again that biostratigraphers, rather than reveling in a blind obsession with an interminable morass of detail, are engaged in solving some of the most interesting intellectual puzzles in geology.

THOMAS J. M. SCHOPF
Department of the Geophysical Sciences, University of Chicago, Chicago, Illinois 60637

Maya Architecture

The Puuc. An Architectural Survey of the Hill Country of Yucatan and Northern Campeche, Mexico. H. E. D. POLLOCK. Harvard University Peabody Museum of Archaeology and Ethnology, Cambridge, Mass., 1980. xxx, 600 pp., illus., + packet of figures. Paper, $50. Memoirs of the Peabody Museum, vol. 19. Published in cooperation with the Carnegie Institution of Washington.

The Puuc hills of the northwestern Yucatan Peninsula provide the only relief in what must be one of the world's flattest landscapes. They were the locus of the finest architectural achievements of the ancient Maya. The beauties of such sites as Uxmal, Kabah, Labna, and Sayil are familiar to archeologists and tourists alike and have influenced such modern masters as Frank Lloyd Wright.

For a knowledge of the Puuc architectural style, until now we have largely relied on John Lloyd Stephens's 1843 *Incidents of Travel in Yucatan*, with Frederick Catherwood's magnificent engravings. With the publication of Harry Pollock's long-awaited survey of Puuc sites, our concept of the style is on firmer

A figure, shown in a modern wall, from the Main Palace, or Palace of the Figures, at Xculoc, Campeche. [From *The Puuc*. Peabody Museum, Harvard University; photograph by Carnegie Institution of Washington]

ground. Long a staff member of the Carnegie Institution of Washington, Pollock began his fieldwork in that hot, tick-infested land as far back as 1932 and continued it until 1940, with an additional field trip in 1948. During that time, he was able to locate about 140 Puuc sites within an area of 7000 square kilometers, a remarkable density that must indicate one of the heaviest populations in the native New World.

In the preface, Pollock frankly admits to the volume's shortcomings, most of them stemming from a research plan that would now be considered outmoded. The most glaring one is the total absence of data from excavations. Remarkably, no Puuc site—not even Uxmal with its nightly *son et lumière* extravaganza—has been properly excavated. Evidence from stratigraphy and reliable radiocarbon determinations is thus nonexistent. This means that we cannot now date the Late, or Classic, Puuc style accurately (it may cover the span from about A.D. 800 to 1000); that we have no idea of the function of Puuc buildings, other than ball courts; and that any proposed sequence of architectural development remains purely hypothetical.

A second shortcoming, typical of most but not all Carnegie fieldwork of the period, is a lack of concern for what we would now call settlement pattern. Were sites like Uxmal real cities, like those of Aztec Mexico, or were they relatively empty "ceremonial centers"? Only a few sites (Sayil, Kabah, and Oxkintok) have been adequately mapped, and not even for these do we have data on house mounds; for Uxmal, Pollock has been forced to rely on the hopelessly inadequate Tulane map of 1930. We thus do not know the degree of ancient urbanization in the Puuc area.

The volume does contain first-class architectural plans, sections, and elevations of individual buildings; it provides a definitive record of much standing architecture, which is a considerable

One of the major architectural assemblages at Sayil, Yucatan, looking northeast. Situated at the northern end of a causeway that roughly bisects the city, the structural complex looks southward to other major architectural assemblages located midway along the causeway and at its southern terminus. [From *The Puuc*. Peabody Museum, Harvard University; photograph by Carnegie Institution of Washington]

achievement in itself. Unhappily, an archeologist's photographs have once again been so reduced and printed so badly that many are virtually useless—particularly in the case of monuments and carvings included in the survey.

Pollock's commentary shows throughout the good sense and acumen of an architectural expert and the modesty of one who knows that if he could do the survey today he would do it differently. There are, however, lacunae in interpretation as well as data. I find no mention of the work of the architect Horst Hartung and the astronomer Anthony Aveni, who have had much to say about the orientation and placement of Maya buildings, including those at Uxmal. There is no attempt to deal with the iconography of Puuc architectural ornament, especially the masks over doorways and at corners. And the great causeways or *sacbeob* within and between sites are scarcely mentioned.

Despite its shortcomings—and what archeological report is free of these?—this is a monumental work on one of the world's major architectural styles.

MICHAEL D. COE
Department of Anthropology,
Yale University,
New Haven, Connecticut 06520

Primate Parental Relations

Baboon Mothers and Infants. JEANNE ALTMANN. Harvard University Press, Cambridge, Mass., 1980. xiv, 242 pp., illus. $17.50.

The helplessness of human and other primate infants means that they rely heavily on their mothers for protection merely in order to survive. Over ten years ago John Bowlby therefore suggested that if the significance of maternal behavior is to be understood psychology must unite with biology. The causes and consequences of the way mothers and infants interact, he argued, should be viewed from an ecological perspective.

Until recently Bowlby's advice has been heard but not acted on. Most studies of the social development of primates have been carried out in captivity. Jeanne Altmann's book is therefore a landmark. Drawing on eight years of demographic data and 15 months of observation in a natural habitat, she assesses the nature and extent of external influences on baboon mothers and infants. Altmann provides detailed descriptions of the course of the mother-infant relationships and relates individual differences to the constraints and opportunities different pairs happen to face. In doing so she not only indicates how ecological and social pressures mold mothering styles but significantly deepens our appreciation of the complexity of baboon social organization.

The harsh problems of survival are emphasized throughout. The study site was in one of the simplest and most arid ecosystems inhabited by primates, an area of scattered *Acacia* woodlands in Amboseli National Park, Kenya. Newborn infants had a 50 percent chance of dying before the age of two, and there were data suggesting that females had higher death rates when accompanied by dependent infants. With the aid of a simple model, Altmann argues that to provide enough food and care for their infants mothers sacrificed their own condition. In Amboseli there is no daily provisioning of laboratory feed, so food and time are in short supply.

The central result concerned a distinction between two types of mothers. "Laissez-faire" mothers were tolerant of other individuals approaching, grooming, or playing with their babies and were generally calm. For instance, they had low rates of glancing at their neighbors. "Restrictive" mothers showed opposite tendencies, and as a result their infants remained dependent for several months longer than those of laissez-faire mothers. Altmann argues plausibly that calm mothers are likely to be more successful at rearing their infants. This might imply that restrictive mothers were behaving maladaptively, but data suggest they were using the best style available to them. Thus, they tended to be subordinate individuals whose infants would have suffered from being grabbed by peers if they were not protected as effectively as possible. Like many of Altmann's results on the mother-infant relationship, this conclusion confirms and extends those of laboratory workers.

Like most field studies of primate behavior, this was conducted on a single group. Such a narrow focus has disadvantages, but here it meant that long-term information was available on many aspects of individual behavior and relationships. It was possible, for instance, to use mother's age and probable identity of infant's fathers as independent variables, and several results benefited by being related to data collected by colleagues on other topics. The book is rich in fascinating asides, such as that dominant mothers tended to have female babies.

Lucid writing, careful methods, excellent illustrations, and several appendixes make the merits of this study easy to appreciate. Its main drawback is its small sample size (18 mother-infant pairs, of which eight were observed for six months or more). Though the data base was larger than in most captive studies, the fact that only a few pairs could be observed, and none for many hours, makes some interpretations questionable. Thus, Altmann suggests that some individual differences had more to do with personality than with age or dominance rank. Without tests of the reliability of the behavioral samples, however, it remains possible that apparent differences emerged by chance. Personality differences raise important problems concerning both the ultimate and the proximate sources of variation in reproductive success, and Altmann points the way to further work. Several studies of social development in wild primates are currently in progress, and more will surely now be stimulated. The researchers conducting them will do well to emulate the broad perspective and tidy conclusions displayed in this model of a book.

R. W. WRANGHAM
King's College Research Centre,
King's College,
Cambridge CB2 1ST, England

Anion and Calcium Transport

Membrane Transport in Erythrocytes. Relations between Function and Molecular Structure. Proceedings of a symposium, Copenhagen, Aug. 1979. ULRIK V. LASSEN, HANS H. USSING, and JENS OTTO WIETH, Eds. Munksgaard, Copenhagen, 1980. 558 pp., illus. D. kr. 275. Alfred Benzon Symposium 14.

The red cell has long been a favorite vehicle for the study of membrane transport. Even in this era of tissue culture, membrane vesicles, and reconstitution, the mammalian red cell has some unique advantages. Its only membrane is the relatively simple (in terms of protein composition) outer plasma membrane. Because there is no internal structure or compartmentalization, the internal concentration of most solutes can be determined unambiguously. By the use of ghosts or vesicles, alteration of the internal composition can be accomplished easily, allowing independent control of the composition on the two sides of the membrane. The best example of the exploitation of these advantages is the characterization of the Na-K-adenosine triphosphatase pump. Nearly everything