

sequent chapters dealing with nutritional intake, absorption and excretion, and riboflavin deficiency syndromes. Currently, these chapters strike me as a compendium of phenomenological observations without rational conclusions. This reflects the state of the science.

The chapter by Lambooy on biological activity of analogs of riboflavin and that by McCormick on riboflavin metabolism may be of interest to pharmacologists and medicinal chemists. Although the literature references in some chapters are as recent as 1974, no mention is made of either roseoflavins, 6- and 8-hydroxyflavins, or 5-deazaflavins as analogs of biological interest.

The concluding chapter by Rivlin on the medical significance of riboflavin and cancer and on hormonal regulation of riboflavin metabolism may be the most stimulating and tantalizing to life scientists. They serve the function of indicating problems of medical interest where much of the basic research knowledge is still lacking. These include transport of the vitamin in plasma and across cellular membranes, regulation of enzymes of flavin metabolism by adrenocorticotrophic hormone and thyroid hormone, and adaptation of flavin adenine dinucleotide synthetase in hepatomas.

It is likely that this volume is of more direct interest to medical and clinical researchers than to biochemists or enzymologists, yet the latter groups will find it worth perusal also because the material is not usually reviewed in biochemical publications.

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Genetics of Fungi

Mycogenetics. An Introduction to the General Genetics of Fungi. J. H. BURNETT. Wiley, New York, 1975. xiv, 376 pp., illus. \$34.

Fungi have had considerable, but quite selective, attention from biologists for many years. A mycologist will concentrate on taxonomy; a molecular biologist on mitochondrial DNA or enzyme aggregates; a geneticist on gene conversion and tetrad analysis; an industrial researcher on mushroom, beer, penicillin, or citric acid production; and an agriculturalist on rusts, smuts, and other pathogens. Few workers in any of these fields can know much about the other specialties, largely because of the variety of intellectual traditions involved.

Yet one phenomenon that bedevils or intrigues almost all workers is the variability and diversity of fungi. Usually fungal variation is mastered or exploited in narrow ways appropriate to a given situation. But by now fungal biology is advanced enough to support sophisticated population and evolutionary studies. Fungi offer enough unusual genetic mechanisms, such as mitotic recombination, heterokaryosis, and non-Mendelian systems, to suggest that unique modes of evolution might be discovered. Many phenomena in quantitative genetics, pathogenesis, mating type systems, and isolating mechanisms are waiting to be fully rationalized in terms of these unusual genetic mechanisms. The book under review is an initial and largely successful attempt to do this. In the course of it, mycological phenomena are brought to the attention of geneticists, and experimental mycologists are invited to consider their world in genetic terms.

The first major section of the book is an introduction to mutagenesis, formal genetics, and the unusual features of the genetic system of fungi referred to above. Unfortunately, the author is forced to be quite telegraphic when dealing with well-known aspects of these subjects, and the use of algebraic discourse, which is almost wholly dispensable to an intuitive understanding, makes these aspects even more daunting for a naive reader. Also, many phenomena, such as complementation or temperature-sensitivity of mutants, are described initially without reference to physiological or molecular mechanisms, which gives the appearance of superficiality. The unique genetics of fungi is treated more amply, however, with well-chosen examples and references. The second major section of the book, on fungal population genetics, demonstrates through examples of work on mutation, mating systems, natural and experimental selection, and isolating mechanisms, that a sophisticated population genetics of fungi is well within our grasp. While speculation is limited, the author points clearly to problems, such as the sympatric origin of species, deserving of solid genetic work. A final section integrates some of the themes of the previous two in a discussion of the applications of mycogenetics. These include descriptions of improvements in penicillin yield, the analysis of virulence and aggressiveness of plant pathogens, and the analysis of recombination mechanisms and gene action. But for the last two topics, the section is a very successful reinforcement of the preceding material. Throughout, the prose is simple and the illustrative tables and figures, taken from the original literature, are informative.

Mycogenetics is highly recommended to biologists conversant with genetics who wish to explore this field. One might hope, with Burnett, that the book will stimulate a more intensive study of the population biology of fungi.

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Northern Ungulates

Alces. Moose Ecology. *Ecologie de l'Orignal*. Papers from a symposium, Quebec City, Mar. 1973. J. BÉDARD, E. S. TELFER, M. L. WOLFE, J. PEEK, D. W. SIMKIN, P. C. LENT, and R. W. RITCEY, Eds. Presses de l'Université Laval, Quebec, 1975 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). x, 742 pp., illus. Paper, \$27.50. *Le Naturaliste Canadien*, vol. 101 (1974).

This publication consists of papers that were presented at an international symposium on moose ecology. Of the 42 papers, four are from workers in the U.S.S.R. and four from Scandinavian biologists. With one exception the papers are in English. All the major workers in the field have contributed, and with few exceptions the papers meet a high standard. As a result the volume is a complete and up-to-date summary of all aspects of moose ecology under current investigation, and it will be essential reading for all those who are interested in game biology and wildlife management.

The volume is made up of six sections. There are eight papers on habitat distribution over almost the entire range of the species. It is difficult to compare these papers because of the lack of standardization of the information presented. It is remarkable to find such a large list of environmental factors being considered responsible for regulating the distribution of moose. The factors appear to vary not so much with the geographical distribution of the moose as with the state or provincial boundaries involved.

Of the five papers on nutrition, three are good reviews of food habits, energy requirements, and blood chemistry. In the first, the author comments also on the lack of standardized data collection systems. The paper on blood chemistry is an outstanding contribution in its clarity and as a data source. Emphasis is placed on the role of stress in the handling of large ungulates and subsequent effects on blood parameter values.

The next two sections consider inter-

and intraspecific behavior patterns. In a very informative paper on mother-young relationships the author notes that the calf often misinterprets the alert stance posture as a nursing invitation posture. An effect of this is to ensure that the calf's attention is almost always on its mother. There is a "compleat" review of seasonal movements in moose in which the author presents an interesting categorization of migration patterns. Among the six papers on moose coactions with other species is a perceptive report of the effect of snow on wolf predation of moose on Isle Royale. The other papers are competent but mainly descriptive.

The next section, on population dynamics of moose, is the weakest, as that is a subject on which there are already many good papers in the literature. A shallow review of reproduction is disappointing in view of its author's previous contributions in the field. No comment is made about the absence of basic information (estrus length, estrous cycle length, length of gestation, and so on) from the paper. More significantly, no data are given on age-specific fecundity—a crucial piece of management information. A theoretical paper attempts to explain the incidence of twinning in moose in the light of varying selection pressures due to alterations in habitat. This paper would be more convincing if a better data base were referred to. The best paper in this section describes a significant experiment in Ontario in which deliberate overhunting was studied in some detail. However, the author reaches the remarkable conclusion that "since recovery from overhunting is likely to be quite rapid, moose can be harvested close to the annual surplus with confidence" (p. 539). Surely the vagaries of weather could prove this statement a dangerous tenet of management. Indeed, several other papers in the book describe highly significant effects of weather on moose populations.

The book closes with seven papers on moose management in different areas of the world. These papers show a remarkable similarity of approach in the North American scene but a considerably different approach in the U.S.S.R. and Scandinavia.

It was singularly appropriate that the keynote address and first paper have been presented by R. L. Peterson. In almost every paper reference is made to his pioneer book on North American moose published 20 years ago. This volume demonstrates the considerable increase in our understanding of moose ecology since that time. Despite this increase, however, there are considerable gaps in the data base for moose biology. Almost nothing is known

about detailed seasonal growth rates of adult moose, nor do we know much about the factors affecting calf survival. There is a real need for information on lactation phenomena. Astonishingly, in a species remarkable for its antler development, there appears to have been no study on calcium metabolism or on the ecology of calcium supply.

The volume is well produced, with clear type and good figures. There are some spelling mistakes, but the editing has ensured clear and readable papers. It is a pity that the editors did not see fit to include English captions for the figures in the single French article. Abstracts in Russian would have been a useful gesture.

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Site Locations

Archaeological Atlas of the World. DAVID and RUTH WHITEHOUSE. Maps drawn by John Woodcock and Shalom Schotten. Freeman, San Francisco, 1975. 272 pp. Cloth, \$17; paper, \$8.95.

This is intended as a reference book for both professional archeologists and amateurs. It lists, locates, and culturally and chronologically identifies "some 5,000 pre- and proto-historic sites" the world over. The format is compact and excellent. The 103 illustrations are maps, prepared to a high quality standard by John Woodcock and Shalom Schotten. They range in size from half-page (6 by 5 inches) to double-page (8 by 12 inches) layouts. They are done in white and sepia with the archeological sites superimposed in heavy black symbols. These symbols indicate various categories of sites (settlements, religious monuments, mineral sources, and so on, and combinations of these). The finding of site locations is facilitated for the reader by an index, alphabetically arranged, which keys into the page number of the map and the location of the site on a standardized grid.

After a brief introduction, which says something about the development of archeology, dating methods, and models or classificatory-developmental schemes for prehistory, the atlas is organized into seven major geographical sections: Palaeolithic Sites in the Old World; Africa; Western Asia; The Mediterranean Basin; Europe with Russia; South and East Asia, Australasia and the Pacific; and The Americas. In each section, which is led off with a little

synopsis of its archeology, are maps and subsections treating of the geographical, chronological, or combined geographical-chronological position of the sites.

A question that must be asked is, How useful is such a compendium? Speaking for myself, I can answer this positively. As an Americanist, I turn to it for locations of Old World sites and some general information about them. A specific case in point would be Siberian sites that are claimed to show relationships to early American lithic industries. From the atlas I will at least know where they are and have some beginning knowledge about them. At the same time, I am a little uneasy when I turn to the Americas section and find no references to early agricultural sites for the Intermediate area or Amazonia under the heading "The first farmers in the Americas." I realize the difficulties of definition here, and the authors have, in part, compensated for them with their map and discussion, farther along, of "The Intermediate area and Amazonia." This kind of criticism, I suppose, could be offered by specialists at any point in the book, and I do not mean to be carping about something the authors clearly cannot do, and did not set out to do, in a general reference of this type; nevertheless, the user of the atlas should realize that a work of this kind can provide him or her with only an entry into archeological information. From this point the reader can go to the general survey references that are listed for each section and subsection and from these proceed further. Given this stipulation and procedure, I think the *Archaeological Atlas of the World* scores as a success.

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Books Received

All Change Here. Girlhood and Marriage. Naomi Mitchison. Bodley Head, London, 1975. 160 pp. + plates. £3.

Annual Review of Biochemistry. Vol. 44. Esmond E. Snell, Paul D. Boyer, Alton Meister, and Charles C. Richardson, Eds. Annual Reviews, Palo Alto, Calif., 1975. x, 1040 pp., illus. \$16.

Anterior Ischemic Optic Neuropathy. S. S. Hayreh. Springer-Verlag, New York, 1975. x, 148 pp., illus. \$41.80.

At the Sign of Midnight. The Concheros Dance Cult of Mexico. Martha Stone. Illustrated by Laurie Cook. University of Arizona Press, Tucson, 1975. x, 262 pp. Cloth, \$16.50; paper, \$7.45.

Chemische Evolution und der Ursprung Lebenssysteme. Klaus Dose and Horst Rauchfuss. Wissenschaftliche Verlagsgesellschaft, Stuttgart, 1975. xii, 220 pp., illus. DM 56. Bücher der Zeitschrift *Naturwissenschaftliche Rundschau*.