological significance if it can also contribute to archaeological studies. It is also possible for the one site to possess significance for both Indigenous and European people. This is the **Burra Charter model** for assessing significance, established as a result of several international movements to conserve and restore monuments and sites. While by no means the only model used worldwide to establish how and why places are valuable, it is the one generally followed in Australia.

An assessment of significance requires more than merely determining what categories of cultural significance are appropriate. Each category must also be assessed in terms of the degree of its significance. This is essentially an assessment of comparative significance, or of the relationship between the place and other places which are either like or unlike it. Not everything is equally significant, and assessing the degree of significance is the first step in deciding which places are more significant than others (and why). The next step assesses the level of a place's significance in two further ways: against representativeness and rarity. **Representativeness** is an assessment of whether or not a place is a good example of its type, illustrating clearly the attributes of its significance. **Rarity** is an assessment of whether the place represents a rare, endangered or unusual aspect of our history or cultural environment that has few parallels elsewhere. Thus a place which has historical significance might be representative of the historical development of a region, but might not be rare in that other similar places might also exist in the region. It could, however, be rare locally if no other similar examples exist in the immediate vicinity. An outstanding place might be both representative and rare on a national scale.

Aesthetic significance

This is one of the hardest categories to evaluate, as almost everyone has their own idea of what is visually pleasing. In addition, there is a general recognition that aesthetic significance is a Eurocentric concept which may remain quite alien to Indigenous cultures. In an attempt to break away from narrow or conventional—and certainly Eurocentric—definitions of 'pretty' or 'beautiful', the Australian Heritage Commission's working group into identifying and assessing aesthetic value has defined it very broadly as:

> the response derived from the experience of the environment and cultural attributes within it. This response can be to visual or non-visual elements and can embrace emotional responses, sense of place, sound, smell and any other factors having a strong impact on human thoughts, feelings and attitudes. (Paraskevopoulos 1994: 81)

This hints at some of the problems inherent in trying to capture aesthetic significance: it is a product of a powerful emotional experience rather than a checklist of attributes.

The qualities which might be considered part of aesthetic significance have been most clearly set out by James Semple Kerr as the formal or aesthetic qualities of a place which make it visually pleasing (Kerr 1985: 10–11). Kerr argues that aesthetic significance can be assessed in terms of the individual elements present at a place, in terms of the unity of scale, materials, texture and colour evident between elements, in terms of the degree of contrasting elements which may or may not be disruptive, or in terms of the entire landscape setting in which each of these elements combine to produce an overall impression (Kerr 1985: 11). Of importance in assessing aesthetic significance is the degree to which a place has a relationship between its parts and its setting which reinforces the quality of both (Kerr 1985: 11).

Obviously, many archaeological sites will be sub-surface and therefore will not be able to be assessed on aesthetic criteria. You will need to decide on a site-by-site basis whether aesthetic significance is a relevant category to assess, rather than taking this as a given.

Historical significance

Historical significance relates exclusively to the period of European occupation of Australia, although it does not refer exclusively to European archaeological material (for example, Indigenous–European contact sites may possess significance under this category). Such significance is commonly identified in terms of a set of themes which relate to such influences as an historic figure, event, phase or activity. More specifically, a place may have historical significance because it typifies past practices, or because it may be the site of an important event (Kerr 1985: 26; Pearson 1984: 32).

The Australian Heritage Commission (2001) has developed a range of generic historical themes applicable to Australia as a whole. These are intended to apply to all places at all levels of significance—local, regional, state or national—and aim to stimulate you to think more widely and help you to make comparative assessments. Some states (such as New South Wales and Queensland) have adapted these national themes to produce sets of complementary state historical themes which you should also make yourself aware of. Any of the government bodies which administer cultural heritage matters in your state should be able to give you a copy of the state themes.

Scientific (archaeological) significance

This is an assessment of the research potential of a site and the relevance of any data that the site might contain for the pursuit of academic research questions. Bear in mind that the research questions may well be applicable beyond the context of the single site being studied (Schiffer and Gummerman 1977; Pearson 1984). Significance under this category includes the research potential of the site itself and its representativeness within a wider suite of known sites. The scientific significance of Indigenous heritage sites is normally determined by the project archaeologist in cooperation with the Indigenous community. Ideally, scientific significance is evaluated in terms of a detailed research design focused on some aspect of past Indigenous lifeways. If a site can be demonstrated to contain information important for addressing issues in the research design, a defensible evaluation of scientific significance can be made.

Scientific significance is also concerned with the potential of a site to address anticipated future trends in academic research interests and should take into consideration the issue that future research capabilities and interests cannot be predicted with any accuracy. Since it is impossible to anticipate all research questions, it is also difficult to identify and conserve suites of sites that may be capable of addressing all future research problems. To avoid the problem of using specific research designs to evaluate sites, the concept of 'representativeness' was advocated in Australia as an additional consideration for evaluating scientific significance (Pearson 1984: 2). According to this concept, an adequate data set for all present and future research designs can be conserved by identifying and preserving a representative sample of the complete range of site types in an area.

There is no nationally set threshold for archaeological significance, partly because the issue of what constitutes an archaeological 'research resource' is still highly debated. One guide which may help you to decide whether a site is of archaeological significance rests on its ability to answer three questions (Bickford and Sullivan 1977: 23–24):

- Can it provide information not available from other sources?
- Can it provide information not available on other sites?
- Can it answer pertinent research questions?

Social significance

The significance of any site in terms of its social value lies mainly in its association with a particular recognisable community, or parts of a community. Social significance is often defined in terms of the degree of contemporary community esteem which is attached to a place and aims to establish whether, for example, damage to the site or its contents would cause the community a sense of loss, or whether the site contributes to a sense of community identity. To meet the National Estate threshold for social significance, a site must be well known and highly valued, have a long history of association, or be valued as a landmark or community signature (i.e. a place people identify with as part of who they are, such as places they show to visitors, or places that everyone recognises as a landmark). Social significance can also be assessed in terms of representativeness and rarity, in light of whether the place represents a seminal or optimal example of a class of items which is valued by a community, or whether it is a scarce example of a particular style, custom or human activity which is esteemed by a community.

Whenever you assess social significance, you will have to make a decision about who constitutes the community. It is not necessarily going to be simply all the people who live in a particular area, because sectors of this geographic community may be unaware of a place, or may value it completely differently to other sectors. If a place is a popular recreational destination, for example, it may be of value to a much wider community than simply the people who ordinarily live there. Holidaymakers may come from all over the country to visit it, making the community which values it much broader.

When assessing how socially significant a place may be, ask yourself these questions:

- Is it widely known amongst the community?
- Is it highly valued by members of the community?
- Has it been known and valued for a long period of time?
- Does it have symbolic value as a local landmark or icon which people identify with?

Answering yes to one or more of these questions means the place has social significance. Assessing how large the community which values it is will give you some guide as to how significant it may be.

HOW TO ASSESS CULTURAL HERITAGE SIGNIFICANCE

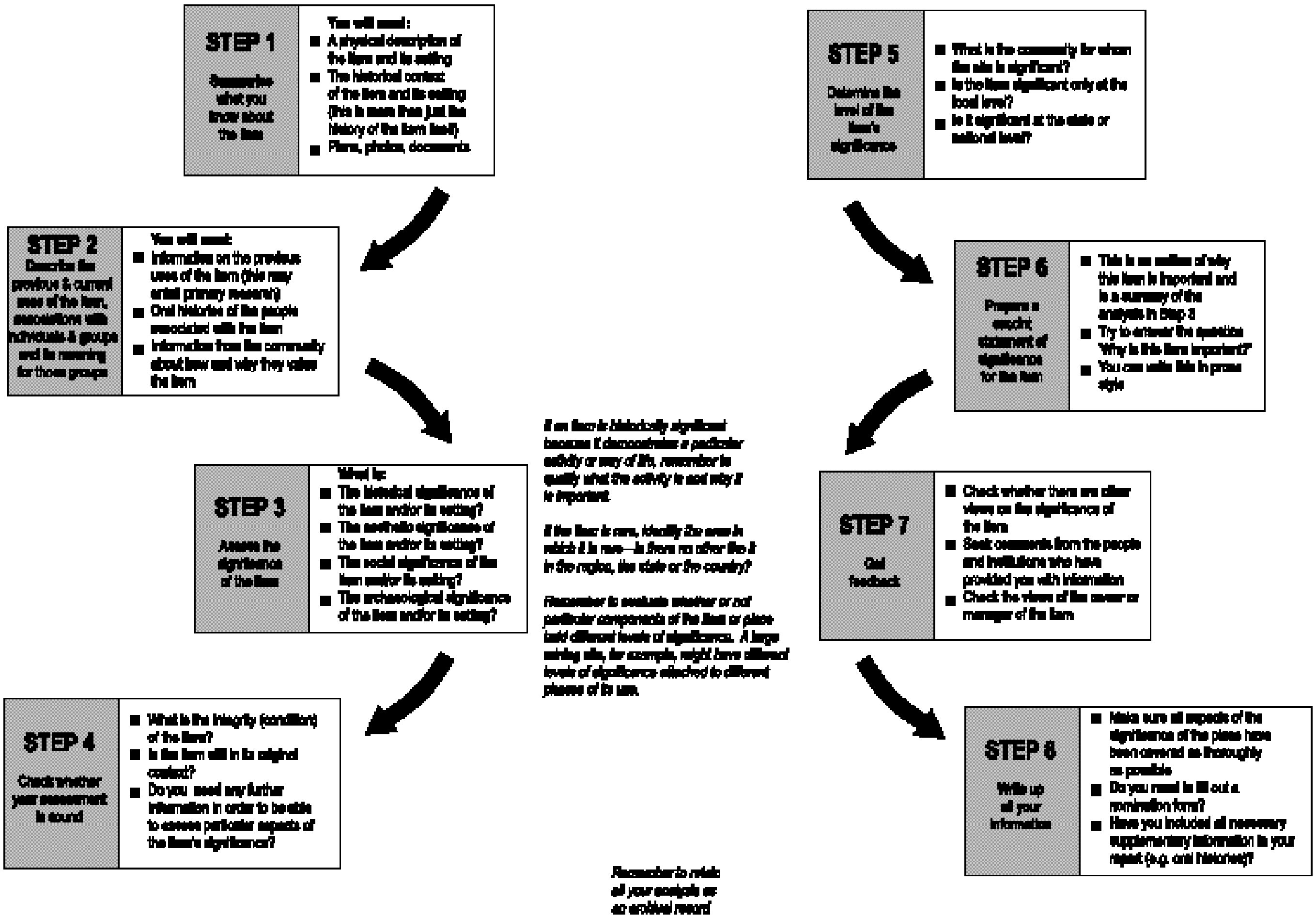
According to the New South Wales Heritage Office (2001: 6–7) ,there are eight essential steps in the significance assessment process (see Figure 8.1 on page 252):

- Summarise what you know about the site, place, or artefact.
- Describe its previous and current uses, associations with individuals or groups and its meaning for those people.
- Assess significance using valid heritage assessment criteria (for example, for New South Wales this means using the state heritage assessment criteria).
- Check whether you can make a sound analysis of heritage significance based on this.
- If you can, determine the level of significance.
- If you can't, find out whether there are other sources of information which might be helpful.
- Prepare a succinct statement of heritage significance.
- Get feedback from all interested parties.
- Write up your information.

The Australian Heritage Commission has published more specific sets of guidelines to use when assessing particular categories of archaeological sites. Pearson and McGowan's (2000) *Mining Heritage Places Assessment Manual*, for example, deals with some of the specific problems associated with assessing historical mining sites; *Tracking the Dragon* (Australian Heritage Commission 2002) covers the identification and assessment of Chinese heritage sites in Australia; and *Migrant Heritage Places in Australia* (Australian Heritage Commission 2001) deals with locating and assessing places associated with immigrants to Australia.

As a final note, if you find yourself in the situation of having to assess a place's significance but without the time and resources to conduct a thorough community survey, or find that your time has run out before you could track down all the relevant people, it is perfectly acceptable to note in your report that you couldn't assess some categories of significance with the information you had to hand. If you do this, however, you will need to stipulate that it isn't because these places have no significance, just that more research needs to be done before this can be adequately evaluated. This could be as simple as inserting a phrase such as 'More information will need to be collected before an accurate assessment of the social significance of . . . can be determined.'

FIGURE 8.1: Steps in the assessment process (after NSW Heritage Office 2001:6–7)



WHAT COMES NEXT? ASSESSING THE IMPACTS OF DEVELOPMENT

If your significance assessment is part of a consultancy project involved with development, then your responsibilities do not end there. Once you have established how significant a place is and why, the next step is to work out the potential impacts of development on the place and, from this, to draw up a set of management recommendations which indicate in detail how the place should be treated and who is responsible. You cannot make management recommendations without a sound statement of significance.

An 'impact' can be defined in many ways: as something which will directly affect a site (e.g. if a site is located in the middle of a potential road corridor) and as something which is related to the development, but which may only indirectly affect a site (such as when increased heavy-vehicle traffic along a track might widen or change the course of the track, or generate greater quantities of dust, thus affecting any sites nearby). You must therefore carefully consider both the potential for direct and indirect impacts on sites. To do this, you will need to find out as much information as possible about the type of development, its size and scope and the degree to which it might affect both surface and sub-surface archaeological remains. This information is not always easy to come by and you might have to quiz the builder, engineer or developer to work this out. You will also have to consider impacts in both the short and long term. Will people continue to visit/use this site? What impact is this likely to have? Will access tracks have to be continually maintained, even after the development work itself is completed?

The final thing to bear in mind is that assessing impacts not only involves determining the potential impacts on recorded sites (i.e. those that you know about), but also the impact on areas with archaeological potential. In other words, if you think there is a high likelihood of archaeological evidence existing in an area, even though you were not able to see any such evidence at the time of survey, or if the evidence you could see seemed limited, then flag this as an area of potential, and assess what impacts the development could have on it.

Gordon Grimwade's tips for rapid site and artefact evaluations

- Consider using a metal detector to help out, but recognise its limitations if you do. They don't pick up all metals all the time, but they do provide an indicator.
- Use a probe to investigate for sub-surface material on historical sites. The best ones are T-shaped, with the shaft about 500 millimetres long. Have a steel ball-bearing of slightly larger diameter welded at the tip: it goes in and can be withdrawn more easily because the bearing is the only point of contact with the soil. If you use a probe,

remember to be gentle when pushing it into the ground. You could be right above a rare artefact.

- Grids and salvage archaeology on large sites don't mix. Use a dumpy level, an EDM or other highly accurate survey equipment to fix the locations of finds.
- We may not agree with bottle collecting, but some collectors possess a wealth of knowledge on the history of bottles. Some are even becoming more interested in the historical aspects than the dollar value of the bottles. If you need some help, it may be worth contacting your local bottle club. There are some useful websites around now too. Try:
  —Antique Bottles (www.antiquebottles.com);
  —Federation of Historical Bottle Collectors (www.fohbc.com);
  —www.geocities.com/redgumfalls2;
  —www.antique-bottles.net.

DEVELOPING MANAGEMENT STRATEGIES

The final step in an archaeological consultancy is to develop management strategies which can be used to direct development in a responsible way. Management refers to any actions that will affect the heritage resource and may be actions which protect sites, actions which destroy sites (bearing in mind that collection and excavation are both forms of destruction), or actions which will change the development process so that it is more receptive to archaeological issues. Not all management relates to development, either—heritage sites which are also tourist destinations will require strategies to manage visitors to the site, and even the interpretation of heritage sites in signs and brochures is in part a management issue. In short, managing a site can involve any combination of seven separate but closely related issues (Burra Charter 1996):

- **Conservation** involves all the processes of looking after a place which will retain its cultural significance. The main processes are maintenance, preservation, restoration, reconstruction and adaptation.
- **Preservation** means maintaining the fabric of a place in its existing state so that it does not deteriorate. **Fabric** is all the physical material of the place: on an historic mine site, for instance, this would include the mine equipment, shafts and mullock heaps, the construction materials of the mine buildings, the waste products from the mining process which are still on site and any archaeological materials (either on the surface or sub-surface). Sometimes the setting of the site can also be defined as fabric, particularly if the setting is an integral part of the site's cultural heritage significance.

- **Restoration** means returning the existing fabric of a place to a known earlier state (e.g. to a particular historical time-period) by removing newer material or by reassembling existing components without introducing any new material.
- **Maintenance** means the continual protection of the fabric, contents and setting of a place as it exists at that point in time. This should not be confused with repair, which may involve restoration or reconstruction.
- **Reconstruction** involves returning a place, as nearly as possible, to a known state by introducing outside materials (either new or old) into the fabric. A reconstruction should always be based on solid and thorough research, and should never be conjectural. If you don't know or are not sure what went there, then you can't reconstruct it.
- **Adaptation** means modifying a place to suit proposed compatible uses, such as when an historic building is modified to become a museum.
- In addition, there is also **destruction**, which involves the removal of part or all of the site.

When it comes to deciding the current best practices to follow for any of these issues, consult the Burra Charter, which is considered the basic conservation document for all sites of historic and cultural significance in Australia. It is derived from a series of internationally recognised resolutions on site conservation, and adherence to its principles helps to ensure compliance with current conservation legislation. If you are not experienced with heritage conservation issues, the Burra Charter sets out some general guidelines for what measures are considered acceptable on heritage sites which have become standards for best practice. For an excellent explanation on how these different processes have been successfully employed on many heritage sites and the variations which are possible, see Marquis-Kyle's and Walker's (2003) easy-to-read guide, *The Illustrated Burra Charter*.

In essence, site management is an ethical process (see 'Archaeologists and ethics' on page 11), involving four key principles (Marquis-Kyle and Walker 2003):

- **respect for the significance of the fabric of a place** (i.e. don't replace any original fabric unless there is no other alternative);
- **minimum intervention in the fabric of a place** (i.e. do as little as possible, but as much as is unavoidably necessary);
- **reversibility of treatment** (i.e. so that whatever is done can be undone with little or no damage);
- **full documentation of all actions taken**, including the rationale behind them (i.e. so that the complete history of the place and its treatment is known and can be referred to at any time).

Remember that all physical interference with a site, whether it takes the form of conservation, preservation, maintenance, restoration, collection, excavation or other destruction, can *only* be conducted following approval by the appropriate state or federal authorities. This is a legal requirement for sites in all states and territories that are protected by cultural heritage legislation. Sometimes you may be involved in work which is not typical archaeological excavation or collection, such as monitoring the excavation of building footings at an archaeological site, or even monitoring and recording the destruction of a site. In these cases, you will still require legal permission to conduct this work, usually through the normal excavation permitting process. Sometimes this can lead to unusual definitions of 'excavation': in New South Wales, for example, one mine site was required to obtain an excavation permit to blast an open-cut pit!

STRATEGIES FOR MANAGING WORK AT CULTURAL HERITAGE SITES

Management is about controlling the type and degree of interference at a site, so that the cultural heritage values of the place, their levels of significance and any essential physical changes to the site can be properly balanced. Management strategies may be directed towards preventing any interference with the fabric of the site, they may require interference to be carefully conducted, or they may outline the way in which the site is to be destroyed. The process for preventing or limiting the physical interference at a site is called **mitigation**. You should always outline your strategies for mitigation clearly. A developer may not be aware of proper conservation or preservation methods, and may not realise that erecting a 6 metre high chain-link fence around the site might not be the most suitable option. This means that you will have to think through each stage of the management process, so that your recommendations are specific and not open to incorrect interpretation. If you recommend that a site be preserved, for example, how is this best achieved? If it is to be fenced, what is the best form of fencing? When should this fencing take place? Who should do it? How should it be done? If you are unsure of your options, take a look at recommendations for other, similar sites, or ask around to see what else has or hasn't worked.

The process for outlining how a site may be destroyed often involves **salvage**, or the emergency recovery of archaeological material prior to development. **This should be a last resort.** It is *not* an alternative to conservation, and if you choose it your responsibilities will be far-reaching. Salvage is not just the process of excavating or collecting the material, but entails all of the subsequent analysis, conservation, curation and documentation work. You will be responsible for ensuring this is completed correctly and that all of the artefacts from this work will be cared for in the long term and that all of the information is archived and deposited adequately (see Managing archaeological collections' on page 156). In some states there is a time limit on how long you have to analyse and write up the report of a salvage project (in New South Wales, if you are working on historical sites, the time limit is twelve months, for example). Once again, you are responsible for ensuring that all of this work can be finished within the allotted time period, so don't recommend it if you can't complete it. Salvage is *only* appropriate when all other avenues have been exhausted and where it will provide a substantial or unique contribution to archaeological research.

Considering that no archaeological survey is ever likely to uncover all the archaeological remains in an area (see Chapter 3 'Finding sites',) you may wish to adopt a strategy that flags this potential weakness and makes it into a central component of the project. One way to do this is to make sub-surface testing a component of the management recommendations, so that you can examine an area in more detail prior to any work commencing. Another way to cope with this is to recommend **monitoring** (i.e. employing a heritage professional to watch the development process carefully and keep a look out for any unexpected or unusual archaeological remains) for some areas of development. This is not usually considered an adequate replacement for evaluating sub-surface archaeological potential through careful sub-surface testing, however. If you suspect there might reasonably be archaeological evidence below the ground surface, it is your ethical responsibility to find this out *before* development commences.

One way to cope with a site that has areas of different significance is to create zones of significance, which will dictate their own hierarchy of management recommendations. For example:

- Zone 1, represents the areas of highest significance, containing the rarest, oldest or best preserved archaeological remains. No work should be undertaken in these areas which will adversely affect these physical remains.
- Zone 2, covers the areas of medium significance, containing those archaeological features which are not so well preserved or informative. Physical intervention in these areas should be limited, guided by appropriate conservation principles and conducted in a sympathetic and responsible manner.
- Zone 3, covers all those areas assessed as being of low cultural significance, including all those areas which have been heavily altered during the most recent phases of the site's life, or those which are severely limited in both the quality and quantity of information which they can convey. Maintenance or rehabilitation measures undertaken here should be guided by a general recommendation that physical intervention be kept to a minimum.

These zones can be ranked in terms of their relative significance and thus the level of physical intervention (defined as disturbance to the surface and sub-surface relics or remains) which is permissible within each.

If it is at all possible to encourage public participation in your project, this can be an excellent way of creating a positive public image for the heritage management process. Wherever possible, it is worthwhile to encourage volunteers or to suggest and develop displays or other interpretive material for public presentation which will result in positive publicity for your project.

Throughout the process of developing management strategies, you need to keep in mind all of the options that are available to you: monitoring, salvage (collection), test excavation, sub-surface survey, further surface survey, comparative analyses, further research, protection, conservation or destruction. When drafting your management strategies, do the following:

- Clearly separate which recommendations are mandatory because they arise out of legal requirements and which are simply desirable from an archaeological or management point of view (Haglund 1984: 2.4).
- Clarify all the alternatives which you can see and rank these in terms of preference from an archaeological or management point of view (Haglund 1984: 2.4).
- For any recommendations which entail allowing damage to the archaeological material, you will need to argue clearly for these recommendations based on your archaeological assessment of the site. In other words, it is not sufficient to simply state that the site is 'unimportant' or 'small', and therefore can be disturbed (Byrne 1997). You must provide clear and well-argued reasons for allowing any impact on a site or artefact.
- Clearly separate short-term from long-term management recommendations.
- You may also wish to recommend that a site which has been preserved during development is audited (checked) regularly to ensure that your recommendations were sufficient. Sites may be audited in both the short and long terms to ensure that they are being sufficiently cared for.
- If you are recommending zones of significance or areas to be preserved or protected, make sure you show these clearly on a map. The developer will need very clear guidelines as to what to do, and the more specific you are, the less chance there is of any mistakes occurring. If you only recommend that 'Site A' be fenced, without specifying how, when and exactly where, then you will be to blame if the developer unwittingly destroys any part of the site or its significance in the process.
- If you are contracted to work on a large site, or for a company which employs many subcontractors to carry out particular tasks on the site (such as a working mine site), it is the developer's responsibility to ensure that their subcontractors comply with

the heritage management recommendations. If you are worried by this, you could outline a protocol for subcontractors to follow, or specify in your report that all subcontractors should be bound to the same recommendations.

- If you believe that further work or research is required before a proper assessment of the impacts of the development can be made, then clearly state this as a recommendation. So that there is no room for misunderstanding, be as clear as you can about the scope and type of work considered acceptable or unacceptable, and any protective measures which you think need to be instituted.
- Finally, think about whether your site is part of a suite or complex of sites. This is probably more likely with Indigenous sites, which are commonly thought of as part of a wider network of places which cannot be separated, but this might also be applicable to historic sites, if there are others of the same age or purpose or with complementary functions in the area. When you are formulating your management recommendations, consider what the effects of changes made to one site will have for the other sites in the complex.

BEFORE YOU SUBMIT YOUR REPORT . . .

Get feedback, particularly if you are working with other groups of people with a vested interest in the site. Feedback may mean submitting a draft report to the client and to any other interested parties, and waiting for responses before you submit the final version. This gives all stakeholders an opportunity to comment. This is particularly important if you are working with Indigenous communities, as they are likely to have definite and often quite specific ideas about what they think are adequate management strategies. Before you submit your report, take your recommendations back to the community, and carefully go through them together to make sure that everyone understands what is at stake and has an opportunity to comment on whether and how they think the recommendations are suitable or unsuitable.

Finally, remember that you are not just submitting your report to a client, but also to the government authority who administers cultural heritage in that state. The cultural heritage managers who work for these authorities (usually, but not always, archaeologists) are ultimately the people who will assess your report, and they will assess it according to how closely it conforms to current best-practice guidelines (see Chapter 10: Getting your results out there: Writing, publication and interpretation). These are the people who are most likely to ask you for clarification on certain aspects of your work, to rewrite sections of your report or even to request that you do more research or fieldwork before they accept it. You must also satisfy your client, of course, because they are paying for you to do an adequate job in the first place. A client is unlikely to be sympathetic if they have to pay more money because you did a substandard assessment to begin with, which later requires substantial reworking before the state government authority will accept it.

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USEFUL WEBSITES

The Australian Heritage Commission maintains an excellent website which contains a range of useful online publications. *The Australian Historic Themes Framework*, *the Mining Heritage Places Assessment Manual, Migrant Heritage Places in Australia* and *Tracking the Dragon* are all available free online at www.ahc.gov.au/index.html. The AHC website also offers a free guide called Protecting Local Heritage Places.

www.heritage.gov.au/protect-places/scr3_06.htm has a series of guides on protecting and assessing heritage places, including step-by-step instructions on what goes into a heritage study.

www.icomos.org/australia, the website of the Australian branch of the International Council on Monuments and Sites, has the Burra Charter available online.

www.heritage.nsw.gov.au, the website of the New South Wales Heritage Office, has a wide range of online guides to assessing and managing places of cultural significance, including guides to the photography of heritage places, historical research on heritage places, and preparing thematic histories. Even though its contents are intended specifically for New South Wales, they contain many useful general principles.

CHAPTER NINE

PHOTOGRAPHY AND ILLUSTRATION

WHAT YOU WILL LEARN FROM THIS CHAPTER

- How a camera works
- The relative benefits of digital and SLR cameras
- The advantages of maintaining a good photographic record
- Techniques for photographing sites
- Techniques for photographing artefacts
- What makes a good illustration
- Conventions for drawing different kinds of artefacts
- How to produce high-quality photographs and drawings for publication
- Procedures for archiving your photographs and illustrations

The basic photography toolkit

A square of black, non-reflective, cotton material (velvet is ideal)
A 10 centimetre IFRAO* colour scale for photographing small objects
A 1 or 2 metre scale for photographing large objects
A three-in-one collapsible gold and silver reflector and diffuser
Information board and chalk
Blu-tack ®

Lens tissue
Lens cleaner
Cotton wool buds
A small packet of tissues
A squeeze bulb, or blower brush
Two pieces of chamois, for cleaning the outside surfaces of the camera
A sable or camel hair brush for cleaning the camera lens
Small jeweller's screwdriver
Spare camera batteries

The basic illustration toolkit

Technical pencil or lead pencils, preferably HB or the hardest of the B series
Clean erasers: soft eraser for pencil drawings; fibreglass or special ink-eraser for final ink drawings
Pencil sharpener—metal ones are best, but in a pinch fine sand-paper will do just as well
Scale ruler
Graph paper
Masking tape
Invisible or 'magic' tape
Callipers or dividers
T-square or set square (make sure this is flat and right-angled)
Protractor (a full circle or square 'Douglas' protractor is easiest to use)
Permatrace (translucent drawing film) or good-quality tracing paper
Drawing board—you can make one easily from plywood covered with laminated graph paper
Blu-tack ®
Scissors
Clothes pegs
String
Nails
Carpenter's line-level

Optional:
Portable camp-stool, to sit on while you are drawing.
Planning frame: this is a square timber frame with an internal metric grid-work of string.

It is most useful for drawing rock art panels and detailed horizontal surfaces such as excavation squares.

For final inked illustrations, you will also need a range of technical drawing pens, preferably of at least three point sizes (0.25, 0.35 and 0.5), good-quality ink, a sharp scalpel with a rounded or pointed blade and replacement blades.

Archaeologists have an ethical responsibility to produce high-quality and accurate recordings of their work. This is done not only through written reports, but also through photographs and illustrations. All of these materials eventually become part of your fieldwork archive and will be an invaluable aid to anyone involved in subsequent analysis or re-analysis of your work. Archaeologists use photographs and illustrations for a variety of purposes: to record a site or an artefact; to document the process of excavation or survey; to record field conditions; to illustrate the technical data provided in a report; or to interpret a site to the public. The best way to learn how to take good photographs or draw good illustrations is through practice. Both activities will hone some of the basic skills of an archaeologist: detailed observation and accurate recording.

THE BASICS

A photograph is a visual recording of a moment in time. Photography is perhaps one of the most important ways in which archaeologists record all aspects of their fieldwork on a daily basis. Because they are seen as objective, photographs have always played an important role in the scientific documentation of sites and excavations, as well as constituting important historical documents in their own right. This visual record can also be used to fill in some of the gaps that every archaeologist occasionally finds in their field notes or to revisit troublesome problems. In the case of contested finds, a detailed photographic record may become the ultimate verification of your field technique.

There are many publications which detail the essence of good photography; however, it is worth pointing out that a 'good' archaeological photograph is not the same as a 'good' artistic photograph. Because archaeological photography has a particular and quite narrow aim (to document a site or artefact in the necessary technical detail), it is much more analytical and precise than simply snapping shots. For this reason, while you will still need to follow some basic rules of composition and lighting, archaeological photography has its own set of standards. While there is always room for artistic or personal shots on a dig, the three basic elements of archaeological field photography are:

- Learn enough basic technical skills to ensure you can take photographs which show sufficient technical detail (see 'Taking good shots' on page 268).
- Always include a scale, because there is no point in photographing a site or artefact without also indicating how big or small it is (see 'Scales and information boards' on page 277).
- Always record the details of every photograph on a written recording form. Because all photographs will ultimately become part of the permanent site archive (see 'Archaeologists and ethics' on page 11), written descriptions of each photograph are always noted on recording forms, so that no detail of any photograph is lost (see 'Keeping photographic records' on page 283).

In general, archaeological photographs should be descriptive and realistic, rather than interpretive. Think about the purpose of the photograph—what are you trying to show? What point of the report or article is this photograph intended to illustrate? Are there specific features or elements which you want to emphasise? Always imagine that someone else will be analysing your results or re-analysing your material: will they be able to grasp what you are doing, and understand the point of the photograph? Don't just snap off photographs, always look critically at what you are recording and assess whether this particular photograph will help you to show it.

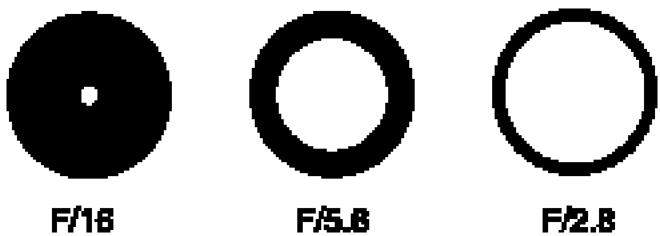
HOW A CAMERA WORKS

A camera works by capturing the light reflected from an object on film. A camera has a lens to focus the light, an aperture which allows a fixed amount of light to pass through the lens and a shutter which opens and closes to allow the light in for a specific period of time. All of these mechanisms are designed to control the amount of light reaching the film so that the final picture will be neither under-exposed (as a result of too little light) nor over-exposed (as a result of too much light).

- The **aperture** is literally the 'iris' of the camera's eye: it is the adjustable opening through which light passes in the lens. It is controlled by the aperture ring on the lens barrel and can be opened or closed to allow in more or less light, depending on the situation. The aperture controls the **depth of field** of a photograph, or the area that will be in focus (see 'Getting things in focus' on page 270).

- **F-stops** are the numbers on the aperture ring which describe the size of the aperture. The important thing to remember is that, as the f-stop number increases, the area of the aperture decreases, so that moving one f-stop will either double or halve the amount of light allowed through the lens. Basically, the bigger the f-stop number, the less light will be allowed to reach the film through the iris of the camera.

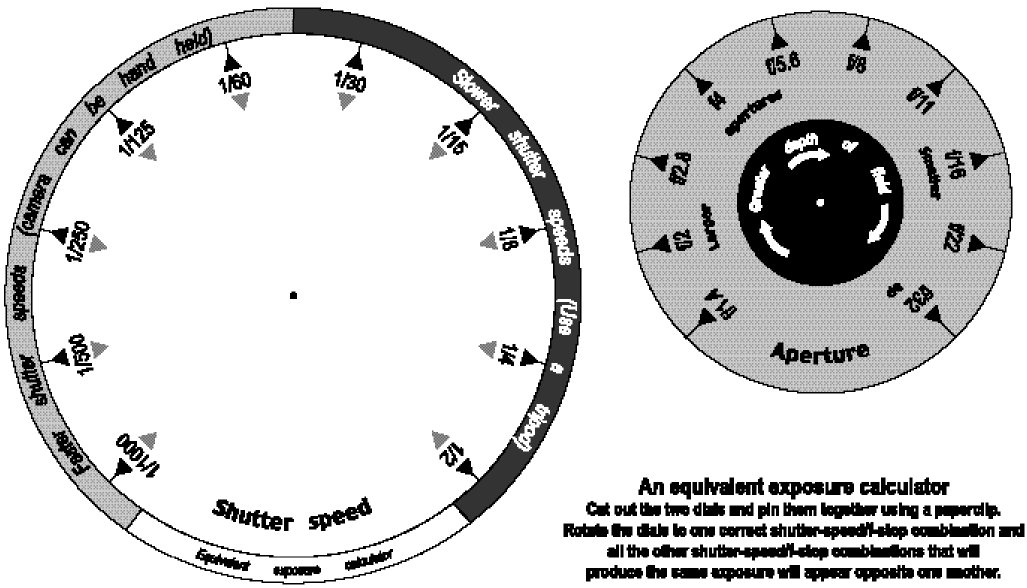
FIGURE 9.1: The relationship between the aperture and the amount of light passing through the lens. Apertures with smaller f-stops let in more light



- The **shutter speed** is the amount of time that the shutter remains open to allow light into the camera. The speed of the shutter is measured in fractions of a second: 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000 and so on. Shutter speed is closely related to aperture and one of the main rules of photography is to make sure that you have the right balance between them. They have an inverse relationship, which means that whatever you do to one, you will have to do the opposite to the other. In other words, if you are increasing the size of the aperture (i.e. moving down through the f-stop numbers), you will need to decrease the shutter speed to compensate for the greater amount of light being allowed through the iris. Conversely, if you are making the aperture smaller (moving up through the f-stop numbers), you will need to increase the shutter speed to allow the smaller amount of light being let in by the iris to expose the film for a longer period of time (see Figure 9.2 on page 267).

In archaeological photography, particularly small artefact photography, you should always choose the aperture before you choose the shutter speed, because it is the aperture which controls the depth of field.

FIGURE 9.2: An exposure calculator to help you get used to the inverse relationship between aperture and shutter speed



- **Exposure** is the total amount of light which is allowed to reach the film. You can calculate exposure by multiplying the aperture by the shutter speed.
- **Lenses** alter a camera's field of vision. The main ones used in archaeology are telephoto and wide-angle. A telephoto lens (usually from 85 to 200 millimetres), brings the distance close, magnifying a subject. A wide-angle lens has a focal length below 35 millimetres and is ideal for taking landscape shots.
- **Filters** are used to help control contrast and create special effects. Polarising filters control the effects of reflection, soft-focus filters soften hard edges and UV filters reduce the blue cast that occurs in photographs taken in the shade or on overcast days. In archaeology, filters can be useful for bringing out details on artefacts.
- **Film speed** refers to the film's sensitivity to light and is expressed in terms of an ISO number. A slow film will have an ISO of 25 or 40, a fast film one of 200 or above. Standard film speed is ISO100. Basically, the faster the film the less time it needs to be exposed to light to produce a suitable image. There is a trade-off to consider here, of course. Fast film allows you to take a good image in poor light, but will also appear much grainier than a slow film. Grains are the tiny, light-sensitive particles of silver which make up the negative, and are much smaller and finer in slower films, giving

them higher definition (Hester et al. 1997: 163). If you are using a manual camera, make sure you set it to the appropriate film speed.

Because they are finer-grained, slower films are better if you want to make big enlargements. If you are intending to prepare posters or other interpretive materials, keep in mind that slower films, because they are more finely grained, will be better if you want to make big enlargements.

TAKING GOOD SHOTS

The direction and intensity of lighting can make all the difference between a great and a poor photograph. Very directional light, such as through a window, can maximise textures, cast strong shadows and reduce the mid-tones. It can also create shadows, however, and obscure the outlines of objects. Very bright or harsh light can create deep shadows and intense reflection, washing out details and making some parts of the photograph over-exposed (very bright) and others under-exposed (very dark). Very dim light will be too dark and will not reveal enough to make the outlines of any object clear. Because of the softer lighting, the best times for taking field photographs are early in the day (preferably just before sunrise), or later in the afternoon at evening or twilight. Obviously you will not always be able to control the lighting conditions or wait until the perfect time to take each photograph. In these cases, you will simply have to make the best of the circumstances you find yourself in, but if you have a basic working knowledge of what is important in taking a good photograph, you should know enough to be able to avoid the worst.

Essentially, the main principle in taking a good photograph is to even out the highs and lows so that all the detail of the bright and dim areas can be captured. All good cameras will allow you to regulate the amount of light coming through the lens via combinations of shutter speed and aperture to achieve the correct exposure for the speed of the film. If your camera is set to automatic, these decisions will be made for you, although this does not mean that your photos will always be perfect. Part of the problem with light meters in cameras is that they tend to average the amount of light using the middle 30–50 per cent of the scene. This means that the light reading which the camera will then use to determine the aperture and shutter speed may not actually be reflecting off the subject and you may run the risk of under- or over-exposing your shot. This can particularly be a problem if you are trying to photograph artefacts on a black background, as it is very easy to include too much of the background in the meter reading (Howell and Blanc 1995: 24). Photographers often use a grey card (a piece of poster board with a neutral grey tone) to counter this problem and to determine the correct exposure for photographs. An exposure reading taken from a grey card provides a mean reading between extremes that will allow you to capture the detail in both the highlights and the lowlights.

You can also try physical solutions to problems of too much light or shadow. One way to remove shadows is to use a reflector to brighten the darker areas (see Figure 9.3 on page 270). If you don't have a commercial reflector, you can use almost any bright object which comes to hand, even something as simple as a large sheet of white card, a space blanket or aluminium foil taped to a flat surface. The reflector should be placed on the shadowed side and moved just close enough to lighten the shadow, so that you are able to record detail in those areas. If you are also using artificial light, this should be shone directly at the reflector, which can then be positioned so that it reflects the light on to the precise spot you want illuminated.

One way to even out the light is to use a diffuser to spread the light and minimise both shadows and highlights. One of the best commercial diffusers available is a combination gold reflector, silver reflector and diffuser in the one collapsible package. The gold and silver surfaces diffuse different wavelengths of light and so give quite different results. If you are photographing artefacts outdoors, you may have to diffuse the light, as direct sun often is too harsh to give a satisfactory result. Photographs taken without diffusion in direct sunlight will have high contrasts, with the light areas very light and the dark areas very dark, and are unlikely to show details well. This may not be necessary if the day is overcast, or if the light is shadowed or hazy, because cloud cover is actually one of the best light diffusers you can have. If you can't wait for an overcast day, however, and don't have a commercial diffuser on hand, try improvising with a large piece of paper, a white cotton shirt or sheet, or the lid of a white plastic container if you are photographing small objects. Experiment with a diffuser to work out the best effect before you take the photograph.

Grey cards can be purchased from any photography dealer, although if you find yourself caught without one you can improvise. A reading taken from a non-reflective brown paper bag, hessian sack or even from the palm of your hand will come within about one f-stop of a reading taken from a grey card (Howell and Blanc 1995: 24–25). A reading taken from a piece of plain, white paper will come within about two. To compensate, take the reading from the bag or the palm of your hand, and then over-expose the reading by one f-stop (i.e. drop the aperture one f-stop down from that suggested by the reading). If the reading from the palm of your hand suggested a shutter speed of 125 at f8, for example, then the corrected reading would be 125 at f5.6. If you are taking a reading from a piece of white paper, you will need to overexpose it by two f-stops, so drop the aperture ring down two f-stops.

FIGURE 9.3: Reflecting light to eliminate shadows (photograph courtesy Aidan Ash)

Getting things in focus

The aperture in a camera controls two things: the exposure (i.e. the amount of light reaching the film) and the depth of field, or the area of the photograph which is in focus. Controlling depth of field is an important way of concentrating attention on particular features in your picture and is also essential for maintaining sharp focus. A shallow depth of field can help soften unwanted or distracting detail, while a greater depth of field will bring into focus objects that are before and behind the main image. The overall depth of field is influenced by three factors: the focal length of the lens (how long or short the lens is); the distance the photographer is from the subject; and the size of the aperture. For a large depth of field, select a small aperture (a large f-stop number). For a small depth of field, select a large aperture (a small f-stop number).

A simple rule to remember is that the smaller the aperture (the larger the f-stop number), the more narrowly the light coming through the lens will be focused and therefore the greater the depth of field will be.

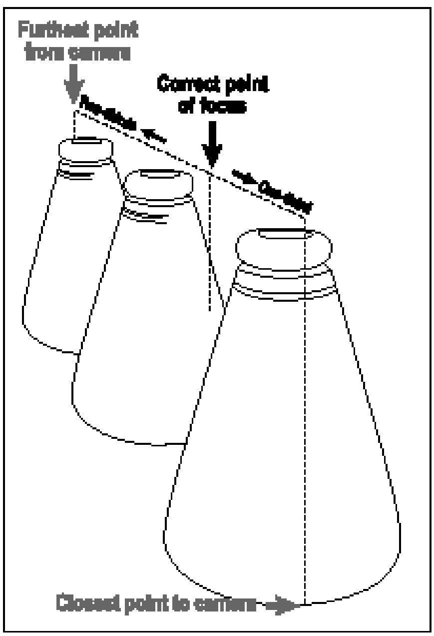
When you're photographing artefacts, getting them into sharp focus by maintaining the maximum depth of field is one of the most difficult things to do. A general rule to follow is the **one-third rule,** which suggests that you focus on a point that is one-third of the way into your composition (see Figure 9.5 on page 271). The depth of field in a photograph extends from approximately one-third in front of the point of focus to two-thirds behind. If you focus on the background, this will waste the one-third that is behind the point of focus and give an image that is blurred for one-third in the front. Remember that you can't see this zone of sharpness through your camera viewfinder, so you'll only find out which parts of the object are out of focus when you get your finished prints back. If you're photographing a ceramic vessel, for instance, and have only focused on the very

FIGURE 9.4: The effects of varying depths of field on the sharpness of a photograph

F4.5 (50 mm lens) | F11 (50 mm lens) | F22 (50 mm lens)

front of the vessel, you might find that the sides and rear edges are blurred. Using the one-third rule, however, you would focus approximately one-third of the way back from the front edge, bringing both the foreground and the background into sharpness. Some good SLRs may have a depth of field button that will let you see before you shoot.

FIGURE 9.5: One-third rule



F22 (50 mm lens)

Tips for taking good archaeological photographs

- Always keep the plane of the film (i.e. the back of the camera) in the same plane as the subject to avoid distortion.
- Always take light meter readings from your subject and not the background or foreground. If you can't get close enough, take a reading on something that's a similar colour or is in similar light.
- Try to diffuse the light wherever possible, or use reflection to reduce contrast in dark shadows.
- Always include a scale.
- Always record the details of each photograph in a log or on photographic recording forms.
- Shoot the first frame on a roll of an information board, noting the site, date and location in case your logbook or recording forms are lost.
- Make sure there is no extraneous material intruding on your shot (you'd be surprised at how distracting a yellow bucket or a red folder off to one side can be).
- Check regularly to make sure your camera is set to the correct film speed and hasn't been moved inadvertently.
- Remember that film is cheap in comparison to the cost of returning to a location. Always take at least twice as much film as you expect to use. It is also a good idea to take more shots that you think you will need, especially if you are planning to include the images in a report or publication.
- You can never plan for the weather. Take film in a variety of speed ratings so that you'll be prepared for a range of lighting conditions.
- If you are in doubt that your choice of aperture and shutter speed will actually give you the correct exposure, try bracketing your photographs. This is the photographic equivalent of an insurance policy. Take one shot at the exposure which you think is correct, and then take additional shots either side of this to give more and less exposure. If you took one photograph at 1/125 of a second at f-stop 8, for example, then you would also take one shot at 1/125 at f/5.6 and one at 1/125 at f/11.
- Keep it simple. Whereas a painter starts with a blank canvas and builds on it, a photographer starts with a multitude of images and edits them down. For effective composition, especially when photographing small objects, take elements away until images are reduced to their simplest components. One of the most common errors is to try to include too much.

HOLDING THE CAMERA

The quality of your image will be enhanced by how well you hold the camera. The stiller it is, the sharper the resulting image will be. How steady the camera needs to be to take a good photograph is directly related to the shutter speed. In other words, if the shutter needs to be held open for a longer period of time to let in more light, then the camera needs to be held steady for a longer period of time. Very few people can hold a camera steady at a shutter speed of 1/60 or lower, so if your exposure time will be long, you'll need to use a tripod (see 'When to use a tripod' below).

When taking a hand-held photo:

- If standing, make sure you are relaxed and comfortable. If you place your feet slightly apart and tuck in your elbows, this will help distribute your body weight more evenly and provide a secure platform for supporting the camera.
- Try bracing your body on a solid object, such as against a tree, table or the side of a building.
- If squatting, steady the camera by supporting your elbow on your knee.
- If kneeling, distribute your weight evenly.
- If lying down, use your camera bag or case to support the camera.
- Try holding your breath when you press the shutter release button.
- Press the shutter release button softly to avoid sudden movement.

WHEN TO USE A TRIPOD

A tripod anchors the camera in a way that is impossible for the human hand. A highly flexible tripod, particularly one with individually and highly adjustable legs (see Figure 9.6 on page 274) will be able to cope with just about any fieldwork situation. Remember to use a cable release to take tripod pictures so that you do not have to touch (and thus jar) the camera with your hand. If you don't have a cable release, or if you lose it, you can also use the self-timer built into the camera to avoid unnecessary camera movement. You will need to use a tripod if you are taking photographs:

- with long exposures at night;
- in close-up, where any camera movement will have a serious impact upon the quality of the image;
- in rough terrain, where it is hard to maintain a steady stance;
- with a very small aperture (a high f-stop) to allow for maximum depth of field.

FIGURE 9.6: The advantages of using a tripod to photograph archaeological sites

Tripod tips

- If you need to steady the tripod, tie a bottle of water or sand to it to balance the weight of the camera.
- In gusty weather, try putting a weight (such as your camera bag) on the tripod to stop it moving.
- If you don't have a tripod with you, a small bean bag placed on a fence-post or similar object can be used to cradle the camera.

CHOOSING THE RIGHT CAMERA: SLR VS DIGITAL

Most archaeological photography is done with 35 millimetre SLR (Single Lens Reflex) cameras, although digital cameras are becoming more common. All standard manual/automatic cameras are 35 millimetre SLR and usually come with a range of lenses. They use mirrors and prisms to focus the light coming through the lens on to the film. Digital cameras, by contrast, do away with film altogether and instead use a light sensor to capture an image. The sharpness of this image is defined according to the number of pixels the camera can create: basically, the more pixels, the higher the quality of the image will be. Point-and-shoot digital cameras are relatively affordable. They work well if you are planning to use the images on an internet site, or on your computer, but do not produce images that are of high enough quality to be published. The equivalent image quality of a 35 millimetre SLR camera is an 8 million pixel digital camera. This level of quality was available at the time of writing only in extremely expensive high-end models.

TABLE 9.1: The pros and cons of SLR versus digital cameras for archaeological fieldwork

The advantages of SLR	The advantages of digital
The utility of an SLR camera can be improved through the use of different lenses and accessories.	Digital image-making is usually much cheaper than buying and processing film.
The main advantage of an SLR camera in manual mode is that you have complete control over the image. The camera only does what you tell it to do. Therefore, if there are any mistakes, you know that you have made them, and you can work on improving your technique.	Digital cameras allow you the luxury of continuous point-and-shoot in those situations where there is no time to wait for a composed image, such as if a procession is moving by. With digital photography you can also take a series of images without worrying about the cost of film and processing.
When considered in terms of comparable image quality, SLR cameras and their accessories are cheaper than their digital equivalents.	Many digital cameras have a direct-to-printer cable which allows you to make prints without needing a computer. This can be useful in the field, especially if you wish to give copies of images to local people.
SLR photography requires less skill in composing, as you can draw upon the technology of super-wide angle lenses or extra long telephoto lenses.	Storing digital images is easy and copies of images can be produced more cheaply. Image data is saved on to removable memory cards, but in the cheaper models these can be limited to as few as fifteen images before they have to be downloaded.
Digital cameras are more limited in their format than SLR cameras, as they do not take interchangeable lenses. If you are shooting distant images, an SLR camera fitted with an extreme telephoto lens will produce a much better result than a digital camera. Similarly, it is very difficult to take truly wide-angle views on digital cameras.	Unlike conventional cameras, many digital cameras allow you to preview the image on a small LCD screen. This means that you can assess immediately whether you have achieved the image you were after. If you are conducting ethnographic research, this also gives you an opportunity to break the ice with the people with whom you are working.
SLR cameras are more robust than digital cameras. Digital cameras are more prone to the kinds of damage that occur in the field, such as dampness, dust, heat and cold. Also, many digital cameras have rotating parts, which are more vulnerable than fixed parts and require extra care.	

MAINTAINING YOUR EQUIPMENT

A daily and weekly routine should be established for checking photographic equipment. Inspect your cameras, lenses and tripods on a daily basis and wipe them clean. Inspect them closely once a week and clean all their outside surfaces with a clean soft rag, or piece of chamois. Pay special attention to the interior of the camera case. Blow dust from the interior of a camera body and case using a squeeze bulb, or blower brush, or a can of filtered compressed gas. Commercial lens tissues are good for lint-free, dry cleaning of lenses and cameras. Tissues and lens cleaner should be used for wet cleaning, with cotton wool buds for cleaning in spots that are difficult to access. When cleaning the lens or filter, remove as much dust as possible with a soft brush and blower, then use lens cleaning fluid and tissues. *Never* apply lens cleaner directly to the lens, as it may leak through the casing. Instead, apply it to the lens tissue. Rub the dampened lens tissue in a spiral motion outwards from the centre of the lens.

Some basic precautions:

- Make certain that the equipment is operational a week or so before you leave, so that you will have time to fix any faults.
- Store all items in dustproof containers.
- While in the field, inspect and clean cameras and other equipment regularly.

CHOOSING THE RIGHT FILM

Black-and-white or colour prints are the usual choice for archaeological reports. Colour transparencies (slides) are also common as archival documents because they are more stable than prints. Black-and-white transparency film is rarely used in archaeology. The most stable colour print or slide film is Kodachrome, which is also relatively cheap and has good colour balance. Your choice of film will also be determined by what you're photographing and what you're trying to show. Colour slide film can only record a relatively narrow range of light, colour print film a slightly greater range, and black-and-white print film a greater range again (Howell and Blanc 1995: 20). This means that if you're trying to photograph artefacts outdoors, where high contrast between light and dark areas might be a problem, black-and-white film will be able to capture more detail in both the very dark and very light areas. Colour slide film, on the other hand, will probably increase the contrast and make your artefacts highly shadowed. If in doubt, use colour print film—ISO100 outdoors and ISO400 or 800 indoors.

Caring for film

- Always check the expiry date on the outside of the film carton. When you purchase film, make certain that it is not near the expiry date.
- In the field, store film in an esky, or wrapped in a wet towel, to keep it cool. Remember

to keep the film in an airtight container, so it doesn't become damp and remove it an hour or so before you plan to use it, so it is at room temperature when you load it into the camera.

- Load and remove film in the shade, or at least shield it from direct sunlight with your body.
- Never leave a loaded camera in the glove-box or boot of your car. The high air temperature in confined spaces such as these can damage the film's speed and colour.
- If the air is very humid, do not return exposed film to the canister. Keep it in an airtight bag with a few packets of silica gel to absorb any moisture.
- Have exposed film processed as soon as possible, so that if there have been major mistakes or problems you can fix them immediately.

SCALES AND INFORMATION BOARDS

All archaeological photographs for technical purposes should include a scale, irrespective of the subject being photographed. The purpose of a scale is to provide something of known dimensions against which the size of the object can be judged (Dorrell 1994: 51), so a clear and readable scale is essential. Ideally, you should have a variety of scales to suit any circumstance, but each one *must* have the unit of measurement clearly marked on it (e.g. millimetres, centimetres or metres) and, if possible, at least one—if not more—major length divisions (e.g. 10 centimetres, 15 centimetres, 50 centimetres, 1 metre). The standard scale for site photography is a 2 metre range pole, marked in 50 centimetre sections in alternating red and white. If you do not have this, you can make your own scale from a length of timber by simply painting the divisions in either red and white or black and white. The standard scale for object photography is 10 centimetres, marked in 1 centimetre sections in alternating black and white, though a range of smaller scales can be used for some laboratory shots. The International Federation of Rock Art Organisations* produces a free 10 centimetre colour scale for use in artefact recording. The advantage of this scale is that it also includes a colour reference strip which can be used to assess the degree of colour distortion resulting from lighting conditions or the development process.

The most important principle when using a scale is that it should not overwhelm, or detract attention from, the object. *Never* place a scale on top of an artefact, even if you feel that it does not obscure essential information. The scale should be placed to the right or left of the object or centred across the bottom or top of the picture. Because distortion is an inherent part of the photographic process, make sure you align the scale parallel to either the horizontal or vertical frame of the photo. This means making sure that the scale is not leaning at an angle or twisted so that it faces away from the camera. If you happen to be caught in a situation without a scale, then it is still essential to include some object in the photograph for the same purpose. A person (of average height) is acceptable for larger features or site photography; for small items or areas, use a relatively common and recognisable object such as a lens cap or pencil, but remember *always* to include a note of the length of the object in your field notes and figure captions.

An information board is also useful, as it provides a basic record of the photographic event which can be checked against other records. A small child's blackboard is not only effective as an information board, but is cheap and can be reused quickly and easily. Information boards should be marked with the location, date and roll number. If photographing an excavation, you should also include information on the unit, square, context or trench. Such photographs are not always attractive, so if your aim is to produce images for publication in articles or reports, it can be an idea to take two photographs: one with and one without the information board.

PHOTOGRAPHING STANDING STRUCTURES

The conventional approach to architectural photography requires a measure of technical skill and a camera or lens that can be adjusted to correct for converging vertical lines. At their best, these pictures convey the proportions, textures and colours of a building. When you are photographing the outside of a building, try to visit it at different times during the day, so that you can view it in different lights. Then choose the lighting angle that best shows the shape and texture of the materials. When photographing the inside of a building, use available light wherever possible, but if this is insufficient, try bouncing a flashlight from a ceiling or wall, or using a reflector.

To record perspective accurately, it is necessary to keep the back of the camera parallel with the subject. When you photograph a building from ground level, however, it is usually necessary to tilt the camera back a little so that you can include the top of the building in the frame. This means that the bottom of the building will seem larger than the top, and the sides will appear to converge. The easiest way to deal with this is to stand well back or use a telephoto lens so that you will not have to tilt the camera.

When photographing a standing structure:

- Always take orienting shots which show the building in its context, including the surrounding landscape and other buildings.
- Take external shots of the façade with a normal or telephoto lens, and then individual shots of the details on the façade.
- If you are taking many shots of the exterior or interior of a building, it is wise to note the direction and location of each shot on a photographic plan. Draw a sketch map of

the building or site and indicate the physical location of each shot tied to the exposure number and the approximate direction you were facing for each shot with an arrow.

PHOTOGRAPHING EXCAVATIONS

It is particularly important that you produce an accurate photographic recording of archaeological excavations. When photographing excavations, it is worthwhile taking two types of photographs: accurate recordings of the results of excavation and photographs that record the work in progress. In terms of recording the past, the important point is to make a complete record of the site before, during and after excavation. In more general terms, you need to think of the many purposes to which archaeological photographs can be put.

You should take each of the following:

- an establishing shot, taken with a wide-angle lens, that shows how the area to be excavated fits into its surroundings;
- a 'before' series of shots that records the excavation area before it is disturbed;
- overall shots of people in action. This can give a vivid impression of the excavation process;
- full-face portraits of people in action. Try to get candid shots of people performing routine activities, such as trowelling and sieving. The best technique here is to take lots of photographs. While people will be stiff at the beginning, after a while they will become less aware of you, and you will be able to get increasingly natural shots. Don't direct people too much. Let them be themselves, and try to capture this on film;
- shots of sponsors or visitors to the site, which may be used subsequently for publicity purposes;
- close-ups of special finds, which should be photographed *in situ*. Bear in mind depth of field and make certain that all of the object is in focus;
- close-ups of individual features as they are exposed;
- individual photographs of the spatial association between artefacts;
- individual photographs of the step-by-step excavation of a significant discovery;
- individual photographs of each context or unit once it has been excavated, recording the particular surface characteristics of each unit. These should include both vertical and horizontal faces (i.e. separate shots of the walls and floor of the trench). They should be taken after the walls have been straightened and the surface tidied and brushed clean (see 'Recording sections' on page 135);
- an 'after' series of shots which records the excavation area once work is complete, but before the site is backfilled.

When taking shots of successive levels in an excavation unit or trench, make sure that all shots are oriented in the same direction. In other words, if the first photograph of the excavation unit is taken facing north, then all subsequent shots documenting the excavation of that square must also be taken facing north, so that the complete series of photos can easily be compared. Obviously, if you are also taking individual shots of particular features within the unit, these can be taken from any angle. To avoid problems of distortion when photographing whole excavation units, you should try to keep the plane of the film (i.e. the back of the camera) parallel to the ground surface. This may mean elevating the photographer above the site so that the photograph can be taken looking down (see 'Taking aerial photographs' below).

Trouble shooting?

- If you have problems with shadows in deep trenches, try using a reflector or diffuser (or both) to make the light more even.
- If the stratigraphy is unclear, you can lightly spray the walls with water. This will darken the earth and can highlight differences in soil colour. In fact, at some sites differential drying is the best way to record important stratigraphic boundaries. If you do use spraying to enhance stratigraphic resolution, however, this should be recorded in your notes and on the photographic recording form.
- Take close-ups of any areas that are difficult to interpret, such as post holes, as you may want to revisit these problems later or rethink your previous assessments.

TAKING AERIAL PHOTOGRAPHS

The purpose of aerial photography is to obtain a bird's eye view of an archaeological site. This can give you quite a different view to that which you normally take. For example, if you are on the ground you may be able to see a large number of mounds, but it is only from above that it is possible to see the relationships between them. Aerial photography can be undertaken in two ways. Either the archaeologist has to find a way to place themselves above the site, or they have to find a way to elevate their camera. The elevation of the archaeologist can be achieved through the use of a light plane or a hot-air balloon. In some instances, low elevations may be all you need and it may be enough to climb a ladder, a tower, a tree or a rock outcrop. A cherry picker is another possible solution, although they can be quite expensive and are not always easily manoeuvrable on site. A higher viewpoint will enhance your ability to interpret the site in terms of its surrounding environment, as well as to make sense of the relationship between different parts of the site. In terms of site photography, elevating the photographer or the camera can be a solution to problems of distortion inherent in photographing large areas from ground level. Alternatively, the camera can be elevated independently through a variety of means, such as balloons and bipods.

PHOTOGRAPHING ROCK ART

Unlike rock paintings in Europe, rock art in Australia is usually found in rockshelters or outdoors on boulders. Normally, there is sufficient light to take good photographs. Photographs of rock art should be taken using an SLR camera, as digital images do not yet provide high enough resolution for high-quality publication and tracing. When photographing rock art, take each of the following:

- orienting shots, showing the immediate environmental context;
- a close-up of each motif, which can be used as the basis for tracing;
- wide-angle images, which show the motifs in relation to each other;
- close-ups of details, such as superimposition or areas of damage, which can be used in site interpretation.

Remember to keep the back of the camera (i.e. the plane of the film) in the same plane as the rock surface as much as possible to avoid distortion.

As opposed to rock paintings, rock engravings are often located at open sites and can be difficult to photograph. The best time to photograph a particular engraving site will depend on that site's orientation and location in the landscape, but as a general rule it is best to take photos in the early morning or late afternoon, when the sun is at an oblique angle and will reveal the engraved lines more clearly.

It is especially important to visit rock art sites at different times of the day to work out which is the best light for photography. Experiment with filters and diffusers to see whether they help bring out different features in the art. If the rock art is in an area of little sun, it may have to be photographed using artificial light. In this case, it is important to make certain that the light spreads evenly across the surface, so that you can record the greatest detail. Sometimes, it can be helpful to photograph rock engravings at night using an artificial light source held very close to the surface of the rock so that the light shines *across* the art surface rather than straight at it. You can also try holding a hand-held mirror close to the rock surface in daylight to redirect sunlight to the same effect. If you are trying this during the day, it is much more effective to shade the area you are trying to illuminate, so that the light cast from the mirror is not washed out by the brighter sunlight (Clegg 1983: 99). Using oblique light in this way highlights the relief on the surface and can be very helpful in providing detail for tracings. This technique can also be useful for recording other hard-to-interpret relief surfaces such as weathered gravestones.

Never use chalk, paint or any chemical to outline or emphasise rock art motifs, as this can cause permanent damage to the art surface. For the same reason, never remove graffiti, lichen or moss from the art surface so that you can see it better. Removing any such coverings is likely to cause unforeseen damage and you must have permission from the relevant state authority before you can clean up any archaeological site. If you cannot manage to bring out the best in the rock art through the use of filters, oblique light or other lighting conditions, then you will have to rely on tracing or drawing the rock art panels to show their detail (see 'Drawing rock art' on page 302).

PHOTOGRAPHING ARTEFACTS

Because artefact photography is designed to reveal technical details, it is very important that you can see all parts of the artefact clearly. Lighting will be crucial in the close-up photography of artefacts. If you are photographing something small like a coin or a stone artefact, mount it so that it is a centimetre or two above the background. This will allow you to focus on the object, while throwing the background out of focus. Plasticine or Blu-tack® is not ideal, as it may mark the material, but it will work.

Make sure that the background contrasts with the colour of the artefact so that the entire margin of the artefact is clear. A plain-coloured background is best: either black or a relatively neutral colour, such as the inside covers of this book. Try to avoid casting shadows, which can obscure the margins of the artefact, and try to ensure good, even light. Take the time to get it right, because you may never find that object again!

Tips for artefact photography

- The most important factor in taking a good artefact photograph is to ensure that you use the entire negative to frame the artefact. There is nothing worse than looking at a vast expanse of background with a tiny artefact in the centre. While you can crop photos later, if you are not focusing sufficiently closely on the artefact, your photograph will lack the detail necessary for a good archaeological photograph. If you are going to be taking lots of photographs of small artefacts (for example, stone artefacts), this may mean investing in a micro-lens to get the necessary close-ups.

- Glass artefacts are some of the most difficult artefacts to photograph well. When photographing flaked glass, try holding the artefact up to the light in order to reveal the detail of the worked edge.
- If you're photographing several artefacts in the one shot (e.g. an assemblage of bone buttons, or stone artefacts), arranging the artefacts in rows and grouping together artefacts of similar size usually works best.
- Choose the appropriate background for your photographs. This doesn't always have to be artificial (e.g. a background of pale sand can work as well as a piece of cloth or paper), but make sure that the colour of the background doesn't make it difficult to see the artefacts clearly.
- Always try to keep the plane of the film as close as possible to the horizontal or vertical to avoid distortion. When photographing artefacts, for example, you'll need to get directly above them to keep the camera horizontal.
- The most important factor when using a person for a scale (e.g. in site/context photographs) is to make sure they do not look artificially posed. A photograph of them casually examining the site, or a detail of the site, will look more natural than a photograph of them standing to attention.
- When photographing underwater, remember that the deeper you dive, the less light there will be to take good photographs. You will also lose different wavelengths of light at different depths, which will give a colour cast to your photographs.
- Also remember that objects underwater will actually be one-third further away than they appear.

KEEPING PHOTOGRAPHIC RECORDS

Given the enormous cost of getting into the field, it is absolutely essential that you make certain the information relating to your photographs is not lost. Some form of record keeping in the field is essential if the images are to remain meaningful for archaeological purposes. Precise information on when, where and why a photograph was taken can be permanently lost if photographs are not securely correlated to good records.

- Number each roll of each type of film in sequence (colour slide film 1-X, black-and-white 1-X, and so on). When you take the first shot on each roll, make certain that it includes either an information board or a piece of paper with the roll number, date and location. This means that at least one frame within each roll will have basic identifying information. This can be especially important if the photographic recording sheets are ever lost, not filled in, misplaced or filed separately from the images.

- Basic information, such as date, time, location, subject, frame number and roll number should always be included on a photographic recording form (Appendix 1), which should also include specific remarks. It is also a good idea to carry a small notebook and jot down basic information, or record this in your field diary.
- *Never* succumb to the temptation to write up your photographic records later. Record the information after each photograph is taken, and update remarks and general information throughout the day. While it can be tempting to wait until evening, by then the nuances will be lost, and if you put it off until morning or for a few days, you can easily omit important details.
- If several sites are involved, you should record the photography on a site-by-site basis, making especially certain to enter information on the first frame used on a new site on the recording form.
- Another way of protecting information is to take photographs using a Polaroid camera. When setting up to take a series of photographs, take a couple of Polaroid images first and mount them directly into your field notebook. Record the roll and frame numbers alongside the appropriate Polaroid print. If other records get lost or misplaced, you can locate where the main prints were taken by comparing them to the Polaroid scenes in your field notebook. Note that Polaroid prints are unstable and will become darker with time. For this reason, they are not suitable for archival purposes.

THE BASICS OF FIELD ILLUSTRATION

Just as a 'good' archaeological photograph has a particular role to fulfil, so too a 'good' archaeological illustration is not the same as the artistic representation of an object. The general aim of all archaeological illustration is to produce an objective drawing that can be used for the purposes of comparison (Drewett 1999: 177). For this reason, all archaeological drawings must be carefully measured and are designed to reveal technical information of use to archaeological analysis. Good-quality illustrations are an important part of archaeological recordings. Journal articles and archaeological reports will include a range of illustrations, such as maps, site plans, section drawings, illustrations of artefacts and, in some cases, imaginative reconstructions of past lifeways. The quality of illustrations can make an enormous difference to the final publication. If all else fails, and you do not draw particularly well yourself, it can be worthwhile paying someone else to produce good illustrations for you.

The essential equipment for any good field illustration is graph paper, a sharp pencil, a scale ruler and a good eraser. You can either draw your illustrations directly on to graph paper, or draw them on to translucent drawing film (such as Permatrace) or tracing paper held down with sticky tape over graph paper. You can buy drawing film from any art supply shop.

The archaeological illustration process has two parts: the initial in-the-field pencil drawing of the plan, section (see Chapter 4: Site surveying) or artefact, and the final inked version for publication. The final inked part of the process is not so much part of the fieldwork, but something which is done later in the lab. It is essential for publication, however, and so has been included here as part of the general process (see also Chapter 10: Getting your results out there). There are also many computer programs which can be used to produce high-quality professional illustrations from your initial pencil drawings.

FIGURE 9.7: Many archaeologists use a drawing board when in the field made from a light sheet of masonite or plywood holding a fixed sheet of laminated A3 sized graph paper. You can then easily tape drawing film or tracing paper directly over the laminated graph paper.

An inked drawing is essentially a tracing of your pencilled original. It must be done on high-quality translucent drawing film or high-quality tracing paper (make sure you avoid cheap and nasty 'lunch-wrap'-style tracing paper). When inking drawings, you should use high-quality technical pens (such as Rotring Isograph or Castell Rapidograph pens which come in a range of point sizes) filled with good-quality ink. Don't try to draw inked illustrations directly on to paper, because the fibres in the paper will cause the ink to bleed and make the illustration messy. Because you cannot simply rub mistakes out when you are using ink, however, you need to exercise care. Remember that, because you are simply making a copy of the original pencil master drawing, you can make as many copies as you like and keep practising until you get it right. On good-quality drawing film, you will have to use a scalpel to scrape off any mistakes. The blade must be very sharp, however, and it is not something you can do too often as eventually it will permanently damage the surface of the drawing film. When removing mistakes by scalpel, hold the blade parallel to the surface and remove the ink with a firm, smooth sweep, using as few passes as possible. Be careful not to let the point of the scalpel gouge the surface or to let the blade start and stop jerkily, as this will create cavities in the drawing film which will make the ink bleed or pool and mess up your drawing.

DRAWING HORIZONTAL SURFACES (PLANS)

The drawn record of any piece of archaeological fieldwork will consist mainly of measured drawings of surfaces: either horizontal (plans) or vertical (sections) (Drewett 1999: 130). Site plans are one of the most common types of archaeological illustration. Because it is usually impractical to photograph a site from the air, a plan is often the only way to document and convey spatial information about a site quickly and easily. Plan drawing uses the measurements taken from a baseline and offset or compass and pacing survey (see Chapter 4: Site surveying) and converts these to a suitable scale to fit on to a sheet of graph or drawing paper.

Because sites are rarely if ever drawn at a scale of 1:1, the first and most important thing to consider when drawing a plan is the most appropriate scale (Table 9.2, on page 287 see also Table 2.1 on page 34). Obviously the drawing can't be so large that it won't fit on to the paper, but by the same token, there is no point drawing it so small that you can't see any of the details.

How to draw a plan in the field

- Decide on the most appropriate scale *before you begin*. There is nothing more frustrating than getting halfway through a plan before you find out that part of the site literally will not fit. To work out the scale, find out the longest measurement that you will be required to plot and work out a scale that will fit this on to the drawing. Obviously if you can fit the longest measurement, then everything else will fit too.
- Work out roughly where this measurement will be located on your drawing to ensure that you can fit the other elements of the site around it (i.e. if the longest measurement is running through the middle of the site, there is no point placing this on one edge of the drawing).
- Mark the baseline or the edges of the planning frame *lightly* on to the drawing, and indicate the measurement gradations.
- Work out where north is with a compass and convert this to a north arrow on your plan using a protractor. To do this, first take a compass bearing along your baseline (see 'Using a compass' in Chapter 2 on page 47). Then orient your protractor over the drawn version of the baseline from the same point so that it faces the same direction.

TABLE 9.2: The relationship between scale and the level of detail which you can reasonably expect to include on a site plan. For any objects smaller than specified, you could indicate their location with a dot, but would not be able to include any details of their shape or form.

Scale	Means	Main uses	Level of detail
1:1	Life size	Only for small artefacts, or examples of decoration on artefacts	Excellent, can include everything.
1:10	10 cm on the ground = 1 cm on the plan	Sections and elevations, skeletons and small complex deposits	Expect to draw every object above 1 cm in length (which will be 1 mm on the plan)
1:20	20 cm on the ground = 1 cm on the plan	Feature plans	Expect to draw every object above 2 cm in length (1 mm on the plan)
1:50	50 cm on the ground = 1 cm on the plan	Site plans, large simple sections and elevations	Expect to draw every object above 5 cm in length (1 mm on the plan)
1:100	1 m on the ground = 1 cm on the plan	Simple site plans only, sketch plans	Expect to draw every object above 10 cm in length (1 mm on the plan)
1:250	2.5 m on the ground = 1 cm on the plan	Larger sites or sketch plans of sites	Expect to draw every object above 25 cm in length (1 mm on the plan)
1:500	5 m on the ground = 1 cm on the plan	Large, complex sites	Expect to draw every object above 50 cm in length (1 mm on the plan)

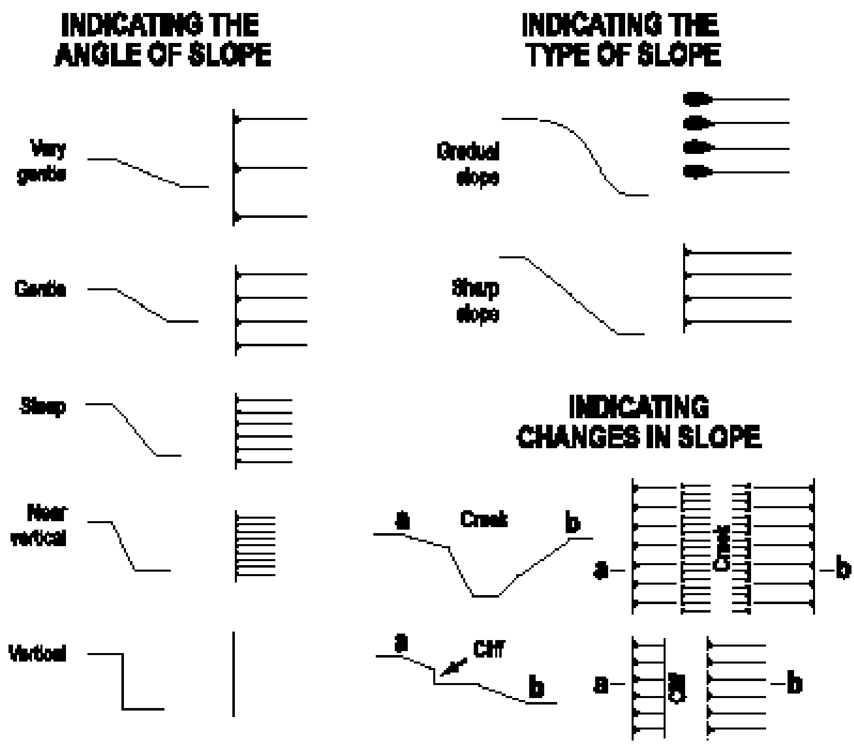
If you took a compass reading of 90° from the southern end of the baseline, for example, you would position the centre of your protractor over the southern point of the drawn baseline so that the 90° mark lined up with the baseline. From this, you would mark the direction of north (0°) at the edge of the protractor and then draw a short solid line capped with an arrow to represent north. While it is the convention for all plans and maps to be oriented with north to the top of the page, because you will have established your baseline according to where it is most useful to record archaeological information, you probably will not have the luxury of being able to automatically place north at the top of your field plan. In this case, don't worry. When you eventually come to draw the final inked version of your plan, you can simply redraw it in a new orientation so that north will face the top of the page.

- Use the same method to convert any directional bearings from a compass which you make during the course of the plan to directions in degrees on your plan.

- Draw in the larger, dominant features first. This will help you to position the smaller features around them and may save you time if you are running short at the end. If all else fails, as long as you have the dominant site features accurately plotted, then you can always draw in the lesser features by eye.
- Clearly label the drawing with the site name, trench or square designation (if you are drawing a plan of an excavation), your name, the names of any people who have measured for you and the date.
- Always draw the scale of the plan as a linear (bar) scale, rather than just noting down the scale ratio (1:10, 1:100, etc.) and make sure that you note what units of measurement the scale refers to. If the scale is in centimetres, mark it with a 'cm', if in metres mark it with an 'm' and so on. There is absolutely no point in drawing a beautiful, accurate scale if nobody knows what units it represents.
- If you are drawing a very large or extensive site, it may not be possible to fit the entire area on to a single plan and still preserve the detail. In this case, you may need to break the site down into discrete parts which can be drawn separately, but you will also need to draw an overall plan of the site showing each part in relation to the others. If your plan is running across two or more sheets of paper, make sure that you note how they fit together and that you write this on *both* sheets. One way to do this is to make sure that the adjoining parts contain the matching halves of a single symbol (such as a circle, square or solid line) so that you can literally put the two halves back together again. Another way is to number the sheets and mark the adjoining edges 'Plan 1 adjoins Plan 2' and so on. If you adopt this latter method, make sure that someone else will know precisely *where* they join up: there is no point noting which plan joins which, if there is no other indication of which edges actually join.
- When you come to draw the final inked version of the plan, always remember to include the scale and your north arrow marked with the letter 'N'.

There are various conventions for drawing slopes. A plan makes the distance between any two points appear horizontal, as if both were at the same level. In reality, of course, your site may include various kinds of slopes, which need to be indicated on your plan. This will help you to convey an idea of the contours of the ground, and will be essential if the site you are recording consists of hummocky relief (i.e. mounds and hollows), or if there are distinct changes of slope which are an essential part of the arrangement of the site (such as mine-processing plants, which were commonly built down the slope of a hill to take advantage of gravity to move materials between different stages of the process). You indicate slope by using **hachures**, or short lines which indicate the top of the slope with an arrow and the length of the slope with a line (see Figure 9.8 on page 289).

FIGURE 9.8: Coventions for illustrating slope



DRAWING VERTICAL SURFACES (SECTIONS)

A section is simply the drawing of a vertical, rather than a horizontal surface, but employs all of the same basic techniques. You can apply these techniques to any vertical surface, whether the side of an excavated trench or the wall of a standing structure.

When drawing vertical surfaces:

- Set up a horizontal baseline (datum) across a suitable part of the section—either at the top if it is a small section, or halfway down if it is a large section. To do this, first set out the datum using a piece of string secured firmly to two nails. These can be inserted into the corners of the section if you are drawing a trench profile, or into cracks in the masonry if you are drawing a wall. Use a line level to make sure that the string is horizontal. Once you have established this, fix a tape measure to the string baseline with clothes pegs.

- Draw the datum line *lightly* on to your graph paper or drafting film as a horizontal line parallel to the top of the drafting sheet and mark the gradations of the tape measure on to it. Remember to place this appropriately on your page (i.e. at the top if your baseline is at the top, in the middle if your baseline is in the middle and so forth).
- Begin by drawing the gross elements, such as the limits of the section or wall, the level of the topsoil and the base of the trench by taking offset measurements above and below the datum line.
- Once you have established the boundaries of the drawing, begin on the details, such as the layer boundaries and features. If you are drawing an excavation trench, you may have to go back and forth between your drawing and the trench notes and recording forms to make sure that you have all the layers.
- Remember that it is ok to draw in some smaller features by eye, or to fill in some details by eye, and as you gain experience this will become much easier to do.
- If you are drawing a trench profile, make sure that you label each excavated context which appears in the section with its correct context number (usually represented according to the Harris matrix system by the number inside a square (see 'Interpreting stratigraphy' on page 136).
- If the four sections of a trench are to be drawn on the one sheet, then draw them in the order of north, south, east and west.
- Clearly label your drawing with the site name, trench number and profile description if appropriate, date, scale, your name and the name of anyone who has taken measurements for you.

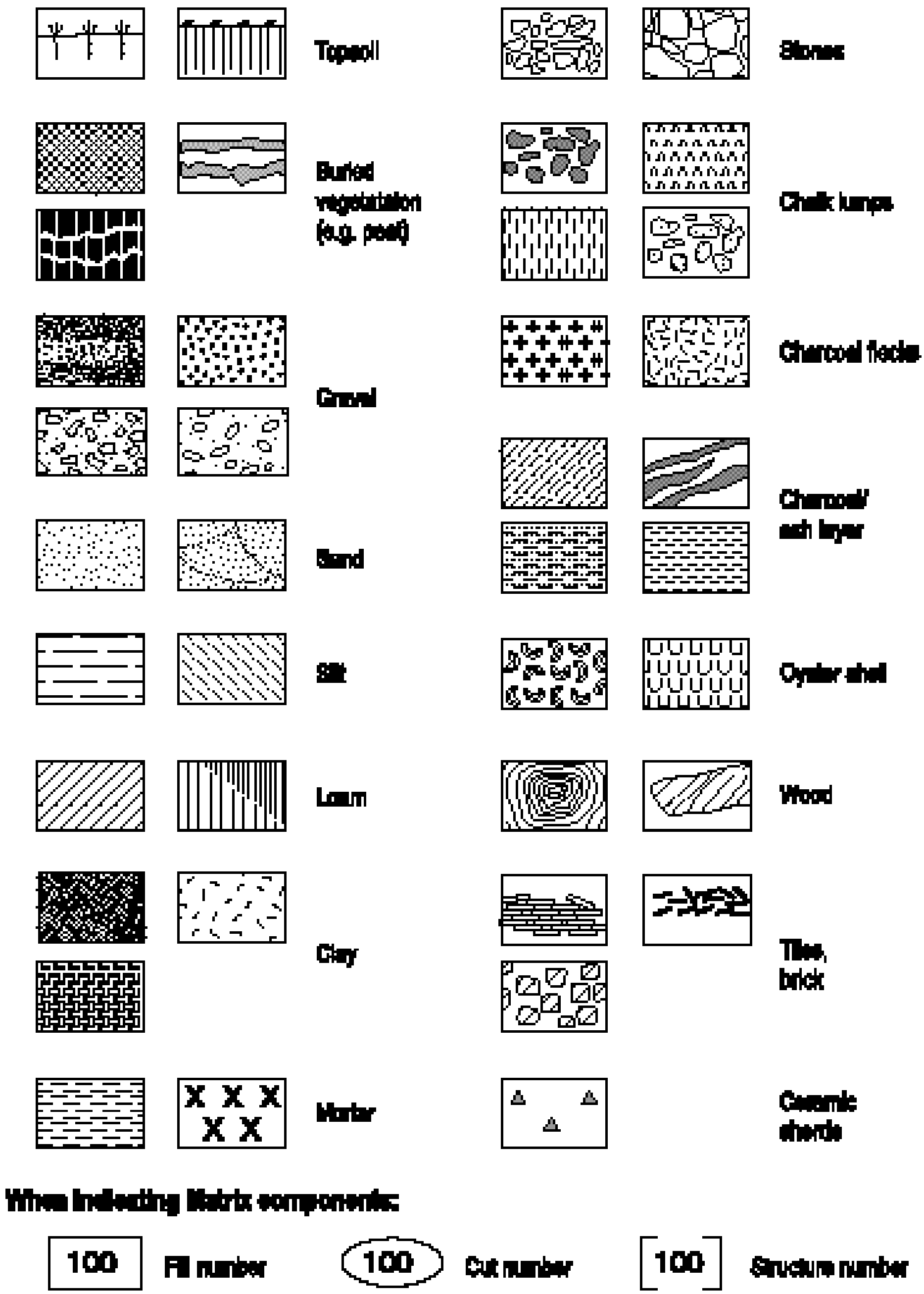
If you are excavating a large and complex site, you can secure an aluminium tag clearly showing the unit number to the trench section as the surface of each new unit is identified. This will help you later when drawing up the sections.

While there are standard systems of symbols to use in drawing sections and plans, it is difficult to achieve a uniform system because sites and their contents vary so widely (Adkins and Adkins 1989: 74) (see Figure 9.9 on page 291).

DRAWING ARTEFACTS

Measured drawings of individual artefacts are time consuming and usually only done for publication. The drawing of any artefact is not simply a mechanical process, but requires some interpretation and selection (Drewett 1999: 177). First, carefully examine the object

FIGURE 9.9: Conventions for drawing archaeological sections



and decide which aspects are most important to convey. The size and shape of the object will always be important, but what about its material? Evidence for how it was made? Different surface finishes, or areas of damage? What will need emphasising in the final drawing? It is also important to consider how you will convey the three-dimensional nature of the object on a two-dimensional surface: which side or aspect is the most important to draw? This will determine what will be regarded as the 'front' or the 'back' of the object, and therefore what is also drawn as the side, top or basal view. All good artefact drawings will not only be technically correct and convey the relevant technical information, but also be pleasing to the eye.

The basic process to be followed is similar for all kinds of artefacts. Unlike plans, it is far easier to draw an object at a scale of 1:1 (i.e. actual size), rather than to try to reduce or enlarge it. If an object is particularly large or small, however, the drawing may need to be reduced or enlarged as appropriate, simply for ease of working. There are four main stages in drawing most artefacts:

- drawing the outline;
- drawing the details;
- drawing a side view;
- drawing a cross-section.

Some more complex artefacts may require more views than this (such as a top, base or back view for instance)—use your own judgment as to which will convey the most useful information, or look at published drawings of similar artefacts as a guide.

If you are drawing more than one artefact, you will also have to give some thought to the placement of artefacts together on a page:

- Set your drawings in horizontal rows to the extent allowed by their shape and size.
- Don't be tempted to rotate the artefacts to fit them in, however. Always keep them in their correct conventional positions.
- Put the smallest, lightest-looking artefacts at the top of the layout, and the darkest, heaviest ones at the bottom (Addington 1986: 68).
- Try to keep all the specimens of one artefact type together in a series. Do not randomly mix your drawings in complete disregard of their classifications (Addington 1986: 69).
- If you are numbering each artefact, put the numbers in the same relative position beside each artefact and make sure that the numbers or letters are arranged in a logical order (i.e. running from left to right and top to bottom).
- Make the numbering or lettering as unobtrusive as possible.
- Consider placing a border around the drawings to visually draw them together.

Drawing the outline

To draw whole objects, place the object flat on a piece of graph paper (it can be held in place with Blu-tack® or small wooden blocks if necessary). If you are drawing a small artefact, you may be able to trace directly around it using a sharp, long-pointed lead pencil. If you can't trace directly around it, use the pencil to project points around the edge of the artefact which can be joined to give the outline (see Figure 9.10 on page 294). If you are drawing a large artefact, use a set square to project points in the same fashion around the edge of the object on to the paper. If the object is regular in shape, you can probably get away with relatively few points, but if it is irregular you will need to draw as many as are necessary (generally, wherever there is a major change in angle/shape) to indicate its precise outline (Figure 9.10 on page 294). Remember to keep the pencil or set square vertical while you are doing this, otherwise you will distort the shape of the object.

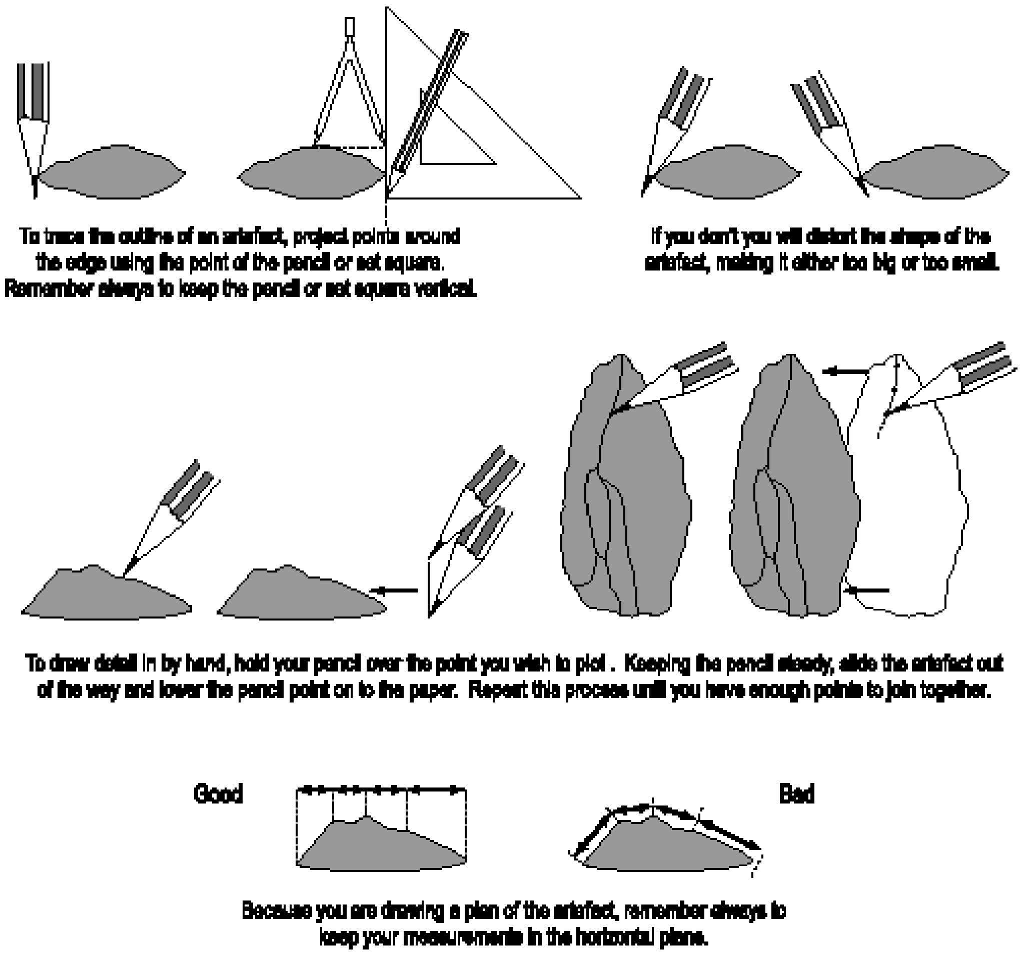
Now place the artefact to one side of the outline and compare them critically by eye. You will no doubt see several anomalies in the outline which have dropped out or become 'softened' through the tracing process (indentations will be smaller than they ought to be, and bumps bigger). Correct the outline to define the details of the edge more sharply. If necessary, check your measurements with callipers to ensure that your outline is accurate. Remember that you are drawing a plan of the artefact, therefore make sure that all of your measurements are kept in a horizontal plane (Figure 9.10 on page 294). If you are drawing a stone artefact, make the lines of the outline angular rather than rounded, because this will emphasise details rather than obscure them (Mumford 1983:161).

Drawing the details

Once you have a measured outline, you can begin on the detail. You can plot in details of the surface of an artefact by hand (Figure 9.10 on page 294), or by measuring the artefact with callipers. If you are doing it by hand, place the artefact over its drawn outline and hold your pencil over the point you wish to plot. Keeping the pencil steady, slide the artefact away, then simply lower the pencil point on to the paper immediately below. You can repeat this process until you have enough points on the paper to draw the feature in fully.

This will give you a complete 'skeleton' of the artefact: its edge and all its features in outline. Sometimes this is all that you will need to show the artefact clearly and indicate its main features (Figure 9.11 on page 295). If you think your artefact requires more interpretation, you can do this by adding shading to make it three-dimensional. Shading can be added as stippling (small dots which increase in frequency in darker, more shaded areas), or cross-hatching (diagonal lines which increase in frequency in darker, more shaded areas). If you are at all hesitant about adding shading, then don't attempt it—it takes as much effort to do it badly as to do it well and it is not always vital to the understanding of the object (Mumford 1983: 166) (for more tips on shading, see 'Golden rules for drawing' on page 297).

FIGURE 9.10: Measuring the outline and details of an artefact for illustration (after Griffiths et al. 1990: 96; Mumford 1983:161)

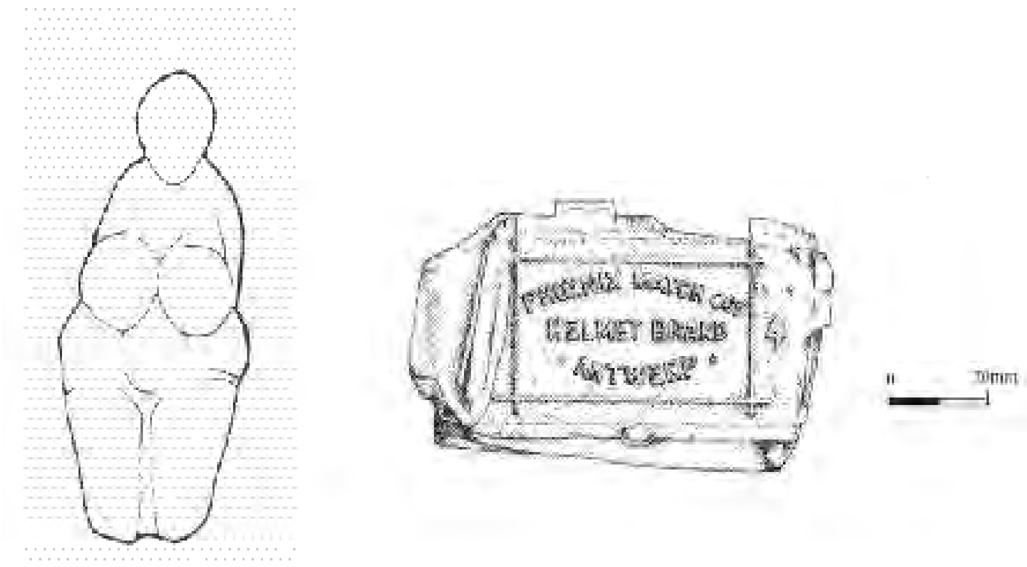


Drawing a side view and cross-section

A side view is drawn by rotating the object through 90° from the surface or 'front' view. Always place a side view parallel and to one side of the front view—it doesn't really matter which, although the convention is to place it to the right.

Many object drawings also require a cross-section to show the thickness or shape of the artefact. This is not a substitute for a side view. For ceramic vessels, a cross-section will be a half-profile divided down the long axis of the pot; for stone artefacts, it will be

FIGURE 9.11: Shading is not always essential to an understanding of an artefact, but can be used to add three-dimensional form



a cross-section through the middle, or most informative section of the artefact. When measuring the thickness of an artefact for a cross-section, make sure to measure it at as many points as are necessary to convey the object's precise form (because its thickness may not always be constant).

Whenever you draw a cross-section, make sure you indicate the line of the section (i.e. the place on the object which the section passes through) with a short line on either side of the object in the appropriate spot. Make sure the cross-section is always placed parallel to the axis of these lines and to one side of the front (surface) view. In Britain and Australia, the convention is to place this on the left-hand side, in the United States it is to place it on the right. Either way, the cross-section should either be coloured in solid black (if it is a cross-section of a pottery vessel), or cross-hatched (if it is a stone artefact).

Reduction

Very few finished drawings of artefacts will be reproduced at life size. Drawings are reduced for many reasons, most of them economic (some artefacts are simply too large to fit on a page and many will often need to be included on the same page). This means that the scale and level of detail you choose for drawing an artefact is very important. Bear in mind that reduction will affect every aspect of your drawing: every line will be reduced in thickness, the white space will be reduced in area, any shading, stippling or cross-hatching you have used will be closer together. This will be particularly important if your drawing is going to be reduced to one-third or one-quarter of its size for publication: if you think of how your drawing will look even when only reduced to half its size, how much of the decoration or fine detail will still be visible? When it comes to making decisions as an illustrator, one of the most important things to think about is the final scale of the published drawing: large artefacts are usually drawn at a scale of 1:1, but then reduced to 1:3, or 1:4 in the final publication; while small artefacts are usually drawn at a scale of 2:1 so that they can be reduced to life size in the final publication.

> The positive side of the reduction process is that it can actually make your drawing look better because it reduces any flaws. If you want to get an idea of how reduction will affect your drawing, try reducing it on the photocopier to see how it will look.

When preparing an illustration for publication:

- Draw lines which will be thick enough to reduce without disappearing. The thinnest line which can be printed confidently is 0.1 millimetre, any less than this and the line will break up (Griffiths et al. 1990: 8). Your lines will therefore have to be proportionally thicker than this: for those that will be reduced to one-quarter of their size, the safest thin line would need to be 0.4 millimetres thick, for example; for drawings which will be reduced to half their size, the safest thin line would need to be 0.2 millimetres thick, and so on.
- When shading or cross-hatching, make sure the lines are not so close together that they will simply appear black in the published drawing.
- If you are using different shades of grey for infill, make sure that reducing the drawing will not simply make them all look the same. In general, go for readily distinguishable and separable shadings (e.g. white, 50 per cent black or 100 per cent black) and not minute variations in between.
- Think about the size of your lettering or numbering, including the size of your scale, and how this will look when reduced. For scales, it is best to stick to simple and easily legible black-and-white bar scales with lettering that is large enough to still remain legible after the reduction process.
- Bear in mind that the white space is just as important as the black lines when it comes to the reduction process This will apply particularly to the spacing between text labels and the objects you are labelling. Make sure that you don't place the text too close to the object, because the reduction process will reduce this spacing even more.

Golden rules for drawing

- Keep your pencil sharp.
- Try not to use a hard lead pencil (H series) as this will leave an indelible mark on the paper or drawing film, which will remain even if you rub the pencil itself out. HB or B series pencils are softer and can be rubbed out completely.
- Never give only a written description of a scale (e.g. 'Drawn at 1:1'), as the size at which an illustration will be published is unlikely to be the same as the original (Mumford 1983: 168). Always include a simple bar or linear scale.
- Always include your name as the illustrator, and the names of any others who have taken measurements for you, as well as the date and the name of the site or other title.
- If you are drawing a plan, always include a north arrow.
- Use conventional symbols wherever possible.
- Use a heavy grade of tracing paper, as lighter grades crinkle too easily and absorb moisture from your hands.
- If you decide to use drawing paper, choose one that has a smooth surface, as a textured surface will break up the lines of ink, making copying difficult.
- Never use felt-tip pens, magic markers ('textas'), fountain pens or ballpoints to make final illustrations.

For artefacts

- Always draw an artefact as if the light is coming from the top left-hand corner. This means that shading will be to the right and on the lower right-hand sections of the artefact. If you are unable to arrange lighting from the left-hand corner, use your imagination to guide your shading.
- The main component is the front or surface view (remembering that 'front' will be arbitrary in some cases).
- Always use a consistent orientation, and make sure the vertical axis of the object is always kept parallel to the vertical axis of the page.
- Other standard components for most artefact drawings are a side view and a cross-section. Some very complex artefacts may require a view of the top and bottom of the artefact as well.
- Draw views of the top or the bottom of the artefact above or below the object respectively.
- Side or back views should be drawn to the right of the front view.

For stippling

- When stippling, hold your pen upright to produce a discrete dot rather than a small comet. If the drawing is used in a publication, it will be reduced and stippling can easily become a black blob. Start with an overall light covering and work from lighter (less dense) to darker (more dense) areas.

- Remember that the dots should be randomly placed and not ordered in rows or lines (this is harder to do than you might think). They should be evenly spaced and their density should increase gradually (Mumford 1983: 167).
- If the surface of the artefact is smooth and uniform, keep the dotting fine and uniform, with only gradual changes in tone.
- If the surface is rough and coarse, stipple with more vigour in some areas according to the character of the surface features (Addington 1986: 18–19).
- When stippling, remember that variation in the amount of white space between dots can give an impression of an undulating surface.
- Add the dots for the more heavily shaded areas last. Try to fade these areas gently into each other, unless you are trying to indicate a change of plane. Bear in mind that the densest parts should be on the right-hand side, if the light is coming from the upper left-hand corner.

For cross-hatching

- Cross-hatching should be at the same spacing as the line shading and generally should be at right angles to the lighter tones.
- On curved surfaces, hatching should follow the curves, either round the edges or radiating down curved surfaces.
- If you need a particularly dark shadow, add a third level of diagonal hatching across the cross-hatching (Griffiths et al. 1990: 31). Avoid the temptation to add a fourth level of hatching, as it will simply appear solid black.
- It is always easier to add extra lines, cross-hatching, dots or stippling than to take them away from too crowded a drawing. If you are unsure, it is better to do less rather than more.

DRAWING STONE ARTEFACTS

Stone artefacts are probably one of the most difficult things to draw, simply because they come in a wide variety of raw materials and sometimes show extremely detailed evidence of working. One of the main conventions to follow is to use different drawing techniques to represent the different kinds of raw materials: stippling for coarse-grained material such as sandstone, commonly used in grinding implements, and hatching for smooth, fine-grained materials such as obsidian, chert or flint.

To draw a stone artefact, follow the usual basic sequence: outline, details, side view, cross-section. There are some specific conventions to follow, however:

- When drawing the outline, remember that pencil lead will leave a residue on the artefact. If you are intending to analyse residues, use only a set square to project the outline and don't trace around the artefact with the pencil.
- Draw the outline of the artefact first, followed by internal features such as scars and ridges.
- Draw the positive features of the ventral surface, such as ring cracks, eraillure scars and undulations.
- The position of the flake scars can be measured with dividers or callipers. Remember that you are drawing a plan of the artefact, so all measurements need to be taken from a horizontal plane (see Figure 9.10 on page 294).
- Do not leave flake scars or retouched edges incomplete. If you can not decide where each starts and ends, either dot it in, or do not show it at all.
- If the outlines of the flake scars and other details have been precisely drawn, then the direction of flaking will be self-evident (Mumford 1983: 165). You *can* draw curved lines within each flake scar to indicate the direction from which flakes were struck for both positive and negative scars, if you wish, but this is not generally recommended unless you are sure you can do it well. If you are not confident that you can, then leave it out.
- Indicate the point of force application with a small arrow outside the drawing.
- Cross-sections are used to show the form and thickness of an artefact. When drawn, they should be parallel to the axis on which they were taken. Draw two identifying marks outside the artefact plan to show the line of this axis.
- If drawing cross-sections of several flakes, make sure all cross-hatching lies in the same direction.
- If you are in any doubt about how much detail to include, understate rather than overstate. An artefact is much easier to interpret if it is simply and clearly drawn.

TABLE 9.3: Conventions for drawing stone artefacts

Feature	Convention
Cortex	Stippling
Polished or ground artefacts	Stippling
Flaked stone artefacts	Lines or cross-hatching
Use polish	Stippling
Gum	Black, or stippling
Cross-sections	Blank, or filled with cross-hatching
Part of the artefact broken or missing	Short dashed lines indicating how the missing piece must have continued the outline

Alice Gorman's tips for stone artefact illustration

For the pencil drawing

- Although it is not generally recommended, it is possible to make a pencil drawing from a photocopy of the artefact. This is particularly useful when you have limited access to the artefact, such as when you are working in a museum, or when you are dealing with use-wear and residue analysis, as it greatly reduces the amount of handling of the artefact. Photocopy both the ventral and dorsal surfaces and label these clearly. Then copy the outline on to tracing paper, referring constantly to the artefact, and checking the measurements.
- If you want to enlarge a drawing, this is easily done with a photocopier.
- Remember a bar scale is essential if you, or the printer, is going to enlarge or reduce the drawing. This will remove all doubt about an artefact's size, but only if you label it (e.g. in centimetres or millimetres).
- Begin with the outline and finish with the fine details.
- Keep the pencil drawing as a master copy. If the ink version does not work out, you can easily begin again

For the ink drawing

- Wash your hands before you begin to prevent grease from your fingers being transferred to the drawing film. If you are attempting the final inked version of a drawing, this will be essential because the grease from your fingers will prevent the ink from taking.
- Keep a clean sheet of paper handy on which to rest your hand as you are working to cut down on dirt, grease or smudging.
- If you are right-handed, work down and towards your right so that the movement of your hand does not smudge the ink.
- Keep your wrist straight. Draw lines by moving your whole arm rather than your wrist. It is very hard to keep your hand perfectly steady just using wrist movement.
- Hold the pen as upright as possible. This ensures a more even line.
- Don't exert too much downward pressure on the pen, as you can easily break or bend the nib.
- Always use at least two pen widths: a thicker line (such as 0.35 or 0.5) for the outline, and a thinner line (such as 0.25 or 0.35) for internal lines and detail. This is part of conveying the three-dimensional feel of the artefact: if you draw it with all lines of the same thickness it will look flat and uninteresting.
- Make sure all the lines meet exactly. Even the tiniest bit of overhang can make a drawing look untidy, as can lines that do not quite meet. If necessary, when you are drawing the final inked version, remove any overhanging bits with a scalpel, and thin down any lines that are too thick.

- When removing ink with the scalpel, scrape only in one direction, as this will cause less damage to the drawing film. If you have to draw over the area you have just removed, the ink may run if you have damaged the surface. However, a light burnishing can help restore it partially.
- When stippling (e.g. to represent cortex), be aware that your drawing may be reduced, which can make the stipples look like untidy blobs.
- Good drawing skills require practice. Don't be too disappointed with your first attempts. It is worth putting in the time, however, as drawing is an employable skill and it fine-hones your observation skills for artefact analysis.

DRAWING CERAMICS

Just as there are conventions for drawing stone artefacts, there are also conventions for drawing ceramic vessels. The point of most ceramic drawings is to give an impression of the overall shape and size of the vessel, even if only fragments are available for drawing. If you are drawing a whole pot, the convention is to draw it as though it was standing upright but had been cut in two, with one half of the drawing showing the external surface of the vessel, and the other half depicting the section and interior. The two halves of the vessel are demarcated by a solid vertical line. In a similar way to the process followed when drawing stone artefacts, to capture the shape of a ceramic vessel lie it down upon the drawing paper and use a set square to project points around the vessel down on to the paper and simply join these dots. When drawing the section, don't assume that the thickness will be even. Use callipers to measure the thickness of the wall of the vessel at various points.

If you are drawing ceramic fragments, the focus is usually on rim or base sherds, rather than body fragments, unless the body fragments have particularly interesting or diagnostic decoration. If you are drawing fragments of a larger artefact, they should generally be drawn in their correct relationship to the whole object. In other words, if you are drawing a pot, then rim fragments should be drawn in their correct location at the rim, base sherds at the base, and so on. If you do find yourself drawing body sherds, then you will have to make your best guess as to where they fit in relation to the original curvature of the complete vessel.

To estimate the original curvature of a vessel from a rim or base sherd only, use a rim chart such as the one provided in Appendix 2. Hold the sherd upright with its rim or base flat on the chart so that all parts of the rim or base are touching the surface at the same time. Line up one end of the sherd with the 0 per cent line on the rim chart and slide it slowly along the line until you find the concentric ring which best fits the curvature of the sherd. This is your estimate of the original diameter of the vessel. The radiating line closest to the end of the sherd will give you an estimate of the proportion of the vessel's rim or base that the sherd represents.

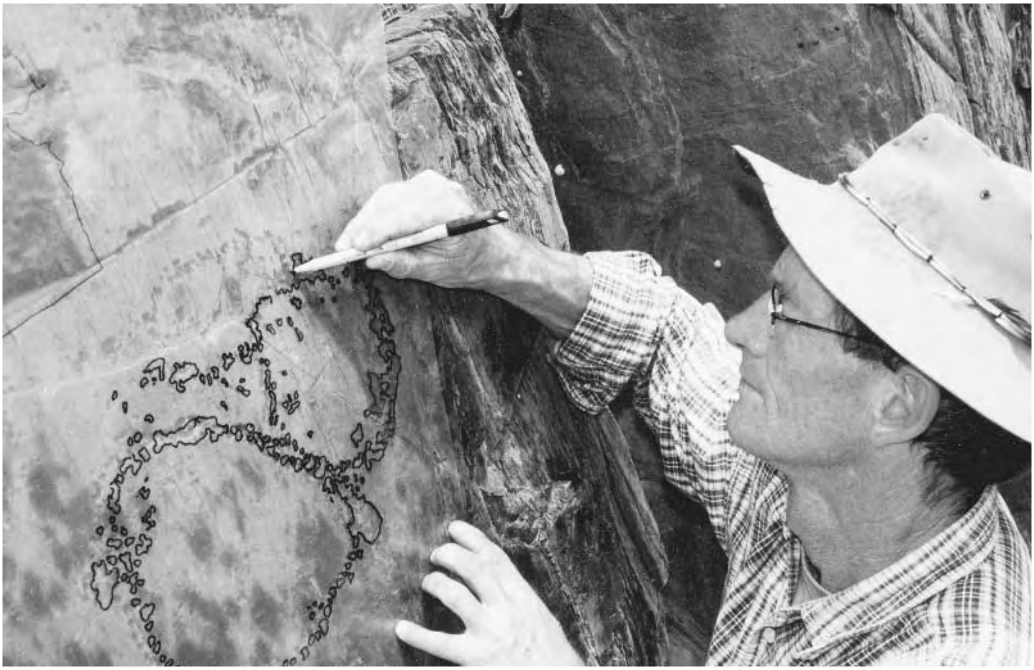
DRAWING ROCK ART

Drawing is a particularly important way of recording rock art. First, sketching a rock art panel in the field makes you focus closely on the motifs, working out what is really there and which motifs overlap. Many rock art panels contain an apparently bewildering variety of motifs drawn around, on top of or through each other, and are often confused further by natural striations or planes in the rock itself. A photograph of this alone would be unlikely to help you sort out what was and wasn't art, and may result in you confusing or not recognising a certain proportion of the motifs. The analysis involved in drawing each part of the panel by hand, which often seems impossible to begin with, will actually force you to sort out each motif and give you an understanding of how the whole panel works together. Second, the time spent drawing motifs at a rock art site means that you have a greater opportunity to get a 'feel' for the site, so that you don't just dash in, take a photo or two and dash out. This time spent at the site will give you a better understanding of how the art operated in its local environment.

Drawing is essential for establishing patterns of **superimposition** (where one motif covers another), which is the major non-destructive way of dating rock art. Sometimes, however, what appears to be overlap is actually the result of micro-erosion in that part of the rockshelter, so you need to look for a pattern of overlap to establish regular superimposition. These patterns can then be interpreted in terms of sequences of painting events. However, you have to be very careful when undertaking these analyses as differences in superimposition could be the result of time differences of one minute, one year, one thousand years or ten thousand years. As a result, to make some decisions about which motifs are older and which are younger, you will also need to take into account the differential weathering of motifs when you are developing a superimposition sequence.

One effective way of recording rock engravings is through tracing. This can be done with heavy plastic and a range of colours using permanent ink pens (Figure 9.12 on page 303). It is best to use permanent markers, in case it starts to rain when you are working and so that the colours do not rub off over time. You can use different coloured pens to code different types of information. For example, you might draw the main motifs in brown, but indicate areas of overlap with blue or red. Or you might use a different colour to dot in an area where a motif has become 'fuzzy', or to indicate areas where you can't quite determine if the markings are made by people or nature. As with all archaeology, it is important that you record as much information as you can, as patterns may emerge later in your analysis that you were not aware of in the field. Another effective way to draw rock art is with a planning frame: a light, portable wooden frame with a metric grid marked out in string that simply rests against the rock surface and visually divides the area into small squares for ease of drawing. If you use this frame, make sure it doesn't touch the art surface.

FIGURE 9.12: Tracing the outlines of engraving sites on to plastic sheets



Inés Domingo-Sanz's tips for digitally drawing rock art

In recent years, several research teams (e.g. Domingo and López-Montalvo 2002) have developed methods for applying new digital imaging technologies to rock art recording. This new system is more objective than previous methods and is less destructive because it doesn't involve direct contact with the paintings. The method is accurate but slow, as it involves a meticulous process of deciphering and continuously checking the tracings against the original images.

In the field

- Identify motifs. Check whether previous documentation on the site exists. If it does, check previous recordings to identify motifs and assess the damage suffered since the site was last documented. If there is no previous documentation, draw a sketch of the motifs and their location in relation to each other, as part of the recording process.

- Draw a site plan. It is important to draw a plan of the site, recording dimensions and the main structural features. The more detail the better.
- Take photographs. To trace a motif using digitised images requires high-resolution photographs. Because digital photography doesn't yet provide the necessary resolution, we use conventional photography (6 mm x 7 mm negatives) with large-format cameras. The process also can be undertaken using any 35 millimetre SLR camera, though the quality of the image will not be as good. For tracing rock art, three kinds of photographs are necessary:
  —close-ups of each motif: these will form the basis of the tracings;
  —close-ups of details of motifs, such as areas of superimposition, which you can refer to later for clarification;
  —wide-angle pictures, which show the motifs in relation to each other.
- Record measurements of each motif and the distances between them. Inevitably, your photographs will generate some distortion. To counteract this, measure the shape of each motif as well as the distances between motifs.
- Identify the colour range of each motif using a Munsell colour chart.

In the lab

- Scan the negatives. These must be scanned at a high resolution because you will be working with fine details. A resolution of 2400 dpi is best, although you can use other combinations of size and resolution to give the same result (e.g. scanning the negative at 800 dpi but at 300 per cent size so the result is the same).
- Trace the motifs using the Adobe Photoshop program, as follows (see page 306):
  —Open the scanned photo you want to trace (Figure 9.13a).
  —Select a portion of the image using the lasso tool (Figure 9.13b).
  —Copy and paste this area into a new layer (Figure 9.13c). It is best to work separately with each portion of the motif, as different sections may have different colour values.
  —Click on one of the two available colour selection tools (the 'magic wand tool' or 'colour range') to select surfaces of similar chromatic range. The width of the range depends on the tolerance values given to the selection (using the fuzziness tool). Modify fuzziness values to small units in the dialogue box, because this will allow you to select more homogeneous colours than if you work with high fuzziness values (Figure 9.13d).
  —Copy and paste the selection into a new layer and save it (Figure 9.13e).
  —Return to the scanned image and select a new area to trace.

- —Repeat these steps until you've traced the whole figure. Each time you save a new selection, make sure you save it at the same resolution as the old.
- —Sometimes Adobe Photoshop will include pixels from shadows, cracks in the wall or the adjoining rock surface as part of the selection because these can have similar chromatic ranges to the motifs. You will have to erase these manually by comparing the tracings against the original images (Figure 9.13f).
- —Each selection will generate a new layer and you'll need to fit them together to see the tracing of the entire panel (Figure 9.13g). When doing this, check that all of your tracings are scaled to their original size, saved at the same resolution and oriented correctly.

- Once you've finished the tracing process, scale the figure to its real size (which you know from your original measurements).
- Check the accuracy of the tracings. Once the tracings are complete, you will need to return to the field to compare them with the original motifs. Keep checking until all the measurements on the tracings agree with the measurements on the motifs.
- Assemble the whole panel. You can assemble the completed traced panel in Adobe Illustrator. Make sure all tracings are scaled to their original size, have been saved at the same resolution and are oriented correctly.

STORING PHOTOGRAPHS AND ILLUSTRATIONS

Once you have completed a project, you have an ethical responsibility to store the complete archive of your fieldwork properly (see 'Archaeologists and their profession' in Chapter 1 on page 15). Photographs and illustrations need special handling:

- Film negatives should be archived in a dark, cool place, such as a filing cabinet.
- Always store negatives in acid-free negative strip holders, not mylar, polyester or polyethylene plastic.
- Never store prints in commercial 'sticky backed' photograph albums. The adhesives will disintegrate over time, but probably not before they have damaged your photos. Ideally you should store your photographs in mylar envelopes or stacked, but separated, with acid-free tissue paper.
- When you get your film back from the processor, put your rolls in chronological order and compare the frame numbers on the negatives with the numbers recorded in the log or on the recording sheets. Adjust the numbers in the log or recording sheets if necessary to make sure everything matches up.
- Make sure that you label *every* photograph individually on the back of the photo,

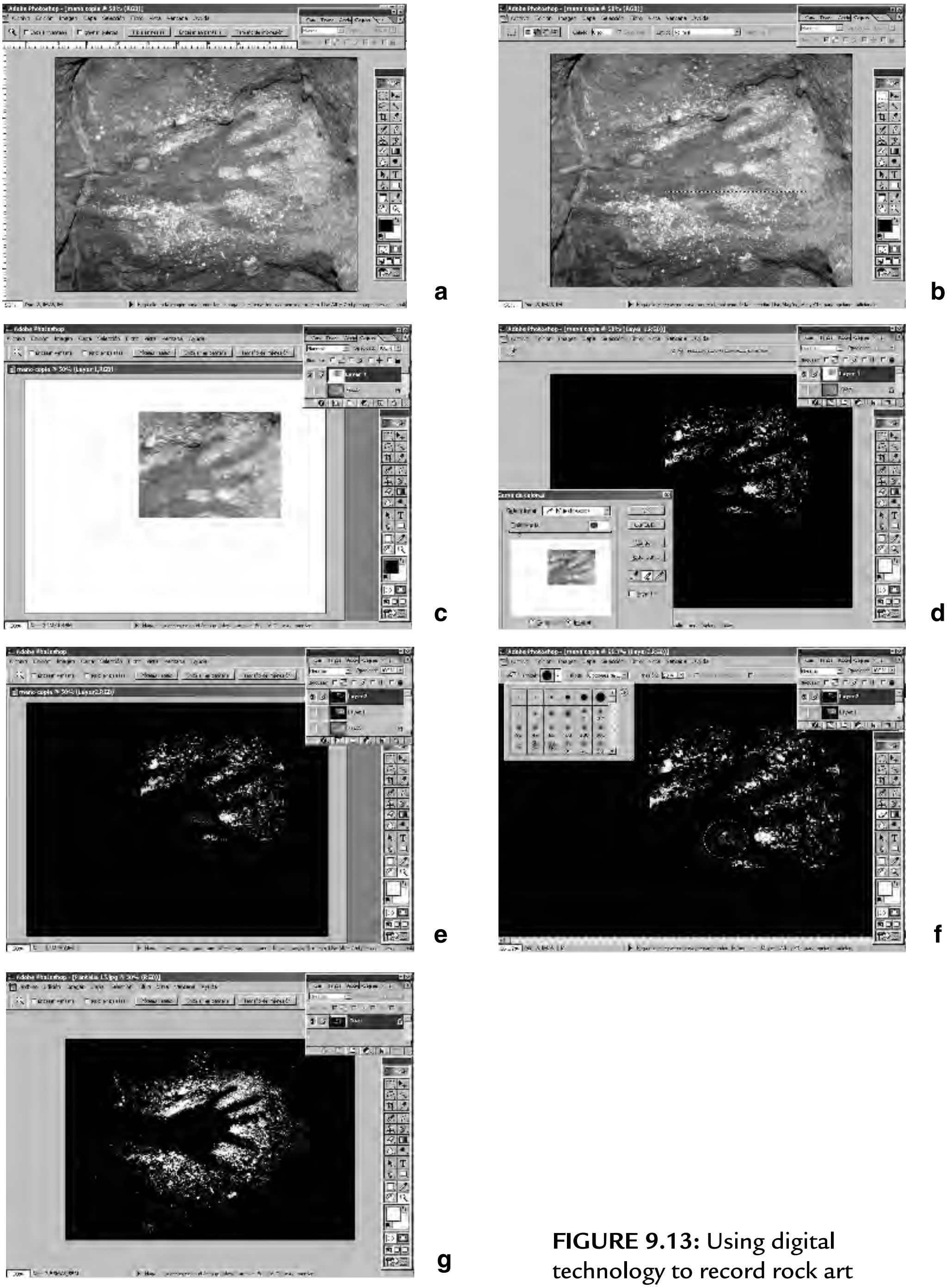


FIGURE 9.13: Using digital technology to record rock art

otherwise they lose their value as an archival recording. Imagine if your photographs became separated both from each other and from the photographic recording forms—would anyone else ever be able to identify whose photographs they were or what they were of? A *minimum* of information to include is the roll number, the negative number, the place, the date and the subject.

- CCD images from digital cameras can be stored by direct connection to your computer's hard drive, or through removable PC cards that are slotted into the camera and then into the computer.
- CD-ROMS can be used to archive both digital and scans of hard-copy film images.
- Remember that archiving images on CD-ROMS is not foolproof. In northern Australia, for example, CDs are only guaranteed for five years and you will have to be careful of fungal growth as well as scratches.
- When archiving digital images, use the smallest possible file-size. One way to save space is to compress your image files. The JPEG format can compress a file to more than 75 times smaller than the original, and can compress it to 25 per cent of the original image, with very little loss of quality. TIFF files are also common and do not lose any data through compression, though they are not as small as JPEGs.
- Images of Indigenous sites should be made available to AIATSIS for copying, so that they can be integrated into a national database.
- For digital images, cataloguing software will catalogue your images much more efficiently than memory. Cataloguing applications work by making a record like a card index. You can add key words, such as date or location, which makes for easy searching of the catalogue.
- Standard A4 drawings can be stored in ring-binders.
- Larger drawings can be kept in a planning folder. If the drawing is going into a planning folder, attach a small tag of masking tape on the top right-hand corner and write the plan number on it, so you can find it again easily (Hawker 2001: 39).

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USEFUL WEB SITES

AEL maintains a data conversion service at www.aeldata.com. It specialises in digitising newspapers, magazines, legal, scientific, technical and medical journals and other archives for online publication. If you are considering digitising your archives, it will do a no-cost, no-obligation sample archiving of your documents and give you an estimate, regardless of the size of the job.

http://groups.yahoo.com/group/MCC_digital_photography. The Melbourne Camera Club's Digital Photography Group is open to all photographers, and provides a forum for the discussion of digital photography. A useful aspect is the group's mentor service, provided by professional photographers and experienced members. To gain full benefit from the group's online services, you should be prepared to register for a free Yahoo membership.

CHAPTER TEN
GETTING YOUR RESULTS OUR THERE: WRITING, PUBLICATION AND INTERPRETATION

WHAT YOU WILL LEARN FROM THIS CHAPTER

- Tips for getting started on writing
- The basics of good archaeological writing
- How to write for different audiences
- The essential components of a good archaeological report
- What constitutes good interpretation
- How to plan and design interpretive materials effectively
- How to produce a professional product

Publication of the results of archaeological fieldwork is a critical ethical responsibility. Once your fieldwork is completed, it is important to make your work available to those people who have an interest in it. You should publish as quickly as practicable and in as many forms as reasonably feasible, to inform as wide an audience as possible. While writing up your results is an obligation, it also gives you the pleasure of sharing your knowledge and experiences, and voicing your opinion. The major avenues for publishing your results are:

- technical reports;
- consultancy reports;

- community reports;
- articles for academic journals;
- websites;
- press releases;
- interpretive material.

WRITING WELL

Like all archaeological skills, writing is a skill that can only be acquired and honed through practice. The more you write, the easier it becomes. It is a myth that people can either write or not write. Everyone can learn to do it well, if they are willing to put in the time and effort.

There are many strategies you can employ to enhance the quality of your writing. Since the purpose of writing is communication, the best are those which make your writing accessible to as many people as possible, without losing the nuances of your argument. While you will have to adjust your writing style to suit your particular audience, making your writing user-friendly is a great start to communicating your ideas, whatever your audience. Above all, this means presenting your work in a professional manner (see 'Producing a professional product' on page 324).

AskOxford's tips for keeping your writing user-friendly

- Over the whole document, make 15 to 20 words the average sentence length.
- Use words your readers are likely to understand.
- Use only as many words as you really need.
- Use active voice unless there's a good reason for using the passive.
- Use the clearest, crispest, liveliest verb to express your thoughts.
- Use vertical lists to break up complicated text.
- Put your points positively when you can.
- Reduce cross-references to the minimum.
- Try to avoid discriminatory language.
- Make accurate punctuation the heart of your writing.
- Plan before you write.
- Organise your material in a way that helps readers to grasp the important information early and to navigate through the document easily.
- Consider different ways of setting out your information.
- Use clear layouts to present your words in an easily accessible way.
- For more information, go to www.askoxford.com/betterwriting/plainenglish

GETTING STARTED

> It's simple. First I get all the words out, then I push them around a little. (Evelyn Waugh, cited in McLaren 2001: 18)

Unlike Waugh, for most of us, the hardest part of writing anything is getting started. Writing is scary. It is scary for people who are writing for the first time and it can be scary for people who are writing for the hundredth time. Since being faced with a blank sheet of paper is daunting, the best strategy is to fill that paper as quickly as you can. This can be done through a process known as freewriting, in which you sketch out your ideas without editing them, or judging them against the standard of what you want to produce. The point is simply to get rid of the scary, unfilled page. Once you have something written, you can edit it later to make it into what you want it to be.

David Schmitt's tips for getting started

- Don't wait for inspiration, just *do it now*.
- Write the easiest parts first.
- Begin each writing session by revising what you wrote last time.
- Set clear writing goals on your schedule.
- Avoid 'one best way' thinking and realise that there is never a perfect way.
- Don't get down on yourself if you are stuck.
- Develop a positive attitude towards your work and your potential success as a writer. (Schmitt 1992: 239)

THE STAGES OF WRITING

Research

You should already have conducted a thorough search of the archaeological literature, the web and appropriate databases as part of writing your research design and researching the history of your site. The point here is to start to shape this mass of information into a cohesive and focused report. Start by identifying comparable reports or papers, as their structure and content may be useful models for your own work. You may find that major and minor headings, the range of information in each section, the sequence of points or the effectiveness of tables and diagrams will provide you with a useful template for your own writing. You will find that there are similarities and differences between publications, that some ways of presenting information will appeal to you, and others will not. In addition, various categories of archaeological writing will have different requirements. For instance, the aim of a community report is quite different from that of a research paper, and this is reflected in the format, style and language of each. It is important to select appropriate models which you can then use to develop the approach, structure and style of your own writing.

Much of your research will be directed towards a **literature review**, the main purposes of which are to:

- make certain that somebody else has not already done this project;
- establish the significance of your project through identifying important gaps in existing research;
- identify methods used by others to deal with comparable issues, as well as any potential problems with your research methods;
- find out how your project fits in with other people's work;
- prove that you are familiar with, and can critique, current research in the subject area.

A typical archaeological literature review is a synthesis of the known archaeology of the region, including major sites previously found within or near to the study area. It will also identify the main archaeological issues and questions being addressed by your study and assess the results of earlier studies in terms of what you propose to do. The literature review should include three main features:

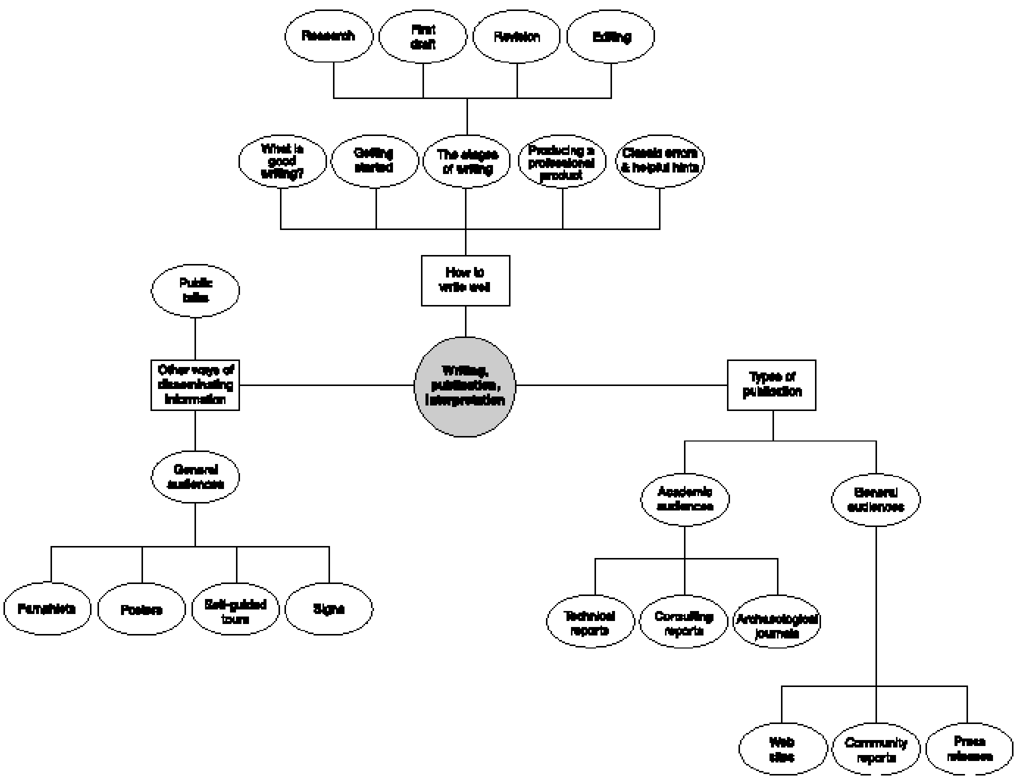
- a **geographical review**, in which you show not only that you are familiar with previous research conducted in the study area, but also how your own research builds on this;
- a **thematic review**, which identifies important gaps in previous research and shows how your research has built on this. This emphasises the importance of your project;
- **case studies**, which highlight the importance of your questions.

First draft

The first thing to do when putting together an initial draft is to write an outline, with chapter titles, headings and sub-headings. It is worth spending a day or more on this. This outline is a guide only and will need revision as your ideas develop and you get a better handle on the topic. It is an excellent way of thinking through your project and will help you identify the various elements that need to be included in your writing. This is the time for making sure that your argument is structured logically, as an outline is much easier to shape than passages of text.

When writing a first draft, concentrate on writing whatever comes into your head, and save the critical appraisal until later. The important thing is to write down as many ideas as you can. Remember, writing an idea down does not commit you to it. If it is a horrible idea, you'll edit it out. Writing it down will give you the material to make links between ideas later. A different, but conceptually related, approach is mind-mapping, or branching. This is a visual method, based on writing down as many ideas as you can as they radiate outwards from the central or core idea (see Figure 10.1). Don't be afraid to include even silly or absurd ideas in this process and remember that it is important not to impose a pattern. Allow the pattern to emerge from the material itself.

FIGURE 10.1: Getting your information out there



Revision

> Perfection is achieved, not when there is nothing left to add, but when there is nothing left to take away. (Antoine de St Exupery)

You are not likely to produce a perfect document in one draft. You may write three or more drafts before you are happy with the logical progression and your expression. Revision is an essential part of good writing. This is the stage where you refine your ideas and focus your writing so that every part of it is relevant to the original question or aim. Normally, whatever you write needs re-drafting at least twice. This is the time when you make sure your argument is cohesive and well organised, find details and examples to support your argument, revise those sections which are not up to scratch and refine your expression. An important part of revision is deletion. Remember that if you can write one set of words, you can write another. Do not treat your words as precious. In fact, deleting words (even whole sections) can be quite cathartic, as you work towards the lean, clean machine that you wish to produce.

When using a computer, one way of finding the emotional courage to cut words drastically is to save the new draft with a new name, so you can go back to the old words if you need to. Another way is to open a new document, revise your outline and cut and paste into the new outline.

Robyn Najar's tips for rewriting

- Don't be afraid to cut and paste. If you are not working on a computer, then a pair of scissors and sticky tape will work fine.
- Read your draft version aloud. This is an effective way to detect grammatical errors and unclear thinking.
- Tidy up your writing by eliminating or tightening your words.
- Avoid lengthy quotations, as these may convey the message that you don't know enough about the topic to write about it yourself. On the other hand, brief quotations can add force to your writing.
- Allow time for your paper to get cold. This allows you to return to it with a fresh and more objective perspective.
- Keep it simple. Do your best to avoid jargon, big words and long sentences.
- Double-check the paper for accuracy. Be sure you have documented your sources correctly.

Editing

It is in the editing phase that the quality of your work will be established. Sloppy editing conveys the impression that your work has been rushed, whilst painstaking editing conveys the impression that your work has been conducted in a meticulous manner. Students who are writing theses should be especially aware of this. It is virtually impossible to award a First Class Honours degree to a thesis that is full of spelling, stylistic or grammatical errors.

It can help to have other people read through your work at this stage. While it can be hard to accept criticism, it is best to get the first brunt of it from your friends, family or close colleagues. Their comments will help you improve your writing skills, as well as the final product. People who are not archaeologists can be especially helpful here, as they will be able to tell you if your writing is clear and understandable.

An essential part of editing is proofreading. This should be done at least three times: first, to see if the text flows and the ideas link coherently; second, to look solely for errors in grammar, punctuation, spelling and word usage; and third, to check that you have formatted your work consistently. Inconsistent styles for headings, font styles and layout can indicate to the reader that you don't care about the quality of your work. Those 'silly little formatting issues' make all the difference between an amateur and a professional product.

Klauser's five Rs for writing using both sides of the brain

Klauser (1987) believes that most forms of writing follow a pattern which alternates between using the left- and right-hand sides of the brain. Following these five steps religiously will dramatically increase your 'fluency and persuasion':

- **Ruminate.** This first stage involves left-brained activities, such as planning, thinking about the main issues and exploring a range of possibilities for presenting the data.
- **Rapidwrite.** This stage uses right-brain techniques, such as rapidwriting and branching. Rapidwriting (or freewriting) is similar to brainstorming, in that the aim is to access your creative thinking without the censoring that can cripple so many writers. This is similar to the process of mind-mapping.
- **Retreat.** This is a period of about a week during which you put the work aside and think about something else. This will allow you to go back to your writing with fresh eyes. This period of rest is 'non-negotiable'.
- **Revise.** When you return to your work, you will find it much easier to understand what works and what doesn't. Try pencilling notes alongside the sections that are weak or unclear. Read the work with the following questions in mind: Does this

contain all the data I need? Is there anything missing? Does the argument flow smoothly? Don't make major corrections at this stage, just look for the overall flow (however, it is worthwhile jotting down your ideas as they occur).

- **Repeat.** Now go through the cycle again. (McLaren 2001: 139–40)

TECHNICAL REPORTS

The basic nature of technical reports is that they are based on evidence. All such reports are aimed at readers with a special interest in the subject. They present original data and, most importantly, present this data in such a way that it can be checked and verified.

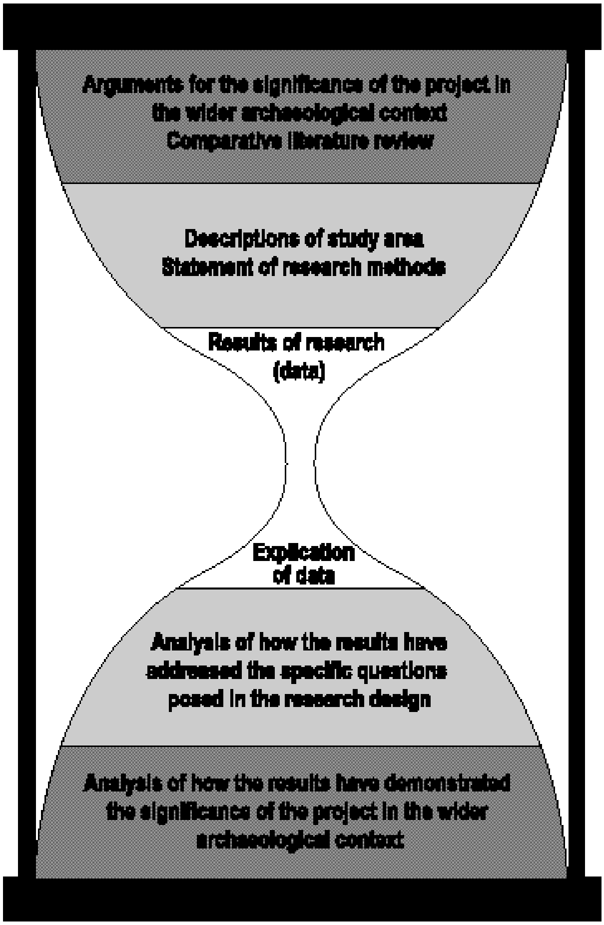
The basic format of a report is like the shape of an hour glass: it leads the reader from a wider, general view (e.g. placement of the research problem within its theoretical context), to the particular (the background to the region, methods and results), back to the general (placing the results of your research into a broader regional, international or theoretical context). The logical progression of your argument is established through this format, making it easy for the reader to follow your actions and understand your reasoning. A technical report has four main sections:

- aims and significance;
- methods;
- results;
- discussion.

The *aims* section tells the reader what was done and why, what the report will cover and how the research articulates with other projects, or fits into current theoretical debate. When writing this section, you will need to think about the gap in knowledge that is going to be filled by your research. Definitions and assumptions can be outlined in this section, although they can also be placed in a glossary. In archaeological reports, the aims section normally includes your literature review, highlighting the significance of your project in terms of previous research.

The *methods* section describes how and where the project was undertaken, and how the data were collected and analysed. A clear and precise description of your methods is one of the most essential parts of any report. This is what allows others—either other researchers who may want to expand or re-analyse your data or, more importantly, assessors within the government body that administers the cultural heritage legislation—to decide whether your methods were adequate to answer your research questions, and

FIGURE 10.2: The shape of a technical report



whether they need to gather any further information before they can make a decision. In theory, this section should provide enough detail so that a reader could replicate your research if they wished.

The *results* section outlines what was found. This is a statement of findings or observations, presented with very directed discussion. You need to present your results in a logical progression. Graphs and tables are an excellent way of communicating your results, as they present your findings in an easily understood visual format and in part allow the reader to make their own interpretations. If you use percentage graphs, make sure that you always include the raw data, so that the reader can assess whether the numbers you present are likely to be statistically significant. Normally, numbers of less than ten are considered to be insufficient to be statistically significant (though they may still represent a genuine phenomenon).

Interpretation of the significance of the results to the wider world is presented in the *discussion* section of the report. It is important to tie your interpretations closely to the aims or questions that were originally posed at the beginning of your study. This is your opportunity to answer those questions. If the results are inconclusive, then say so, and provide some possible explanations as to why. Any recommendations for future research should also be included in your discussion.

Technical reports will also require an *abstract* at the beginning that allows the reader to determine the results and recommendations of your report quickly and succinctly. The abstract should contain a brief overview of the major sections (aims and significance, methods, results, discussion, recommendations), but should be as short as possible. Ideally, an abstract should be one page or less. One tip for putting an abstract together is to take the first and last paragraph of each of the major chapters and reduce them to one paragraph. When you have one paragraph per chapter, you only need to polish the text so that it flows from one paragraph to the next. Hay et al. (2002: 106–11) outlines some useful strategies for constructing an abstract or summary.

CONSULTANCY REPORTS

These follow the same basic structure as technical reports, but require some specific features. The most important thing when writing a consultancy report is to make your data and results comparable with that of others. This means that you need to be absolutely clear about all of the methods you followed, the limitations you faced, the definitions you used, and the data you collected and analysed. Precise descriptions of the extent of survey areas and the amount of coverage the survey achieved are essential (and, indeed, are mandatory in some states. For more information on determining effective survey coverage, see Chapter 2), and wherever possible should be supplemented with clear diagrams showing the size and location of your transects, survey areas or sampling zones.

Instead of an abstract, a consultancy report should include a brief executive summary at the very beginning which encapsulates all of your findings and recommendations. This is a device for site managers who do not wish to wade through your entire report to assess your findings. It is also a device which allows you to be absolutely clear to your client about what their responsibilities are and what the proper management of the site requires. Copies of reports need to be lodged with major and local public libraries as well as government departments. You should also give copies to Indigenous community groups, volunteer organisations and local societies. The latter are best accompanied by plain English, or community, reports. A checklist for what to include in a consultancy report is included in Appendix 4.

HOW ACCOUNTABLE IS YOUR REPORT?

Finally, before you submit your report, check how closely it conforms to these best practice expectations. Check the following:

- ❑ Have you used standard measures and terminology to describe sites and artefacts?
- ❑ Have you defined all your terms and categories, either in the body of the report or in a glossary?
- ❑ Have you been explicit about how you chose to define a site, and the way that you decided on the site's boundaries?
- ❑ Have you outlined the logic of your sampling strategy?
- ❑ Have you shown clearly on a map where your sampling units/transects/excavation squares were located?
- ❑ Have you shown clearly on a map the location of all of your sites (unless requested to keep details of sites secret)?
- ❑ Have you been explicit about your methods during all phases of the project?
- ❑ If you have used a new method, have you been explicit about how you went about it and what its limitations were?
- ❑ Have you been explicit about the limitations you encountered during all phases of the project?
- ❑ Have you evaluated the effectiveness of your survey coverage?
- ❑ Have you evaluated the usefulness of your historical or ethnographic sources?
- ❑ Have you provided grid references for all of your sites (unless requested to keep details of sites secret)?
- ❑ Have you made your data accessible to reinterpretation (e.g. included all supporting material relevant to your data analysis as an appendix, such as your tables of raw data, your database and/or your recording forms)?
- ❑ Have you included details of all consultation undertaken with any parties or individuals as part of the project?
- ❑ If you obtained a permit to survey or excavate, have you included details of the permit number in the report?

COMMUNITY REPORTS

Community reports are shorter, more accessible versions of technical or consultancy reports. Their purpose is to make archaeological information accessible to members of the community. Such reports are written in plain English. This means using clear language at a level that is suited to the average person and structuring the layout of your report so that people can easily find the information they want.

Writing in plain English is not as easy as it sounds. It takes effort and practice to write simply without being patronising. Plain English does not mean always using words simplistically, especially when there are other words that are more accurate, or structuring your report in a naive manner. It means writing simply, clearly and effectively. One trick is to steer clear of jargon, which is often just a way of showing that you are part of an in-group (and which can automatically make the reader feel part of an out-group). Another trick is to avoid using long words or sentences. If you can say something simply, then do so. As with other types of writing, the best strategy is to look at some examples, decide on the ones that you think work well, analyse how they are constructed, and model your own work on them.

Jack Radley's tips for writing for a general public

Whenever you are not pleased with something you can always do better. How? You have learned many of the facts of the profession you have chosen but this does not mean you automatically have the word-power to write down your own ideas well enough for other professionals, let alone the world in general. You might imagine your proposed work to be a tapestry upon which you can stitch facts. However, factual evidence alone can be boring to a non-specialist reader, so you must find suitable words to embroider between your facts.

Remember the taboos. Don't use clichés. Tautology—the contextual repetition of the same phrase, idea or statement in different words—is a wickedness that can creep up on you, often in the same sentence or paragraph. Even the simplicity of 'a quick riposte' is a tautology, as a riposte is a quick retort.

Perhaps the greatest traitor of all is jargon, because it fools the author with its 'educational approach'. The use of jargon is irresponsible. It wastes the value of words by being used to perplex and confuse the reader rather than to communicate information.

Never forget your readers and the fact that clear communication is the real purpose of all writing.

SPECIALIST PUBLICATIONS

The main point to remember when writing for such publications is that you are writing for specialist readers. When writing in this sphere, you can assume an intelligent and informed interest on their part. You don't need to spoon-feed them or engage their interest with a showy writing style. In fact, you should use restrained language for specialist publications as this conveys the impression (correctly or not) that your research has been conducted in an objective manner. Nevertheless, don't let yourself be fooled by objective, scientific language: it does not necessarily mean objective, scientific research, just as subjective language does not necessarily mean that the research has been conducted in a non-scientific manner.

Tips for writing for archaeological journals

- Submit articles strictly in the format of the particular journal.
- Use specialist or technical terms to give clear descriptions, but be careful not to allow this to degenerate into jargon.
- If using specialist terms, remember to define them the first time you use them. For example, TL dating should be defined as Thermoluminescence Dating the first time you refer to it. Other clarification can be given in footnotes, but only if this is essential to a thorough understanding of the main point.
- Journal articles need to be precise. They should contain exact details, which are presented in a way that makes it possible for this information to be checked.
- Use headings and illustrations to clarify your points, but remember that each figure should be presented so that it can be understood by itself, without reference to the text.
- Submit articles on single-sided A4 paper, with double or one-and-a-half spacing, and a minimum of a 3 centimetre margin all round.
- Clean copy is important. Make sure that the professionalism of your work is not marred by typographical or grammatical errors, or by poor presentation.
- If you submit to a peer-reviewed journal, such as *Australian Archaeology*, or *Archaeology in Oceania*, your paper will be assessed by one or more referees. If asked to revise and resubmit your paper, do so. Use the referees' comments to identify any holes and to improve the quality of your paper, but remember that you can argue against the comments in a reply to the editor if you feel they are unwarranted. You will have a much better chance of acceptance the second time around.

WEBSITES

Writing for the web is different to writing for paper publications. We read screens differently to the way that we read paper and we must write differently for them as well. The most important things to do are to structure the site for the audience you plan to attract and to use an appropriate tone. Is the site instructional? Promotional? Personal? Each of these will require a different tone. When writing for the web, it is especially important to write concisely, to help your reader get to the point. Waffle on a website is a particularly heinous crime and, since the web is self-driven, as soon as you start to bore people they will leave (either the section or the site). Clear headings help readers to find their way around the site, while the multi-dimensional capacity of hot-links (which link through to another page or site) can be used to deepen your arguments or direct people to other useful sites. Our best advice here is to find a site you like and can read easily, and use this as a model for the construction of your own.

Tips for good web writing

- Put the main points at the top of the web page.
- Write short paragraphs.
- Write short, simple sentences. Use one idea for each sentence.
- Use the present tense because this makes your writing active rather than passive.
- Be friendly. Use 'I', 'we' and 'you' instead of 'the archaeologists', 'the researcher', and so on.
- Use hot links to deepen your argument.
- Don't clutter your site with too much colour or too many gimmicks.
- Make sure that the size, font and colour of the text can be read easily against the colour and contents of the background. A common mistake which many people make is to have a highly cluttered, 'busy' background against which the text can't be read, or to use a text colour which does not read or print easily. Dark-coloured texts against light-coloured backgrounds will always print more easily than the reverse.

PRESS RELEASES

A press release is the basic communication tool for those wanting journalists to publish their story. The writing style of journalists, developed through fierce competition for readers, is a good model to follow. Take the current front-page story in your local newspaper. Go through it and mark out where it answers the questions *who, what, when, where* and *why*. Use this as a model for formatting your own press release. All press releases follow a basic format. They are normally a single page with the words 'Press release' at the top and an eye-catching headline. They are dated, and have a contact name and number at the bottom of the page.

The basic rule for writing a good press release is to ensure that it engages the interest of the reader. Journalists usually only have time to scan press releases when they are making an initial assessment of them, so it is important to keep your words interesting, your sentences short and your message clear.

- Present your information in short, punchy sentences using vivid language and include only a minimal number of ideas in each sentence.
- Use active rather than passive voice and concrete details rather than generalisations.
- Present your ideas in the order of their importance, with the most interesting or significant information first.
- Use direct quotes from principals involved in the project to give the release life and a personal angle.
- Allow plenty of white space to avoid a cluttered look.

When you have written your press release, put it aside and read it again a day or two later, preferably aloud. Get a friend to read it as well, as this will help you to see whether you are communicating your ideas simply and clearly. If your friend stumbles when reading it, it needs rewriting—which probably means editing down to make it shorter, sharper and crisper. Don't forget to keep a file of any media coverage generated by your release. This information can be useful in showing public outreach for your project, as support for funding applications and as a model for future press releases. A sample press release is included in Appendix 7.

AskOxford's checklist for writing a press release

- ❑ Do I need a press release?
- ❑ Have I got anything interesting to say?
- ❑ Would an individual approach be more successful?
- ❑ What story do I have to tell?
- ❑ Are there any individual tales that prove a point?
- ❑ Do I have any statistics that support my case?
- ❑ Are there any third-party anecdotes/trends on the same theme?
- ❑ How can I get the story over in a nutshell?

- ❑ Have I got the who, what, where, when and why in the first paragraph?
- ❑ What headline can I use to draw the reader in?
- ❑ What supporting themes can I develop to sustain interest?
- ❑ What follow-up action can I suggest (e.g. photo opportunity or interview)?
- ❑ For more information, go to www.askoxford.com/betterwriting/osa/pr/#press

PRODUCING A PROFESSIONAL PRODUCT

A well-designed document is easy to read and reduces the chance that you will be misunderstood or misinterpreted. Quality of presentation, while important, is no substitute for content. It is worthwhile thinking carefully about how you present your work. Producing a professional product is largely a matter of adhering to the conventions for the type of writing you are undertaking and taking care that your work is free of errors and formatted in a consistent manner. Since the object of writing is to communicate ideas, it is sensible to present your work in such a way that it can be read and understood easily. Don't forget that the quality of your work reflects directly upon you: if it looks sloppy, people will assume (rightly or wrongly) that you are sloppy and may be less inclined to believe you or hire you. Here are some tips:

- Make certain your grammar, spelling, punctuation and word usage are correct. Poor expression makes writing seem unprofessional.
- Make sure the formatting is consistent.
- Choose a clear font.
- Use headings carefully as signposts to your argument, and format them consistently.
- Use maps, illustrations, graphs, and diagrams to present your information clearly.
- Always have the final publication proofread by somebody else.
- Make certain you submit the project on time.

Modern technology makes it possible to choose between a wide range of fonts and layout styles, and to produce professional quality reports from your own desktop. While there are many different fonts, they do not all function in the same way. Fonts can be divided into three broad categories: script, display and text (www.askoxford.com/betterwriting/osa/reports/#presenting).

- Comic Sans MS is a *script* font that simulates handwriting and gives text a light, easy feel.

- COPPERPLATE LIGHT is a *display* font, which is effective at getting people's attention. Display fonts are used in advertising and posters but are difficult to read for an extended period.
- *Text* fonts can be divided into two types: serif fonts, such as Times and Times New Roman, and sans serif fonts, such as Arial and **Chicago**. Serif fonts are a little more formal than fonts without serifs, while sans serif fonts are slightly easier to read.

The font you choose will depend upon the nature of your publication and its planned audience. For example, it would be considered distinctly odd to submit an article to an academic journal using a script font. Formal submissions, such as journal articles and technical reports, should always be in a text font. A community report, however, could well be suited to the relative informality of a script font, and you may choose to experiment with something quite different for interpretive materials. Press releases and websites are best written in a very clear font.

Tips for successful publication

- Get into the publishing habit. Start with book reviews or conference reports.
- Divide a project into several publishable sections (e.g. history, theory, minor data, the big picture).
- Publish in a range of media (e.g. academic and general publications, film/video, exhibitions) to give your ideas maximum exposure.
- Offer opinion pieces to local or national newspapers and magazines.
- Try to arrange publication *before* rather than after you have done the writing. Submit a synopsis for a journal paper, or a prospectus for a book.
- Don't publish the same thing twice.
- Be prepared for critical analysis of your work. Learn from it, and learn how to deal with it.
- Submit to one journal at a time. Start at the top and work down.

PUBLIC PRESENTATIONS

One of the most effective ways of sharing information about your project is through giving a public presentation. The kinds of presentations that archaeologists regularly give range from conference presentations and talks at local schools, to public lectures and interpretive tours.

Tips for successful public speaking

- Only speak on topics that you know well, and have prepared fully.
- The best way to be sure of giving a good presentation is to be well prepared, have a written text to refer to and rehearse your presentation.
- The best way to deal with nerves is to be well prepared, practise your speech and have some visual material to support you.
- Target your audience. Knowing the backgrounds of the people who will be your audience allows you to shape your speech to their ages, interests and levels of knowledge.
- Never give a public talk where you merely read a written text aloud. For formal occasions, prepare a full script, as this ensures your speech develops logically and without serious omissions. When writing the text, write it in a conversational manner, rather than an essay form. Remember, your aim is oral communication, not written. Edit the script into a good outline, which you can write on palm-sized cards, and speak to this outline.
- Keep your message simple. A speech cannot take the density of information and nuance that can be included in an essay. A listener has to grasp the ideas immediately and, unlike a reader, does not have time to review the text if there is something they do not understand immediately.
- If you know individual people in the audience, referring to them occasionally can make your talk more friendly and relevant.
- Use audio-visual equipment to clarify important points (say, through graphs or maps) and to add interest to your presentation.
- Check the audio-visual equipment before you have to speak. Make sure the equipment works, and that you know how to use it.
- Answer questions effectively. If someone asks a two-part question, don't try to remember both parts. Concentrate on the second part and, after you have answered that, ask for clarification of the first part.

USING POWERPOINT

Even if you've never used it before, PowerPoint lets you produce an impressive and professional looking presentation the first time around. The best feature of PowerPoint is that it allows you to integrate images (including moving images), text and sound into the one presentation. As with all things, however, there are a number of guidelines that you should follow when using it.

- The judicious use of moving parts (such as moving arrows or sequentially appearing text and images) will not only emphasise your key points, but also catch the audience's attention. Having said this, however, having too many moving parts is simply confusing (not to mention annoying) and should be avoided. The same is true for sound effects, which have the potential to be very distracting. Think *emphasis* rather than *everywhere*.
- As with any presentation, go through it beforehand (preferably more than once) until you're happy with the timing and are sure that you have the slides in exactly the right order. A non-specialist audience is ideal at this stage (your friends, neighbours, parents), because they can give you feedback on anything they find confusing or tell you if you're rushing things. The more you practise, the better you'll feel and the more relaxed you'll be when you actually present.
- Don't just read your slides to the audience (they can do that for themselves). Make the images and text complement your words, so that people are looking, listening and reading simultaneously (and therefore staying awake).
- Don't include enormous amounts of text as part of a PowerPoint slide. People only want to read the key points, not the detailed explanation of each point (that's for you to expand upon).
- Make sure the font size is large enough to be read easily by someone sitting in the back row. A minimum of 20–24 point font is advisable.
- Because PowerPoint can incorporate coloured and textured backgrounds as well as text, make sure that the combination works. As with websites (see 'Tips for good web writing' on page 322), the size, font and colour of the text must be able to be read easily against the colour and contents of the background.
- If you are presenting in a new environment, or using someone else's technology, *always* have an old-fashioned back-up on hand in the form of overheads and slides in case the technology fails. We can't emphasise this enough—the alternative will be completely improvising your presentation in front of the audience with no visual support.

For more information, including step-by-step guides and tutorials to the many features of PowerPoint, try the tutorial supplied with the program or visit Microsoft's website: www.microsoft.com/office/powerpoint/using/default.asp.

INTERPRETING ARCHAEOLOGY TO THE PUBLIC

Interpretation is different from information—one is simply facts, the other is intended to provoke ideas, create new associations or even jolt people into new understandings (Carter 1997: 6). The essence of good interpretation is that it reveals new insights into what makes a place or object special (Carter 1997: 6). Depending on the nature of your research, you might choose to produce a poster, pamphlet, a self-guided tour guide, an interpretive sign, or the text for a more formal guided tour. Regardless of which type of interpretation you choose, you will need to think through what you want to do and how you are going to do it, particularly in terms of how the interpretive story can be linked to physical artefacts or places.

The goal of any successful interpretation is to make the information you have support an interesting story or idea. It is best to do this by careful planning, rather than simply throwing a whole lot of information together and seeing what comes out. Start by focusing on what you want to achieve:

- What do you want people to *know* as a result of your interpretation?
- What do you want people to *feel* as a result of your interpretation?
- What do you want people to *do* as a result of your interpretation?

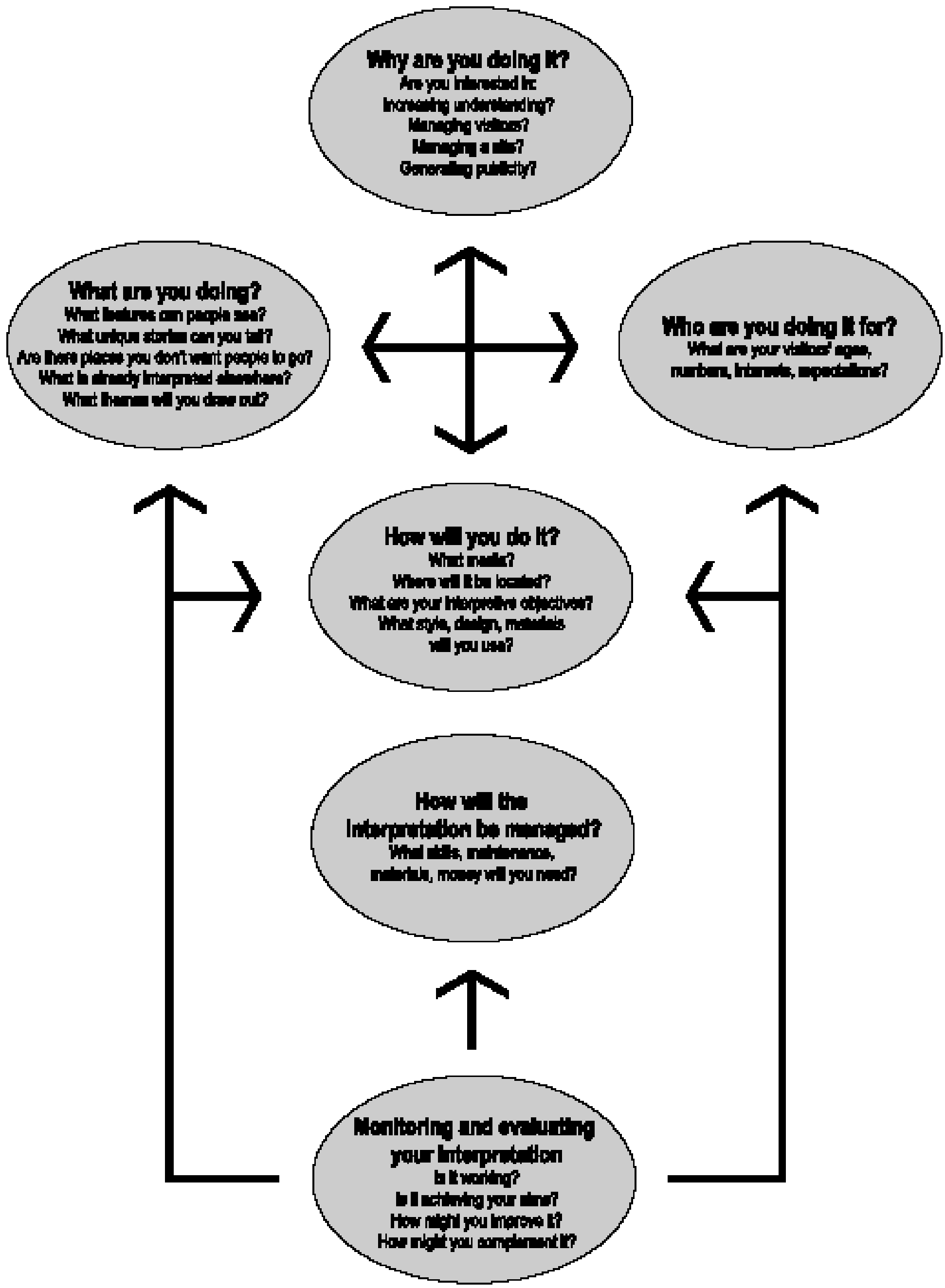
The core of interpretation is to capture the essence of a place or idea, not to tell people everything there is to know. If you try to present every interesting aspect of a place, people will be overwhelmed or bored, or both. At some point you will have to make a choice about what to interpret and what to leave out, which will undoubtedly involve drastic editing. The best way to do this is to use some form of interpretation project planner to give your ideas structure and to force you to consider:

- Why you want to communicate with visitors?
- Who will your audience be?
- What does your site or object have to offer?
- What do you want to say?
- How best can you say or show it?

It is only by working systematically through these questions that you will be able to tread a concise path through the mass of material which you have no doubt collected. This is a central part of making sure that your story will be coherent and that the form and content of your interpretation will be focused and will actually achieve your objectives. If you don't want to use a formal planner, try to write a storyline, breaking your narrative down into its component ideas, each of which can serve as the basis for a paragraph. A sample interpretive planner is included in Appendix 6.

Once you have a plan, you then need to write the text and design the layout for your interpretation. Writing good interpretive text requires a totally different approach to writing a consultancy report or academic paper. You are not only trying to make information available to a much wider audience than your professional peers

FIGURE 10.3: The interpretive process (after Carter 1997: 10)



but, more importantly, to make it *meaningful* for them. This is more easily said than done, however, and in the end you will never be able to cater for everyone. You will have to decide who is your priority and interpret for them. There are four key dimensions to consider when actually writing and designing your interpretive materials (Carter 1997: 40–41):

- Make it grab attention (colour, font size, catchy or provocative titles, activities, things to handle). Audio or tactile labels, pictures and 'hands-on' components can actually double visitors' attention spans.
- Make it enjoyable (make it meaningful, make it personal—link it to people's own lives if you can. Emotion is a powerful trigger which makes people pay attention and remember).
- Make it relevant. Try to give greater dimension to your interpretation by telling the story from different perspectives or through the eyes of different people. Wherever possible, use stories and quotations to refer to real people and their lives and use dynamic photographs of people or activities, rather than static shots of buildings or scenery. The key to any good interpretation is to forge a connection between people then and people now.
- Make sure it has a structure. Use everyday language—not everyday archaeological language!—so that everyone will understand. If you are going to use specialist terms you will have to explain them. The idea is to create a closeness between the reader and the material, not to distance them by making the text difficult to read or understand.
- Try to keep your writing style personal and 'chatty', rather than formal and academic. In particular, try writing for an individual, not for the 'general public' or another archaeologist (Binks, Dyke and Dagnall 1988: 113). If you're worried about the tone of your text, give it to someone else to read and listen to their comments. A good starting point is to look critically at other leaflets, posters or signs and decide what you think works and what doesn't.

There are also various practical issues to consider when designing interpretive materials. In terms of legibility, some fonts work better than others, and short, well-spaced paragraphs are much easier to read. Unless your text will be internally illuminated (e.g. from a light box), white or pale-coloured backgrounds with contrasting text work best. Give careful consideration to what illustrative material you include as well and don't just duplicate in images what people can already see around them. Make your illustrations or photos complement the text and tell their own story (e.g. try using them to show what people can't see or what things may have looked like at another time) (Carter 1997: 43–44).

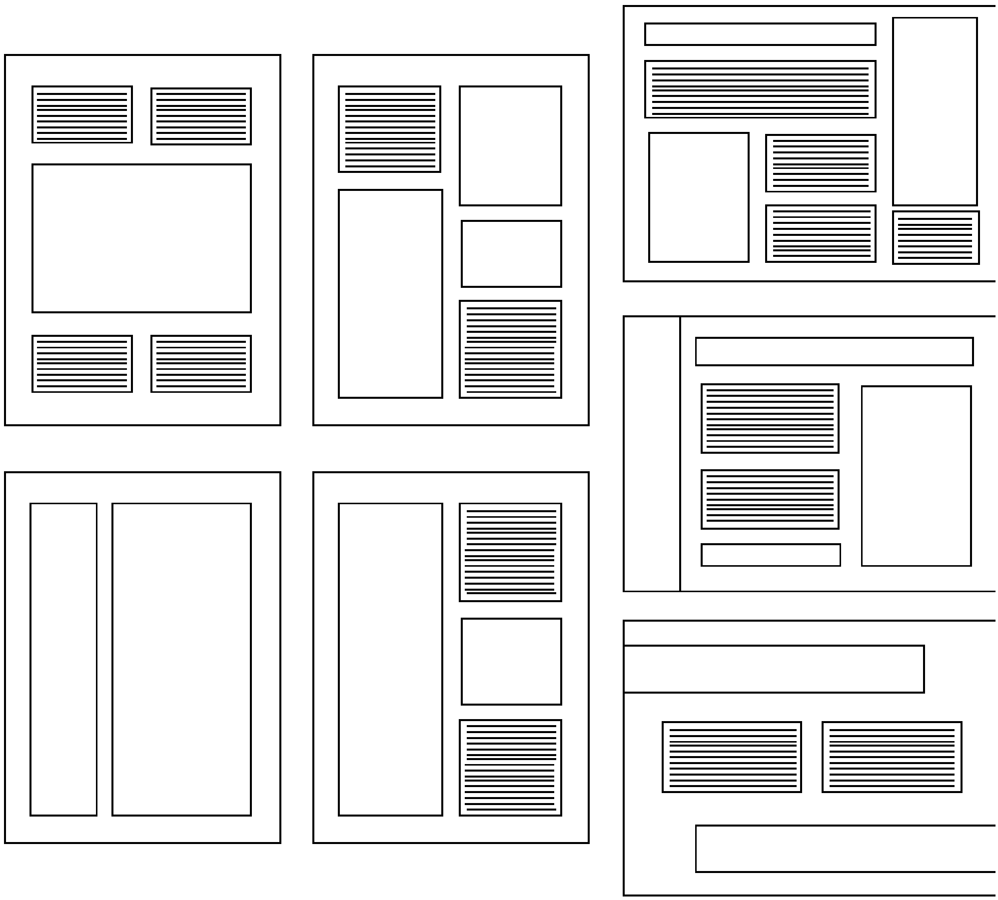
Tips for making your text work

- People will seldom read more than 150–200 words at a time. Don't be tempted to write long paragraphs—stick to short, sharp ones.
- Keep your sentences short—around twenty words each.
- Keep your titles short and sharp—a maximum of around five words for each heading.
- Keep your lines well spaced so that the text does not look dense and crowded.
- Remember that the greater the distance between viewer and text, the larger the font size and the greater the spacing between words, lines and paragraphs will have to be.
- Break the text into plenty of paragraphs and keep them well spaced, so that people can visually distinguish manageable parcels of information. Try to make each paragraph represent a particular idea or related set of points.
- Vary the font size you use throughout—e.g. a large font for titles, a lead-in sentence which is smaller than the title but still larger than the main text size, and then main or body text which is smaller again.
- The size of headlines and titles needs to be at least 30 point. For sub-headings use at least 16–18 point, and 12–14 point for general text.
- Only some fonts, like Helvetica and Times, are easy to read in long runs (Binks, Dyke and Dagnall 1988: 115). Restrict the use of more exotic fonts to titles or sub-headings.
- For overall consistency, try not to use more than two fonts.
- Make sure there are no spelling mistakes or typos—nothing looks worse!

Tips for making your layout work

- Keep text to a minimum and break up large columns of text with illustrations wherever possible.
- Many graphic designers use a preset grid in which the text and illustrations balance each other, so that the spacing between blocks of text and between images and text remains consistent (see Figure 10.4 on page 332).
- Remember that you don't have to fill up all the space. Blank or 'white' space can be used to emphasise different elements, particularly images.
- Wherever possible, convert written information to a graphic or visual form.
- Use large images that can attract attention from a distance.
- Use headings to attract attention or to emphasise main points.
- Include important or one-off information separately to the main text (in a box, like the tips in this book). Don't bury it in a welter of other words.
- Make all aspects of the project work together—the choice of colour, font, style, design and materials can all tell a story apart from just the words.

FIGURE 10.4: Using a grid to lay out your interpretive text ensures that your text and images complement each other, are arranged in a logical order and are easy to read. The grid is a guide only—your columns don't have to be equal widths and you can cross over columns to fit in illustrations, titles or quotations.



PRESENTING YOUR RESEARCH AS A POSTER

One way of sharing information about your project is through presenting a poster, which can be exhibited at an archaeological or public meeting, or used as a standing display on the walls of a school or community office.

Tips for preparing a poster

Remember that posters are initially seen from afar and need to be designed so that people want to go closer to view them. The poster title and the images are what will draw the viewer, not blocks of text (see 'Tips for making your layout work' on page 331).

- Keep your text to a minimum. The major mistake which many people make is to try to fit their entire project on to their poster. Remember that people will not read blocks of more than 200 words at a time (see 'Tips for making your text work' on page 331).
- It can be helpful to think of a poster as telling the story in images. For the poster to be effective, you almost need the images to stand alone. Think of the adage 'a picture tells a thousand words' and only choose images that will convey the story you want to tell.
- Use no more than two or three sentences, in no less than a font size of 20 points, to explain each image.
- Use images to convey several forms of information at once. For example, an image of an archaeologist conducting fieldwork with an Indigenous elder can convey information about local environment and collaborative relationships, as well as the way in which the actual task has been undertaken.

Lyn Leader-Elliot's tips for presenting the perfect poster

Interpretive posters need a strong story line and the best images you can find to attract attention and tell the story.
Your first step is to answer these questions:

- What idea should the poster convey?
- What story will it tell?
- Who is it aimed at?
- What is the best way to convey the idea and tell the story to your chosen audience?
- Where will the poster be displayed? This will affect your design, choice of materials and colours.

Images

- Photographs, maps, cartoons, graphs and charts all have their place, depending on the ideas you are working with.
- Use clean, uncluttered design—don't try to put too much in.
- Use empty space to separate different ideas.

- Keep related ideas, images and text together so that the poster is easy to read.

Text

- Choose a heading (title) which immediately conveys the main theme of your story.
- Focus on the main messages you want to convey—strip out the detail until you have the essence.
- Most people won't read blocks of text on a poster.
- The amount of text will depend on the purpose of your poster and its audience. You may choose to use only a title and captions for your images, or you may want to include more text.
- Use simple language and sentence structures. Make every word count—you have very few to work with.
- Choose fonts and font sizes that are easy to read. Avoid *italics*, UPPER CASE and fussiness.
- And always make the images and text work together.

CLASSIC ERRORS AND HELPFUL HINTS

Discriminatory language

An important part of good writing is choosing language that doesn't offend the audience. Language is a powerful tool, and it is important to use it in ways that empower people, rather than stereotypes or trivialises them. Government departments, universities and many private businesses in Australia have policies requiring the use of non-discriminatory language. The *Style Manual for Authors, Editors and Printers*, published by the Australian Government Publishing Service (AGPS 2002: 112) has the following definition:

> Language use is discriminatory when it makes people invisible; when it excludes them, or highlights only one characteristic to the exclusion of other often more relevant ones; when it stereotypes people; treats people asymmetrically; and denigrates or insults people.

The most common form of discriminatory language is sexist bias, which either overlooks or trivialises the roles of women, or assumes that something can be done by, or applies to, only one gender when it is really applicable to both. Often, this style of writing is done inadvertently, especially by people who are not trained in the Australian university system. Sexist bias should be avoided. It is poor English usage and makes your work appear dated and unprofessional. It also detracts attention from the very worthwhile ideas that are being put forward. There are a number of ways of dealing with sexist bias in language. For example, from an original which reads:

> This requires not that the writer make all his sentences short, or that he avoid all detail and treat his subjects only in outline, but that every word tells (Strunk, in Strunk and White 1979: xiv).

you could try to:

- *make it a direct address.* This does not require you to make all sentences short, or avoid all detail and treat subjects only in outline, but that every word tells;
- *make it passive.* This does not require that all sentences be short, or that all detail be avoided and subjects be treated only in outline, but that every word tells;
- *turn it into a plural.* This requires not that writers make all their sentences short, or avoid all detail and treat subjects only in outline, but that every word tells.

Other ways of dealing with this are to use 'his or her' instead of 'his', or to alternate between 'his' and 'her' as generic pronouns. These two methods are a little clumsy, so we do not recommend them. Neither do we recommend using 'her' as a generic pronoun, as this simply replaces one form of discrimination with another.

The other form of discrimination regularly found in archaeological publications is racist bias. The unthinking use of racist language has been a part of earlier stages of archaeology. Using value-laden terms to describe Indigenous Australians is one example of this. A short perusal of the early archaeological literature will find descriptions of Indigenous peoples as 'primitive', 'backward' or as 'children of nature'. All of these terms reinforce erroneous stereotypes and deny the complexity and diversity of Indigenous Australian cultures. It is particularly important that archaeologists deal with such biases. We write the pasts of other peoples and have a responsibility to do so without discriminatory bias.

Placing illustrations apart from the text

Some archaeologists choose to separate their illustrations in an appendix at the end of their report, rather than integrate them within the text proper. We do not recommend this, as it can make the report difficult to follow, forcing the reader to move back and forth between text and illustrations. As a general rule of thumb, illustrations should be included in the body of the report, preferably as closely as possible to the in-text reference. Any additional material that you think would be of interest to people researching a similar topic, but which is not essential to the main argument (such as your raw data), should be included as an appendix.

Listing figures in a confusing manner

When you are listing figures, don't bother separating plates from other figures—this is an old-fashioned method and will only increase your workload. It is far simpler to treat all photographs, illustrations and maps simply as 'figures', numbered consecutively within each chapter (Figure 1.1, 1.2, 2.1, 2.2, etc.). Do separate tables from figures, however, as they contain totally different types of information. A checklist for tables and figures is contained in Appendix 7.

Presenting numbers

Presenting your data numerically is an important part of archaeological writing, but is often done in a confusing or inconsistent manner. The following suggestions derive from the recommendations of the *Style Manual for Authors, Editors and Printers*, published by the Australian Government Publishing Service (AGPS 2002) and the better writing recommendations of Oxford University Press (2003). The accepted convention is to spell out the numbers from one to ten, then to use numerals for all figures above ten (11, 12, 25, etc.). Follow the same rules for ordinals: first, second, third . . . then, 11th, 12th and so on. Use figures if you are dealing with measurements (1 km, 2 per cent), ranges of numbers (2–4 months), or fractions and decimals (41/2, 4.5 months). When using fractions, write them out (two-thirds, three-quarters), write out percentages (per cent, not %), express ranges of numbers as 10 000–12 000 (not 10–12 000) and present periods as 1914 to 1920 or 1914–20. When indicating dates or ranges of years, there should be no apostrophe: e.g. 1960s, not 1960's.

Failing to acknowledge sources adequately

In all writing, it is important that you adequately acknowledge all sources. Any ideas that are not your own must be referenced, even if you are not using direct quotes. Otherwise, you can be accused of plagiarism, which is stealing other people's ideas and pretending they are your own. One way to avoid this is to always include page numbers in references for ideas or direct quotes. When referring to an internet source, your in-text reference should provide either the author or site name and a date (either the date of publication, the date of revision or the date you accessed the site). Your reference list should include a document title or description, a date and a uniform resource locator (URL). Whenever possible, identify the author of the document and direct readers as closely as possible to the information being cited. If you can, reference specific documents rather than home or menu pages (www.apastyle.org/elecmedia.html).

Tips for referencing

When you are conducting your research, you will need to read widely. It is very easy to forget where a quote or piece of information came from, even though that seemed impossible at the time you were reading it. As a minimum, you need to record the following information for each quotation or piece of information you record:

- the title of the work;
- the author, if this information is available;
- the title of the journal or book from which the work was taken;
- the publisher;
- the date of publication;
- the place of publication;
- the page range of journal articles or edited chapters.

If you take the time to do this as you go along—and do it for everything you read—you will save time later.

Distinguishing between a reference list and a bibliography

A 'references' or 'bibliography' section must be included with all reports and published papers. Many people confuse a reference section and a bibliography. They are different. A reference list records only the references used in the text, while a bibliography includes these references as well as other publications which may be of interest to the reader, but which are not referred to directly in the text. Sometimes, as in this book, this is called 'References and further reading'. A bibliography can also be a list of recommended reading.

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USEFUL WEBSITES

The Scottish Interpretation Network: www.scotinterpnet.org.uk. *The Interpretive Planning Handbook* is available free online from this website.

Ask Oxford: www.askoxford.com. Lots of excellent tips for writing well, online exercises and expert feedback. The sections on 'better writing' and 'ask the experts' are particularly useful. This site also provides the key points of each book in the One Step Ahead series.

You Too Can Write Good: Writing about Archaeology for Local Newspapers: www.saa.org/publications/saabulletin/16-3/SAA17.html. This site is a guide to how to make your archaeological project interesting for local newspapers.

www.apastyle.org/elecref.html contains detailed information on how to cite a range of electronic references.

Online, searchable databases from the archives of *The Australian* and 150 other News Limited papers are available online at www.newstext.com.au.

Appendix 1
SAMPLE RECORDING FORMS

SURVEY: BACKGROUND INFORMATION

ENVIRONMENTAL BACKGROUND RECORDING FORM

Page 1

SITE/LOCATION: ______

RECORDERS: ______ **DATE:** ______

RECORDING FOR: ☐ Site location (single exposure) ☐ General survey information only (multiple exposures)

WEATHER: ☐ Clear ☐ Cloudy ☐ Raining

LIGHT CONDITIONS: ☐ Good ☐ Poor

ATTACHMENTS/OTHER FORMS: ☐ Open site ☐ Historic ☐ Scarred tree ☐ Sketch map ☐ Rock art ☐ Other

PERCENTAGE OF GROUND SURFACE VISIBLE: ______ % ☐ Average across survey area ☐ Average within exposure

SEDIMENT/SOIL: ☐ Clay ☐ Silt ☐ Sand ☐ Other: ....

DISTURBANCE: ☐ Stock ☐ Insects ☐ Erosion ☐ Vegetation ☐ Other animals ☐ Development ☐ Other: ....

GEOMORPHOLOGICAL REGIME: ☐ Aggrading ☐ Eroding ☐ Stable ☐ Unknown

EXPOSURE(S):

☐ None ☐ Erosion patch ☐ Dam bank ☐ Patchy ground cover
☐ Unformed track ☐ Fence line ☐ Backhoe/grader scrape ☐ Other: ....
☐ Formed track ☐ Cow pad ☐ Water course/drainage line ....

GROUND COVER:

With exposure(s)	Off exposure(s)
☐ Leaf litter/bark/twigs/wood	☐ Leaf litter/bark/twigs/wood
☐ Grass/vegetation	☐ Grass/vegetation
☐ Moss/lichen	☐ Moss/lichen
☐ Rubble/gravel	☐ Rubble/gravel
☐ Water	☐ Water
☐ Redeposited sediments (e.g. slumping)	☐ Redeposited sediments (e.g. slumping)
☐ Other:	☐ Other: ....

PERCENTAGE GROUND COVER ON EXPOSURE: ______ %

PERCENTAGE GROUND COVER OFF EXPOSURE: ______ %

ROCK OUTCROP:

☐ No rock outcrop (No bedrock exposed)
☐ Very slightly rocky (<2 % bedrock exposed)
☐ Slightly rocky (2–10 % bedrock exposed)
☐ Rocky (10–50 % bedrock exposed)
☐ Very rocky (>50 % bedrock exposed)

COARSE FRAGMENTS (*in situ* aggregates):

☐ 2–6 mm (Small pebbles or fine gravel)
☐ 6–20 mm (Medium pebbles or gravel)
☐ 20–60 mm (Large pebbles or coarse gravel)
☐ 60–200 mm (Cobbles)
☐ 200–600 mm (Stones)
☐ 600mm–2 m (Boulders)
☐ >2 m (Large boulders)

BACKGROUND NOISE:

☐ Leaf litter/bark having same colour/sheen/shape of artefacts
☐ *In situ* aggregates (coarse fragments from parent outcrops—see above)
☐ Imported aggregates (e.g. road gravel/sand/shell, etc.)
☐ Other: ....

PERCENTAGE BACKGROUND NOISE: ______ %

OTHER DETECTION LIMITING FACTORS:

☐ Deep excavation/erosion (ie. below archaeological horizon)
☐ Burning effects mimicking artefacts
☐ Other: ....

LANDFORM:

Slope:

☐ >30° (>58 %) Very steep
☐ 18–30° (33–58 %) Steep
☐ 6–17° (11–32 %) Moderately inclined
☐ 2–5° (3–10 %) Gently inclined
☐ 1° (1 %) Level

Relief:

☐ Very high
☐ High
☐ Low
☐ Very low

Pattern: >300 m, 90–300 m, 30–90 m, 9–30 m, <9 m

☐ Hillcrest/ridge ☐ Creekline/bank
☐ Upper slope ☐ River terrace
☐ Mid slope ☐ Swamp
☐ Lower slope ☐ Lake edge
☐ Flat/plain ☐ Dune
☐ Other: ....

Page 2

EXISTING VEGETATION:

- [ ] Grassland
- [ ] Open woodland
- [ ] Rainforest
- [ ] Forest
- [ ] Mangroves
- [ ] Shrubland
- [ ] Heathland
- [ ] Other: ....

Tallest stratum:

- [ ] Trees ....
- [ ] Trees/Mallee ....
- [ ] Shrubs ....
- [ ] Palms ....

Species noted: ....

Height:

- [ ] >20 m
- [ ] 13–20 m
- [ ] 7–12 m
- [ ] 4–6 m
- [ ] 1–3 m
- [ ] <1 m

Crown separation:

- [ ] Touching to overlapping
- [ ] Touching or slightly separated
- [ ] Clearly separated
- [ ] Well separated
- [ ] Trees ~100+ m apart/shrubs ~25+ m apart
- [ ] Clumps of 2–5 trees/shrubs 200+ m apart

Understorey:

- [ ] None ....
- [ ] Trees ....
- [ ] Trees/Mallee ....
- [ ] Shrubs ....
- [ ] Palms ....

Height:

- [ ] >12 m
- [ ] 7–12 m
- [ ] 4–6 m
- [ ] 1–3 m
- [ ] 0.5–1m
- [ ] 0.25–0.5 m
- [ ] <0.25 m

Crown separation:

- [ ] Touching to overlapping
- [ ] Touching or slightly separated
- [ ] Clearly separated
- [ ] Well separated
- [ ] Trees ~100+ m apart/shrubs ~25+ m apart
- [ ] Clumps of 2–5 trees/shrubs 200+ m apart

Ground Layer:

- [ ] Tussock grass ....
- [ ] Sod grass ....
- [ ] Ferns ....
- [ ] Moss ....
- [ ] Vines ....

Height:

- [ ] 1–3m
- [ ] 0.5–1 m
- [ ] 0.25–0.5 m
- [ ] <0.25 m

LAND USE:

- [ ] Undeveloped
- [ ] Forested
- [ ] Cleared
- [ ] Grazed
- [ ] Ploughed
- [ ] Cultivated
- [ ] Built-up area
- [ ] Road verge
- [ ] Other: ....
- [ ] Quarry/extraction
- [ ] Mining

SITES/ISOLATED ARTEFACTS LOCATED (see separate forms):

NOTES:

PHOTOGRAPHS:

SURVEY: OPEN SITES

Page 1

OPEN SITE/ISOLATED ARTEFACT RECORDING FORM

SITE NAME:

RECORDER/S: DATE:

DIMENSIONS: LENGTH: m WIDTH: m ☐ Measured ☐ Approximation

STRUCTURE/ POTENTIAL: ☐ Surface only ☐ Possible sub-surface deposits ☐ Possibly stratified DEPTH: cm/m

LOCATION DETAILS:

☐ AMG EASTING: 1:25K MAP No:

☐ GPS NORTHING: MAP NAME:

DESCRIPTION OF SITE AND LOCATION: ....

....

....

SITE BOUNDARY DEFINITION CRITERIA:

☐ Natural boundary ☐ Aboriginal testimony
☐ Decline in artefact density ☐ Limit of survey area/impact area
☐ Decline in visibility ☐ Arbitrary
☐ Other: ....

EXPOSURE DIMENSIONS: WIDTH:

LENGTH: m/m cm m/m cm

Measured ☐ Approximation ☐

VISIBILITY ON SITE: %

decreasing to % m away from site

SLOPE: °

ASPECT: N NE E SE S SW W NW

CONDITION OF SITE: ☐ Good (in situ/ largely in situ) ☐ Fair (some sections disturbed) ☐ Poor (heavily disturbed) ☐ Destroyed

DISTURBANCE FACTORS: ....

....

SITE CONTENTS: ☐ Clustered/clumped ☐ Scattered

☐ Stone ☐ Metal
☐ Bone ☐ Glass
☐ Shell ☐ Ceramics
☐ Wood ☐ Charcoal
☐ Plant material ☐ Other: ....

STONE ARTEFACT RAW MATERIALS:

☐ Chert ☐ Quartzite
☐ Silcrete ☐ Volcanic
☐ Mudstone ☐ Sandstone
☐ Quartz ☐ Other: ....

....

No. OF ARTEFACTS: ☐ Estimate ☐ Absolute count MAXIMUM DENSITY: artefacts per cm m

STONE ARTEFACT TYPES: ☐ Flaked ☐ Ground ☐ Quarried

☐ Whole flake ☐ Broken flake ☐ Core ☐ Grindstone ☐ Blade ☐ Unifacial point ☐ Tula
☐ Retouched flake ☐ Flaked piece ☐ Axe ☐ Hammerstone ☐ Backed blade ☐ Bifacial point ☐ Other: ....

WATER SOURCES IN PROXIMITY (Code nearest source as '1' and tick others within 1.5km radius):

☐ Waterhole ☐ Gully ☐ Other: ....
☐ River ☐ Lake/lagoon
☐ Creek ☐ Swamp
☐ Spring/soak ☐ Claypan

DISTANCE TO NEAREST WATER SOURCE: metres ☐ Measured ☐ Estimate only

Page 2

STATUS OF WATER SUPPLY: ☐ Permanent ☐ Temporary ☐ Unknown

TYPE OF WATER: ☐ Fresh ☐ Brackish ☐ Unknown

WATER MOVEMENT: ☐ Still ☐ Flowing

PHOTOGRAPHS: ☐ No ☐ Yes **Roll No.:** ____ **Exposure No.:** ____

SKETCH PLAN OF SITE:

SURVEY: SCARRED OR CARVED TREES

SCARRED OR CARVED TREE RECORDING FORM Page 1

SITE/LOCATION: ☐

RECORDER/S: ☐ DATE: ☐

RECORDING FOR: ☐ Scarred tree ☐ Carved tree

LOCATION DETAILS:

☐ AMG ☐ GPS

EASTING: ☐

NORTHING: ☐

1:25K MAP No: ☐

MAP NAME: ☐

NUMBER OF SCARS: ☐

Origin of scar(s):

☐ Definitely Indigenous ☐ Possibly Indigenous
☐ Probably Indigenous ☐ European
☐ Other (please specify): ....

Possible natural sources for scarring:

☐ Bush fire ☐ Pests ☐ Poor soil
☐ Branch fall ☐ Lightning strike ☐ Other (please specify): ....

TREE: Species: ☐

☐ Living
☐ Dying
☐ Dead

Status: ☐ Standing ☐ In danger of falling
☐ Fallen ☐ Removed elsewhere

Height of tree: ☐

Circumference 1m above ground: ☐

CONTEXT: ☐ Isolated tree
☐ With other potentially scarred/carved trees
☐ With other trees, but no other potentially scarred/carved trees

☐ Hillcrest/ridge ☐ Creekline/bank
☐ Upper slope ☐ River terrace
☐ Mid slope ☐ Swamp
☐ Lower slope ☐ Lake edge
☐ Flat/plain ☐ Dune
☐ Other: ....

LAND USE: ☐ Undeveloped ☐ Grazed ☐ Built-up area
☐ Forested ☐ Ploughed ☐ Road verge
☐ Cleared ☐ Cultivated ☐ Other: ....

DISTURBANCE FACTORS:

☐ None ☐ Grazing ☐ Vehicles
☐ Animals ☐ Ploughing ☐ Other (please specify): ....

☐ Directly affecting tree ☐ Adjacent to tree ☐ Nearby only

DESCRIPTION OF SCAR(S):

SCAR No: ☐

Location: ☐ Trunk
☐ Branch

Length: ☐ cm

Width: ☐ cm

Depth (bark thickness): ☐ cm

Diameter of tree at middle of scar: ☐ cm

Height of base of scar above ground: ☐ cm

Degree of scarring: ☐ Bark only removed
☐ Heartwood removed

Shape: ☐ Oval (round ends) ☐ Square ends
☐ Lenticular (tapered ends) ☐ Indeterminate

Axe marks: ☐ Yes → Number: ☐
☐ No

Derivation of marks: ☐ Steel axe ☐ Other: ....
☐ Stone axe ....

Type of marks: ☐ Parallel lines ☐ Random lines
☐ Crisscross lines ☐ Surveyor's mark
☐ Other: ....

Regrowth: ☐ None ☐ Middle of scar
☐ Top of scar ☐ Bottom of scar

Width of regrowth: ☐

CONDITION:

☐ Good (>80 % intact)
☐ Fair (20–80 % intact)
☐ Poor (<20 % intact)

ORIENTATION:

☐ North
☐ South
☐ East
☐ West

Compass reading: ☐ °

PHOTOGRAPHS:

☐ Yes
☐ No

Page 2

SCAR No: ______

Location: ☐ Trunk ☐ Branch

Length: ______ cm

Width: ______ cm

Depth (bark thickness): ______ cm

Diameter of tree at middle of scar: ______ cm

Height of base of scar above ground: ______ cm

Degree of scarring: ☐ Bark only removed ☐ Heartwood removed

Shape: ☐ Oval (round ends) ☐ Square ends ☐ Lenticular (tapered ends) ☐ Indeterminate

Axe marks: ☐ Yes → Number: ______ ☐ No

Derivation of marks: ☐ Steel axe ☐ Stone axe ☐ Other: ....

Type of marks: ☐ Parallel lines ☐ Random lines ☐ Criss-cross lines ☐ Surveyor's mark ☐ Other: ....

Regrowth: ☐ None ☐ Middle of scar ☐ Top of scar ☐ Bottom of scar

Width of regrowth: ______

CONDITION: ☐ Good (>80 % intact) ☐ Fair (20–80 % intact) ☐ Poor (<20 % intact)

ORIENTATION: ☐ North ☐ South ☐ East ☐ West Compass reading: ______

PHOTOGRAPHS: ☐ Yes ☐ No

SCAR No: ______

Location: ☐ Trunk ☐ Branch

Length: ______ cm

Width: ______ cm

Depth (bark thickness): ______ cm

Diameter of tree at middle of scar: ______ cm

Height of base of scar above ground: ______ cm

Degree of scarring: ☐ Bark only removed ☐ Heartwood removed

Shape: ☐ Oval (round ends) ☐ Square ends ☐ Lenticular (tapered ends) ☐ Indeterminate

Axe marks: ☐ Yes → Number: ______ ☐ No

Derivation of marks: ☐ Steel axe ☐ Stone axe ☐ Other: ....

Type of marks: ☐ Parallel lines ☐ Random lines ☐ Criss-cross lines ☐ Surveyor's mark ☐ Other: ....

Regrowth: ☐ None ☐ Middle of scar ☐ Top of scar ☐ Bottom of scar

Width of regrowth: ______

CONDITION: ☐ Good (>80 % intact) ☐ Fair (20–80 % intact) ☐ Poor (<20 % intact)

ORIENTATION: ☐ North ☐ South ☐ East ☐ West Compass reading: ______

PHOTOGRAPHS: ☐ Yes ☐ No

SCAR No: ______

Location: ☐ Trunk ☐ Branch

Length: ______ cm

Width: ______ cm

Depth (bark thickness): ______ cm

Diameter of tree at middle of scar: ______ cm

Height of base of scar above ground: ______ cm

Degree of scarring: ☐ Bark only removed ☐ Heartwood removed

Shape: ☐ Oval (round ends) ☐ Square ends ☐ Lenticular (tapered ends) ☐ Indeterminate

Axe marks: ☐ Yes → Number: ______ ☐ No

Derivation of marks: ☐ Steel axe ☐ Stone axe ☐ Other: ....

Type of marks: ☐ Parallel lines ☐ Random lines ☐ Criss-cross lines ☐ Surveyor's mark ☐ Other: ....

Regrowth: ☐ None ☐ Middle of scar ☐ Top of scar ☐ Bottom of scar

Width of regrowth: ______

CONDITION: ☐ Good (>80 % intact) ☐ Fair (20–80 % intact) ☐ Poor (<20 % intact)

ORIENTATION: ☐ North ☐ South ☐ East ☐ West Compass reading: ______

PHOTOGRAPHS: ☐ Yes ☐ No

SURVEY: QUARRIES

QUARRY/QUARRIED OUTCROP RECORDING FORM: Page 1

SITE NAME: ____________________

RECORDER/S: ____________________ DATE: ____________________

LOCATION DETAILS:

☐ AMG EASTING: __________ 1:25K MAP No: __________

☐ GPS NORTHING: __________ MAP NAME: __________

☐ Hill top or ridge line ☐ Creek/river

☐ Slope ☐ Other: ....

FORM: ☐ Isolated outcrop ☐ Pebble beach ☐ Other: ....

☐ Series of outcrops ☐ River cobbles

ASSOCIATED FEATURES: ☐ Flake removal scars ☐ Imported raw materials

☐ Knapping floors ☐ Other: ....

DIMENSIONS OF SITE:

LENGTH: __________ m/cm WIDTH: __________ m/cm

If outcrop, average height: __________

If series of outcrops number: __________

Number of pits/ flake scars: __________

Measured ☐ Approximation ☐

Average length of pits: __________

Average width of pits: __________

Average depth of pits: __________

PIT SHAPE: ☐ Circular ☐ Rectangular ☐ Other: ....

☐ Oval ☐ Lenticular ....

RAW MATERIAL:

☐ Chert ☐ Quartzite ☐ Mudstone ☐ Unknown

☐ Silcrete ☐ Volcanic ☐ Quartz ☐ Other: ....

No. OF ARTEFACTS: __________ ☐ Estimate ☐ Absolute count

MAXIMUM DENSITY: __________ artefacts per __________ cm/m

% of blanks on site with cortex: __________

% of available stone worked: __________

ARTEFACT TYPES:

☐ None ☐ Trimmed blanks ☐ Modified cores ☐ Flakes/blades ☐ Decortication flakes

☐ Untrimmed blanks ☐ Unmodified (unused) cores ☐ Hammerstones ☐ Other: ....

CONDITION OF SITE: ☐ Good (in situ/ largely in situ) ☐ Fair (some sections disturbed) ☐ Poor (heavily disturbed) ☐ Destroyed

DISTURBANCE FACTORS: ....

....

WATER SOURCES IN PROXIMITY (Code nearest source as '1' and tick others within 1.5km radius):

☐ Waterhole ☐ Gully ☐ Other: ....

☐ River ☐ Lake/lagoon

☐ Creek ☐ Swamp

☐ Spring/soak ☐ Claypan

DISTANCE TO NEAREST WATER SOURCE: __________ metres ☐ Measured ☐ Estimate only

Page [illegible]

STATUS OF WATER SUPPLY: ☐ Permanent ☐ Temporary ☐ Unknown

TYPE OF WATER: ☐ Fresh ☐ Brackish ☐ Unknown

WATER MOVEMENT: ☐ Still ☐ Flowing

PHOTOGRAPHS: ☐ No ☐ Yes **Roll No.:** ☐ **Exposure No.:** ☐

SKETCH PLAN OF SITE:

SURVEY: STONE ARTEFACTS

STONE ARTEFACT RECORDING FORM **SITE:** ______ **DATE:** ______

RECORDER: ______ **Area/ Trench:** ______ ☐ Surface scatter ☐ Excavation: **Spit/ Level:** ______

FLAKES (FOR CORES SEE REVERSE)

Artefact No.	Raw material (if known)	Typology F = Flake BF = Broken flake FP = Flaked piece	Length (mm)	Width (mm)	Thickness (mm)	Platform width (mm)	Platform thickness (mm)	[illegible] to ridge relationship N = None R = Retained S = To one side TW = Between I = Indeterminate	Platform Preparation [illegible]	Over-hang removal (Y/N)	% Dorsal cortex	Dorsal scar count	Dorsal scar terminations F = Feather H = Hinge S = Step	Core rotation (Y/N)	Termination F = Feather H = Hinge S = Step P = Plunging I = Indeterminate	Breakage N = None P = Proximal M = Medial D = Distal L = Lateral	Comments

CORES (FOR FLAKES SEE REVERSE) **SITE:** ____ **DATE:** ____

RECORDER: ____ **Area/ Trench:** ____ ☐ Surface scatter ☐ Excavation: **Spit/ Level:** ____

Artefact No.	Raw material (& texture)	Typology S = Single platform M = Multi platform	Length (mm)	Width (mm)	Thickness (mm)	Platform count (number)	Platform preparation (Y/N)	% Cortex	Cortical surface count (number)	Core body P = Pebble O = Outcrop F = Flake I = Indeterminate	Feather termination count (number)	Step/hinge termination count (number)	Weathering (Y/N)	Comments

SURVEY: CEMETERIES

CEMETERY RECORDING FORM

SITE/LOCATION:

RECORDERS:

DATE:

DENOMINATION:
- ☐ Catholic
- ☐ 7th Day Ad.
- ☐ Anglican
- ☐ Jewish
- ☐ Presbyt.
- ☐ Unknown
- ☐ Baptist
- ☐ Other:
- ☐ Methodist ....

GRAVE No (or REF No.):

SURNAME OR FAMILY NAME:

GRAVE TYPE:
- ☐ Individual
- ☐ Double plot
- ☐ Group plot

Number of interments:

BASIC FORM:
- ☐ Tablet (upright slab)
- ☐ Horizontal slab
- ☐ Block
- ☐ Obelisk/pillar
- ☐ Statue/sculpture
- ☐ Cross
- ☐ Combination
- ☐ Other: ....

SPECIFIC SHAPE:

OTHER ASSOC PLOTS?: ☐ No ☐ Yes Name/No:

ORIENTATION:
- ☐ North
- ☐ South
- ☐ Northeast
- ☐ Southwest
- ☐ East
- ☐ West
- ☐ Southeast
- ☐ Northwest

SIZE OF HEADSTONE: LENGTH ...... cm / m WIDTH ...... cm / m HEIGHT ...... cm / m

MATERIAL:
- ☐ Slate
- ☐ Sandstone
- ☐ Marble
- ☐ Concrete/cement
- ☐ Granite
- ☐ Cast iron
- ☐ Timber
- ☐ Tile
- ☐ Other: ....

FENCE/BORDER:
- ☐ NONE
- ☐ Cast iron picket
- ☐ Timber picket
- ☐ Brick border
- ☐ Stone border
- ☐ Tile border
- ☐ Other: ....

FENCE/BORDER HEIGHT: ...... cm / m

INCLUDES FOOTSTONE: ☐ Yes ☐ No

LETTERING:
- ☐ Engraved
- ☐ Lead
- ☐ Other: ....
- ☐ Engraved and painted
- ☐ Painted only

OTHER ITEMS ASSOCIATED WITH GRAVE:
- ☐ NONE
- ☐ Photos
- ☐ Plantings
- ☐ Vase
- ☐ Statues
- ☐ Other: ....
- ☐ Glass covered display
- ☐ Tiles
- ☐ Personal items
- ☐ Shells

MOTIFS:
- ☐ NONE
- ☐ Ribbon
- ☐ Foliage
- ☐ Masonic
- ☐ Other (please list): ....
- ☐ Angel
- ☐ Dove
- ☐ Book
- ☐ War service
- ☐ Wreath
- ☐ Flowers
- ☐ Cross
- ☐ Pillar/urn

INSCRIPTION (Please record exactly as it reads on stone, i.e. line by line and in same spatial order:

MASON:

TOWN:

EXCAVATION 1

SITE:						TRENCH/ SQUARE:	
QUADRAT/ AREA:		SPIT/LEVEL/ CONTEXT:		DATE:		RECORDER/S:	

Start heights:

End heights:

WEIGHTS

Quadrat/ area	Total	Coarse	Fine

Soil pH:

Soil colour:

Quadrat/ area	Comments/description

Please describe aspects of deposits in this order:

Compaction

Composition/ particle size

Inclusions

Thickness & extent

Other comments

Method & conditions

FINDS:
- ☐ None
- ☐ Stone
- ☐ Wood
- ☐ Seeds
- ☐ Ceramic
- ☐ Glass
- ☐ Bone
- ☐ Metal
- ☐ Plants

☐ Other: ....

....

....

PHOTOS:

☐ Yes ☐ No

SAMPLES:

☐ None ☐ Bulk

☐ Soil

☐ Material for dating (please specify)

....

☐ Other: ....

....

EXCAVATION 2

SITE: ____________ TRENCH/SQUARE: ____________

QUADRAT/AREA: ______ SPIT/LEVEL/CONTEXT: ______ DATE: ______ RECORDER/S: ______

CONTEXT TYPE:

DEPOSIT ☐

1. Compaction
2. Colour
3. Composition/particle size
4. Inclusions
5. Thickness & extent
6. Other comments
7. Method & conditions

CUT ☐

1. Shape in plan
2. Dimensions
3. Depth
4. Orientation
5. Truncated
6. Other comments

Stratigraphic matrix:

This context is: ______ It correlates with: ______

Your interpretation: Internal ☐ External ☐ Structural ☐ Other ☐ ....

Your description of it: ....

Why do you think this?:

....

FINDS: ☐ None ☐ Stone ☐ Wood ☐ Seeds ☐ Ceramic ☐ Glass ☐ Bone ☐ Metal ☐ Plants ☐ Other: ....

PHOTOS: ☐ Yes ☐ No

WEIGHTS: ______ Total ______ Coarse ______ Fine

SAMPLES: ☐ None ☐ Bulk ☐ Soil ☐ Material for dating (please specify) .... ☐ Other: ....

SKETCH PLAN (REMEMBER TO LABEL ALL CONTEXTS AND TO INCLUDE SCALE, NORTH AND DIMENSIONS):

LEVEL BOOKING FORM

LEVEL BOOKING FORM SITE: ____ DATE: ____

SURVEYOR(S): ____ Height of site datum ____ ☐ Height set ☐ Arbitrary Page ____ of ____

1. Level position	2. Backsight	3. Inter-sight	4. Upper cross-hair	5. Lower cross-hair	6. Foresight	7. Height of instrument (HOI) (line of collimation) [= RL + backsight]	8. Reduced level [= HOI - inter-sight]	9. Upper cross-hair minus lower cross-hair	10. Distance in metres [= upper x-hair - lower x-hair x100]	11. Bearing (°)	12. Description

PHOTOGRAPHY

PHOTOGRAPHIC RECORDING FORM

SITE: ____________________ DATE: ____________

PHOTOGRAPHER: ____________________ CAMERA: ____________

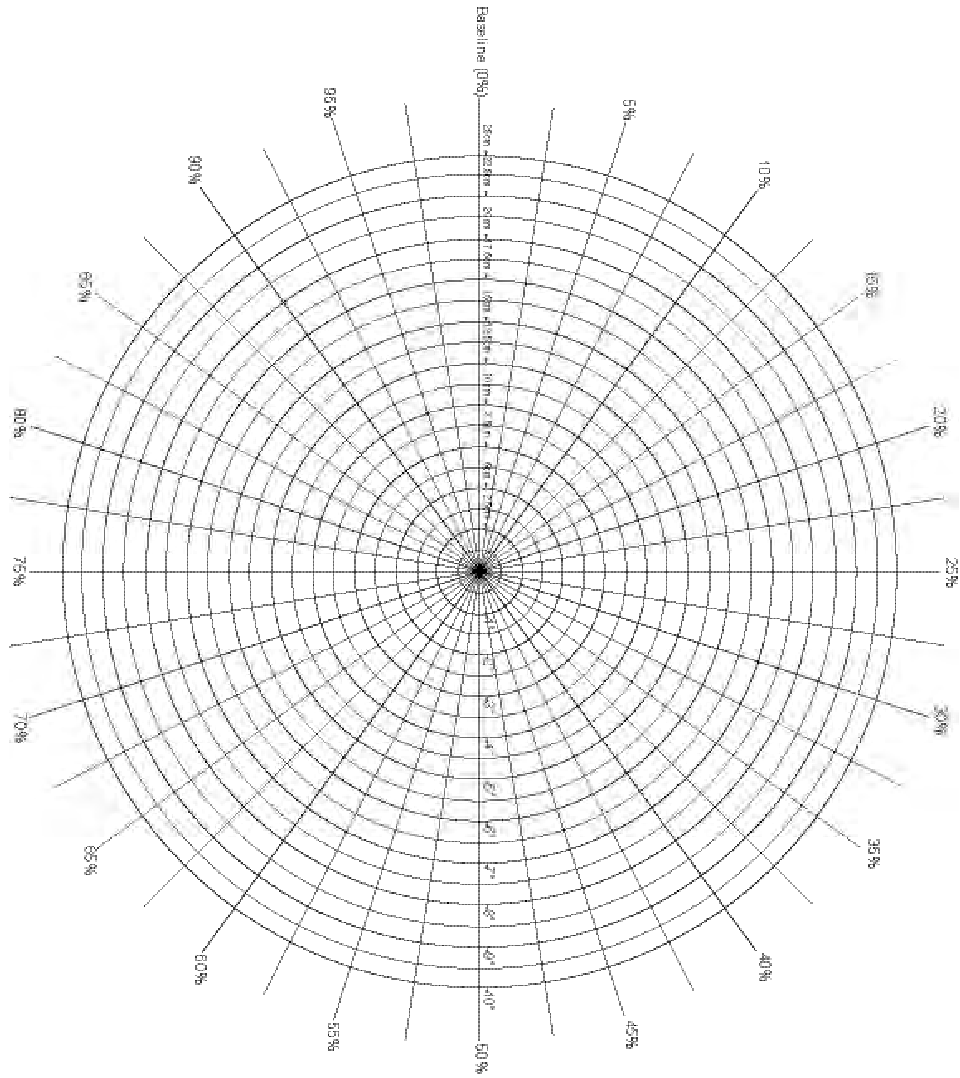
FILM TYPE: ____________ FILM SPEED: ________ FILM No: ________

FRAME No.	DESCRIPTION	DIRECTION

Appendix 2
RIM DIAMETER CHART

Please note: The chart on page 357 must be enlarged by at least 206% to be accurate.

Rim/base diameter chart for nineteenth century ceramics



Rim/base diameter chart for nineteenth century ceramics

Appendix 3

GUIDES TO DATING COMMON HISTORICAL ARTEFACTS

DATING COMMON HISTORICAL ARTEFACTS

All artefacts come in a wide range of shapes, sizes and materials. In many cases, changes in the manufacturing process have led to changes in the form, style and components of an artefact over time. Any of these changes, if their history is known, can be used to date an artefact, and by extension the site on which it is found. It is not possible here, of course, to provide a detailed list of the many variations which have occurred over time in the production of every common historical artefact. What we intend is simply a guide to some of the more generally known changes in artefact manufacture or morphology that can suggest a rough date or date range. In many cases these ranges will be so broad that you will need to research your particular site and its artefacts in more detail. Most artefacts will not be dateable to a more specific point in time without further background research into specific manufacturers and the local situation.

DATING BOTTLE GLASS

Most dating techniques for bottle glass are based on changes in manufacturing techniques, particularly changes to the moulding and finishing processes and the methods of sealing different kinds of bottles. This section presents an outline of some of the major technical innovations that help to date bottles, rather than a history of particular brands, trademarks or factories. When attempting to date a site from the bottle glass contained within it, you should also take into account the fact that empty bottles were frequently reused throughout the nineteenth century. An old date for a bottle, therefore, does not necessarily imply an old date for a site.

TABLE A3.1: continued

TABLE A3.1: continued

TABLE A3.1: continued

TABLE A3.1: continued

TABLE A3.1: continued

DATING CERAMICS

Fragments of ceramic are almost as ubiquitous as fragments of bottle glass on historical archaeological sites. Maker's marks or trade marks will always be the best means to accurately date a piece of ceramic, although date ranges can also be suggested based on colour and in some instances on pattern (Samford 1997). Blue was the most common colour for printed decoration on English ceramics during the nineteenth century, although black, brown, purple, green and red were introduced in the 1820s and 1830s (Samford 1997: 20–22). For example, blue transfer printed wares have a date range of at least 1784–1859, black a range of 1785–1864, brown of 1818–1869, red of 1818–1880, green of 1818–1859 and purple of 1814–1867 (Samford 1997: 20). These date ranges, however, refer to beginning and end production dates only, not the total date range for production of a particular colour. They merely serve to bracket an artefact to its most popular production period, not to date it absolutely. Furthermore, such ranges only date the artefacts, not necessarily the site itself. When interpreting ceramics from an archaeological site, bear in mind that ceramic table and kitchenwares were often carefully looked after and only discarded when eventually broken beyond further use, so can often be much older than the site in which they are found.

Patterns will only be able to provide a date if you can identify who made them. For this, you will have to search pattern catalogues such as Coysh and Henrywood's (1982)

Dictionary of Blue and White Printed Wares, or Godden's 1967 *Illustrated Encyclopedia of British Pottery & Porcelain*.

The earliest underglaze printed pattern (standardised in 1790) was the Willow Pattern, and from 1814 onwards it was the cheapest available transfer printed pattern in the potters' price fixing lists (Miller 2000: 93). It became so ubiquitous that it is still in use today. Other types of decoration can be dated but only approximately (AHAPN Draft Historical Archaeological Materials Cataloguing Guidelines 1998): transfer prints to 1790s–1860s; plain whiteware 1850–1900; decals 1890s–present; reproduction transfer prints 1890s–present; hand-painted, floral polychromes 1780s–present; embossing 1850–1890; coloured glazes 1930s–1960s. Moulding or embossing was particularly popular between 1850 and 1890 on clear-glazed, white, ironstone vessels.

Trade marks are also important chronological indicators, although it would be impossible to document every known trade mark in the history of ceramics manufacture. When you record a trade mark, make sure you describe the design and wording of the mark itself and indicate whether it is stamped (impressed), incised or hand painted. You should also include the colour of the trade mark. Lists of British ceramic trade marks can be found in various editions of Geoffrey Godden's (1993) *Encyclopaedia of British Pottery and Porcelain Marks* and similar catalogues are available for Australia and Europe.

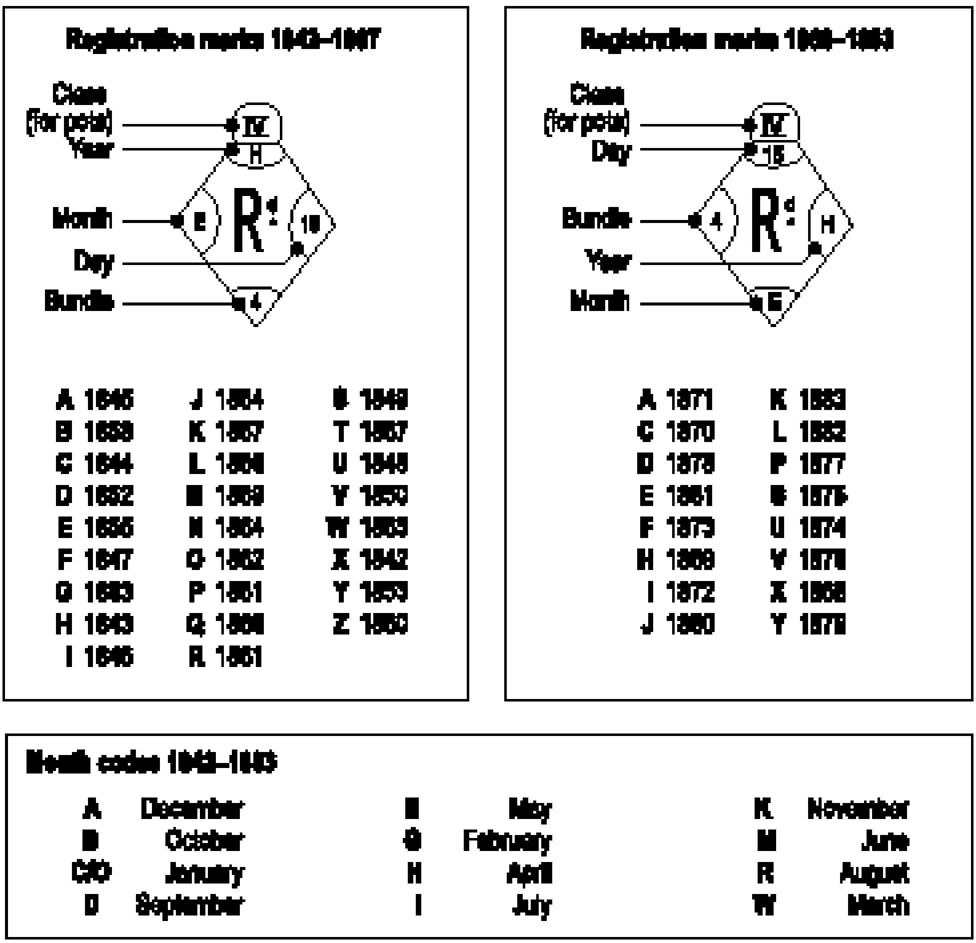
TABLE A3.2: Some terms used on ceramic vessels (from Godden 1993; Kovel and Kovel 1986: 229–34)

Term or mark	Period of manufacture
Mark including a royal coat of arms	After 1810
Mark including the name of the pattern	After 1810
Ironstone	After 1813
Diamond registration mark*	1842–1883
Royal	After 1850
Pearl or P	'Pearl' = After 1840, 'P' = After c1868
Limited or Ltd	After 1860, not usually on pottery until after 1880
Trade mark	After 1862, not usually on pottery until 1875
Copyright reserved	After 1876
Rd No	After 1884 (see Table A5.3)
England	After 1891
Made in England	After 1900, usually after 1914
Nippon	1891–1921
Japan	After 1921
Semi-vitreous	After 1901
Oven proof	After 1933
Oven tested	c1935
United States of America	After 1935
Incorporated	After 1940

Term or mark	Period of manufacture
Detergent proof	c1944–present
R(egistration mark)	After 1949
Dishwasher proof	After 1955
Freezer–Oven–Table	After 1960s

A system for registering ceramic designs came into effect in 1842. Up until 1883, this system used a registration diamond to indicate the precise date a design was registered (Figure A3.1). Not all ceramics contained such a mark, however, so its usefulness as a dating tool is limited.

FIGURE A3.1: How to read a ceramic registration mark



From 1884 onwards, the diamond-shaped registration mark was replaced by a simpler system, using the abbreviation 'Rd No' before the number. Note that this number only gives the date the design was registered, and therefore the vessel could have been made any time after that date. This system is still in use today and because the numbers changed from year to year, is a reliable guide to dating such marked ceramics (see Table A3.3).

TABLE A3.3: Dating ceramics by the ceramic registration mark system

Year	Registration nos beginning with	Year	Registration nos beginning with
1884	1	1919	666128
1885	19756	1920	673750
1886	40480	1921	680147
1887	64520	1922	687144
1888	90483	1923	694999
1889	116648	1924	702671
1890	141273	1925	710165
1891	163767	1926	718057
1892	185713	1927	726330
1893	205240	1928	734370
1894	224720	1929	742725
1895	246975	1930	751160
1896	268392	1931	760583
1897	291241	1932	769670
1898	311658	1933	779292
1899	331707	1934	789019
1900	351202	1935	799097
1901	368154	1936	808794
1902	385180	1937	817293
1903	403200	1938	825231
1904	424400	1939	832610
1905	447800	1940	837520
1906	471860	1941	838590
1907	493900	1942	839230
1908	518640	1943	839980
1909	535170	1944	841040
1910	552000	1945	842670
1911	574817	1946	845550
1912	594195	1947	849730
1913	612431	1948	853260
1914	630190	1949	856999
1915	644935	1950	860854
1916	653521	1951	863970
1917	658988	1952	866280
1918	662872	1953	869300

Year	Registration nos beginning with	Year	Registration nos beginning with
1954	872531	1960	895000
1955	876067	1961	899914
1956	879282	1962	904638
1957	882949	1963	909364
1958	887079	1964	914536
1959	891665	1965	919607

DATING TINS AND TIN CANS

No comprehensive study of tin-making technology and local manufacturing changes has been carried out for the Australian region. Regional studies by historical archaeologists working in New South Wales (Heffernan and Smith 1996) and New Zealand (Ritchie and Bedford 1985) have provided some broad guidelines.

TABLE A3.4: Dating techniques for tin cans and metal containers (from Heffernan and Smith 1996; Ritchie and Bedford 1985; Rock 2000: 278–84)

TABLE A3.4: continued

DATING NAILS

The manufacture of nails in Australia has progressed through a number of stages, from hand-made, wrought or forged nails to mass-produced, machine-made wire nails. Given this transition, and provided that the nails are sufficiently well preserved so that their method of manufacture can be identified, it is possible for them to serve as broad chronological markers. Hand-wrought nails, for instance, were in common use up until the 1850s, although they continued to be used sporadically throughout the nineteenth century (Coutts 1984: 282). Generally, machine-made nails provide better subjects for dating, as their production resulted from the patenting of a specific invention (Varman 1980: 31). Wire nails were manufactured from drawn wire and were first imported into Australia around 1853, although they did not become widely used until after the 1870s, when manufacturing processes improved enough to make them both cheap and plentiful (Varman 1980: 36).

The diagnostic features of a nail are the head, and sometimes characteristics on the shaft or shank.

Dating any nail is quite problematic, mostly because they rust very quickly and because their heads often become distorted through use. Both of these processes alter their diagnostic features.

FIGURE A3.2: The parts of a nail

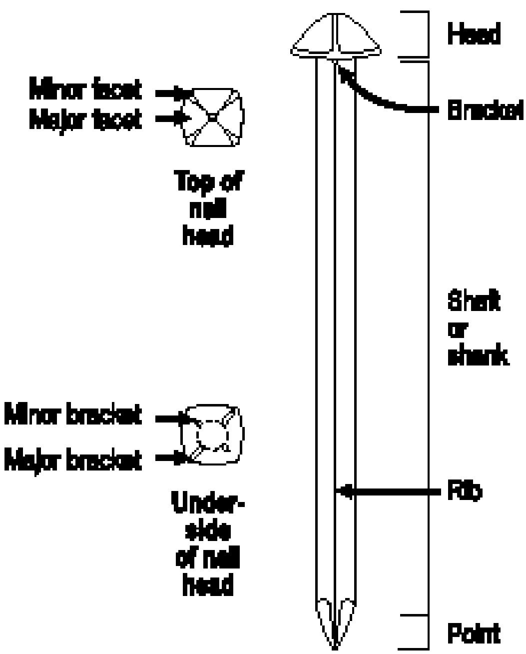


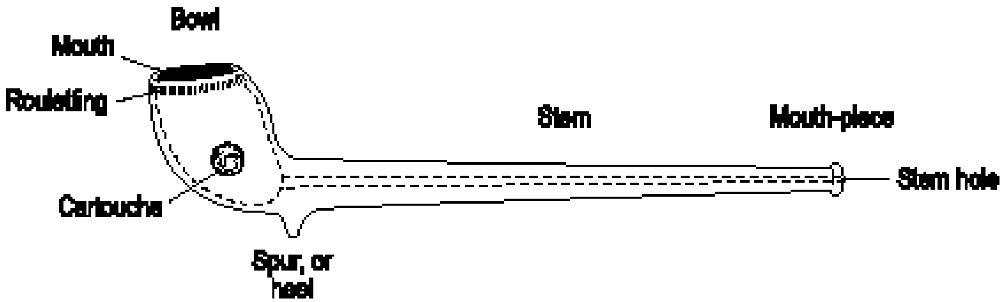
TABLE A3.5: Dating techniques for nails (from Coutts 1984; Smith 1998; Varman 1980)

TABLE A3.5: continued

DATING CLAY TOBACCO PIPES

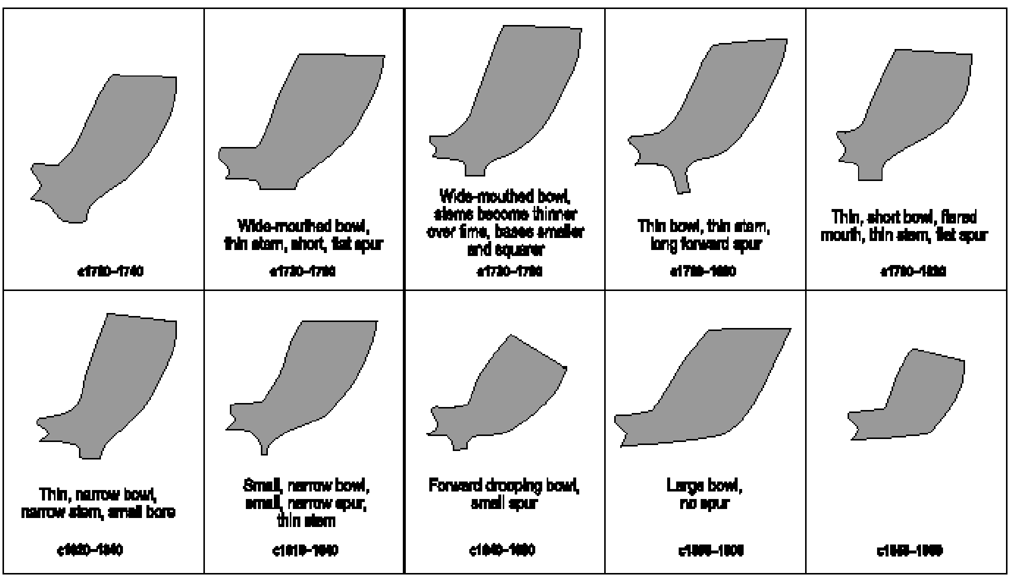
While clay tobacco pipes are relatively common on archaeological sites, they are not the best dating tools. The diagnostic features of a clay tobacco pipe are shown in Figure A5.3.

FIGURE A3.3: The parts of a clay pipe



Great variations in the shape and style of clay pipes have existed since the start of their manufacture, and changes in bowl shape or stem length are not always reliable guides to their period of manufacture. Oswald (1975: 37–41) has produced a simplified bowl typology which is of some use when dating pipes, although the many local variations in design and manufacture make this only useful as a general tool.

FIGURE A3.4: Dating techniques for clay pipes (from Oswald 1975: 37–41)



DATING METAL MATCHBOXES

The use of small tin boxes for storing matches was current from about the 1830s until the 1940s. No comprehensive study has been undertaken on wax vesta matchboxes, and therefore there are few guidelines available for dating. The most detailed studies to date have been completed by archaeologists working on historic mining sites in New Zealand (Bedford 1985; Ritchie and Bedford 1987) and the Northern Territory (McCarthy 1986). Without comparable regional studies from other parts of Australia, there is no better guide at present.

TABLE A3.6: Dating techniques for tin wax vesta boxes (from Bedford 1985; Bryant and May 1987; McCarthy 1986)

TABLE A3.6: continued

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Appendix 4
DETAILED CHECKLIST FOR CONSULTANCY REPORTS

This is only one suggested format for a standard consultancy report and not all categories will apply in every circumstance.

Title page

- ❑ Title of report
- ❑ Client or group for whom it is prepared
- ❑ Date
- ❑ Author's name and address

Summary

- ❑ Overview of project
- ❑ Overview of results
- ❑ Overview of significance
- ❑ Overview of recommendations
- ❑ Any restrictions on the use of the report or on the information contained within the report.
- ❑ (Table of) Contents
- ❑ (Table of) Figures
- ❑ (Table of) Tables

Introduction

- ❑ Brief description of project
- ❑ Where the project is located (e.g. brief statement of nearest town, or important geographical feature, state or area of state, borders of study area, etc.) and why the project was commissioned/carried out
- ❑ Who commissioned/funded the project
- ❑ Aims and scope of the study. Include any formal brief or informal instructions issued as part of the project
- ❑ Types of investigation conducted (e.g. field survey, Aboriginal consultation, excavation, document searches, oral histories)
- ❑ When fieldwork, analysis and report writing took place
- ❑ Who undertook fieldwork, analysis and report writing
- ❑ Any constraints or limitations which were imposed on the project (e.g. bad weather limited time, attitudes of landowners, particular instructions which limited the survey in any way, such as instructions from traditional owners to stay away from areas)
- ❑ Any constraints or limitations of the data (including documentary sources) collected during the project (e.g. lack of suitable oral history informants, loss of data, inability to find certain information)

Background information

- ❑ General description of study area (e.g. size, present land use, access, etc.)
- ❑ General description of environment (e.g. geology/geomorphology, topography, water courses, flora and fauna, relevant raw material sources, etc.)
- ❑ Previous impacts on the study area (e.g. past logging, clearing, ploughing, mining, erosion, etc.)
- ❑ Description of proposed development and associated works, including what activities could be expected to have an impact on the archaeology

Previous research

- ❑ Relevant ethnographic studies and findings within the region and the study area
- ❑ Relevant historical studies and findings within the region and the study area
- ❑ Relevant archaeological studies and findings within the region and the study area
- ❑ Relevant oral histories and findings within the region and the study area

Methods

- ❑ Research strategy and aims
- ❑ Detailed description of fieldwork methods for all stages of fieldwork. Outline clearly the equipment and techniques used to implement the research strategy (e.g. choice and location of sample areas, recording methods, collection methods, storage of artefacts/information, methods of analysis)
- ❑ Discussion of any problems which arose during fieldwork, analysis or report writing
- ❑ Detail of the constraints on archaeological visibility during the survey
- ❑ Description of any decisions made in the field or the laboratory which changed the scope of the study
- ❑ Details of people involved

Results

- ❑ Summary of what was found or achieved (e.g. quantities, types, distribution)
- ❑ Description of findings based on field notes and recording forms
- ❑ Relevant tabulations of data, photographs, illustrations

Discussion

- ❑ Summary of points of interest or major research problems emerging from the study
- ❑ Discussion of the evidence in regional and local perspective
- ❑ Implications of the findings and areas for future research

Assessment of significance

- ❑ General statements of significance for the study area
- ❑ Specific statements of significance for individual sites/areas (including whether further research is necessary to adequately determine significance)

Statement of impacts

- ❑ Implications of the probable effects of development on the study area and the findings (including both direct and indirect impacts)

Recommendations

- ❑ General management recommendations, including alternatives where possible (e.g. dealing with the study area in general or with particular zones or areas within it)

- ❑ Specific management recommendations, including alternatives where possible (e.g. dealing with individual sites or artefacts)
- ❑ Discussion of any issues or problems attached to these recommendations (e.g. client's preferences, difficulties, attitudes, compromises, etc.)
- ❑ Identification of any legal requirements or processes which must be followed
- ❑ References

Appendices

- ❑ Relevant additional information, including information which needs to be kept restricted
- ❑ A glossary of any technical terms or definitions used in the report (including definitions of artefact types, attributes, measurements, etc.)
- ❑ Copy of the project brief and any other relevant information from the client outlining the scope of work, etc.
- ❑ Letters of advice outlining management recommendations/opinions from community groups (e.g. Indigenous Land Councils)

Appendix 5
SAMPLE PRESS RELEASE

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Flinders University
Returns to Burra!

The year 2000 sees the beginning of long-term research and fieldwork by the Department of Archaeology and Cultural Studies at Flinders University, in Burra. Collaboration between Flinders and the Burra branch of the National Trust of South Australia, the Goyder Regional Council and the Mid-North Development Board began in 1998 when a pilot study was undertaken. The project will be launched with a public lecture at Burra on 9 March, 2000.

One outcome of this collaboration was the award of a three-year PhD Australian Postgraduate Award (Industry), to Peter Birt in December 1999 to study the archaeology of multiculturalism in colonial Australia, with Burra as the case study. Peter was involved in the 1998 pilot study and subsequently undertook his Honours research in 1999 on the village of Hampton, which is situated on the edge of Burra.

Peter has begun work on his PhD, which will involve extensive documentary research, archaeological survey and excavation (subject to the appropriate permits being granted). Initial plans include work at Mitchell Flat on the collapsed miner's dugouts, further work at Hampton which includes one German-built house and a general survey of Burra's extant early built environment. Fieldwork will begin by mid-year and will be ongoing during the remainder of the project. Flinders University staff members involved in various aspects of the project are Claire Smith, Jane James and Mark Staniforth. Dr Thomas Stöllner, Director elect of the Bergbau Museum, Bochum, Germany, will also be involved in the project.

The dugouts, in particular, provide a unique opportunity for archaeologists to obtain information about a class of people (mostly immigrant miners) who are grossly underrepresented in current studies. One of the strengths of archaeology is the ability to shed light upon the lives of ordinary people, who often are not recorded in historical material.

The project will generate information that can be used to provide additional interpretive information for visitors, but will also welcome the involvement of interested locals and provide a public archaeological experience for visitors. Ongoing research will see regular visits to Burra by Flinders staff and students undertaking study and fieldwork. The collaborative aspects of the project are real and will have direct benefits, both in the short and long term for Burra.

To enhance these benefits, staff and students of cultural tourism at Flinders University will participate in the fieldwork and also become involved in determining how the project's outcomes can best be used. The collaboration between community, industry and different areas of academia is somewhat unique (at least in South Australia) and promises to be a fruitful experience, drawing upon a wide range of skills and knowledge to produce results of tangible benefit to the town of Burra.

The project is innovative from an academic point of view because it consciously integrates cultural tourism and archaeology. This new approach should be able to provide new directions for making archaeological research more relevant to members of the general public. It is part of a growing recognition in universities that research needs to serve—and be seen to serve—the public good, rather than just the interests of an academic elite.

This collaboration has already produced Honours theses by Peter Birt and Paul Saeki, and another student, Dianne Jones, is beginning a study of the Burra cemetery this year.

Other benefits that will accrue from these activities are publications in both academic and popular literature, and increased public awareness of Burra's past and present appeal. It is hoped that, as activity increases, other students will undertake further research, which will value add to the project as a whole.

This project will include excavations as well as surveying and archival research. The first of a series of archaeological excavations is planned for April 2000. Tourists will be able to visit the excavations, and will be guided by archaeology and cultural tourism students. This will allow the public to gain an understanding of the process of archaeology as well as of the importance of the archaeological heritage of Burra.

This project provides a unique collaborative focus that will benefit all parties. 'Win–win' situations are rare in life, but this is one with great and continued potential for all concerned.

For further information contact:

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Goyder Regional Council

John Brak	Ph: 8892 2100	Fax: 8892 2467

The Mid-North Development Board

Craig Wilson	Ph: 8842 3115	Fax: 8842 1275

Appendix 6
INTERPRETATION PROJECT PLANNER

STORY OUTLINE

Use this table to indicate an outline for your interpretation. **Themes/messages** are the general elements of the overall story which you think are important and want to convey. Although they could just as easily be told at more than one place, the **story elements** are the ways in which you would illustrate these themes/messages at this *particular* place. **Physical elements/remains** asks you to note down the physical (archaeological) features of the place which could be used effectively to tell particular parts of the story.

Place or element of place	Possible stories	Themes/ messages	Story elements	Sites/physical remains
Example only	**Landscape:** How it formed, How it has been modified Why it looks the way it does now	The landscape is in a constant process of change	Geological events	Eroded valleys, remnant hills, fossil localities; rock outcrops

INTERPRETATION PROJECT PLANNER

Program/Project (title):

Site/Place:

Intended audience (type(s) of people and their age range):

Is there any information about who visits this site now and why?

Visitor analysis (if possible)

Estimate visitor numbers:

What are their needs?

What are their expectations?

What are their movements? (i.e. where have they come from and where are they going to?)

Linked interpretation opportunities:
(are there any complementary sites?)

General objectives for audience to obtain (the aims of your interpretation):

Specific objectives for audience to obtain:

Knowledge/appreciation of:

Skills of:

Attitudes/values of:

Theme/s of your interpretation:

Chosen technique/s:

Essential equipment (if any):

Content outline:

Appendix 7

CHECKLISTS FOR TABLES, FIGURES AND REFERENCES

Checklist for tables and figures

- ❑ Does the table or figure contribute to the presentation?
- ❑ Have the data/accuracy been checked?
- ❑ Does the table or figure follow its mention in the text?
- ❑ Should the table or figure be included in the text or an appendix?
- ❑ Are the tables and figures numbered consecutively?
- ❑ Are sufficient details given to interpret the table or figure? Are they self-explanatory?
- ❑ Is the caption sufficiently detailed?
- ❑ Are the captions in the text consistent with the list of tables or list of figures?
- ❑ Has a consistent format been used for all tables or figures?
- ❑ Are units of measurement clearly stated?
- ❑ Are abbreviations explained in the table or figure?
- ❑ Could the table or figure be presented more simply?
- ❑ Are column entries in tables correctly aligned?
- ❑ In figures, are vertical and horizontal axes of graphs labelled?
- ❑ In figures, is the zero position on the vertical axis shown?
- ❑ In figures, are units of measurements indicated and clearly shown on axes?
- ❑ In figures, are the separate observations comprising the graph marked?
- ❑ Can the figure or table be easily read?
- ❑ Is the table correctly positioned on the page?

Checklist for referencing

- ❑ Has each page of the references been numbered?
- ❑ Has every work cited in the text been included in the references?
- ❑ Have the rules for alphabetical and chronological ordering of references been consistently followed?
- ❑ Have institutional requirements for referencing format been met?
- ❑ Does each book reference include:
  —author(s);
  —date of publication;
  —title of book;
  —publisher;
  —place of publication?
- ❑ Does each journal reference include:
  —author(s);
  —date of publication;
  —title of paper;
  —title of journal;
  —issue and volume number;
  —inclusive page numbers?
- ❑ Have the rules for spacing, capitalisation and underlining been consistently followed?

Checklist for literature reviews

- ❑ Have you synthesised the known archaeology of the region and identified the limits of this in relation to the study area?
- ❑ Have you synthesised the known archaeology of the study area, including all sites previously found within or near the study area?
- ❑ Have you assessed the results of earlier studies in light of current knowledge and of what you propose to do?
- ❑ Have you synthesised the ethnographic information available for the study area and its surrounding region?
- ❑ Have you identified the range of archaeological evidence that is likely to be expected in the study area?
- ❑ From this information, have you identified the main archaeological issues and questions which you will address within your study?
- ❑ From this information, have you presented potential models for past human use of the landscape that are relevant to your research problem?

INDEX