on the Cetacea, 1866, Ray Society, London). Slijper's misrepresentations are italicized: "Eschricht . . . discovered no less than thirteen *complete* porpoises and *fourteen* seals in the first chamber of its stomach (6½ × 4¾ feet). A *fifteenth seal* was found in the animal's *throat*." Eschricht says that only one of the porpoises was even "almost entire, most of them [were] half decomposed and only to be recognized by fragments of the skeletons . . . I satisfied myself [as to their number] by only collecting the heads." Eschricht said that upon first opening the stomach ". . . five or six seals, some large, some small, all flayed . . ." were revealed. As further seal bodies were taken out ". . . a couple of them seemed to be fresh flayed, most of them [were] half digested. . . . some only remaining in the shape of loose parts of the skeleton . . . a fourteenth [seal], a very small one, . . . had [passed on] into the second stomach. . . ." The alleged 15th seal Eschricht described as a seal skin clutched in the killer's teeth and empty except for the "crushed head" and "the paws." He considered this skin to belong "to one of the flayed bodies found in the stomach, and, therefore, . . . not to be counted separately."

Thus, Slijper's words and illustrations imply that the first stomach of the killer whale contained 27 whole animals, when in fact it contained the *remains* of 13 skinless, partly digested seals and the *remains* of 13 partly digested porpoises. And the whole seal in the throat was an empty skin in the teeth. Since most of the remains in the stomach were much reduced from their original bulk, Eschricht's original account is quite credible, whereas Slijper's is not.

As a book intended for scientists and laymen alike, Slijper's *Whales* is flawed by these excesses of enthusiasm, by the lamentably high frequency of error, and by the difficulty of checking errors because of inconvenient and inadequate documentation of original sources. As a slightly contaminated fountain of the knowledge, it will nevertheless be truly invaluable to those adequately fortified by the prophylactic of skepticism. Certainly no cetologist can afford to be without the book, and no mammalogist will find a better single compilation on the Cetacea.

JOSEPH CURTIS MOORE
Chicago Natural History Museum

Entomology

Insect Pathology. An advanced treatise. vol. 1. Edward A. Steinhaus, Ed. Academic Press, New York, 1963. vxiii + 661 pp. Illus. $19.

I have a relatively low opinion of multiauthor books, be they textbooks or advanced treatises. But the present volume is exceptional in that a very high percentage of its chapters are really good.

This volume, the first volume of a two-volume work, treats physical injuries, chemical injuries, nutritional diseases, genetic disturbances, tumors, normal microbiota, the effect of vertebrate pathogens on insect and acarine vectors, immunity, physiopathology, predispositions, the nature of infections, the nature of nuclear polyhedrosis viruses, cytoplasmic viruses, the induction of virus infections, granuloses, and Rickettsiae. Only some of these can be singled out for further comment.

The chapter by Day and Oster on physical injuries only points out how little interesting work has been done. Even with respect to radiation effects the data are mostly superficial (the dosages tolerated), with little on the fundamental nature of the effects. Brown follows with an excellent chapter on chemical effects which covers histopathology, symptomatology, and enzyme inhibitions. The chapter by Berg, on genetic diseases, should be useful to those entomologists who need instruction on what can be determined by genetic analyses. Harker's chapter on insect tumors is excellent; unfortunately, little is known about these tumors. Brook's chapter on the microorganisms found in healthy insects is a comprehensive survey, and I wish that she had been allowed more pages to detail the literature more thoroughly. Stephens' chapter on immunity is one of the half-dozen highlights of the volume. In this difficult and controversial field, she does a nice job of presenting the available data and of evaluating it critically, without making the mistake of taking a stand in favor of this or that idea. Arizama's chapter on the nature of virus infections, despite its poor English, gets across the status of the field today.

The truly superlative chapters by Bergold, on nuclear viruses, and by Smith, on cytoplasmic viruses, are the highlights of the volume. The work on insect viruses, as it is presented by these internationally known leaders, has been important not only to entomology but also to the general field of virology. I recommend these chapters to both entomologists and virologists. Huger deals competently with the granulosis viruses which are less well known, and Krieg treats Rickettsial effects in insects.

No review can do justice to this volume—it can only recommend the volume to those who are interested. When complete (the second volume will cover bacterial, fungal, and protozoan diseases, epizootiology, diagnosis, and the control of insects by microbial methods), this work should not only be a landmark in this field but an indispensable book for everyone concerned with pathological problems in insects.

A. GLENN RICHARDS
Department of Entomology, Fisheries, and Wildlife, University of Minnesota

Measuring the Earth

Geodesy. Guy Bomford. Oxford University Press, New York, ed. 2, 1962. xvi + 561 pp. Illus. $14.40.

Three recent developments, the requirements for guiding rockets from point to point on the earth's surface, the very precise determination of satellite orbits from observations at widely spaced sites, and the need to reconcile distances measured into space from terrestrial base lines with direct radar measurements, have led to an increase in the importance of geodesy, the science of measuring the earth on a large scale. Since the first edition of this excellent book was published (1952), the field of geodesy has developed very rapidly, and a second edition is therefore most welcome.

The subject matter has been brought up-to-date by the inclusion of sections dealing with the Tellurometer, with the geometrical and dynamical uses of artificial satellites, and with modern ideas relating to basic aspects of reduction and computation. The book merits high recommendation for use as a textbook and also as a source for general reading by workers in related fields. The material is exceptionally well organized, the writing lucid, and the numerous

figures assist greatly in the easy comprehension of the text. The pleasure of reading such a well-written treatise is increased by its fine production.

The short chapter "Gravity and geophysical surveys" is the least satisfactory part of the book for, with the exception of a few standard texts, references to modern work are restricted almost entirely to the British experience. "A surface feature can be traced beyond its visible outcrop, and anomalies can indicate the existence of a disturbance of some kind, but it is difficult to go much further" is a rather discouraging summary of the potentialities of magnetic surveys, in view of their extensive and successful use in ore location and in "depth to basement" studies. However, the chapter on geophysics is a minor sideline to Bomford's main topic, and any weakness there is more than compensated for by an excellent discussion of the reduction and use of gravity observations.

J. C. HARRISON
Hughes Research Laboratories, Malibu, California

Irreversible Processes

Non-Equilibrium Thermodynamics. S. R. de Groot and P. Mazur. North-Holland, Amsterdam; Wiley, New York, 1962. x + 510 pp. Illus. $15.50.

Nonequilibrium Thermodynamics. A phenomenological theory of irreversible processes in fluid systems. Donald D. Fitts. McGraw-Hill, New York, 1962. xviii + 173 pp. Illus. $7.95.

With the publication of *Non-Equilibrium Thermodynamics* by de Groot and Mazur, we have at last an authoritative and very nearly definitive treatise on the thermodynamics of irreversible processes. The volume is divided into two parts, A, on principles, and B, on applications. In the first four chapters of part A, the basic hydrodynamic and phenomenological equations, including the Onsager reciprocal relations, are introduced, and the modern version of the second law of thermodynamics is discussed. The remaining three chapters discuss some relevant aspects of the statistical and statistical-mechanical foundations of nonequilibrium thermodynamics. Part B is devoted to a survey of the applications of the principles to chemical reactions, to flows of heat and matter, to electrical phenomena in both unpolarized and polarized media, and to discontinuous systems. The monograph concludes with three appendixes, numerous problems, and author and subject indexes. It is difficult to find much to criticize about this excellent volume. The most that can be said is that an occasional argument is vague, that the book might be too mathematical for some tastes, or that not enough attention has been paid to the experimental foundations of the theory. However, these are merely matters of personal opinion. Without question, *Non-Equilibrium Thermodynamics* by de Groot and Mazur belongs on the bookshelf of every research worker in the field of transport processes.

Nonequilibrium Thermodynamics by Fitts is intended to be an introductory textbook on the advanced graduate level. It consists of 11 chapters, four appendixes, and name and subject indexes. Numerous references are listed. Interestingly, many are different from those cited by de Groot and Mazur. In the first five chapters, the transport equations of fluid systems are developed. The last six chapters are devoted to applications of the equations to systems that are undergoing transport phenomena. The author pays particular attention to the step-by-step derivation of each equation, and for this reason the book will be especially valuable to the beginning student. Although overly formal in places, the treatment of the subject matter is accurate on the whole. The reader should be forewarned, however, that the treatment of the rate of cooling in a magnetic field (in section 6–2) appears to be erroneous. The appearance of experimental results in the sections on diffusion and thermal diffusion lends some perspective to the general theory. The book would have benefited even more by lengthier discussions of how experimental data are related to theoretical transport coefficients. Although *Nonequilibrium Thermodynamics* is not without shortcomings, its pedagogical virtues certainly outweigh them. What it does teach, it teaches well. It can be highly recommended as a first textbook, either for classroom use or for self-study.

RICHARD J. BEARMAN
Department of Chemistry, University of Kansas

Physics and Biology

Biophysical Science. Eugene Ackerman. Prentice-Hall, Englewood Cliffs, N.J., 1962. xiv + 626 pp. Illus. Trade ed., $13.35; text ed., $10.

Biophysics: Concepts and Mechanisms. E. J. Casey. Reinhold, New York; Chapman and Hall, London, 1962. xiv + 335 pp. Illus. $7.95.

It would appear that nature abhors a vacuum in the textbook field as well as elsewhere, and that the prior lack of textbooks in what may be termed general biophysics has accordingly been corrected. The two books reviewed here provide a pleasant surprise in the general similarity of the topics covered, and parenthetically they refute the occasional assertion that biophysics as a field is undefined. The stated purpose in preparing these texts is also similar; they are directed primarily to students of biology or medicine, although they presume different levels of previous training.

The selection of the material seems to have been dictated both by the inclinations of the respective authors and by the unstated admonition to apply physics where it is the most applicable. Yet it is interesting to compare the chapter headings with those in a standard textbook of general physiology and to note the similarity of coverage. The distinction drawn here between biophysics and physiology is not so much one of content, or perhaps even of viewpoint, as it is a distinction of technique and of the use of physics contrasted with talking about physics.

Biophysical Science, the more detailed of the two volumes, is nearly twice as long as *Biophysics: Concepts and Mechanisms*. It presupposes a knowledge of general physics and elementary calculus (actually, Laplace's equation and the diffusion equation are introduced, but the solutions are stated). A considerable portion of the book will be comprehended by the average undergraduate student of biology or medicine. Ackerman has divided his material among six main sections: Special Sensory Systems (on hearing and vision), Nerve and Muscle (nerve conduction and neural aspects of vision and hearing), Physical Microbiology (a miscellany of topics that includes cell radiobiology, ultrasonics, and viruses), Molecular Biology (x-ray diffraction, the radiochemistry of macromolecules,