essays by members of the Nuffield Unit of Medical Genetics.

By and large, the articles are serious reviews, or specific treatments, of mature topics; thus the book emerges as a distillation or reinforcement of older ideas, not as a reaching for new ones. There is a distinct historical flavor; this is suitable in view of Ford's special position in the development of evolutionary biology. In the 1930's, Fisher, Haldane, and Wright laid the theoretical cornerstone of evolutionary thinking in this century. At about the same time, Ford commenced the construction of the edifice with data taken from nature. He had few peers in those days, perhaps only Dobzhansky, and I was delighted to find that the latter has contributed a characteristically lively essay on historical genetic changes in populations of *Drosophila pseudoobscura*.

The introduction to the bibliography refers to the "relentless excellence" of Ford's work. I used this list to locate his first paper, published 50 years ago, on variation in the butterfly *Heodes phlaeas*. Here is manifested the meticulous care and the sure style of the years to come. The young author adduces 50 pages of data and grapples with the prevailing ideas—particularly those of Weismann.

Three of the essays seem to me to be outstanding. One is on plant evolution in extreme environments by A. D. Bradshaw (whose name is missing from the "list of contributors"). After reading this beautifully wrought paper, I conclude that microevolutionary adaptation in plants deserves far more attention than it has had. The paper "Drug therapy as an aspect of ecological genetics" by D. A. P. Evans is full of new perspectives for those interested in the seemingly disparate subjects of pharmacology and population genetics. Finally, I was captivated by Miriam Rothschild's essay "Speculations about mimicry with Henry Ford." The pursuit of knowledge by generations of British naturalists (Gilbert White, Charles Darwin, William Henry Hudson) has been traditionally unfettered by the seductions of applied science. With charm and humor, Rothschild articulates the sheer delights of the intellectual adventure, the "Fragestellung," which is, indeed, characteristic of the Fordian approach to nature.

HAMPTON L. CARSON
Department of Genetics,
University of Hawaii, Honolulu

A Symbiosis

Gardening Ants, the Attines. NEAL A. WEBER. American Philosophical Society, Philadelphia, 1972. xx, 146 pp., illus. $8. Memoirs of the American Philosophical Society, vol. 92.

Long files of ants carrying fragments of leaves over their heads impress visitors to tropical and subtropical America. These "leaf-cutting ants" carry the fragments back to their subterranean nests to provide a substrate for a fungus which grows in large masses in nest chambers. The fungus in turn provides nourishment for the developing ant brood and adults of the colony. About 200 species of ants, constituting the tribe Attini, are known to culture fungi, mainly on insect excrement or dead plant materials. The common name "fungus-growing ants" has been universally applied to attines. Now, Neal Weber has rechristened them "gardening ants," a term fully as descriptive but hardly necessary.

In a personalized account Weber describes the results of a more-than-35-year romance with fungus-growing ants, a subject for which he clearly has preeminence. The nine chapters treat the main aspects of attine structure and biology including the life cycle, colony populations, nest structure, foraging behavior, and fungus gardens. An appendix provides a key to attine genera and records of the distribution of species occurring north of South America, mating flights, and guests, parasites, and predators.

Does each species of ant harbor a different species of fungus? Apparently not. Weber describes his pioneering efforts in developing culture methods to raise the fruiting bodies necessary for the identification of fungi. Only one fungus has so far been identified, but the magnitude of the task makes even that achievement significant. In contrast to the extensive description of studies of fungal culturing, Weber devotes less than half a page to the evolution of fungus-growing, a subject deserving more extensive explanation. Concerning the related question of the phylogenetic origin of Attini, Weber briefly mentions that they closely resemble the harvester ant genus *Pheidole*, a suggestion made nearly 80 years ago by von Ihering. No mention is made of von Ihering or of how attines resemble *Pheidole*.

The book is well illustrated; however, several figures are out of sequence and the captions of several others are misleading. Four tables lack titles. The list of species in the appendix would have been more valuable had it included those living in South America, where the majority of attines occur.

Weber has provided us with a comprehensive review of the literature and a wealth of heretofore unpublished observations. His book should become a primer for those intent on investigating the symbiotic association of ants with fungi.

PAUL B. KANNOWSKI
Department of Biology,
University of North Dakota,
Grand Forks

Anniversary Assessment

Insulin Action. Proceedings of a symposium, Toronto, Oct. 1971. IRVING B. FRITZ, Ed. Academic Press, New York, 1972. xx, 610 pp., illus. $17.50.

In commemoration of the discovery that the lives of depancreatized dogs and, indeed, the lives of patients with diabetes mellitus could be sustained by injections of pancreatic extracts, several international symposia were held during the 50th anniversary year. This book presents the proceedings of a symposium held in Toronto, scene of the historic discoveries of Banting and Best in 1921. As is implied by the title, the organizers of the symposium selected topics relating to the mechanism of action of the hormone and did not attempt to review all of the many scientific accomplishments that were sparked by the discovery of insulin. Thus the historic experiments that led to the elucidation of the primary structure of insulin, the equally historic achievement of the chemical synthesis of insulin, and current concepts of the use of insulin in the treatment of human disease are not considered. This is a commendable restriction in the scope of the symposium but limits the value of the book to medical historians and to the many researchers in the field of insulin action.

As with other symposium proceedings, many of the data have been published elsewhere in greater detail. Nevertheless, it is convenient to have them reviewed and summarized under a single cover. The initial chapters are concerned with the three-dimensional structure of the insulin crystal, and with the structure-activity relations of