

well as information. Dr. Ham has presented the voluminous material in such an understandable manner that the book is admirably adapted for use at the undergraduate level as well as in the medical school.

New features of this edition include a superb discussion of the modern concepts of the ultrastructure of protoplasm, including an excellent collection of electron micrographs; a section on microscopy, including treatment of phase contrast, interference, and electron microscopes; and discussion of work on tissue culture and transplantation of tissues. The text material has been brought up to date with considerable revision of the sections on basement membranes, blood clotting, cartilage, bone, and teeth. Throughout the text the inseparable unity of structure and function is emphasized. Each chapter has an excellent bibliography, with many references from the recent literature.

Ham is certainly to be commended for accomplishing the near-impossible—producing an up-to-date, accurate, comprehensive work so clearly written as to be readily understood by the biologist with a minimum of background.

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The Faunal Connections Between Europe and North America. Carl H. Lindroth. Foreword by P. J. Darlington. Wiley, New York; Almquist & Wiksell, Stockholm, Sweden, 1957. 344 pp. Illus. \$15.

P. J. Darlington, himself the author of a recent and very important general work on world zoogeography, has, I think, accurately summarized in his foreword the contribution of Lindroth's book. He says in effect that it has added significantly to our understanding of the content and history of the best-known northern faunas of the earth, those of Europe and eastern North America. Darlington observes, too, that its author is eminently qualified for his task, since he occupies the unique position of one having more first-hand knowledge of the beetle faunas of both continents than anyone else. This from one who is himself an eminent zoogeographer and outstanding student of Coleoptera should recommend the examination of the present book to any interested biologist.

According to Lindroth, his purpose in writing is to explain how species of certain animal groups came to occupy areas of both continents. In treating the problem he finds opportunity to discuss a number of contingent matters, some quite controversial, that have proved to be of enduring interest for the systematist and zoogeographer.

His most trustworthy materials certainly include the entomological records that he has personally amassed or for which he can vouch. Many of these are new. For animals other than beetles he generally utilizes information available in the literature or supplied by American and European specialists.

His survey of mammals, birds, fishes, many kinds of insects, spiders, myriapods, terrestrial isopods, gastropod molluscs, and lumbricid oligochaetes leads him to believe that not less than 5000 species of such organisms are known to be common to Europe and eastern North America. Of these, about 500 species are apparently indigenous to both, but these latter are largely or entirely circumpolar, or disjunct circumpolar, in distribution. Then how is the existing distribution of those remaining to be explained? Lindroth believes that introduction by human agency or by overseas dispersal (by flight, wind, on floating debris, and so on) can account for most of these.

He suspects that if continental drift ever occurred, it took place too long ago to have had any discernible effect upon the disposition of present-day faunas. In any event he suggests that modern distributions for the most part are understandable without our having to postulate a direct continental connection between Europe and America at some past time.

Similarly, even if there were good geological evidence for a complete trans-Atlantic land bridge, on the basis of existing distributions he feels it unnecessary to postulate one. At the same time his appraisal of the Greenland-Iceland faunas leads him to believe that a dryland corridor of dispersal probably connected them with Europe during the Pleistocene.

Of particular interest for those of us especially interested in soil animals is Lindroth's detailed analysis of the beetle-myriapod-isopod fauna of Newfoundland. He presents quite a plausible explanation for the surprising fact that the fauna of Newfoundland, which is geographically part of North America, is predominantly European. Lindroth learned that, as early as the 17th century, vessels had begun to sail with earthen ballast from southwestern England to Newfoundland where the ballast was discharged ashore and where fish and lumber were taken on for Continental and English ports. Since the ballast usually was carried westward to Newfoundland, and not eastward to Europe, we have a plausible explanation for the occurrence of so many European insects, myriapods, and isopods in both places without a comparable representation in both of New World species. Evidently Lindroth investigated this possibility with great care, supporting his theories

with information gleaned from old sailing records and with collections that he made at known ballast dumps around English and Newfoundland ports. Since ships laden with ballast and agricultural produce also sailed from Europe to the mainland of eastern North America and the Pacific Northwest, it is not difficult to find an explanation for the often spotty appearance of European species in each, especially where the climate is comparable to that of Europe.

Clearly Lindroth has gone to considerable pains to extract from his considerable direct knowledge of the Eur-American beetle faunas some cautious though warranted conclusions. One has the feeling that these first-hand data really form the nucleus of his thesis and that he explores the distributions of other animals to augment or fortify the former. A survey of such scope inevitably includes errors of omission and misidentification, especially since the author had to rely upon secondary sources of information for data on some of the insects and other animals. For instance, as a specialist in Myriapoda, I can say confidently that his list of Eur-American myriapods is neither complete nor entirely accurate. On the other hand, it seems to me that he could come to many or most of the same conclusions on the firmer ground of the Coleoptera alone. As Darlington points out, when Lindroth writes of Eur-American beetles, he has no peer.

The format of the book—its numerous good maps, graphs, and tables—assists the reader to gain a clear picture of the author's text. Following each chapter there is an extensive bibliography. Finally, it is a pleasure to say that Lindroth's writing is direct and lucidly uninvolved. He orders his arguments neatly. His style, plus the fine maps and other aids, makes reading this book quite a pleasurable as well as rewarding experience.

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Bergey's Manual of Determinative Bacteriology. Robert S. Breed, E. G. D. Murray, and Nathan R. Smith. Williams & Wilkins, Baltimore, ed. 7, 1957. xviii + 1094 pp. \$15.

The sixth edition of "Bergey" (1948) was one 1500-page volume. This edition appears in two volumes, the one indicated above and an *Index Bergeyana*, to appear later. The *Index* will include most of the "*species incertae sedis*," the literature index, and the host and habitat indices. (The "*species incertae sedis*" in the previous edition for Micrococcaceae alone numbered almost 800 and occupied 37 pages of text.) Space thus ob-

tained makes possible a more usable book, containing, actually, additional material pertinent to the recognized taxa. A significant change is the omission of the "Small viruses," order Virales, in the present edition. An addition is a 45-page "Comprehensive key to the genera of the manual," prepared by V. B. D. Skerman.

Many changes have been made in the text. Class Schizomycetes now has ten orders instead of five; family XI—Parvobacteriaceae—of the sixth edition is gone, and in its place we have family V—Brucellaceae; formerly six species of the genus *Diplococcus* were listed, now one is listed; 93 species of the genus *Clostridium* are now listed, instead of 61; *Staphylococcus albus* is absent, and so on. The new names and the changes will add to the confusion which is altogether too prevalent among microbiologists with regard to taxonomy. However, it seems to me that the changes made are clearly indicated and based on mature decisions of experts. The net result should be a need for less change in future editions and a very real advance in our understanding of microbes.

The authors are to be congratulated on a superb task well done. The book is of course highly technical, but, after hours spent going over it, I have yet to find a printing error. "Bergey's Seventh" is recommended to all microbiologists, but each who takes it up must be prepared for the feeling of entry into a slightly different world and advised not to put the book aside until it has been well examined. The work of preparing the book has been shared by many, but all will agree that this edition stands in a particular way as a monument to Robert S. Breed, deceased 10 February 1956.

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Zinsser Bacteriology. David T. Smith and Norman F. Conant, Eds. Appleton-Century-Crofts, New York, ed. 11, 1957. xiii + 953 pp. Illus. \$12.

A textbook of bacteriology, appearing five years after a previous edition, requires extensive revision, especially if the over-all length is not to be increased. The authors (this includes, in addition to Smith and Conant, other members of the faculty of Duke University School of Medicine: Beard, Willett, Overman, Brown, Sharp, and Poston) were well aware of this requirement. They have remained faithful, however, to the original purpose of Zinsser's textbook and have emphasized the medical and public health aspects of bacteriology. Thus, the section on physiology of microorganisms,

with the exception of bacterial genetics, has not been greatly enlarged. The chapters on immunology have been arranged in a more logical sequence and have been expanded. A chapter on immunohematology has been added. The sections on pathogenic bacteria and medical mycology have been reduced for the benefit of the section on viruses.

Numerous illustrations have been added, especially in the section on viruses. The book is well written and illustrated and remains a basic text for medical students and medical bacteriologists.

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Artificial Stimulation of Rain. Proceedings of the first Conference on the Physics of Cloud and Precipitation Particles. Held at Woods Hole, Massachusetts, 7-10 Sept. 1955. Helmut Weickmann and Waldo Smith, Eds. Pergamon Press, New York and London, 1957. xvi + 427 pp. Illus. \$15.

The contents of this book are described in the subtitle, "Proceedings of the first Conference on the Physics of Cloud and Precipitation Particles," rather than in the featured title. Of the 49 formal papers included in this impressive volume, only two or three treat somewhat directly certain aspects of artificial stimulation of rain, and even these do not answer questions likely to be uppermost in the minds of general readers—for example, what practical results have been attained in man's efforts to increase rainfall by cloud seeding or other artificial means? The present answer to this general question may be summed up in the words used by the author of one of the papers with particular reference to his own experiments in cloud seeding. He said: "Those are the results. We would be glad if some statistician could tell us exactly what they mean. The *only conclusion* [italics added] that we have drawn from them so far is that they justify a repetition of the experiment in 1955." Moreover, most of the technical papers in the volume reveal by inference how relatively little man knows about the physical processes of formation of hydrometeors. Urgent indeed is the need for basic research in clouds and precipitation.

For the most part the papers are by scientists who have been engaged in research in cloud physics and related subjects. They present some of the latest results of competent studies in the laboratory and in the free air. An interesting feature is the discussion that follows most of the papers. The questions and answers bring out views of many of the leaders in experimental cloud physics in

North America. They show the many complex facets of this broad subject.

The papers are organized around four main headings. Part 1—Aerosols: their origin, distribution, and measurement. Part 2—Condensation and coagulation: measurement of cloud and rain-drop size; rain from water clouds. Part 3—Melting and freezing: studies of snow and ice in the generation of precipitation. Part 4—Crystal growth and nucleation: laboratory and field studies. Two shorter sections treat thunderstorm electricity and international terminology (definitions of hydrometeors)—the latter made complicated by the diversity of precipitation phenomena and the international scope of applied meteorology. Among the subjects taken up in the different articles are mechanics of droplet growth by condensation, collision, and coalescence; the composition, distribution, and meteorological role of condensation and freezing nuclei; supercooling of water droplets (a phenomenon somewhat peculiar to precipitation physics); crystallography of snowflakes and ice clouds; the effects of chemicals in facilitating and inhibiting nucleation of clouds; and use of radar and other instruments in studying cloud physics.

As a whole, the papers collected in this volume are devoted to the problems one would expect would be discussed by research scientists brought together to consider the present state of knowledge of cloud physics and implied applications to modification of clouds and precipitation. The book does not have a subject index, but the convenient table of contents makes it fairly easy to find desired material. It contains extensive bibliography lists and should be a valuable reference source for the researcher, for the student, and for the layman interested in learning more about this field and its widening possibilities.

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The Fishes of Ohio. Milton B. Trautman. Ohio State University Press, Columbus, 1957. xvii + 683 pp. Illus. \$6.50.

Dr. Trautman of Ohio State University has devoted his life, since 1925, to study of the fishes of Ohio. In this book, the glacial history is followed by a description of the replacement of the original habitat with a dense human population and the drastic changes that have taken place in the fishes and other wildlife.

There are sections on artificial keys, equipment for identification, methods of collecting, counting and measuring, comparisons between waters, hybridization,