

much well-trodden ground. Here again Keilin's book treats a number of the same topics in more detail and examines the evidence more critically. Gale, however, provides some interesting perspectives; but, unlike all the other authors in this book, he cites no references. By contrast, the following article, by Kendal Dixon on the progress of neurology, is by far the longest in the book, and ends with five pages of references. It covers the subject from Vesalius to the present, and almost all readers will learn something new from it. There is inevitably little in it that could be called biochemical, although there is much of physiological and medical interest, until the late 19th century, when L. J. W. Thudichum necessarily becomes a central figure; but from then on one sees the gradual progress of neurochemistry, and its relation to the discoveries of the anatomists and physiologists, in a valuable presentation.

F. G. Young treats the evolution of ideas about animal hormones, with an interesting portrayal of the earlier work on internal secretions, throughout the 19th century, before the definitive formulation of the hormone concept by Bayliss and Starling. The later progress in the 20th century is also well presented. The next chapter, by L. J. Harris on the discovery of vitamins, is only 15 pages, half as long as Young's. It gives briefly the early history of scurvy, beriberi, and other deficiency diseases; but the latter half of the chapter becomes largely a short catalog of the numerous vitamins now known. One may question the statement (p. 162) that "the first real indication of the multiplicity of vitamins" came with the work of McCollum and Davis in 1915. Without depreciating the work of McCollum, one should note the simultaneous and equally important work of Osborne and Mendel in New Haven.

In the following chapter Mikuláš Teich of Prague, who, unlike all the other contributors except Needham, is a professional historian of science, explores some of the historical foundations of modern biochemistry. He has new and significant things to say about the notion of vital force, the relations of inorganic and organic chemistry in the time of Berzelius and Liebig, the development of the chemistry of nutrition, and the relations between chemistry and physiology in the 19th century. The closing chapter, by Sir Rudolph

Peters, touches briefly on the life and work of some early isolated pioneers of biochemistry—W. H. Wollaston, Andrew Buchanan, H. Bence-Jones, A. B. Garrod and his still more notable son, A. E. Garrod, and A. Sheridan Lea, among others. All are interesting characters, and some are important; it is good to be reminded of them.

The book is enriched with a series of plates, most of them portraying investigators whose work is discussed in the text. Historians of science will find many parts of it useful and suggestive for further work; inevitably most of the articles, written by practicing scientists who are only incidentally concerned with the historical aspects of their subject, are somewhat sketchy and do not involve deep research into the original historical sources. Although one must note these limitations, this book can be recommended to biochemists and others who wish to obtain some perspective on how this field of science came to be what it is today.

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Madagascan Insectivora

The Tenrecs. A Study in Mammalian Behavior and Evolution. J. F. EISENBERG and EDWIN GOULD. Smithsonian Institution Press, Washington, D.C., 1970 (available from the Superintendent of Documents, Washington, D.C.). vi, 138 pp., illus. \$3.25. Smithsonian Contributions to Zoology, No. 27.

The mammalian fauna of the island of Madagascar has been a source of interest to students of evolution for some time. Madagascar has a range of habitat types, and because of its isolation by about 250 miles of ocean from the coast of East Africa it has been a veritable natural laboratory for adaptive radiation in the mammalian orders present in recent times. Of those mammals endemic to Madagascar, perhaps none provide better raw material for studies of evolution and behavior than the insectivores of the family Tenrecidae. This book presents the results of two years of fieldwork on the Madagascar tenrecs in addition to study of captive animals at the U.S. National Zoological Park. The authors discuss the general physical and climatic features of Madagascar and then describe the

population biology, habitat preference, and ethology (especially social behaviors) of members of the two endemic subfamilies of tenrecs, the rice tenrecs, *Oryzorictinae*, and the hedgehog tenrecs, *Tenrecinae*. Conceptualization of evolutionary trends in morphology and behavior in the context of the varying ecological niches of these primitive mammals completes the main body of this work. There follows a useful series of appendixes setting out in detail experimental procedures and equipment. Behavioral information is variously presented. General descriptions of social behaviors are supported by sample protocols. A more quantitative presentation would have been appreciated by this reader. Acoustic communication is characterized by tabulations of the physical properties and the social contexts in which sounds are emitted. A thorough discussion of the phenomenon of stridulation in *Hemidentetes* is provided and includes results of a series of elegant experiments.

Evolutionary trends in behavior among the tenrecs are established by a careful comparison of both the ecology and the ethology of the species studied. This approach serves to emphasize changes in behavior that reflect differing ecological preferences. Many aspects of tenrec behavior are quite conservative; for example, comfort and marking movements, nest construction, mother-neonate responses, and acoustic signals. On the other hand, agonistic behaviors have undergone extensive changes that appear to be related to modifications in feeding patterns and to the development of a spinescent body covering. The latter, together with the ability to roll up into a quill-studded ball, is best developed in the specialized genera of the hedgehog tenrecs.

The book has been quite well produced with a minimum of typographical errors. The line drawings are informative although some have been reduced too much. A minor source of annoyance is the frequent shift from metric to English units of measure. In sum, I think the authors have provided us with a well-conceived example of how behavioral evolution can be reconstructed. In addition to devotees of mammalian ethology, students of population biology and evolution should find this monograph of value.

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