Book Reviews

Physical Methods in Chemical Analysis. vol. III. Walter G. Berl, Ed. Academic Press, New York, 1956. $15.

The practice of quantitative analysis is based on the measurement of properties. The field of analytical chemistry is continuously expanding as new molecular, atomic, nuclear, and other subatomic properties are being discovered. This expansion is further implemented by the phenomenal progress—especially since World War II—in the field of instrumentation. This is evidenced by the development of a large number of new instruments, which make possible rapid and accurate measurement not only of classical (optical, electric, and so forth) properties but also of newly discovered properties. The expansion of analytical chemistry is so vast that it becomes impossible for any individual to master the theoretical and experimental progress in his field. Even an expert in a limited domain can hardly digest all the new developments published in the numerous journals all over the world. The rapid expansion of quantitative analysis and the immense literature demand that up-to-date descriptions of newly developed and modernized classical techniques be available.

Volume III of *Physical Methods in Chemical Analysis,* like the two previous volumes, satisfies such a demand. The first article, on gas chromatography, gives a thorough survey of the subject in 28 pages. It could be made more useful by a brief introductory statement of what gas chromatography is, what type of experimental technique is used, and what can be accomplished. A similar comment can be made on some of the other articles. Space does not permit a review of each article in detail. The following diverse topics, in addition to gas chromatography, are presented: electrochromatography (36 pages), electroanalytic methods in trace analysis (34 pages), high-frequency method of chemical analysis (26 pages), field emission spectroscopy (46 pages), theory and principles of sampling for chemical analysis (32 pages), flame photometry (56 pages), microwave spectroscopy (20 pages), analytic applications of nuclear magnetic resonance (75 pages), fluorescent x-ray spectrometric analysis (14 pages), analytic distillation (43 pages), neutron spectroscopy and neutron interactions in chemical analysis (170 pages).

All the chapters are written by experts and cover the topics adequately. Even though the entire field continues to expand rapidly, many chapters will be of lasting value, because they present the fundamentals of the subject in a very thorough way.

The editor has maintained his policy, which is to present a review of the status of physical measurements and their application as analytic tools. This volume is a valuable addition to the literature and will be appreciated, not only by analytical chemists, but by all scientists who use new techniques in their research.

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Principles of Zoology. John A. Moore. Oxford University Press, New York, 1957. 667 pp. Illus. $7.50.

Only an experienced and talented teacher could have written a book like this, which fills the needs of so many students in the biological sciences. John Moore's literary and pictorial treatment of the principles of zoology is by far the most efficient ever put into book form.

This book is divided into six parts: "General features of a biological system"; "The development of genetic concepts"; "Embryology"; "Evolution"; "Human physiology"; "The philosophy of science."

Moore writes with a high purpose of mind that "biology today is very different from what it was fifty or a hundred years ago, and we should humbly admit that it probably will be very different fifty or a hundred years from now." He makes no tacit assumptions and spells out the soundest principles of biology and zoology.

The first part of this book includes an explanation of the general features of biological systems. The author provides examples ranging from unicellular animals (amebas) to multicellular animals (with special reference to the frog). Included in this section is a description of the invertebrate phyla. Classical examples of all the important invertebrates are cited and shown pictorially.

In the second part the author follows the development of genetics in an illuminating manner. This section elucidates the following carefully: Darwin's theory of pangenesis; the cell and its division; fertilization and gamete formation; the nucleus and heredity; Mendel, Boveri, and Sutton; sex chromosomes; variations in Mendelian ratios; Morgan's white-eyed *Drosophila*; linkage and crossing over; mapping the genes; genes on the chromosomes; multiple alleles; induced mutations; salivary gland chromosomes; and the basic concepts of classical genetics. The genetic process is made very clear for the student, and in a world where there are so many children being born every minute, this carefully put together section will be of tremendous value for students and laymen alike.

The section on embryology is quite complete. Numerous illustrations document the text, and the combination of words and well-chosen illustrations leaves nothing to be desired in the way of information at the student level.

In the fourth section, on evolution, Moore gives a scholarly analysis of the views of Charles Darwin. Teacher and student, alike, will enjoy the author's account of the way in which Darwin's theory was formulated. Furthermore, the very practical reference to Darwin's "trumpery" feelings, as revealed in his letters to Sir Charles Lyell, will add a great deal of interest for students. The crowning achievement of this section is the author's able résumé of the process and dynamics of evolution, the changes in gene frequency, the patterns of evolution in animals, chromosome changes and species formation in plants, and finally the origin of life.

These four sections provide the student with a wealth of information for understanding human physiology. That the author is an able teacher is well demonstrated in his approach to a careful series of demonstrations designed to elucidate physiological mechanisms.

Finally, the last section, on "Science and its methods," is an honest statement of what we really know and, more important, of the amount of information we lack. James B. Conant will be delighted to see the fruits of his many years of labors [see *Science and Common Sense* (Yale University Press)] realized in the form of an excellent textbook that makes biology an inspiring, rewarding, and meaningful approach to an understanding of hitherto seemingly complex phenomena.

This book will be welcomed by both teachers and students. It is clearly writ-

ten, is beautifully illustrated, and not only will hold the interest of students but, I feel confident, will stimulate their desire for more information from specialized courses in biology. This book is a fine contribution; the author and publisher are to be congratulated for the publication of a very useful textbook of zoology.

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Research in the Effects and Influences of the Nuclear Bomb Test Explosions. pts. I and II. Committee for Compilation of Reports on Research in the Effects of Radioactivity. Japan Society for the Promotion of Science, Ueno, Tokyo, 1956 (order from Stechert-Hafner, 31 East 10th St., N.Y.). 1824 pp. Illus. $25.

The test explosion of a thermonuclear weapon at Bikini Atoll in March 1954 resulted in a major effort on the part of Japanese scientists to measure the spread of radioactive fission products and to assess the nature of the effects on man and his environment. The results of this work have been published in a two-volume report containing more than 200 papers. Included among these are also some papers related to the delayed effects of injuries sustained at the time of the Hiroshima and Nagasaki explosions in August 1945. The subjects dealt with are meteorology, physics, chemistry, genetics, agriculture, fisheries science, economics, and medical science.

In addition to a large number of papers dealing with the measurement of activity in rain, snow, and sea water, the meteorology section includes a comparison of the efficiency of the air impinger and electrostatic precipitator as "particulate" collectors. The members of the "Japanese Bikini Expedition" were given the task of surveying the waters around Bikini and near Japan and were able to show that some of the radioactivity was transported by air but that most of it moved in the North Equatorial Current. Included are some interesting observations of pressure waves from the 1952 and 1954 explosions, from which both the total energy release and the time of firing of the weapon are calculated, using the amplitude and the velocity of propagation of the wave.

The physics section is concerned largely with studies of contamination found on the Japanese fishing vessel No. 5 "Fukuryu Maru," though a few papers deal with physical properties of the particles. A complete survey was made of the ship, and from this the integrated dose to crew members was estimated. This is, of course, invaluable information when it is combined with the results of the medical studies. Also included are details of the locations of most of the Japanese fishing vessels during the Bikini trials in relation to the contamination found on them subsequently. Numerous methods were used to investigate the physical properties of the ash, which was shown crystallographically to be calcite granules with a diameter of 0.3 millimeter, presumably recrystallized from the vaporized coral reef.

Much of the chemistry section deals with qualitative radiochemical analyses of this material, together with an investigation of the fission-product content of the organs of the crew member who died. It is of interest that in addition to the fission products, several of the actinide elements were detected in air-borne material by the chemists, who also reported the absence of activities other than those arising directly in the fission process. Some discussion of the physical significance of these findings is included.

The genetics section consists almost entirely of descriptions of the mutations and chromosome abnormalities appearing in the descendants of crop plants and weeds which survived the Hiroshima and Nagasaki explosions. The most conclusive finding was a tenfold increase in genetic abnormalities in rice plants grown from seeds gathered within 600 meters of the hypocenter at Nagasaki. The dose is not estimated, but, from the human mortality data reported elsewhere, it was probably much greater than 500 roentgens.

The agriculture section gives extensive information on the contamination of trees, plants, animals, soil and water, as a result of the Hiroshima, Nagasaki, and Bikini explosions, together with a brief description of the injuries sustained by animals in Hiroshima. Unfortunately, many of the data on contamination are difficult to interpret, because in most cases only the shorter lived nuclides—for example, strontium-89 and barium-140—are measured, and in many instances the results are given in counts per minute.

The fisheries science section is one of the most extensive and is concerned primarily with measurements of the radioactivity found in the fish caught commercially between Japan and Bikini following the 1954 explosion. It is of interest that a radioisotope, zinc-65 (which is not an important fission product and was not reported in the air-borne contamination) was widely distributed in sea life. Most of these reports, however, were written before a full chemical analysis had been carried out. Included also are descriptions of what are probably the most detailed experiments so far reported, on absorption both of mixed fission products and of radioisotopes of strontium, calcium, and zinc by aquatic animals. The serious effects of the publicity associated with the possibility of radioactive contamination of fish is dealt with in the economics section, where the plight of the workers in the industry is vividly described.

The medical science section contains the best and most detailed work in the report. This is probably due to the fact that the Atomic Bomb Injuries Investigation Research Committee had been working since 1953 on systematic investigations of the results of the Hiroshima and Nagasaki explosions, its membership merely being extended following the Bikini accident. The collection of papers presented is a book in itself. It starts with a description of the events which befell the "Fukuryu Maru" before dawn on the morning of 1 March 1954, reviews the early clinical features of the radiation injuries in her 23 crewmen, deals in detail with the later hematological, pathological, histological, and bacteriological observations, and includes the autopsy findings on the one fatality which occurred 6 months later (although it is not certain that the death was caused by the exposure). It is estimated that the crew probably received an accumulated exposure of from 270 to perhaps as much as 440 roentgens of external radiation during the 2 weeks which it took the "Fukuryu Maru" to return to its home port of Yaizu.

In assessing the scientific value of these volumes one should not lose sight of the difficulties which must have been associated with the collection of such a bulk of descriptive material. It is true that the individual contributions show little apparent attempt at integrating the final report into a cohesive whole, that there is sometimes a lack of control observations where one would wish them, and that the measurements of radioactivity can often be translated only very roughly into standard units. It is much more important, however, that this extensive and diverse material did in fact get collected and brought together into a single publication. The task of extracting and coordinating the information into a more readily assimilable form has yet to be carried out, but it might never be undertaken if the descriptions had not been gathered together in the present volumes.

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Physics. John S. Marshall and Elton R. Pounder. Macmillan, New York, 1957. 906 pp. Illus. $8.50.

A survey of the many introductory physics texts that have appeared recently and a glance at the direction in which established texts have evolved reveals that the emphasis has been upon including a greater number of topics and