

import from Germany in the 1920s and '30s. It was a strong critique of behaviorism and introspectionism, though Gestalters used introspection as a method.

Finally, the interview with Herbert Simon (Carnegie-Mellon) is enlightening. Simon, trained as an economist and management specialist, has profoundly influenced psychology without any formal training in the field. His comments are wise and judicious as befits a Nobel laureate. Simon is responsible for the interest in artificial intelligence, now an important aspect of cognitive psychology. He has developed computer programs for problem-solving and for playing chess and has been a leader in the emergence of a new academic field called "cognitive sciences," which may absorb cognitive psychology as it combines psychology, linguistics, philosophy, and computer science.

Baars has written an interesting and useful book on selected aspects of experimental psychology over the past 80 years. I would not again teach a course in the history of psychology without referring to this book. He writes well. He paints the demarcation between behaviorism and cognitive psychology too sharply. It has been said that cognitive psychology is a disguised S-R formulation with some fancy talk between the S and R. And should the author believe that the history of psychology is linear I would point out that there is discussion again of connectionism among cognitive psychologists, reminiscent of the associationism of behaviorism.

HARRY LEVIN

*Department of Psychology,
Cornell University,
Ithaca, NY 14853*

Carbonate Complexes

Reef Diagenesis. J. H. SCHROEDER and B. H. PURSER, Eds. Springer-Verlag, New York, 1986. x, 455 pp., illus. \$59. Based on a symposium, Papeete, Tahiti, 1985.

In compiling this collection of 19 papers Schroeder and Purser have done carbonate geology a truly valuable service. Most of the papers are case studies describing ordered diagenetic sequences in specific reef complexes; thus taken together they offer a comprehensive view of reef alteration. They include diagenetic studies of many of the best-known depositional reef facies models in various parts of the world and adequately encompass the span of geologic time.

Two papers are special studies: one on details of fabric control of coral diagenesis (B. R. Constantz) and another on the hydrology of Eniwetok and Davies Reef in the

Australian Great Barrier Reef (R. W. Bud-demeier and J. A. Oberdorfer). The latter is particularly important because so few hydrodynamic studies are available. It reports that fabric variation in reefs makes for high but variable permeability. Sea water penetrates well into these two modern reef masses. The Ghyben-Herzberg freshwater lens is thin and irregular despite the exposed reef mass at Eniwetok. The study also reports that microbial activity affects internal water chemistry throughout reef masses, a diagenetic control often not considered.

Very useful general descriptive accounts of Neogene diagenesis are given in papers on submarine cements in the Great Barrier Reef (J. F. Marshall); peripheral cementation and dolomitization by mixing of marine and fresh water in reefs of Mururoa Atoll, French Polynesia (D. M. Aissaoui, D. Bui-gues, and B. H. Purser); and diagenesis in Pleistocene coral reefs in the Red Sea (W. C. Dullo) and in Miocene reefs in the Gulf of Suez (D. M. Aissaoui *et al.*). Older reefs — Paleocene coral knobs of southern Egypt — are also discussed (J. H. Schroeder). The Cretaceous is well represented by papers on northern Spain's Albian reefs in the tectonically active Cantabrian basin (J. Reitner) and rudist reefs in Tunisia (A. M. Rabet *et al.*).

A major paper by P. Enos reviews work on the Cretaceous of the Valles Platform in central Mexico and is followed by studies of the southern German Jurassic sponge-algal reefs in Schwabia and Franconia (R. Koch and M. Schorr) and the Triassic Wetterstein limestone of Bavaria (R. Henrich and H. Zankl). For the Paleozoic, two Upper Permian examples are included: the Zechstein-Magnesian limestone of northeastern England (M. E. Tucker and N. T. J. Hollingworth) and aragonitic sponges from the Djebel Tebaga of southern Tunisia (M. Scherer). A paper on micrite diagenesis in the Carboniferous Waulsortian (J. Miller) is followed by two on Upper Devonian reefs: the subsurface Nisku of Alberta, Canada (H.-G. Machel) and the Canning Basin of western Australia (C. Kerans, N. F. Hurley, and P. E. Playford). Two Silurian reef studies complete the case histories: a subsurface study of northern Michigan basin pinnacle reefs (K. R. Cercone and K. C. Lohmann) and a study of the Klinteberg formation in the Baltic Gotlandian (P. Frykman).

The reviews are admirably summarized by the editors, both of whom contributed to some of the case histories. They list seven reasons why diagenesis is so prominent in reefs, most important that reefs are high-standing barrier-forming masses with great internal porosity and metastable mineralogy consisting of aragonite and are organic-rich.

The summary points out that hydrodynamic models of reefs (indeed of all carbonate masses) need intensive additional study and calls attention to tidal movements, thermal convection, and wave surge as reasons for surficial cementation on windward sides of reefs and for the strong internal penetration of marine waters, the latter offering an additional explanation of dolomitization. The majority of the studies show that the depth of the Ghyben-Herzberg lens is controlled by surface outcrop exposures and internal inhomogeneity and that its general thinness diminishes the influence of mixing-zone dolomitization. Incidentally, 14 out of 19 of the reported examples include dolomitization, much of which is associated with solution and therefore may originate in mixing zones. Evaporites are involved in the stratigraphic sequences in only two of the 19 examples.

The studies show that early marine cementation is pervasive but that meteoric cementation is also present in all the reefs studied. These cements are volumetrically important and serve to stabilize the reef mass. Later burial diagenesis (compaction, pressure solution, and cementation) is generally porosity-destructive. The editors have included several useful cartoons of suggested water masses and their flow paths in reefs. In their conclusions, they urge more careful plotting of the geographic variations in diagenetic effects within individual reef bodies. I strongly recommend this book to both specialists and students interested in carbonate rocks.

JAMES LEE WILSON

*1316 Patio Drive,
New Braunfels, TX 78130*

Invertebrate Immunology

Hemocytic and Humoral Immunity in Arthropods. AYODHYA P. GUPTA, Ed. Wiley-Interscience, New York, 1986. xiv, 535 pp., illus. \$59.95.

Within the field of comparative immunology much of the growing body of research has dealt with arthropods. This volume on the subject consists of 20 chapters by 32 authors. The first seven chapters pertain to cell-mediated immunity and the next ten are concerned with humoral factors. The final three chapters deal with techniques.

The chapters vary in quality and scope. The lead chapter, by A. P. Gupta, is a comprehensive and thought-provoking analysis of the structure and functions of arthropod immunocytes and their similarities to vertebrate B and T cells. Similarly, the contribution by A. Vey and P. Götz is an in-depth review of the antifungal defense

mechanisms in insects, and the review by T. M. and R. M. Rizki of hemocyte surface changes in *Drosophila* during encapsulation is authoritative. The review of the biochemistry of arthropod agglutinins by H. D. Hapner and M. R. Stebbins and the review by J. S. Chadwick and G. B. Dunphy of antibacterial and antiviral hemolymph factors are also well done. On the other hand, J. G. Stoffolano's contribution pertaining to nematode-induced responses is strictly descriptive, with very little on the molecular basis of nonself recognition or the mechanisms governing the types of host response—the areas where the most significant advances have been made during the past five years.

Two additional contributions require comment. In the chapter dealing with transplantation immunology, A. Lackie champions her own interpretation that insects cannot recognize allografts. She bases her argument primarily on the nondestruction of implanted nervous tissues and neurosecretory organs reported in the literature. Although additional studies are required, it may be that such tissues are less stimulatory than others and that her conclusion is biased and premature.

In the chapter dealing with crustacean agglutinins and lectins, G. A. Amirante makes the strong appeal that the terms "lectin" and "agglutinin" should not be employed interchangeably. The latter term should be reserved for those molecules that react against an antigenic determinant not characterized by a specific group or one sugar. This is a point well taken.

In conclusion, this is a most useful book for those who wish to be initiated into the fascinating subject of invertebrate, especially arthropod, immune mechanisms. It should be required reading for scientists interested in the application of biological control agents against destructive insects and those concerned with prevention of diseases of economically important arthropods.

THOMAS C. CHENG
Marine Biomedical Research,
Medical University of South Carolina,
Charleston, SC 29412

Archeology in the Andes

Telarmachay. Chasseurs et Pasteurs Préhistoriques des Andes I. DANIELLE LAVALLÉE, MICHÈLE JULIEN, JANE WHEELER, CLAUDINE KARLIN, and six others. Editions Recherche sur les Civilisations, Paris, 1985. In two volumes. 461 pp., illus., + maps. Paper, F. 317.79. "Synthese," no. 20.

The cold and windswept high-altitude puna grassland of Peru may seem an odd

place to find abundant evidence of early South American hunters and herders or large international teams of archeologists in pursuit of early sites. A series of books and articles, however, of which the Telarmachay report is the latest and most impressive, testifies to the importance of this environment in Andean prehistory. The centrally located Puna of Junín is dotted with cave sites rich in stone tools and animal remains and promises to be a key natural laboratory for understanding early Andean hunting adaptations and the shift to herding of the llama and alpaca. This book focuses on the preceramic levels of the Junín site of Telarmachay, excavated from 1974 to 1980 by a French-led international and interdisciplinary team. The first volume consists of six major sections describing and interpreting the artifacts and their distributions. An appendix of specialist studies covers pollen analysis, lithic use-wear, and human skeletal remains, among other topics. A second "volume" consists of loose maps showing the distributions of different materials in Telarmachay levels.

The Telarmachay site is an unimposing shallow rock shelter located at an altitude of 4420 meters, yet it was the subject of the most meticulous and well-documented excavations yet published on the Peruvian preceramic period of around 10,000 to 2,000 B.C. An area of 35 square meters was exposed through seven major stratigraphic units by the "decapage" method, which laboriously leaves all notable objects in place. These are then mapped and photographed, providing an extremely detailed record of each sublayer of a stratum. Thus the Telarmachay reports contain oversize maps and photographic mosaics of the most important preceramic layers at 1:10 scale, showing animal bones and stone tools in cases so tightly packed that only a jumble of overlapping forms can be appreciated.

What is the reason for so many cold months of field time spent on this detailed work? Lavallée, primary author and leader of the project, in keeping with trends in French prehistory, hopes to document the use of space within the shelter area. How was daily life organized, and where were activities like cooking, sleeping, butchering, and tool preparation performed? The primary evidence is the visual impression of artifact distributions, and the interpretation is quite direct: where there are concentrations of objects there was either dumping of garbage or debris-producing activity. Notably sparse areas are interpreted as cleaned floor surfaces of habitation structures, and notable changes in densities of remains are often assumed to be caused by structure walls. In some layers postholes seem to

confirm this assumption, and the classes of material found around hearths seem logically related to cooking and manufacturing.

In the rush for "paleo-ethnographic" detail, however, there is a danger. When can we be sure that any given pattern of remains represents any specific prehistoric human behavior? A couple of decades of research examining recently abandoned hunter-gatherers' camps has shown a complex relationship between human activity and material deposits. Notably absent in Lavallée's interpretations of Telarmachay's organization are references to this work. Perhaps she is leaving the task of considering regularities that would help span the gap between the observed distributions and past daily life to others, but any quantitative reanalysis will require laborious measuring of artifact positions from maps, since no numerical spatial data are presented. Nevertheless, her map-based approach does give a general vision of what these ancient surfaces looked like at the time of their abandonment.

The Telarmachay report concentrates on the shelter area, an important but limited part of the site. The excavations document subtly changing space use within a pattern that shows surprising constancy in the placement of structures, hearths, and some activity areas. Very significant is the detailed delimitation of primary living surface and outside area, and Lavallée is careful to note the degree to which the contents of any particular level are determined by the proportion of living, outside activity, or dumping surfaces. This understanding is crucial if the remains are to be interpreted in a comparative chronological manner, since major assemblage differences across time could simply be an effect of the surfaces sampled and not represent changes in the overall character of the prehistoric society. In this regard it would have been useful to have a sample of remains from the more distant talus slope areas, which may have witnessed whole ranges of activities not present in the shelter.

Lavallée's vision is not restricted to details of site organization but encompasses the origins of camelid domestication. The approximately 400,000 animal bones, of which one-third have now been analyzed, offer a detailed record of changes in animal exploitation. Important among these is an apparent shift from hunting to herding around 4000 B.C., taken by paleozoologist Jane Wheeler to imply that Telarmachay was a locale of alpaca domestication. The lack of forms intermediate between wild and domestic leaves room for doubt about the actual site of this transition. The primary evidence for herding comes from an increasing presence of newborn camelids, which