

birds are socially monogamous? Here we move onto thinner ice. In the final chapter Davies argues that the necessity for biparental care has been oversold and that limitations on opportunities to acquire additional mates are more important determinants of monogamy in birds, a distinctly mammalian point of view. If this is so, why have alternative mating systems, and particularly polyandry, not evolved more often in birds? Davies suggests that dunnocks may be exceptional both because their dependence on small insect prey makes additional male help highly beneficial to females, who consequently attempt to acquire additional mates, and because the habit of foraging in dense cover makes it difficult for an alpha male to evict a persistent sexual competitor. The answer then may lie in the economics of competition between males, and especially in the female's role in adjusting the payoffs.

My one criticism of Davies's book is that it contains little that has not appeared already in the primary literature. For those who have not followed the dunnock story over the past decade, however, it provides an engaging introduction to current questions about the evolution of mating systems, a model of what can be achieved by a judicious blend of field observation and experimentation, and a salutary reminder that solutions to important problems in behavioral ecology may reside in one's own back yard.

Robert Gibson
Department of Biology,
University of California,
Los Angeles, CA 90024-1606

The Seventh Continent

The Geology of Antarctica. ROBERT J. TINGEY, Ed. Clarendon (Oxford University Press), New York, 1991. xxiv, 680 pp., illus., + map. \$195. Oxford Monographs on Geology and Geophysics.

Antarctica, the seventh continent, is more than one and a half times the size of Australia and makes up about 9 percent of the earth's continental crust. It is largely covered by ice, only about 2 percent of its area being ice-free. Rock outcrops along the coast, in the Transantarctic Mountains, and in the Antarctic Peninsula make up the only surface expression of the continent beneath the ice. Although it occupies a sizable portion of the earth's surface, Antarctica was the last continent to be explored, owing to its isolation and harsh environment. Though first sighted in the early 19th century, it was not until the beginning of the 20th century that geological investigations were first undertaken in Antarc-



"Jurassic Kirkpatrick Basalt lavas at Scarab Peak, Tobin Mesa, Mesa Range northern Victoria Land. The basalt sequence in the Mesa Range has a stratigraphic thickness of at least 780 m. The black bluff forming the summit mesa is in the high-Ti unit which is about 100 m thick. The underlying Exposure Hill Formation crops out at the base of the long, low ridge trending away to the right (northeast) from Scarab Peak." [From *The Geology of Antarctica*; photograph by D. H. Elliot]

tica as part of Robert Scott's *Discovery* expedition, and not until the late 1950s, beginning with the International Geophysical Year, that geological investigations became a regular occurrence each Austral summer. Since that time, the number and diversity of geological research projects have increased along with the number of nations sponsoring Antarctic research programs. Compared to that in other parts of the world in the early 1980s, however, the pace of geological research in Antarctica was still slow, and in many respects the visibility of Antarctic research and its integration with geological work elsewhere had been less than optimal. In a way, Antarctic geological research had been suffering from a kind of intellectual isolation that perhaps was related to its geographical isolation.

In this compendium of papers Robert Tingley has attempted to produce, for the first time, a comprehensive review of the geology and geophysics of Antarctica in order "to open up Antarctic earth science to a wider geological audience." In the context of Antarctic geological research in the early 1980s, when this book was conceived, there was a glaring need for such a review. A new generation of Antarctic earth scientists was emerging as existing national Antarctic research programs expanded and new programs, particularly the German and Italian ones, were begun. With this book I think Tingley will achieve his goal of stimulating wider interest in Antarctic geology.

The book's 19 chapters describe major aspects of Antarctic geology, from records of Archean and Proterozoic events in East Antarctica through the Cenozoic glacial and volcanic history of the continent. The last chapter discusses the special value of Antarctica as a meteorite bonanza. The authors of all the chapters except that on the Ferrar tholeiitic province are recognized experts on their topics. In keeping with the spirit of the Heroic Age of Antarctic exploration, in which cer-

tain things had to be done even if one wasn't fully qualified to do them, Tingley, a self-proclaimed nonexpert on the Ferrar, wrote this chapter as a literature review because, as he says, "an account of the Mesozoic tholeiites is needed in a book of this type." All things considered, I think he has done a commendable job.

I have two criticisms of the book. The first is that some parts of it are more out of date than would be suggested by the 1991 publication date and do not take into account some key discoveries that have both built on and changed the interpretations presented. The second relates to the indiscriminating treatment of isotopic ages. The discussion of isotopic ages of the Proterozoic and Paleozoic is somewhat rambling and confusing, and, perhaps because of the relative paucity of isotopic dates from Antarctica, there seems to be a tendency for all previously published dates to be perpetuated without caveat or reevaluation. Many of the rubidium-strontium isochron dates are rather tenuous, being based on only two- or three-point isochrons, and the dates discussed have not been recalculated with a common decay constant. The lack of a common decay constant translates to a difference of only about 7 million years, which is not large in terms of the general state of geochronology in Antarctica, and knowledgeable geochronologists will identify this problem easily. Nevertheless, it does indicate the need for Antarctic earth scientists to stop citing dates that are not defensible, as well as the need for close scrutiny of all dates that are to be used for interpretations of geological history.

Several chapters are particularly timely because they provide background to important unresolved controversies and ongoing research relating to the history and dynamics of the ice sheets. For example, the chapters "Cainozoic history of the Antarctic ice sheet" by Denton, Prentice, and Burckle and "The Cainozoic glacial record

in south Victoria Land" by McKelvey provide useful insight into the important controversy surrounding the interpretation of the Sirius Formation, a till found at scattered localities in the Transantarctic Mountains. The key question is whether the East Antarctic Ice Sheet has existed essentially as a persistent feature or has collapsed to an archipelago of smaller ice sheets over the last 15 million years. Similarly, the chapters by Tingey and Laird on Archean, Proterozoic, and Paleozoic geology provide useful background to the recently proposed hypothesis that Antarctica, Australia, and North America formed a supercontinent in late Precambrian time.

Overall, I think this will prove to be a useful reference book for both experienced and novice Antarctic geologists. Interpretations of the geological history of Antarctica are changing rapidly, and in some cases have perhaps already passed this book by; such is the nature of scientific inquiry. Nevertheless, the value of Tingey's book as a guide to the older literature will remain high for some time to come, especially given that much of the previous work is contained in symposia volumes and unpublished theses.

Scott Borg

National Science Foundation,
Washington, DC 20550



Maya Paleodemography

Precolumbian Population History in the Maya Lowlands. T. PATRICK CULBERT and DON S. RICE, Eds. University of New Mexico Press, Albuquerque, NM, 1991. xx, 395 pp., illus. \$40. Based on a meeting, Denver, CO, 1985.

How many people inhabited the Maya Lowlands during the Classic period? What was the nature of pre-Hispanic Maya urbanism? How many people can a tropical forest habitat support? These are questions that have been repeatedly addressed in the archaeological investigation of the Yucatan Peninsula and adjacent low-lying areas of Central America. The present volume represents a pause for assessment at the end of several decades of research on the paleodemography of lowland Maya civilization. This period has seen the prevailing view of the ancient Maya change from one of largely vacant ceremonial centers surrounded by an environmentally limited low-density rural population to one of the Maya as a true urban civilization supported by a wide range of agricultural systems. With the pace and scope of settlement studies increasing rap-

idly in recent years, some reflection on the accomplishments of and problems encountered in the investigation of ancient Maya population dynamics is certainly called for.

The purpose of the volume, as Rice and Culbert put it in their opening chapter, is to provide a sourcebook of lowland population data and to make clear the grounds on which population estimates are derived from the raw data. One of the principal strengths of the volume is that through the focus on methodology comparisons of population characteristics across the Maya Lowlands become possible. Collectively, the chapters summarize the diversity of settlement in the Maya Lowlands and bring into focus the true range of demographic variation across both space and time. Ironically, the focus on demographic reconstruction also gives rise to the only fundamental weakness of the volume, the avoidance of issues of environmental carrying capacity. By avoiding the quasi-independent check of population figures provided by carrying capacity estimates, slippery though that subject may be, the volume generally skirts the important question of to what degree population growth in the Maya Lowlands was experienced as population pressure. In short, the editors consciously turn away from trying to explain changes in population across space and time, a mandate followed by most of the authors.

The 16 chapters in the volume are organized chiefly by site and region. A few of the authors address paleodemography on a regional scale, analyzing data from several areas of the lowlands such as the Peten lakes and Belize River valley. Most of them, however, consider data from site-scale surveys, including Copan, Quirigua, Seibal, Tikal, Nohmul, Santa Rita Corozal, Komchen, and Sayil. Despite this spatially fractured organization, many common problems are discussed.

One of these is the degree to which residential features are visible as recognizable surface remains. Faced with geomorphological settings ranging from alluvial floodplains (as at Quirigua) and wet regions with rapid soil development (as at Seibal) to semiarid regions with scant soil cover (as at Komchen), the studies make it clear that sampling strategies must be adapted to specific environments. A related problem is that of determining which features or parts of features functioned as actual residences. Though many archaeological features have direct ethnographic counterparts, most sites also include features of ambiguous function and origin. At Sayil, for example, Tourtellot, Sabloff, and Smyth wrestle with the problem of how to interpret a large number of small, amorphous rubble mounds. At Nohmul, Pyburn notes that the form of dwellings, and hence the way they are represented in archaeological remains, appears to have varied significantly over time.

Several of the authors also consider other effects of archeological sampling strategies on demographic data, including the possible underrepresentation of some time periods because of changes in the spatial concentration of population that may not be revealed by standard survey grids. A related problem of distortion may appear on a regional scale, where larger settlements have received more attention than smaller ones. As Fry notes, some smaller sites "do not show the extreme swings in population characteristic of the major central places, and the smaller centers show greater continuity of occupation."

Cumulatively, this volume provides a highly useful database for examining such pervasive questions in Maya studies as the nature of population growth associated with the rise of Maya civilization and the extent, severity, and timing of the collapse of Classic civilization in the eighth through tenth centuries A.D.—as well as earlier, more limited demographic declines. It should also prove useful to other scholars interested in examining the nature of demographic changes associated with the rise and fall of preindustrial civilization in a tropical environment. As Santley notes in his summary chapter, most studies of long-term population trends have been produced by historical demographers using urban census data, whereas the Maya record allows for the examination of an urban-to-rural continuum in which farming was the principal means of livelihood: "It is precisely here that Maya archaeology has great potential to make a meaningful contribution to our knowledge about long-term patterning in regional and site demography." The fact that the ancient Maya inhabited a range of tropical ecosystems with varying degrees of success makes this work all the more important as increasing numbers of land-hungry people stream into the world's tropical frontiers today.

Nicholas P. Dunning

Department of Geography,
University of Cincinnati,
Cincinnati, OH 45221-0131



A Young Collector

The Dragon in the Cliff. A Novel Based on the Life of Mary Anning. SHEILA COLE. Drawings by T. D. Farrow. Lothrop, Lee and Shepard, New York, 1991. xii, 212 pp., illus. \$13.95.

Children's books about women in science are relatively rare, and only a few tell about women active more than a century ago. One recent book that does so is *The Dragon in the Cliff* by Sheila Cole, an account in the first