sweepstakes dispersal from the Pliocene onward. All the geological and all the faunal evidence does not accord with that interpretation. Nothing in the observational data adduced by Koechlin seems sufficient to controvert the hypothesis that the plant founders, too, with frequently superior capacity for sweepstakes dispersal, came predominantly across a varying Mozambique Channel barrier and in quite small part by likewise sweepstakes dispersal from Indo-Oceanic sources.

It has long been known that Madagascar had numerous striking land vertebrate taxa that lived on until after the arrival of man on the island and later became extinct. That subfossil fauna, here summarized by Mahé, included such curiosities as giant tortoises, the great ratite *Aepyornis*, and the large lemur *Megaladapis*, along with many other, smaller and less striking, animals. Many species in the surviving fauna also are now in serious danger of extinction, as is emphasized here by Griveaud, Albignac, Millot, and others. There is here no impelling evidence either for the extinct subfossils or for the present fauna that direct predation ("overkill") by man is a main cause of extinction. These authors indicate that the most evident although not necessarily the sole and sufficient cause has been the great environmental changes that have followed occupation and ecologically destructive exploitation of the island by man. Nevertheless Battistini, who here writes on geomorphology only, has elsewhere (*2*) with Vérin maintained the direct or "overkill" hypothesis for the larger subfossil species, at least, and so has Walker (*3*) for the extinct subfossil lemuroids as a whole. The point might here have been more fully and explicitly considered.

Although English is not the language of any of the authors, 20 of the chapters are published in English. They have been professionally translated from French in London and the result is uniformly clear and reasonably idiomatic. Why four chapters were left in French is not explained; on arachnids, mollusks, reptiles, and insectivores, they are among the most significant. The editing is subject to some criticism. Apart from misprints, it is, for example, possibly baffling to come across text references to a "Booker Mac Dowell" (who is Samuel B. McDowell) and a "Findell Hopwood" (who was Arthur Tindell Hopwood), and to have no help from a bibliography, which is absent from six chapters and deficient for several others. The index, which includes only technical names of genera, is of little real use.

Despite some unevenness and flaws, this is a noteworthy contribution to biogeography and is now the best general source in (for the most part) English on the natural history of a fascinating island that might be called a minicontinent.

GEORGE GAYLORD SIMPSON
Department of Geosciences, University of Arizona, and *Simroe Foundation, Tucson*

References

1. W. D. Matthew, "Climate and Evolution," *Ann. N.Y. Acad. Sci.* **24**, 171–318 (1915); second edition, 223 pp., 1939.
2. R. Battistini and P. Vérin, in *Pleistocene Extinctions*, P. S. Martin and H. E. Wright, Jr., Eds. (Yale Univ. Press, New Haven, Conn., 1967), p. 406.
3. A. Walker, *ibid.*, p. 425.

Productivity Studies

Tundra Biome. Proceedings of a meeting, Leningrad, Oct. 1971. F. E. WIELGOLASKI and TH. ROSSWALL, Eds. International Biological Programme Tundra Biome Steering Committee, 1972 (available from Swedish IBP Committee, Stockholm). 320 pp., illus. Paper, $4.

The tundra has had a provocative influence on the study of ecology. Early trophic studies by Elton and more recent work on physiological and population ecology of tundra organisms have included noteworthy advances in basic science. Some of the recent investigations of tundra productivity were reviewed in the symposium from which this volume stems.

The volume includes research results from tundra research projects in nine cooperating nations. For the most part, the contributors present progress reports rather than final summaries. Indeed, there are prominent statements suggesting that the contributions, except for those of the Soviets, are to be regarded as preliminary. A review of the papers does provide some perspective on the status of the investigations as a whole.

Fully two-thirds of the text is devoted to material from four major Soviet project sites. The papers vary from the philosophical to a detailed description of techniques for marking reindeer during river crossings. The majority are purely descriptive of the kinds, numbers, and biomass of organisms. There is a fairly even balance in coverage among primary producers, consumers, and decomposers. Matveyeva provides a synthesis of trophic-level productivity estimates for the Tareya site (western Taimyr) comparable to summaries presented for Canadian and U.S. projects.

Soviet interest in the abiotic environment is solidly focused on the soils. The influence of soil characteristics on organism distribution and productivity is not entirely clear from the work cited. The abundance of microorganisms does vary with soils of different structure (Aristovskaya and Parkinkina), but the distribution of vascular plants seems to relate more to microrelief (Ignatenko *et al.*). Vertebrate and invertebrate productivity is described as being coupled to the abundance of food. Smirnov and Tokmakova's description of the stimulatory effect of rodent grazing on primary productivity is one of the few examples of this type of feedback control.

The remaining articles include diverse research reports by non-Soviet investigators and a series of national project reports by biome leaders from eight countries. The paper by Tieszen (U.S.A.) on primary productivity is one of the best in the volume for its integration of process and descriptive information. Much of his work has been published elsewhere, however. Wielgolaski has done an admirable job of summarizing primary production information from several tundra programs. An intriguing paper by Bliss (Canada) on conservation and human impact is all too brief in view of its importance. Only one other paper (Dorogostaiskaya) is devoted to human influences on the tundra.

The national reports provide summary descriptions of component programs. Most include enough specific information to allow a comparative analysis of tundra productivity as revealed by the programs and to provide the rough outlines of an ecosystem-level simulation of productivity. The ecosystem-modeling efforts represented at this point are in the form of static pictures, with a promise that dynamic formulations will be provided in the future. Brown (U.S.A.) does present a flow chart for a dynamic simulation, but without specifics.

This volume will be useful primarily to those with an ongoing interest in tundra productivity. The symposium

itself speaks well for the coordination between national projects. I expect that a similar effort at the completion of the International Biological Programme could result in a valuable document for ecology as a whole.

BRIAN F. CHABOT
Department of Botany,
University of New Hampshire,
Durham

Meteoritics

Meteorites and Their Origins. G. J. H. McCALL. Halsted (Wiley), New York, 1973. 352 pp., illus. $12.98.

McCall is an English geologist of wide experience who migrated to a position in the University of Western Australia around 1962. Shortly after his arrival he investigated the spectacular Wolf Creek crater, and he has authored a steady flow of publications on meteorites and tektites in general and on Western Australian occurrences in particular. His work has included both field and laboratory investigations of considerable scope and magnitude. In this book he has set out "to condense the vast spectrum of meteoritics into a single readable volume beyond the mere elementary statement, but still suitable for use as a general text for amateur scientists, university students and professional scientists." This is an admirable undertaking and one for which McCall is well qualified. It is disappointing to report that he has been only partially successful.

The book is certainly comprehensive, covering all aspects of meteoritics and including two chapters on those enigmatic objects the tektites and one on the significance of the recent explorations of the Moon and Mars. It has an excellent index and an extensive bibliography, including references as late as 1971. The book is well illustrated, with many good photographs of individual meteorites and of characteristic microstructures. The value of these illustrations is diminished, however, by the general absence of any indication of scale; for example, is the Mundrabilla meteorite (p. 60) as big as a barn or as big as a dog kennel? The text in many parts has a strong imprint of the author's own concepts and speculations, which are interesting and stimulating for research workers but could be misleading for students and lay persons. In the chapter "Carbonaceous chondrites—primitive or degraded?" McCall argues well for their nonprimitive nature, but omits any reference to the extensive researches of Anders and his co-workers which support the opposite conclusion. His skepticism regarding the origin of many possible meteorite impact structures is refreshing but iconoclastic, and the subject deserves a more balanced presentation. His enthusiasm for a cryptovolcanic origin for such structures extends also to tektites; he states (p. 298) that cryptovolcanism "remains the best of the terrestrial theories," a statement that will surely raise hackles among his scientific peers.

The book is marred by an excessive number of minor errors and misstatements, evidence of hasty and careless preparation. A few examples will suffice. The weight of the Agpalik meteorite is given as 15 tons on p. 57 and 20.1 tons on p. 58. Figure 5, ascribed to Mason, is not of my making. The Ensisheim meteorite (p. 19) fell in 1492, not 1462. The Henbury craters (p. 52) were first described by Alderman, not Spencer. Xenon (p. 232) is formed by the fission, not the fusion, of heavy radionuclides. The nonterrestrial water content of carbonaceous chondrites (p. 206) cannot be driven off completely at 180°C. Should there be a second edition, I hope the book will be given the critical review and editing expected of a responsible publisher such as John Wiley and Sons.

BRIAN MASON
Smithsonian Institution,
Washington, D.C.

Mammalogy

Functional Anatomy of Marine Mammals. Vol. 1. R. J. HARRISON, Ed. Academic Press, New York, 1972. xviii, 452 pp., illus. $21.

The study of marine mammals has become increasingly popular during the past few years, and as a result several volumes have been produced on various aspects of their biology. In the preface to the one under review, Harrison presents a necessarily cursory, but interesting, history of the study of the anatomy of marine mammals, particularly cetaceans, and places the book in perspective relative to the other existing volumes on marine mammals. He states that "the chapters will consist of reviews as well as contributions containing original work," and this indeed proves to be the case.

The chapters cover growth and development, phocid skulls, cetacean neuroanatomy, the pinniped ear and hearing, the pinniped eye, hind limb anatomy of otters and seals, and reproduction in some odontocetes. I was particularly pleased with the chapter on growth and development by M. M. Bryden, who is one of the leading authorities on this topic as it relates to marine mammals. Bryden reviews the literature by species and discusses not only overall growth patterns so far as they are known but also the growth of the various tissues and organs. Most important, however, is that Bryden has attempted to standardize the existing growth data so that growth curves can be compared interspecifically. P. J. Morgane and M. S. Jacobs present a considerable amount of new information on the neuroanatomy of *Tursiops truncatus.* I found their section on the blood supply to the brain most interesting, and I was impressed by their photographs of corrosion casts of the circulation to the brain and vertebral column of *Tursiops.* The chapter on the functional morphology of underwater hearing in seals by C. A. Repenning is also interesting, partly because it brings together the scattered literature on this subject, but more so because it attempts to correlate structure with function. Such attempts are made to varying degrees in most of the chapters and are a feature that I consider very important in a book such as this.

I found two aspects of this volume somewhat distressing. First, there appears to be a lack of consistency between chapters with regard to cetacean taxonomy. Cetacean systematics is constantly being revised, but I wish that, at least for large publications, everyone would agree on the same name for the same animal. Second, the lists of references omit the titles of most of the papers cited. I realize that this method saves space and therefore money, but I find it convenient to have titles available to speed up literature searches.

In summary, I found this book to be generally well done and I am looking forward to seeing future volumes in the series. I wish this one had been available when I was writing a series of lectures on marine mammals.

DANIEL K. ODELL
Department of Biology,
University of California, Los Angeles