

adequate knowledge of the normal variations that are related to sex and age. Manning attempts to overcome these problems by amassing as large a sample as possible (628 skulls), separating them into sex and age groups, and subjecting the cranial measurements to exhaustive statistical analysis. The total sample consisted of 240 adults, 106 sub-adults and 282 young. Of these only slightly more than half had the sex documented. When the specimens were grouped within five geographic regions, the largest samples of known sex were 31 males and 18 females from the Canada-west Greenland area (plus 34 presumed males and 17 presumed females). Unfortunately, the material was not extensive enough for any one population to establish meaningful trends in morphometric characters related to either sexual dimorphism or age, although data on these aspects are considered.

Manning used various statistical methods and tests in attempting to document geographical variation. The use of data from non-adults by adjusting their measurements to average adult length appears to be of questionable value. Moreover, it is highly doubtful that the summary of significant differences in Table 6 can be interpreted as a Duncan's multiple range test that would allow one to decide which of the populations are responsible for observed differences.

A minimum of conclusions is reached in spite of exhaustive statistical analysis. "Criteria previously used to distinguish races of *Ursus maritimus* were examined and found to be of no diagnostic value."

"A cline of increasing skull size from east Greenland westward to Bering Strait is demonstrated."

"The possible origin of the Alaska south population . . . is discussed . . .; it could be considered subspecifically distinct, but is left unnamed pending further investigation."

The regional differences in the size of adult bears is used by the author to postulate that there is no large-scale circumpolar movement and that some populations may be partially isolated by such factors as ancestral breeding and denning areas.

This work makes a much needed contribution to our understanding of morphological variation

in polar bears by providing a base for further study.

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Ecology and Physiology of Parasites: A Symposium

Edited by A. M. Fallis. University of Toronto Press, Toronto. 1971. 258 p., illus., \$15.00.

This book comprises the twelve papers presented at a symposium held at the University of Toronto in February 1970. The contributors, editor, and publishers are to be congratulated for producing this volume with so little delay. The book is well bound, printed on good quality, glossy paper, and the text is remarkably free from typographic errors. The articles are illustrated with approximately 140 line drawings, photographs, and electron micrographs.

The following topics are covered in comprehensive reviews of 18-36 pages: development and ecology of coccidia and related intracellular parasites (D. M. Hammond), epidemiology of the leishmanias (R. Lainson and J. J. Shaw), morphological and physiological considerations of extracellular blood protozoa (K. Vickerman), helminths as vectors of micro-organisms (D. L. Lee), site-finding behaviour in helminths (M. J. Ulmer), physiology and behaviour of *Entobdella soleae* (G. C. Kearn), and ecology and evolution of blood-sucking Diptera (J. A. Downes). Shorter review papers deal with the following: physiological, morphological and ecological considerations of some microsporidia and gregarines (J. Vavra), microcosm of intestinal helminths (C. P. Read), movement of nematodes (H. R. Wallace), ecology of onchocerciasis (B. O. L. Duke), and *Culex*-host-encephalitis complex (W. C. Reeves). Each paper is followed by the opening remarks of the discussion leader.

Although one objective of the organizers of this symposium was to "interest those in various biological disciplines and professions", this book seems destined to appeal primarily to those working in the fields of animal parasitology and tropical medicine. Most parasitologists will find something of direct application here, and will welcome

the opportunity of being brought up-to-date in some areas peripheral to their own.

Graduate students in parasitology, and those beginning their teaching careers in this field should find these review articles particularly useful. Probably this book could be used to complement a seminar approach to parasitism at the graduate level.

The cost of this volume may deter some potential purchasers. It is unfortunate that this collection of informative papers was not published in a durable paperback edition at perhaps one-third to one-half the present price.

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The Rust Fungi of Cereals, Grasses and Bamboos

By George Baker Cummins. Springer-Verlag, New York. 1971. 570 p. \$19.50.

Professor George Cummins has presented taxonomists, mycologists and phytopathologists with a much needed manual of the rust fungi. Rust pathologists in particular will find this book most useful because it offers a logical classification and nomenclature for pathogens in the Uredinales.

In the preface Dr. Cummins suggests that he may have "partially failed" in his principal goal, namely, to develop a system by which rust fungi can be characterized on the basis of their morphology, without dependence on the identity of the host plant. Having tested the manual with respect to a number of *Puccinia* species of direct concern to me, I am happy to report that the author was unnecessarily modest in his self-evaluation, and has indeed accomplished much of what he set out to do.

Most of the species described are accompanied by illustrations of the various spore forms, and since the drawings are at a uniform magnification throughout the manual, direct comparisons can be made. The frustrations of trying to work with illustrations at different magnifications is something most workers in the field know very well.

The critical part of any such manual is the success with which the average worker is able to use

the keys to identify an unknown or unfamiliar species. As the reviewer I felt obliged to test the keys. I'm happy to report that despite my own very limited abilities in mycological sleuthmanship I was able to correctly key out five specimens using both the differential host and morphological keys.

George Cummins' expertise in the rust fungi is once again demonstrated by the publication of this book. It is a useful and well co-ordinated manual which will serve plant pathologists and mycologists for many years to come.

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Systems Analysis and Simulation in Ecology. Volume 1.

B. C. Patten, Ed. Academic Press, New York. 1971. 560 p. \$27.50.

This book has been long awaited by ecologists with quantitative interests. A collection of ten related papers by associates and students of Bernard Patten, it is the first real synthesis of ideas and techniques that constitute the growing field of "systems ecology."

The book is directed to relatively sophisticated audiences, and assumes a considerable mathematics background in the reader. It will probably not be suitable as an undergraduate text, or as an overview for people wanting an introduction to the field of mathematical ecology. The collected papers are divided into three sections. The first two chapters, by Patten and Norman Kowal, give an introduction to basic concepts and methods of mathematical model building, focussing on the formulation and solution of dynamic (time dependent) models by analytical and computer methods. Next is a series of three papers on models of single-species populations. F. N. Williams gives a fascinating account of *Chlorella* population dynamics, while Steve Hubbell and Norman Glass examine problems of bioenergetics in sowbugs and largemouth bass. The last five papers present examples of ecosystem simulation. For the most part, these examples deal with the representation of energy flow, and much emphasis is placed on



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