duced into the United States about 1920, they spread rapidly, damaging certain crops and stinging painfully. Leaf-cutting ants (*Acromyrmex* and *Atta* spp.), by contrast, are the predominant herbivores of the New World tropics. They energetically harvest fresh vegetation on which to cultivate fungi as food for their larvae, providing intense competition for agriculture. Five sections of the book cover economics, biology and ecology, behavior and semiochemicals, physiology and biochemistry, and control strategies. The international group of contributors (15 of the 34 papers have at least one foreign author, and much of the work on leaf-cutters appears in English for the first time) make accessible an extensive literature and summarize their recent findings.

Three especially noteworthy reviews present the intricacies of chemical communication in these species (Fletcher on *Solenopsis* queen pheromones, Howse on leaf-cutter trail following, and Vander Meer on *Solenopsis* trail following). Such investigations are only beginning to elucidate the impressive sophistication of social insect semiochemicals, with multiple active constituents contributing different components of complex behavioral responses. Also exciting is the neurobiological study of *Acromyrmex* by Delabie *et al.* suggesting that maturation of the olfactory system enables ants to learn certain chemical cues in an imprinting-like manner. Despite intensive research, large gaps remain in our understanding; topics for future work on *Solenopsis* ecology and physiology are surveyed by Tschinkel and Vinson, respectively. The recent appearance of a polygynous form of *S. invicta* in the United States has particularly significant biological and control implications.

Insufficient distinction is made between the appropriate goals for control of fire and leaf-cutting ants. We would be well rid of our imported fire ants, despite their potential control of other insect pests; however, this is not so easily accomplished. Indiscriminate use of toxic baits may even aid *S. invicta's* advance, as this species quickly invades new habitat from which we have obligingly eradicated the competitive native species. Leaf-cutting ants, on the other hand, are a spectacular component of the indigenous Neotropical fauna. Reading, for example, Vilela's worry about reinfestation from poorly controlled populations, I found myself hoping that "permanent reservoirs" of leaf-cutters would remain untouched. It is disturbing to learn that such toxicants as mirex (dodecachlor), heptachlor, and aldrin, no longer permitted in the United States, are recommended for use in Brazil. Alternative management methods, addressed in several papers, are urgently needed.

This important and useful collection maintains a salutary balance among pure and applied studies. Indeed, these approaches are often appropriately combined. Tschinkel's observation on *Solenopsis* applies to both groups: "Society's relatively high need for knowledge of this ant gives us the opportunity to carry out this research." Perhaps the ants provide moral instruction after all.

NORMAN F. CARLIN
Museum of Comparative Zoology Laboratories, Harvard University, Cambridge, MA 02138

Population Scenarios

Prehistory in the Pacific Islands. A Study of Variation in Language, Customs, and Human Biology. JOHN TERRELL. Cambridge University Press, New York, 1986. xvi, 299 pp., illus. $42.50.

This book is a must for every scholar of Pacific prehistory—not necessarily because they will agree with all its conclusions but because of its sweeping overview of different disciplines and the challenge it throws out to examine critically many well-established theories. The reader will find little in the book about the present state of archeological knowledge of the Pacific area, however, for, with the exception of details of the author's own excavations and related investigations on the island of Bougainville, the "cold" evidence is missing. By contrast, there is a great deal of theoretical speculation culminating with the view that if we keep three lessons in mind "there is hope that our present ignorance may give way to new understanding" (p. 270). These lessons are: that science is a two-step process requiring both imagination and evaluation; that there are many ways to learn about the past; and that we must draw our portraits of the past with people in them, giving proper weight to the human qualities that made successful colonization and integration possible.

There has been no shortage of theories about the peopling of the Pacific. Before the advent of modern archeological studies in the 1950s and '60s these theories were based on the apparent differences in physical types in various parts of the Pacific, on differences in language, and, largely, on conjecture. There emerged finally a view that has become accepted widely that there are two main elements making up the Pacific Island population—a dark-skinned group speaking non-Austronesian languages and a brown- or yellow-skinned group speaking Austronesian languages. Further, it is accepted generally that these groups moved out to colonize their Pacific homes at different times, the former migrating from Asia perhaps some 50,000 years or more ago, the latter perhaps only 7000 years ago.

Terrell argues cogently that the prehistorian not only must examine all the available evidence but must construct models of all possible alternatives. Ideally, tests must be made to determine which model best fits the evidence, and also to identify what further evidence is needed to validate the model that is favored.

One of the best examples of testing hypotheses for colonization of the Pacific Islands used by Terrell is provided by the computer simulations carried out by Levison, Ward, and Webb (*The Settlement of Polynesia*, Australian National University Press, 1973). Utilizing data about winds, currents, islands, and other variables, they conducted computer experiments showing the outcomes of hypothetical voyages. Their simulations showed the probability of successful colonization of particular islands from various points of origin. In the present book Terrell gives examples of many other models. For example, he lists alternative scenarios for the settlement of the Pacific Islands by members of two distinctive "races," or alternatively by two identical groups that then proceeded to differentiate from one another to give rise to the contrasts observable today. He examines models that could explain the extraordinary differentiation between languages in certain parts of the Pacific and great similarities in other parts. Other models examined refer to the effects of population size on the chance of survival or extinction on islands, the importance of communication networks and stepping-stone models in the transfer of goods and ideas, the likely effects of change and adaptation, and, finally, population growth and the implication of population size on the development of social strategies for living together.

There is a danger, of course, in demanding that models representing all possible alternatives be examined, since it allows the author to attempt to hide his own prejudices. In discussing the views of physical anthropologists that there are at least two different physical types derived from originally different stocks Terrell suggests that we might "think instead that Polynesians evolved their anatomical appearance just as they *evidently* evolved their language habits right there in the region formed by Fiji, Tonga and Samoa" (p. 150; emphasis mine), and he concludes, "Those who tell us that isolation alone could not have led to the evolution of differences among Fijians, Tongans and Samoans *are only guessing*" (p. 151; emphasis mine).

It is perhaps salutary that Terrell also uses non-rigorous approaches to arrive at conclusions. "*Common sense* and statistical reasoning alike tell us that too many long-distance migrations would have to be *imagined* to make such a hypothesis about the past seem credible" (p. 156; emphasis mine).

Despite its broad range, the book is in parts unnecessarily tedious. The best example is the first ten pages of the chapter "Structure and function," following which we are told, "Thus far, however, we have been talking in generalities" (p. 222). And among the omissions is any detailed discussion of the effects of natural disasters on particular Pacific populations or of the effects of contact with Europeans during the nearly five centuries that have elapsed since the first contacts were made. Of particular importance was the depopulation of many islands during the 19th century by disease and slavery, well documented recently by Maude (*Slavers in Paradise*, Australian National University Press, 1981).

This book is attractively produced, as we have come to expect from Cambridge University Press.

R. L. KIRK
Department of Human Genetics, John Curtin School of Medical Research, Australian National University, Canberra ACT, 2601 Australia

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