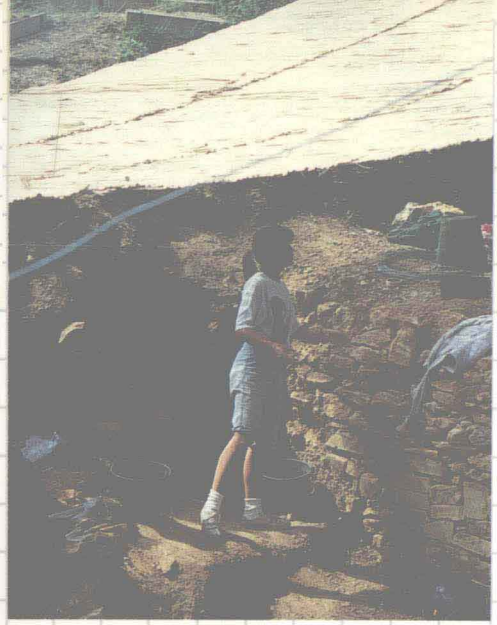

VIRTUAL DIG

A Simulated Archaeological Excavation of a Middle Paleolithic Site in France

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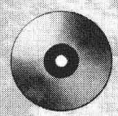

A Simulated Archaeological Excavation of a Middle Paleolithic Site in France

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Preface

With the increased use of computer technology in the classroom today, the need for applications of computer technology to teach fieldwork has become a reality. The idea behind *Virtual Dig* is to use computers to teach students the basics of excavation methods in archaeology and also to have fun. We have designed this program so that it provides a "feel" for doing archaeology without the time and expense of a field school. Although it is not a complete substitute for field experience, it gives students an opportunity to address issues that are not always presented in the typical classroom situation, such as how to set up a research design, deal with the logistics of a field project, and develop a fundable budget. As such, *Virtual Dig* is more realistic than a standard text and provides opportunities to explore a wide range of situations that will be encountered in the field. The interactive nature of the program also allows students to experiment using different excavation techniques.

We have written the software and this workbook for lower division undergraduate students in an archaeology methods course and have geared it specifically toward anthropology majors. *Virtual Dig* is designed so that it can be used in conjunction with other introductory methods texts to elaborate on or cover material that is not covered in the software or workbook.

One of the major strengths of *Virtual Dig* is that it uses real data from the excavation of Combe-Capelle, a Middle Paleolithic site in the Dordogne region of southern France that we excavated in the early 1990s. The use of Combe-Capelle for teaching excavation methods has several advantages. First, we worked there and are familiar with it; this enhances the integration of the software and workbook. Second, the field and analytical data from Combe-Capelle were fully computerized and therefore were easily adapted to this format. We saw a logical progression to go from the computerized field and analysis techniques to publication of the Combe-Capelle data on CD-ROM (Dibble and McPherron 1996, 1997) to teaching about excavation using Combe-Capelle data in a computerized format.

Another advantage of using Combe-Capelle data is that it provides a case study that allows students to carry out a project from start to finish: from developing a research design, excavating the site, and doing the analysis to writing up the final report. Because it is based on real data, the results of the "virtual excavations" will be similar to what we obtained during the real excavation. This means that should they want to, students can compare their results with those presented in the published volume on Combe-Capelle (Dibble and Lenoir 1995). In fact, students could even make new discoveries about the Paleolithic.

There are some disadvantages to using Combe-Capelle as a case study, but we feel these were more than compensated for by the advantages. First, Combe-Capelle is a Paleolithic site and as such lacks things like features, bones, burials, and tombs that might be found at other archaeological sites. Second, Paleolithic techniques are somewhat specialized and adhere to specific traditions that often differ from techniques more common in North American archaeology. However, the basics of archaeology are the same whether they are done at a Paleolithic site or a Maya tomb, and the use of a Paleolithic site, with its focus on lithic typology and technology, should thus be seen as an example of the ways archaeologists use archaeological data.

TECHNICAL SUPPORT

If you experience a problem with the program that you cannot resolve, check this Web site:

www.mayfieldpub.com/techsupport/

If a solution cannot be found there, please report your problem and include the following information:

- Describe what you did and what happened
- Indicate the version of *Virtual Dig* you are using
- Describe the computer you are using and its operating system
- Provide an exact description of the error message

Our support staff will address your problem as quickly as possible.

ACKNOWLEDGMENTS

We wish to thank a number of people who have been instrumental in seeing *Virtual Dig* become a reality. Bruce Mainwaring supported the initial development of this project and was a constant and eager supporter and Richard Price and Chavonne Hoyle of ICON provided the bulk of the financial support. Thanks go to Mayfield Publishing Company, specifically Jan Beatty and Lynn Rabin Bauer; Jeremy Sabloff, Vince Pigott, and the University of Pennsylvania Museum; the Bishop Museum; Oregon State University; and Greg Farrington at the Moore School of Engineering, University of Pennsylvania. Thanks also go to Phil Chase, April Nowell, Anna Agbe-Davis, and the General Honors I class at the University of Pennsylvania (Vikram Bajaj, Alfred Cheng, Elaine Chien, Andy Day, Natalie Derry, Josh Devon, Jonathon Fenkel, Erin Healy, Chris Knutsen, Ryan Leichsenning, Michael McLaughlin, Stephen Org, Anna Schwartz, Irene Shui, Nadaa Taiyab, and Franny Wang) for their helpful comments and suggestions. A grant from the National Science Foundation (BNS 8804379) supported the bulk of the excavation costs at Combe-Capelle. Thanks also to Sande and Harris Hollin for their continued support. We'd also like to thank our reviewers: George Gumerman IV, Northern Arizona University, and his fall 1998 Anthropology 101 class; Sarah K. Campbell, Western Washington University; Mark Hartmann, University of Arkansas; and John P. Staeck, College of DuPage. Last, but by no means least, we would like to thank our families for putting up with us and supporting us while we worked on this project.

Contents

Overview of *Virtual Dig* 1

Archaeologists face many challenges in setting up a field project, excavating a site, analyzing the data collected from it, and interpreting the results. *Virtual Dig* is designed to give you an idea of what it is like to carry out an excavation project from start to finish. This workbook and the CD-ROM take you through a project step by step, and we have divided both of them into four major parts to follow these steps: background information, setting up a field project, the excavation itself, and the analysis of the recovered material.

We have included specific exercises designed to teach concepts presented on the CD-ROM and in the workbook. For most of these exercises, you will use this book and turn in papers or projects to your instructor. *Virtual Dig* can be used in conjunction with general introductory archaeology textbooks (e.g., Hayden 1993; Sharer and Ashmore 1993; Thomas 1995) and with the published volumes on our excavations at Combe-Capelle (Dibble and Lenoir 1995; Dibble and McPherron 1996) if you would like to explore these concepts in more depth.

In addition to these exercises, you may design and carry out what we have called a virtual project. This is a semester- or quarter-long project that allows you to set up an excavation project and see it through to writing up the final report. For the virtual project you will excavate Combe-Capelle to answer research questions that you develop. The data generated during *Virtual Dig* will be based on actual data from our excavations (see last section in this chapter), but it is up to you to excavate the site and analyze the data to answer your research questions.

Although we recommend that you do the exercises and your virtual project from beginning to end, you have a tremendous amount of flexibility in terms of how you use the program. With the aid and advice of your instructor, you may wish to explore only certain parts of the CD-ROM or develop your own course of study. Almost everything–data, graphs, images–can be printed or exported to other programs.

We have based the CD-ROM on our excavations at the Middle Paleolithic site of Combe-Capelle, which is located in the Couze River valley of southwestern France. We begin by giving you background information on

the Middle Paleolithic in general and on the site of Combe-Capelle in particular. This discussion is enhanced through the use of full-color images accessible on the CD-ROM.

The next step is to set up your excavation project. You will learn how to write a research design, how to define and place your excavation units, and how to decide what methods to use for excavating the site. You will also learn about selecting project personnel, planning the logistics of a field project, and developing a budget. This will culminate in writing a grant proposal and budget that you will submit to a granting agency in order to obtain the funding necessary to do the fieldwork for your virtual project. Getting money is never easy, and you will learn some of the issues that must be addressed in order to get your proposal past anonymous reviewers.

After you set up your project, you will excavate the site. *Virtual Dig* provides an interactive interface for excavating Combe-Capelle. Using interactive excavation, you will excavate the site "by hand" and learn the basics of stratigraphy, proveniencing, screening, and field documentation. In addition to giving you a basic feel for what excavation is like, we have also tried to simulate some of the unexpected events that happen during an excavation project and that ultimately affect your budget. If you choose, you can also excavate in a way that only a computer simulation could offer, fully automatic excavation, which can save you a considerable amount of time. At any time, you can instantly access the full Combe-Capelle data set generated by our excavations.

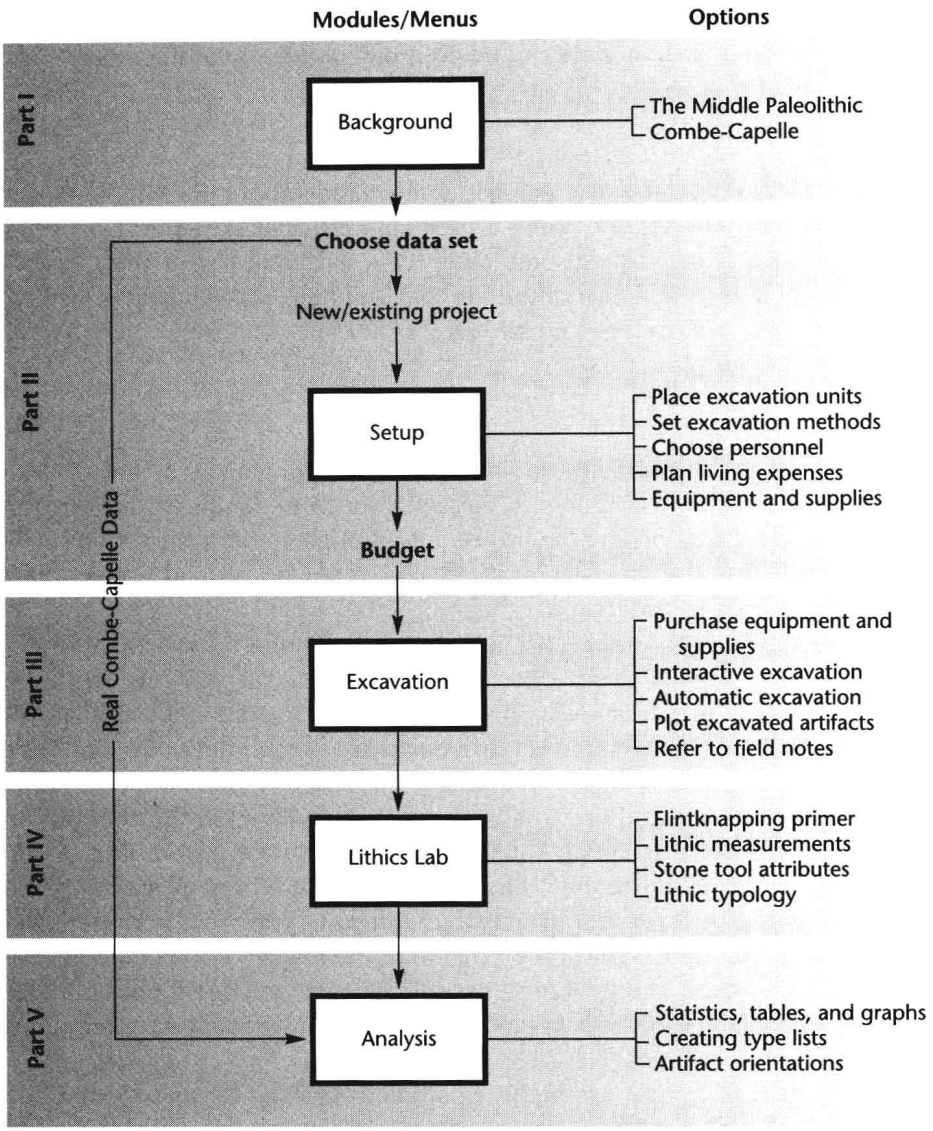
After you finish excavating, you will analyze the data you have collected. *Virtual Dig* teaches you the basics of stone tool (lithic) analysis, technology, and typology, focusing on the analysis of Paleolithic lithic assemblages. We also provide you with an overview of basic statistics and teach you how to generate tables and a variety of charts and graphs that can be used in your analysis. Finally, you will complete an exercise on evaluating site taphonomy, or the formation of an archaeological site, to see how the site of Combe-Capelle has been affected by geological processes. After you have completed the analysis for your virtual project, you will write a final report on the results of your excavations at Combe-Capelle.

While we hope this is a valuable learning experience on excavating a site, we also hope you have fun with it!

INSTALLING THE *VIRTUAL DIG* SOFTWARE

Install the *Virtual Dig* software by inserting the CD-ROM into your computer's CD-ROM drive, click on the **Start** button, then choose the **Run** . . . option. In the space provided, type the drive letter of your CD-ROM, followed by a colon and **Setup.exe** (for example, **e:setup.exe**) or choose **Browse** to find this file on the CD-ROM. During installation you will be given an opportunity to indicate where you would like the program and necessary data files to be located. The setup program will also create a program group with an icon for running the **Vdig.exe** program, or you can click on **Vdig.exe** from Windows Explorer, or create your own shortcut.

Each database file you create requires approximately 4 MB of disk storage. Depending on the amount of material you excavate, the file will increase in size.



Virtual Dig modules and suggested program flow

You must use the same file for your virtual project throughout the time that you are working with the program or you will lose any work you have already done. If you want to experiment with the software, don't use your project file. You should make periodic backups of your file. For the exercises that are not based on your virtual project, you can open up as many new files as you like, delete them as you wish, or reuse them.

HOW TO USE THE *VIRTUAL DIG* SOFTWARE

Virtual Dig is organized into a series of modules that mirror the steps you take in an excavation project. These modules are reflected in the five major sections of this workbook: Background, Setup, Excavation, Lithics Lab, and Analysis.

Although it makes sense to follow this order in using the software, it is not necessary to do so because each module can be used independently of the others.

Background

The Background module provides you with information about the Middle Paleolithic in general and the site of Combe-Capelle in particular. The purpose of this module is to provide intellectual context for the excavation and the Combe-Capelle material, and knowledge of the site that will help you develop a realistic and efficient excavation strategy and budget.

Setup

This module leads you through the various aspects of setting up an archaeological excavation project: Where and how to dig, what kinds of equipment to use, the personnel who will participate in the project, preparing a budget, and other logistical considerations. It can be used by itself, as part of your virtual project, or it can be excluded from consideration.

This module is important because it covers aspects of a project that are not usually found in archaeological texts. All archaeological projects must be designed to provide a match between the research goals and the methods that will be used to collect the data. As you set up your project, each decision you make will affect your budget. Obviously, the budget is affected by the amount of area that you plan to excavate and how many people are involved in the excavation. Because there is a limited amount of funding available for archaeological research, the idea is to maximize the return for the amount of money spent. At the same time, as a project director or principal investigator, you are also responsible for the safety and comfort of your crew. To add to the realism of this module, the final budget is submitted to a fictitious granting agency, which will not only rate the proposal but also supply feedback as to the appropriateness of the excavation procedures and organization.

The planning and budget are highly integrated with the Excavation module and provide more realism to the program in terms of budgeted expenditures and crew morale. During excavation, money is spent in three ways. First, transportation, lodging, and subsistence costs are handled automatically by the software and are charged once the digging begins. Second, you must purchase equipment and supplies for the project, and these are also charged against the budget. This can be done at any time during excavation, although some purchases will be necessary before any excavation can take place. Finally, unexpected, seemingly random events occur during the course of the excavation that will often cost the project money. Although some of these events are truly random, most reflect issues related to crew morale, which is a function of how much planning went into the crew's comfort and safety.

The idea behind the integration of the budget and the excavation process is to show how money is actually spent versus how it was planned to be spent. A major challenge of your virtual project is to stay within the limits of your budget. Because excavations can be run in arrears, you can spend more than you were allotted, but this will be recorded by the program and your actual expenses can be turned in with your final site report. This means that it is possible for you to conduct an excavation project without paying attention to the budget.

Excavation

After acquiring funding, you can begin excavation. You will first choose the mode of excavation that you want to use: interactive excavation or automatic excavation. In interactive excavation you will remove sediment and record artifact provenience "by hand," that is, by moving your computer's mouse over the ground surface and scraping away dirt. You must also empty or screen buckets as they are filled. This is a very realistic simulation of what an excavation is like, but just like the real thing, it is slow. A faster way to dig is by using automatic excavation, in which the computer does the digging and recording for you and at a much higher rate of speed. Remember, unless you are using the real data from Combe-Capelle (which has already been excavated), the only way to get material for analysis is through excavation.

Other concepts covered in the Excavation module include equipping your excavation, creating maps and plans of artifact distributions, and using field notebooks.

Lithics Lab

Because most of the material recovered from Combe-Capelle consists of lithics (stone tools and the by-products of their manufacture), the Lithics Lab module provides you with some background on the nature of stone tool variability. There are four sections to the Lithics Lab. The first is an interactive program to teach the fundamentals of flintknapping, from removing a flake from a core to retouching the flake into a recognizable tool. The next three sections cover lithic measurements, common lithic attributes that are observed and recorded during lithic analysis, and lithic typology. You are first taught how to record proper measurements and recognize particular attributes or types, then you are given a test based on a set of tools from Combe-Capelle. When coupled with the discussion presented in this workbook, these sections not only provide an introduction to the analysis of lithics (the single most common class of evidence in the archaeological record) but also prepare you to make inferences based on the analysis of data derived from your excavations at the site.

Analysis

There are three main goals of the Analysis module: to teach you the basics of modern lithic analysis, to develop your skills in dealing with quantitative data, and to use archaeological data to make inferences about your virtual project. Of course, analysis requires data, and the data you use in this module can come from two sources: your own excavations in *Virtual Dig* or the data acquired during our excavation at Combe-Capelle.

Three sections in the Analysis module provide you with an opportunity to work with data. The first section teaches you the difference between numeric and character data and the kinds of statistics, tables, and graphs that work best for each. You can organize your data in a number of ways and generate output either to the screen or to the printer. The other two sections are for specialized analyses. The first deals specifically with typological data and can calculate and graph type counts, or classes of artifacts, for specified levels or units. The second does the same with orientation data and illustrates the usefulness of orientation analysis

(how the artifacts are positioned in the ground) for addressing issues of site formation and disturbance.

You can gain access to the various modules in two ways. The easiest way is via the main option screen that appears when you start the software or when a screen is closed. Just click on the line corresponding to the module you want. The other way is to use the pull-down menus, which are organized by module name.

A WORD ABOUT THE DATA USED IN *VIRTUAL DIG*

The data used in *Virtual Dig* are the actual data recovered during the excavation of Combe-Capelle. It was necessary, however, to make some small alterations. First, not all of the analytical data are reproduced in the software, primarily because of the more esoteric nature of some of the observations we made. A complete data set in computerized format can be obtained from Dibble and McPherron (1996).

The second alteration has to do with providing the student with more flexibility in designing their own project. During the actual excavation we opened up a series of units and excavated most of these to bedrock. However, our excavation was fairly limited in extent, and we did not think it would be particularly interesting for students to excavate exactly where we did. This creates a problem in that we don't know what is to be found in the parts of the site where we did not excavate.

Our solution to this problem was to create a simulated site based on the samples we excavated from our units. The *Virtual Dig* site areas corresponding to our site sectors match, in probabilistic terms, what we found in those sectors in terms of the stratigraphic levels, the depth of deposits, the density of artifacts, their orientations, and the overall composition of the assemblages. Thus, what a student excavates from a particular unit will not be identical to what we found, but it will be very close to our findings in that general area. If the actual Combe-Capelle data are used and analyzed, the results will match the published results (Dibble and Lenoir 1995).

Background to the Middle Paleolithic

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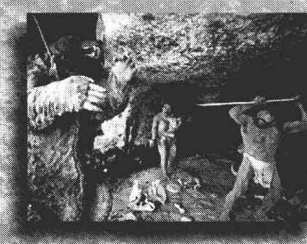

Virtual Dig is based on the French Middle Paleolithic site of Combe-Capelle and uses data generated during recent excavations there. However, before we describe Combe-Capelle (see Chapter 3), it is useful first to summarize our understanding of the European Middle Paleolithic. As you read the text in this chapter and the next, you can look at slides of some of the topics on the CD-ROM. On the menu, choose the **Background/Middle Paleolithic** option and click on the slide names on the left of the screen to see different pictures.

THE MIDDLE PALEOLITHIC

The Middle Paleolithic dates from about 250,000 to 35,000 years ago and coincides with the latter part of the Pleistocene epoch, or Ice Age. The term Paleolithic means Old Stone Age, and, as the name implies, the principal kinds of artifacts recovered from Paleolithic sites are lithics (stone tools and the by-products of their manufacture). The Middle Paleolithic has traditionally been defined as a flake tool industry, which was meant to differentiate it from earlier Acheulian industries (characterized by the presence of bifaces, or handaxes) and later Upper Paleolithic industries (characterized by blades and blade tools).

Our understanding of this time period is based on the excavation of a large number of caves and some open-air sites throughout the Old World, including Europe, Asia, Africa, and the Near East. In addition to the analysis of stone tools and bones recovered at these sites, geological studies and the analysis of prehistoric pollen play a key role in interpreting the Middle Paleolithic, as they provide information on what the climate was like when the sites were occupied.

DATING AND ENVIRONMENT

The Pleistocene, which lasted for about 2 million years, was characterized by cyclical variation in climate over periods of approximately 100,000 years. The colder, or glacial, periods saw massive buildups of ice, primarily