ning graduate students, and the material covered should constitute a good one-semester course. In addition, life scientists who are interested in obtaining a start in the field, or in surveying its possibilities, would do well to start with this book.

The first section deals with the physical aspects of the field, briefly describing the different kinds of radiations, how they are generated, and how they interact with matter. Special emphasis is placed on radiations and radiation reactions of biological interest. It is very interesting to see emphasis placed on the historical approach to the field.

The author then turns to radiation effects at the cellular level, and quite correctly emphasizes the effects produced in the chromosomes. As a research tool, radiations have had their greatest impact in the science of genetics, and several chapters are devoted to this subject.

The next section discusses the effects of radiation on tissues and organs in plants and animals. Many of the effects discussed here were, only a few years ago, thought to be quite mysterious. In the light of modern concepts, as succinctly outlined in these chapters, they fall neatly into place.

There follow several chapters on the more practical aspects of radiobiology, including a treatment of the consequences of overexposure in mammals and the possibilities for protection and therapy. A chapter is devoted to ecology and the consequences of contamination of an ecosystem by radioactive materials. The problem of fallout from atmospheric testing of nuclear weapons is treated in a rational manner. In the final chapter a number of uses of radiation, including insect control by male sterilization and food preservation, are briefly treated.

Each chapter includes a number of references for the further pursuit of specific topics. Such a short book must necessarily be quite incomplete in attempting to cover such a wide field. However, the author has chosen carefully to make it a very readable introduction to all facets of the subject.

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The Rutgers Symposium on Evolution

Evolving Genes and Proteins. A symposium (New Brunswick, N.J.), September 1964. Vernon Bryson and Henry J. Vogel, Eds. Academic Press, New York, 1965. xxiv + 629 pp. Illus. $19.50.

Those who feel that many of the recently published conference proceedings have been compressed at the expense of style and comprehensibility will be especially pleased with *Evolving Genes and Proteins*. The editors and publishers have preserved much of the discussion following each group of papers and have not obviously condensed any of the presentations, some of which are very discursive in tone. The result is an unusually readable (and rather expensive) volume. In most cases, this has added greatly to the sense of being present at a very exciting symposium. Occasionally this prodigality with the spoken and printed word was used for jurisdictional warfare between organismal and molecular biologists. At their best, these exchanges are short and witty, and reading them is good malicious fun. Unfortunately there are also one or two tedious filibusters alleging the superiority of one approach over another. An uncommitted reader will almost certainly feel that amino acid and nucleotide sequences will add tremendously to our understanding of evolution; just as surely he will hesitate to throw the classical taxonomists onto the pavement on the grounds that biochemists can now (laboriously) distinguish a fish from a bird.

An excellent summary of the symposium appeared in advance of the book [V. Bryson and H. J. Vogel, *Science* **147**, 68 (1965)], and little more need be said here. The book itself is organized along somewhat different lines, starting with a section on the general and specific evolution of metabolic pathways, proceeding to the evolution of the amino acid sequences of various single proteins as it can be reconstructed from our knowledge of present-day organisms. This group of papers is followed by a valuable series on the mechanism of action of enzymes, their active centers, and their quaternary structures as related to phylogeny. Finally, there is a section on the consideration of evolution at the polynucleotide level. Each of these approaches, ranging essentially from the phene to the gene, brings new and qualitatively different insights; in the terminology of evolution, the grouping of papers is phylogenetic, though perhaps in a retrograde sense. There are relatively few presentations on prebiotic organic evolution, but the subject is certainly not ignored. Although evolution is the thread that holds the various chapters together, the material will be invaluable to geneticists and chemically oriented biologists whose interest in evolution may be incidental. This book comes at a time when knowledge of our biochemical history is very fragmentary but rich in promise. As such, it is heartening that solid facts and unabashed speculation have been successfully juxtaposed without losing their separate identities.

Each paper in *Evolving Genes and Proteins* is followed by a list of references, and these are compiled into a complete alphabetical author index. There is also a subject index. The printing and proofreading are very good.

In short, this book can be recommended as a remarkable assortment of papers and discussions by eminent biologists. It will be of great value to specialists in evolution and comparative biochemistry and to interested bystanders. No doubt it will be a useful adjunct in the teaching of a number of graduate-level courses.

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Space Technology

Dynamics of Rockets and Satellites. G. V. Groves, Ed. North-Holland, Amsterdam, 1965. xii + 313 pp. Illus. $11.20.

Dynamics of Rockets and Satellites is based on a series of lectures presented at Cambridge, England (in 1963), at a summer school of the same name. It suffers from many of the faults common to books derived in this manner. The material is very spotty. Some authors cover their subject matter very thoroughly, while others are content to outline the problem. Very few references are given; there are no abstracts; the index is inadequate; and

the title is misleading. Contrary to the rule, the proofreading has been very well done (I noted no typographical errors). Although I was disappointed to find considerable duplication of material (indeed, the same equation, the equation for the theoretical exhaust velocity in a rocket nozzle, is derived in two different chapters by two different authors), the editor has otherwise done a commendable job; the book appears to be remarkably free from half-truths or misstatements.

I particularly enjoyed E. Stiefel's treatment entitled "Many-body problems and interplanetary flight" and A. J. Sarnecki's "Dynamics of rigid body motion with especial application to the rotation and stabilization of satellites." Stiefel's treatment of the motion about a central body is quite lucid. Sarnecki spends some 27 pages laying the mathematical framework in tensor analysis on which to develop his thesis. Engineers will find this section of great value in assessing the utility of vectors and tensors as mathematical tools, as in rigid-body mechanics, or in brushing up on a long-neglected technique.

Inasmuch as his material is primarily descriptive, I found H. G. R. Robinson's discussion "The overall design concept of the E.L.D.O. 'Initial Programme' satellite launching vehicle" quite out of place in a book of this title. The chapter "Space vehicle stabilization," by W. G. Hughes, is very sketchy. His discussion of aerodynamic torque, to which he devotes an entire "section," consists of the enlightening statement that " . . . aerodynamic torques are likely to become comparable with gravity torques somewhere in the height range 100 km to 600 km."

R. H. Giese has contributed a chapter entitled "Fundamentals of satellite tracking and orbit determination"; M. J. Davies, "The planetary equations and atmospheric perturbations of a satellite orbit"; and W. M. Kaula, "Gravitational and other perturbations of a satellite orbit." These chapters appear to be uniformly good. D. S. Carton has wasted 10 pages in a discussion entitled "The propulsion and motion of rigid rocket-propelled launch vehicles" inasmuch as virtually all he has said is repeated in much greater detail by J. M. J. Kooy in "Dynamics of controlled rocket launching."

I recommend the book only to those willing to pay the full price for a fraction of the 313 pages.

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Foundations of Modern Chemistry

Nuclear Chemistry. Bernard G. Harvey. Prentice-Hall, Englewood Cliffs, N.J., 1965. viii + 120 pp. Illus. Paper, $1.95; cloth, $3.95.

With rare exception the chapter entitled "Nuclear chemistry" in freshman chemistry textbooks fails to reflect the research activities of present-day nuclear chemists. This is due to the fact that the theory of such research falls under the scope of nuclear physics and, frequently, only the experimental technique or the training of the investigators justifies the use of "chemistry." In this respect, nuclear chemistry is quite distinct from radiochemistry, which is the application of nuclear techniques to chemical problems. Harvey has written this book, one of the Foundations of Modern Chemistry Series, within this definition of nuclear chemistry. He describes his book as "a nonmathematical introduction to the rich variety of nuclear phenomena, intended especially for scientists outside of the field of nuclear physics" and, hopefully, with "appeal particularly to students of chemistry."

In the first five chapters he describes the general features of the nucleus, forces within nuclei, theories of nuclear structure, radioactive decay, and nuclear reactions and fission. Throughout, greater emphasis is placed on interpretation in terms of models than on nuclear phenomena per se. The final three chapters cover material found commonly in freshman chemistry texts—Radiation, matter, and counters; Particle accelerators and reactors; and Applications of nuclear science.

The competence and enthusiasm of the author are evident throughout this well-written book. Furthermore, he meets admirably the demands of selection, conciseness, and clarity imposed by the 120-page format. An average first-year chemistry student may have to struggle, but not unduly, with some sections—for example, the discussion of angular momentum. Although additional reference books are cited at the end of the book, a specific bibliography placed at the end of each chapter might have been more helpful.

It was a pleasure to read this book, and I recommend it as a fine introduction to the major topics of interest to nuclear chemists.

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Virology

Viruses, Cells, and Hosts. An introduction to virology. M. Michael Siegel and Ann R. Beasley. Holt, Rinehart, and Winston, New York, 1965. 175 pp. Illus. Paper, $1.96.

This small book has many features that recommend it for the general reader and as a supplement to a general biology textbook for students interested in virology. It covers the most important and active areas of the subject and takes pains to explain the techniques and manipulations that the virologist uses in making his observations. Hence, it gives the reader a better understanding of the subject than the usual type of popularization in which exciting results are cited without operational details. Successive chapters deal with the structure and organizations of cells, the structure of virus particles, the methodology of virus research, the virus-cell interactions, and the production of malignancy by viruses. In the first part the style and presentation are quite elementary, and occasionally even sloppy; the writing becomes more technical and frequently obscure in later chapters, where the authors are dealing with subjects closer to their professional interest.

The value of some of the background material included is questionable. A reader unfamiliar with the elements of cellular biochemistry given in chapter 2, or with those of atomic structure outlined in chapter 4, would hardly find a book on viruses understandable, even with these brief explanations.

Some major mistakes have been allowed to slip in, as in an illustration of the duplication of DNA, which lists the "free nucleotides" as precursors. Also, one notices some evidence of imprecise thinking or writing, for example, "Proteins give the cell body