Book Reviews

The Mammals of North America. E. Raymond Hall and Keith R. Kelson. Ronald Press, New York, 1959. xxx + 1241 pp. Illus. 2 vols, $35.

It is practically certain that the species of North American mammals are now completely known. Under the influence of man, ranges are still changing, but little more information about natural ranges in early historical times is to be expected. With regard to classification, the principal remaining task is the elimination or lowering in taxonomic rank of a considerable number of supposed species that will almost certainly prove either to be of less than true specific status or to be altogether invalid as taxa at any level. The most important future studies of North American recent mammals will not be classificatory. Almost everything is still to be learned about the actual variation in wild populations of mammals and the real geographic and ecological distribution of such variation—a study that has been as much confused as furthered by the traditional descriptions of subspecies. A somewhat better start has been made on the biological (other than taxonomic) study of North American mammals—of their physiology and behavior and many allied topics—but here, too, the major part of the task is still to be done.

Now, when the era of discovery and classification is closing, it is time to consolidate its data as the required basis for the new era of more broadly biological mammalogy. That is the aim and importance of this enormous work by, among others, Hall and Kelson. This mammoth publication occupies about 285 cubic inches of space and weighs close to 9 pounds. It has 1083 text pages plus 30 introductory and 158 separately numbered index pages. There are 500 distribution maps in the text, two large end-paper maps, and 538 figures of skulls, most of them in three views. There are also, according to the publisher's claim (these figures are unnumbered), 186 life drawings of mammals. Preparation of the book took 12 years, and the work was supported by grants from four sources. Besides the two authors named on the title page, 37 workers are given credit for assistance with the text, ten artists for the illustrations, and eight typists for the manuscript.

"North America," as here defined, runs from Greenland through Panama and also includes the Antilles through Grenada—an enormous area that is not a natural zoogeographical unit. After a prefatory note, the work begins with an all-too-brief discussion of some zoogeographical points. It closes with detailed instructions for inexperienced collectors, which seem somewhat out of place in a publication obviously intended neither for beginners nor for field use. Between these two sections, the great bulk of the study is a systematic treatment of the 3679 recognized basic taxa (subspecies and monotypic species) and the higher categories in which they are arranged. Check lists of the last 35 years have steadily reduced the number of recognized native full species, which stands in this volume at 995. That is still evidently too many, and the authors predict that revision will eventually reduce it to about 800.

This study is not itself a revision. On the contrary, in principle it is a compilation of previously published material with as little new interpretation as possible. It assumes that the last published account of any group based on specimens was correct—even when it obviously was not. The only original data by the present authors are some identifications of specimens for inclusion in the distribution maps, and in making these identifications they have not checked the validity of the taxa to which the specimens are referred. Although the authors do not so state, the over-all classification from genera upward is almost precisely that which I published in 1945. It is not an adverse criticism to note that the authors have aimed at a purely mechanical résumé of previous literature. Such a bibliographically objective compendium is all the more reliable for its avoidance of new personal opinion.

All the taxa recognized above the subspecies are briefly defined or identified, and within each order there are keys for identification of museum specimens down to species. Synonymies, with references, are given for genera and subspecies but not, oddly enough, for species. Brief comments on habits, ecology, or reproduction are made for many species. Standard dimensions are given for species, but a bad habit of mammalogists is inevitably carried over from the primary literature: ranges of measurements are usually given without indication of means, sizes of samples, or differences in range in subspecies or other populations, so that the real nature and limits of the variation are unguessable.

Geographic ranges of subspecies (and monotypic species) are given in the text in terms of marginal records, with references. In most cases geographic distribution is shown on maps as well, with marginal records shown by dots and the inferred total area shaded and numerically keyed. Distributions shown are the maxima justified by any literature and by specimens. They therefore are of varying dates, as is usually made clear in the text. For the bison, for example, the range mapped is approximately that of the period just before America was settled by Europeans, but for the opossum the range is shown as of 1957 and includes areas of recent introduction where opossums never occurred naturally. On the whole these maps are the most valuable contribution of the work. There is no other publication that has so many range maps of such reliable detail.

Some unsatisfactory points in current mammalian systematics are strikingly reflected in the maps, as the authors properly note in the hope that corrections will be made. In map No. 452, for instance, the type localities of 78 "species" of brown and grizzly bears are all listed as if they were valid but with the warning that the majority of them almost certainly are not. Surely all modern mammalogists recognize that these bears represent just one species. In maps Nos. 262–266, the sharply delimited ranges of 213 named subspecies of the pocket gopher *Thomomys umbrinus* (all of which the authors do consider valid) are shown, but with the comment that every local population in this species is distinctive and that selection of those to be given subspecific names is subjective. The authors' plan left them no choice and required mapping the "subspecies," but the reader will surely feel that the traditional approach to systematics in this group has completely failed to promote biological understanding.

It is in line with their aim of mechanical compilation that the authors favor the most rigid application of priority in nomenclature. (Their preface even expresses regret that they have in some cases followed the International Commission and Rules of Nomenclature when under those rules the commission has set aside priority). The most distressing result is that they followed Hersh-

kovitz in using the name *Dama* (for generations always applied to distinctive Old World deer) for the American deer that everyone else calls *Odocoileus*. This compounds confusion and is an obvious case of a situation in which official sanction of the practically universal usage should be sought.

At just one or two points the authors have injected personal views, and the result is not always happy. The worst example is a passage, initialed "E.R.H.," which seeks to justify inclusion of gibbons and apes in the Hominidae. "E.R.H." argues that previous family separation was made "because of an assumed wide gap in intelligence," which is at best an inadequate statement of the case. He then expresses the astonishing opinion that "the gap in intelligence between some microgeographic races of man and some races of apes is . . . no wider than that between genera in some other families, for example, that between the two genera *Canis* and *Dusicyon* of the family Canidae." This is only one spot in a large work, but it is too egregious to be passed over in silence.

In view of some advertising for which the authors are not responsible, general students and nonprofessional readers should be advised that their purposes will almost certainly be better served by any of several less expensive books on North American mammals. For its own properly intended audience, the professional mammalogists, this publication truly deserves the frequently misused adjective *indispensable*. Henceforth no one can work at the technical level in this field without reference to Hall and Kelson.

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Fundamentals of Ecology. Eugene P. Odum. Saunders, Philadelphia, 1959. xviii + 546 pp. Illus. $7.50.

The popularity of this well-written text is attested to by this thoroughly revised and enlarged second edition, which appears less than six years after publication of the first edition. The "statement-explanation-example" treatment of principles has been retained.

The three parts, "Basic ecological principles and concepts," "The habitat approach," and "Applied ecology," have been enlarged by 74, 14, and 41 pages, respectively. There are 41 additional figures. Much of the text has been rewritten to incorporate more recent thinking.

As in the first edition, the ecosystem approach is emphasized. Most of the sections have been enlarged, in particular those on the ecosystem, energy relations, the biotic community, and phytosociology. Some new sections have been added, such as those on biogeochemical cycles and ecological indicators. The new chapter on radiation ecology is comprehensive, clear, and most important at this time.

I have a few—perhaps trivial—criticisms: The extensive use of exclamation points may be somewhat irritating to some readers; the useful term *stand* has apparently been omitted; the "sand sage grassland community" occurs more widely than is stated on page 27; and the section on phytosociology is very brief.

The science of ecology has been criticized, often unjustly, for cumbersome terminology. In this book the meaning of concepts is not lost in unnecessary, abstruse words. Commendable, also, is the procedure of precisely defining words that are used widely in a general sense to explain their meaning in a more specific ecological sense—for example, *community, competition,* and *population.*

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Physics of Meteor Flight in the Atmosphere. Ernst J. Opik. Interscience, New York, 1958. viii + 174 pp. Illus. Cloth, $3.85; paper, $1.95.

The title clearly defines the scope of this book. By treating only the physical phenomena associated with the flight of high-speed objects through the earth's upper atmosphere, the author has been able to present an exhaustive, theoretical treatise covering most of the possible combinations of circumstances involved in this problem. The main purpose of the physical theory of meteors is "to predict the variation of mass, velocity, luminosity, and ionization along the meteor trajectory."

In the first three chapters the author provides the necessary introductory material by (i) defining the problem, (ii) briefly describing the characteristics of those regions of the upper atmosphere in which meteoric phenomena take place, and (iii) classifying and describing meteoric particles and phenomena. The primary divisions in the theoretical problem are made on the basis of whether the molecular mean free path in the upper atmosphere is large or small as compared with the size of the meteoric particle, and whether the particle is solid iron, solid stone, or a "dustball" skeleton of cosmic dust.

In the next three chapters the details of energy transfer, particle dynamics, and ablation are presented. The large number of possible processes at work in the disintegration of the various meteoric particles is treated efficiently by the author, with the aid of a very large number of tables. In chapters 7 and 8, the formation of heat, light, and ionization in the coma near the particle and in its wake is described. The final chapter, "Some applications," treats briefly the "dustball" characteristics of certain sporadic and shower meteors.

Opik is well known for his extensive theoretical and experimental work on meteoric phenomena over the past 37 years. He writes with considerable authority on this subject. There is some tendency, however, to state as fact certain interpretations upon which there is no general agreement.

Meteoric phenomena not treated in this monograph include the astronomical characteristics of meteors and the physics and applications of radio reflections from meteor trails. In staying within the intended scope of this book, the author could not of course survey the extensive literature on radio detection of meteors. However, the results of some of these studies are applicable to his theoretical models—for example, the radio studies of trail diffusion, the size of the rapidly formed coma, particle deceleration, and turbulence. The author also treats only slightly the results of photographic studies of meteors and refers mainly to the earlier visual studies. Little or no specific mention is made of the application of meteoric phenomena to upper-atmosphere studies, radio communication, space-vehicle hazards, and ballistic vehicle reentry. However, the author has certainly been successful in his announced intention of providing a basis for further research on the physical theory of meteors.

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Science Students' Guide to the German Language. A. F. Cunningham. Oxford University Press, London, 1958. xiii + 186 pp. $2.

This guide, although well printed, carefully worked out, and with many individual excellences, will probably not be of much assistance to Americans who are impelled to study German. The chapters are not organized to provide an orderly pedagogical progression into the grammar. Chapter 4, "Declension of nouns," treats only the singular inflection (one and a half pages) and includes no exercises; chapter 7, "Verbs" (ten pages, including exercises), lists the forms of 117 strong verbs and devotes a half page to detailed discussion of the