humorous, historical style. One of the interesting products of the expedition was a remarkable series of photographs. Some 25 of them, mostly of buildings and streets, are reproduced in this volume. Included are such views of San Francisco, which was visited by the expedition in 1863, as the Broderick fire house. One wonders if there were not in the collection a few more photographs of scientific or geographical interest that might have been selected; undoubtedly had the book been written by a naturalist rather than a professional historian some effort would have been made, if the photographs existed, to reproduce fresh earthquake faults, animals, and so forth. In any event, a notable effort has been made to rescue from oblivion the record of a brave and creditable venture in scientific exploration.

JOEL W. HEDGPETH
Marine Science Laboratory, Oregon State University, Newport

Biology of Populations

Topics in Population Genetics. BRUCE WALLACE. Norton, New York, 1968. x + 486 pp., illus. $14.

Textbooks on population genetics deal mostly with the mathematical foundations formulated around 1930 by Fisher, Haldane, and Wright, and with the extension of those foundations; biological observations are largely relegated to illustrating the mathematical formulations. Wallace has shifted the emphasis from the mathematics to the biological realities. To be sure, he discusses, if in a somewhat elementary fashion, the Hardy-Weinberg equilibrium and the algebra of migration, nonrandom mating, mutation, and selection. The muscle of the book, however, consists of experimental studies of animal populations. Mathematical and statistical methods are brought in to interpret and evaluate the experimental observations. In this respect *Topics* fills a serious gap in the literature.

Population geneticists have dedicated considerable effort to the study of genetic polymorphisms, that is, the presence in a population of two or several alternate genetic constitutions affecting the same character or characters of the organisms. Many polymorphisms observed both in nature and in the laboratory are balanced: the alternative genotypes coexist at equilibrium frequencies very often owing to the superior reproductive fitness of the heterozygotes over the corresponding homozygotes. Members of a Mendelian population face environmental heterogeneity of a multidimensional nature: heterogeneity of functions or roles that the organism must be able to fulfill at any one time and place; spatial heterogeneity, since such conditions as food, temperature, and competitors are not likely to be uniform even in a limited environment; temporal heterogeneity, from fertilization through sexual maturity to death and through the daily and seasonal cycles. Wallace proposes the concept of "marginal overdominance." In a balanced polymorphism one homozygous type is likely to have a higher fitness than the alternative homozygote in certain environmental situations but a lower fitness in others. If the heterozygous organisms always or in most cases have the same fitness as the superior homozygote, the average fitness of the heterozygotes in the population will be higher than that of either homozygote and will lead to a stable polymorphism. This concept is worth further experimental exploration.

The geneticists' debates concerning such questions as genetic load, rate of evolution, and population fitness are largely deadlocked, owing to the population geneticist's habit of ignoring the ecological complexities of nature and demographic realities such as population size, age distribution, and rates of birth and death. The most promising developments of population biology for the years ahead lie in endeavors to bridge the gap between population genetics and population ecology. Wallace has given attention to the ecological aspects of population genetics. The geneticist's calculations of average population fitness and genetic load bear no necessary relation to the adaptedness of the population to its environment. Introduction of a genetic polymorphism in a monomorphic population may increase the adaptedness of the population to its environment but will decrease the average fitness of its members. Wallace points out that population fitness—or, as I would prefer to call it, population adaptedness—is a concept which has escaped adequate and operationally valid definition. The average reproductive fitness per individual of a population at equilibrium size is 1. This does not mean that all populations of approximately constant size are equally adapted to their environment. Population size itself may serve as a measure of adaptedness for populations of the same or of related species of organisms. Wallace's distinction (chapter 24) between "hard" and "soft" selection—referring to selection due to genetic causes and that due to density-limiting environmental factors—may prove to be helpful in solving this problem.

As a textbook on population genetics, this volume has some obvious biases. Certain topics are ignored altogether or nearly so, notably those pertaining to plants, such as self-pollination or polyploidy. The book leans heavily on *Drosophila* studies; according to my count only 32 other species of animals, plants, or microorganisms are mentioned, most of them briefly. The author's own experimental studies are overrepresented. Wallace is aware of these biases. "I have attempted to present topics much as they might be presented in a series of seminars. Consequently, *Topics* is not a tightly knit, precisely organized textbook." For a course it may need to be supplemented by an additional text or by the instructor. In spite of its limitations, *Topics* is a major contribution to the literature, likely to be indispensable in the library of students of population genetics.

The volume suffers from insufficient editorial care. Table headings and figure legends are not always clear; misprints are frequent; at least five times the reader is referred to p. 000.

FRANCISCO J. AYALA
Rockefeller University, New York City

Immunology

Biochemistry of the Acute Allergic Reactions. A symposium organized by the Council for International Organizations of Medical Sciences. K. FRANK AUSTEN and ELMER L. BECKER, Eds. Davis, Philadelphia, 1968. xii + 340 pp., illus. $12.

This volume, based on a symposium held in June 1967, is really a progress report on an interdisciplinary field shrewdly designated by J. H. Humphrey as "immunopharmacology." The participants are experts, each with a substantial record of accomplishment, speaking mainly to each other rather than to a larger audience. This monograph should be especially useful to advanced students and investigators of allergic reactions. For less specialized workers, including many immunologists,