and controlling it. The nature of air pollution chemistry requires an almost unique analytical approach that differs in both concept and execution from classical techniques. As a result, many techniques have been evolved, but this latest contribution by Morris Jacobs is the first single, comprehensive volume treating only the analytical aspects of air pollution chemistry.

The range of subjects discussed is quite extensive and would cover almost any conceivable situation likely to be encountered by an industrial or municipal air pollution control officer. The detailed treatment of each subject will allow those unfamiliar with chemical analysis to apply the individual methods. The book will be of value to chemists already familiar with the field, but to them the details may seem overpowering at times. This excessive detail is relieved at frequent intervals by discussions of other aspects of the problem such as sampling, data treatment, and physical laws. In addition, there is sufficient theoretical material to allow an easy understanding of the methods involved. This combination of theory and detail is the book's greatest value and will be the feature with the widest appeal. Unfortunately the air pollution problem has grown faster than our inclination to measure and control it. The methods for measurement and control are available, but with the exception of a few of the more enlightened or harassed communities, there has been little application of this knowledge to the actual problem. Most control is still supervised by agencies which have had little experience except in smoke inspection. These agencies are often understaffed with personnel untrained in the pertinent fields; a single volume such as this one can be an invaluable reference source for use in planning and executing control programs.

The materials covered are, with one exception, the usual types of pollutants produced in urban areas. The exception is an excellent chapter on radiochemical determinations. Radioactive air contaminants are a disputed component of the atmosphere, but there is little chance that the increased use of nuclear processes will decrease the amounts present in the atmosphere. It is reassuring to find that this contamination is now considered by an authority such as Jacobs to be as significant as soot, dust, and noxious vapors. To discuss analytical radiochemistry in a single chapter without some omissions is impossible, but his treatment is a more than adequate summary of most of the present techniques.

One chapter detracts from the book's excellent coverage; compared with the other material, the treatment afforded the analysis of the exhaust gas from automobiles seems out of place. Without doubt the exhaust from motor vehicles is an extremely important source of pollution, and for this reason great emphasis should be placed on the detection and determination of this substance or its reaction products as they appear in the atmosphere. Unfortunately, Jacobs emphasizes the analysis of the gases *before* emission into the atmosphere. Unless some radical change occurs in the internal combustion engine, there is little need for pursuing this aspect of the problem.

In general, the book is well arranged. The development of the material proceeds logically from an initial chapter concerning sampling to a final, brief chapter that gives practical discussion of monitoring instruments. Jacobs is perhaps quite familiar with the budgetary problems of most air pollution control agencies and has kindly omitted mention of most of the more exotic and expensive instrumental techniques.

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Medical Physics. vol. 3. Otto Glasser, Ed. Year Book Publishers, Chicago, Ill., 1960 lx + 754 pp. Illus. $25.

Volumes 1 and 2 of *Medical Physics* have well established their value as outstanding standard works in the fields of medicophysics and biophysics. Volume 3, with contributions by 181 experts and pioneers in the various fields, carries on this reputation in an impressive way. Volume 3 does not purely augment earlier topics; it presents recent developments and progress, but it also covers many new subjects which have become of importance and interest in recent years: aviation medicine, the biological hazards of space radiation, fluorescence microscopy, fluorescopic image amplification, grid therapy and grid protection, the ultraviolet color-translating microscope, and modern microradiography, to mention a few.

The presentation throughout makes clear, stimulating reading. The references are well selected, the volume is arranged alphabetically by title of the topics, and a compendious name index provides a quick reference index for the three volumes. It is impossible to review in detail the 177 chapters of the volume and it is not possible to select the one or the other contribution for detailed comment since every chapter holds its *niveau*. Otto Glasser has to be congratulated for being able to assure the collaboration of so many recognized experts in the different fields. There is no doubt that the new volume will be a welcome addition to the existing medicophysical literature.

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Encyclopaedia Zoologica Illustrated in Colours. vol. 4, *Arthropoda to Protozoa Exclusive of Insecta, Echinodermata, and Mollusca*. Y. K. Okada *et al.* Hokuryu-kan Publishing Co., Tokyo, Japan, 1960. 308 pp. $25.

This handsome volume, although written entirely in the Japanese language except for the scientific names of the animals, will be of widespread interest to naturalists because it portrays in color a significant representation of the Japanese species of the animal groups covered: the Arthropoda (exclusive of insects), Annelida, Nemathelminthes, Trochelminthes, Nemertini, Platyhelminthes, Ctenaria, Coelenterata, Porifera, Mesozoa, and Protozoa. The first 45 pages, devoted to brief accounts of the morphology and classification of the phyla included, are well illustrated with black-and-white diagrams. This section is followed by 123 plates of representative Japanese species of each phylum; mostly in color, and including marine, fresh-water, terrestrial, and parasitic examples.

The color reproduction is excellent on the whole and makes the American reader wish that a comparable guide to our invertebrate fauna were available. Especially noteworthy are the illustrations of arachnids and crustaceans. Also of interest are the colored plates showing some of the more remarkable members of the Japanese fauna: the platyctenid ctenophores; the peculiar genera of stauromedusans; the giant hydroid, *Branchiocerianthus imperator*; the ascothoracican cirripedes; the myzostomids; and the garishly colored polyclads and nemertines.

This volume will be of value to professional zoologists who wish to become acquainted with Japanese invertebrates

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.

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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