models that often characterizes poor biological theory. There is a converse moral well illustrated by the monograph under review: physicists who wish to do useful biology should not try it on their own. The real future of systems like the Volterra one lies in painstaking, time-consuming, and sometimes dull attacks on the problem of independent estimation of the parameters, with the aim of eventually being able to synthesize ecological processes out of the physiology, behavior, and other performance characteristics of individual species members. The resulting body of theory should be free of the "knife-edge" instabilities which plague results in the specific Volterra formalism. Moreover, the theory should de-emphasize random contributions from unknown forces, which probably do more to highlight the poverty of our theories than the final state of our knowledge. In their introduction, the present authors express the hope that a Volterra model "might play the same role that the harmonic oscillator or the Ising model plays in theoretical physics." They apparently do not realize that the harmonic oscillator's importance derives from fundamental physical principles which have no connection with its formalism. The corresponding biology remains to be done.

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Applied Microbial Ecology

Water Pollution Microbiology. RALPH MITCHELL, Ed. Wiley-Interscience, New York, 1972. xii, 416 pp., illus. $19.50.

Biochemical Ecology of Water Pollution. PATRICK R. DUGAN. Plenum, New York, 1972. x, 160 pp., illus. $14.50.

Ralph Mitchell's primary goal in *Water Pollution Microbiology* was to produce a text for advanced students that would show how modern microbiological concepts have been applied to the analysis of water pollution problems. In accomplishing his objective he has assembled an impressive group of environmental microbiologists, chemists, and engineers who have, for the most part, carefully and critically summarized the current state of our knowledge of many topics in this field.

Following an introductory chapter in which the editor attempts to tie together the disparate subject material contained in the volume, he presents the chapters grouped into several parts. The first part contains three chapters on inorganic pollutant materials, namely phosphorus, nitrogen, and acid mine drainage. The second part contains four chapters on the degradation of organic substances. A single chapter on water-borne pathogens constitutes the third part, and this is followed by a consideration of the effect of pollution on the structure of microbial communities in the fourth part. In the fifth part various procedures used in assaying biomass and activity as well as techniques employed for the enumeration of viruses and coliform bacteria are compared and discussed. The final part includes one article that critically and musingly reviews waste-water treatment processes and another that discusses the practice of destratification of impoundments. Altogether there are 17 chapters and 24 authors.

As might be expected, the treatment of the subject material is somewhat discipline-oriented. Perhaps the most notable example of this is the chapter on acid mine drainage by Lundgren, Vestal, and Tabita. Though this is an excellent article on the biology of the thiobacilli that cause the perplexing problem of acid mine waters, it would have been appropriate to discusss, in addition, the substantial, albeit inconclusive, research undertaken to control this problem. All in all, however, the authors have done a commendable job in bridging the interdisciplinary gap.

The book is to be especially recommended to prospective applied microbial ecologists. They will surely heed the "call" when they read some of the enticing comments of la Rivière, such as "microorganisms promise to be excellent tools for model laboratory studies in ecology, just as they are already in biochemistry and genetics."

Bravo for Mitchell! This book has been needed.

P. R. Dugan's book is aimed at a much wider audience including "engineers, economists, biologists, public servants, and others." Assuming that the nonbiologist reader is not intimidated by the title, he will find the first portion of the book highly readable and informative. It presents an overview of the significance, types, and causes of water pollution. In this section Dugan coins the terms "first-order pollution," which refers to the biological excreta of humanity, and "second-order pollution," as nonbiological human excrement, that is, technological pollution (it would not be fair to consider the book as an example of this!).

The second part of biochemistry begins benignly enough, but the chapter on the chemistry and biochemistry of water and those on degradation are, as the author himself suspected, too technical for most of the audience.

This book also has a chapter on acid mine drainage. Unquestionably it is, for the biologist, the best chapter in the book.

The appearance of these books is further evidence that the recently emerging interest of microbiologists in ecology is gaining momentum that will remain sustained for some time to come.

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Faunal Remains

The Study of Animal Bones from Archaeological Sites. RAYMOND E. CHAPLIN. Seminar, New York, 1971. x, 170 pp., illus. $5.75. International Series of Monographs on Science in Archaeology, No. 1.

Clearly the age of the specialist is in full swing in archeology. No expedition worthy of the name will take to the field without having available the expertise of those from a wide variety of disciplines. In many of these fields the degree of sophistication in techniques and analysis has increased remarkably in the years since World War II, and such is the case in the study of animal bones. This book, the first of a forthcoming series by specialists in disciplines pertaining to archeology, is a comprehensive study of most of the current aspects of faunal analysis, and should be read not only by the zoologist studying archeological material but by the archeologist as well. It includes valuable information on the collection, study, and treatment of bones and discusses the three most common methods of quantifying animal remains. There is an important chapter on bone measurements in which Chaplin rightly points out that they should be used with caution: "A dimension should be measured only when it is hoped or known that it will provide information relevant to the problem in hand such as size, weight or sex of the animal." I heartily agree, and wish that all our colleages in faunal studies would take this advice to heart.

I cannot find fault with Chaplin's presentation of field methods and study techniques, which is exemplary if