as they appear in life and to teachers and students who will have an opportunity to feast their eyes on the remarkable diversity of color and form presented by almost every animal group.

An index to the scientific names of all the species of animals illustrated provides a useful guide to the book for Western readers.

WILLARD D. HARTMAN
Peabody Museum of Natural History, Yale University

Digital Computing Systems. Samuel B. Williams. McGraw-Hill, New York, 1959. x + 229 pp. Illus. $7.75.

An Introduction to Electronic Data Processing. Roger Nett and Stanley A. Helzler. Free Press, Glencoe, Ill., 1959. 287 pp. Illus. $6.75.

Digital Computer Primer. Edward M. McCormick. McGraw-Hill, New York, 1959. x + 214 pp. Illus. $7.50.

A Primer of Programming for Digital Computers. Marshal H. Wrubel. McGraw-Hill, New York, 1959. xv + 230 pp. Illus. $7.50.

Programming for Digital Computers. Joachim Jeenel. McGraw-Hill, New York, 1959. viii + 517 pp. Illus. $12.

Programming Business Computers. Daniel D. McCracken, Harold Weiss, and Tsai-Hwa Lee. Wiley, New York; Chapman and Hall, London, 1959. xvii + 510 pp. Illus. $10.25.

Up until several years ago, the published literature on electronic digital computers was very scanty. Most of the information was available only to those active in the field and was in the form of internal reports and memoranda or was passed on as part of an oral tradition. With the rapid spread of the use of computers throughout the economy, it became necessary to make this material accessible to the various groups whose interests were affected by the rapid development of these data processing systems. Many books on computers have appeared within the past few years, and the present group provides a relatively good sample of the types of books on the market.

Digital Computing Systems is concerned primarily with the hardware of computers and is written for those familiar with electrical circuits and apparatus. The five major components of a computing system—input, output, storage, arithmetic, and control—are dealt with in the major chapters. Peripheral subjects such as historical background, number systems, programming, and applications are also discussed. There are many illustrations of computer elements and numerous circuit diagrams. However, the frequent mention of relays and other components which are on their way out gives the book an out-of-date flavor. In addition, it is poorly motivated and has no apparent over-all design. It may have some historical interest, but one who is interested in the present state of computer equipment should look elsewhere.

An Introduction to Electronic Data Processing also describes the five major elements of an information-processing system, but from a functional viewpoint. It emphasizes what a computer can do, not how it does it; it is intended for the administrator considering the advisability of installing a computing system in his concern and tells what is involved in the operation of such a system. The discussion covers the problems of personnel as well as the difficulties resulting from conversion to the computer-oriented system. This conversion problem, in all its ramifications, has been a costly stumbling block for many organizations which have been sold a computer as the solution to their growing paperwork problem but which have not been alerted by the salesmen to the revolutionary impact this would have on their entire operation. The book concludes with an appendix describing electronic data processing systems of several leading manufacturers.

Digital Computer Primer is written for the well-informed layman. As such, a rather complete picture of the computer business is given in elementary terms, but applications are not discussed. There are some inaccurate generalizations which the author admits making to simplify the picture; he hopes that, with time, the exceptions will disappear as a greater degree of standardization is attained among computer manufacturers. Other causes for complaint are the stress given to I.B.M. equipment and the lack of clarity in the explanations of circuits. However, these are minor criticisms of a good introductory text on general-purpose, stored-program automatic digital computers.

One of the principal bottlenecks in the operation of a computer center is programming, which may be broadly defined as the process of taking a problem presented by a potential machine user, reformulating and analyzing the problem from a computer's point of view, preparing a set of instructions for the computer to solve the problem, checking that these instructions as written do what the programmer intends them to do, and finally making sure that proper safeguards are taken against all kinds of mishaps that may occur during the actual running of the problem. Programming a complex scientific, logical, or commercial problem may take several man-years, and with the abundance of computers and problems, there is a shortage of qualified programmers. This shortage is being met, on the one hand, by formal courses in programming taught in the colleges, and on the other hand, by automatic programming systems using the computer itself to perform many of the routine tasks of programming.

A Primer of Programming for Digital Computers is meant to be a text for an introductory course in programming for scientists and engineers. The title is slightly misleading since it is exclusively concerned with programming of the I.B.M. type 650 computer. However, this is justifiable to a certain extent, for you can program any computer with little additional effort once you have learned how to program one machine well. Furthermore, since 650's are available in many universities and since a potential programmer can only realize the pitfalls in programming by actually testing several of his programs on a machine, a text on programming for the 650 is very practical. The book is divided into two parts, elementary programming and advanced programming, but even the second part is elementary and only scratches the surface of the subject.

Programming for Digital Computers is a much more thorough treatment of the discipline of programming, which deals with the techniques in an almost abstract manner. This does not preclude its being a practical book; in fact, much valuable information of a practical nature is found in this admirable presentation of the subject. This book is a must for anyone who wishes to become a professional programmer.

Programming Business Computers is intended for these members of a business organization, who will be directly concerned with programming the organization's problems on a data processor, as well as for their supervisors. The consensus among experts in commercial computer work is that it is more efficient to teach programming to one familiar with the workings of

a firm than to teach the methods of a long established business to a professional programmer. This book covers almost everything about programming and computers, needed by such personnel, except, of course, the specifications of the particular system installed in their office. As in a previous book on programming by McCracken, a hypothetical computer, DATAC, incorporating features of the various business computers on the market, is described and used in the text rather than any existing computer. This is a disadvantage; as I indicated above, one learning to program for a computer should run several programs on that computer. However, there is a good chance that, in view of the excellence of this book, DATAC simulators will be written for various existing computers. This will enable one to run problems written in the DATAC code on a particular computer.

PHILIP RABINOWITZ
National Bureau of Standards, Washington, D.C.

Ascidiacea. *Discovery Reports*, vol. 30. R. H. Millar. Cambridge University Press, London, 1960. 160 pp. Illus. 70s.

This monograph is based on 2500 specimens representing 78 identifiable species, principally from the Falkland Islands and the Patagonian shelf, but also from other subantarctic islands and some material from New Zealand as well. There are 13 new species.

J. W. HEDGPETH
Pacific Marine Station, Dillon Beach, California

Science Study Series. *Horns, Strings, and Harmony*. Arthur H. Benade. 263 pp. Illus. $0.95. *The Restless Atom*. Alfred Romer. 192 pp. Illus. $0.95. Doubleday, Garden City, N.Y., 1960. (Available to secondary school students and teachers from Wesleyan University Press, Columbus, Ohio.)

These most recent volumes of the "Science Study Series" maintain the high standards set in its previous books. The series is being published by the Physical Science Study Committee as one part of its program for improving high school physics education. The books are intended to be read profitably by young students and by laymen. Amazingly enough, they seem to be successful on both levels.

The new books are well written. This does not necessarily mean that they are easy; each book will demand careful, hard reading from the nonprofessional reader. However, if he is sufficiently interested in the subject or if his intellectual curiosity is great enough, his work will be well rewarded.

Horns, Strings, and Harmony was written by Arthur H. Benade (Case Institute of Technology). Benade's main field of research is in nuclear physics, but he continues an old Case tradition by studying the physics of music.

Following an introduction that is partly autobiographical, Benade presents some of the physics necessary for understanding musical vibrators. He then discusses how the structure of the human ear determines our hearing of music. The various types of musical instruments examined range from strings to brasses to woodwinds. The final chapter applies the information found in the earlier sections by giving instructions for constructing simple trumpets and woodwinds.

Benade's book communicates well his love for both music and physics. Not only is the reader reminded of the compatibility of music and physics, but he sees how the study of either subject can provide some valuable understanding of the other.

Alfred Romer (St. Lawrence University) wrote *The Restless Atom*. It is a clearly written, exciting account of the revolution which occurred in physics between the 1890's and the 1910's.

Romer does not attempt to give a complete history of atomic physics; he stops after indicating the first successes of Rutherford and Bohr. Relativity and quantum mechanics are hardly mentioned. Nevertheless, Romer gives the reader a good appreciation for modern understanding of the atom. He accomplishes this by telling his limited story well.

He starts his story with a brief description of Röntgen's discovery of x-rays, backtracks to describe the understanding of the elements current before Röntgen's work, and then proceeds to describe the rapid developments which followed. Romer recounts the work of Becquerel, the Curies, the young Rutherford, Crookes, Soddy, and Bohr, among others. He presents the problems that confused them, their groping for answers, and the gradual creation of a workable picture of the atom.

The Restless Atom leaves the reader eager to learn more about the development of quantum mechanics, and it gives him a good background for such study.

HOWARD LASTER
Department of Physics, University of Maryland

Moisture in Textiles. J. W. S. Hearle and R. H. Peters, Eds. Textile Book Publishers (Interscience), New York; Butterworths, London, 1960. ix + 203 pp. Illus. $6.50.

Although moisture in textiles has been a topic of fundamental importance for many years, not all aspects of the problem have been properly appreciated by students and recent research workers. This book, based on a series of lectures given at the Manchester College of Science and Technology, provides some help in a convenient, compact form. The authors of the various chapters are well known authorities, each an expert in the field he discusses.

In the first chapter, P. S. H. Henry discusses humidity: how it varies seasonally, diurnally, indoors, and out-of-doors; how it is affected by the presence of people, furniture, and windows. A brief chapter by J. W. S. Hearle describes the structures of the principal textile fibers in use today. These two introductory chapters lay the foundation for the remainder of the book.

In an excellent chapter on sorption isotherms, A. R. Urquhart summarizes research on moisture regain and explains in nontechnical language the principal theories proposed to account for the phenomena observed. The next paper, by W. H. Rees, is an interesting and lucid discussion of the heat of absorption; the latter part of this chapter explains the thermostatic action of hygroscopic textile materials when used for clothing.

In the next two chapters, G. King reviews the various theories of moisture absorption. J. Crank follows with three chapters on the rate-of-change of moisture content, simultaneous diffusion of heat and moisture, and diffusion of moisture in fiber-forming substances. Hearle follows with a chapter on moisture and electrical properties. R. Meredith has contributed two chapters on the physical properties of textile fabrics. Hearle, in the final chapter, discusses fibers and liquid water.