and L. K. Rothen; "Benzodioxanes" (16 pages) by R. C. Elderfield; "Sulfur analogs of dioxanes" (26 pages) by R. C. Elderfield; "Pyridazines" (35 pages) by T. L. Jacobs; "Cinnolines" (40 pages) by T. L. Jacobs; "Phthalazines" (48 pages) by R. C. Elderfield and S. L. Wythe; "Pyrimidines" (70 pages) by G. W. Kenner and A. Todd; "Quinazolines" (53 pages) by T. A. Williamson; "Pyrazines and piperazines" (78 pages) by Y. T. Pratt; "Quinoxalines" (41 pages) by Y. T. Pratt; "Monocyclic oxazines" (68 pages) by N. H. Cromwell; "Benzoxazines" (37 pages) by R. C. Elderfield, W. H. Todd, and S. Gerber; "Thiazines and benzothiazines" (23 pages) by R. C. Elderfield and E. E. Harris; and "Phenazines, phenoxazines, and phenothiazines" (103 pages) by D. E. Pearson.

Each heterocycle is treated systematically; nomenclature, numbering, syntheses, and reactions are given. The literature is covered very well. The citations have been selected with care and attention to their importance. The chapters are well written, and the selection of authors is excellent. To assist the reader, each chapter has a complete table of contents, and a good index is provided.

This treatise is a great timesaver for all research chemists in the fields of organic chemistry and biochemistry. Parts of it will be of value to scientists in the fields of chemotherapy and pharmacology, since the authors have mentioned biological activity of important compounds. The book is well printed and edited.

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Water for Industry. A symposium presented 29 Dec. 1953 at the Boston meeting of the American Association for the Advancement of Science. AAAS publ. No. 45. Jack B. Graham and Meredith F. Burrill, Eds. Washington, D.C., 1956. 131 pp. Illus. $3.25, members; $3.75, nonmembers.

This timely little symposium volume contains nine papers by 12 authors who are experts on many of the broader problems of water and water supply. The volume does not cover the complete field of "water for industry," but the included papers fairly sample the kinds of water problems that are confronting industry now and those that are sure to arise in the future. These problems are much broader than those of industry alone. The whole field of water use is involved, because industrial water problems directly or indirectly affect all phases of our national economy. Here are a few of the more significant points made in the symposium papers.

The rapidly closing gap between water supply and demand in many places and the conflicts of interest in water supplies between states, between individuals, and between whole groups of users are forcing increased attention to water supply and water conservation on the part of Government agencies at all levels and of private organizations and citizens' groups. For example, optimum ultimate development of all recoverable water in the United States will be necessary for the national welfare, including national defense. Realistic forecasts of future urban and industrial developments, area by area, must be developed, and water must be reserved or otherwise provided for their supply. The market for farm products is not growing rapidly. Hence, wholesale expansion of agriculture is not the way to expand the national economy. Many thousands of people are drawn yearly from agricultural areas by employment opportunities in industrial centers. Some western areas are promoting local industrial development for purposes of diversifying their economy and holding their population. Many agricultural regions, however, are the very areas which are short of water or have low ceilings on their supplies. In some instances, practically all the water is committed for existing uses, chiefly agricultural. How, then, to supply industry?

Already the economy of certain industrial areas is precarious because of agricultural domination. Lack of planning for industrial and urban development 10 to 50 years hence is one of the greatest deficiencies in river-basin planning. Estimates have been made of urban and industrial requirements up to the year 1975. However, most of these are on a nation-wide or large-region scale and are not tied to specific areas or to river basins. They should be.

In the present stage of our development, water is a compelling influence in all our activities; within the near future it may become a controlling factor. Our national history is the history of a Horatio Alger among nations. We may yet face disaster if we fail to use the knowledge and skill that are now available to provide for optimum harnessing of this prime natural resource, water.

Several papers in the symposium merit special attention. The first, on "The available water supply," was prepared by C. G. Paulsen, retired chief hydraulic engineer, U.S. Geological Survey. In somewhat philosophic vein it analyzes and gives examples of the nation-wide water situation, the causes of varied water problems, and various approaches to their solution, thus establishing an appropriate background for succeeding papers on more specific topics.

Francis A. Pitkin's "Correction of a fluviatile delinquent: the Schuylkill River" is a dramatic historical sketch of the abuse of a watershed by mining, the 200-year deterioration of the watershed and the river, and their recent rehabilitation. One can only comment that man, not the river, was delinquent.

J. R. Whittaker's paper on "Water in the future" is outstanding and is probably one of the best recently published summaries, in simple, everyday language, of present and foreseeable water problems in the United States. The paper also sounds several encouraging notes of optimism. If intelligent planning is done and vigorous action is taken, the next generation may be spared a national problem. Too many problems have already been bequeathed to posterity.

This volume deserves wide reading and study. The analyses of the water problems are scientifically sound but are couched in readily understood, straightforward language.

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Advances in Virus Research. vol. IV. Kenneth M. Smith and Max A. Lauffer, Eds. Academic Press, New York, 1957. 339 pp. $8.

As in previous volumes of this series, the nine articles that comprise volume IV deal with various aspects of virology at a basic level, with considerable emphasis on information derived from application of the methods of physics and chemistry. It is not surprising, therefore, that three of the articles are concerned with plant viruses and two, mainly with bacteriophage, because the nature of these agents has allowed more precise physicochemical studies of the host-virus system in these cases than is possible for other viruses. Two of the articles deal entirely with animal viruses, and two others, with general subjects.

One of the latter, "Factors in virus evolution," by C. H. Andrewes, is a unique attempt to visualize, from accumulated information, the ways in which viruses may have evolved and in which they continue to adapt themselves to changes in their host populations. The question of an arthropod origin of many of the known viruses is raised, and the evidence is examined. Obviously, much of the material presented is highly speculative, but it is based on broad knowledge and experience and contributes to an area that has been largely neglected, that of orienting the viruses in the field of biology as a whole.

Andrewes includes in his discussion the selective effects of the immune state in host populations. An expansion of this theme is included in the article by Keith E. Jensen, "The nature of sero-

logical relationships among influenza viruses." Following a description of the antigens that are demonstrable in influenza-infected tissue, there is an account of the complex immunologic relationships, including the sequence of changes in dominant antigens, found among the numerous strains of influenza virus isolated during the last 25 years. Implications of this situation with respect to a successful method of vaccination are reviewed.

"Bacteriophages as genetic and biochemical systems," by A. D. Hershey, is a scholarly discussion of a complex area of study and contains a wealth of information. It is especially valuable in pointing out gaps in our knowledge and suggesting approaches to further problems. As is indicated by the author, the bacteriophage-host cell system has become a formal, as well as a biochemical, branch of genetics, and he ventures the opinion that this is one of the directions in which virology as a whole will have to advance.

"Attachment and penetration of cells by viruses," by L. J. Tolmach, is based almost entirely on studies with bacteriophage and draws heavily on the valuable contributions made by the Colorado group of which the author is a member. Much is now known, and included here, concerning the chemical nature of the processes discussed, and the kinetics and thermodynamics involved. Because of the tendency of the uninitiated to generalize about viruses as if they were a *bona fide* taxonomic group (Andrewes has something to say on this), it is unfortunate that the title does not indicate the restricted scope of the article and does imply a generalization. The essay concludes with an account of selected experiments from our meager store of information on similar activities of animal viruses. It is clear from both Hershey's and Tolmach's articles that the bacteriophage-host cell system is a special case and that generalizations from it should be strictly limited. It is also clear that the bacteriophage work has been invaluable in pointing the way to study of the intimate relationships between other viruses and their host cells.

Methods are described in considerable detail in "Particle counts and infectivity titrations for animal viruses," by Alick Isaacs. His discussion goes beyond an account of methods, however, and includes questions such as whether infections are initiated by single particles and what the significance of incomplete virus and virus filaments is. Parallel, in part, to Isaac's article is "Mechanical transmission of plant viruses," by C. E. Yarwood. It contains detailed information on the various factors of environment, donor and host plant, adjuvants, and so forth, that affect experimental transmission of plant viruses and thereby influence quantitative experiments.

Further information in one area of this field is given in "Effects of changing temperature on plant virus diseases," by B. Kassanis. It includes effects on susceptibility, incubation period, symptoms, and virus multiplication. The last is analyzed at some length, and a number of intriguing questions are raised concerning the dynamics of plant virus production and degradation. Examples of the value of heat for ridding plants of virus infection are described, and a tabulation of reports on this subject is included.

In "The anatomy of tobacco mosaic virus," N. W. Pirie is critical of the generally held concept, derived from physicochemical studies, that the virus particle possesses constant dimensions and composition. He discusses isolation of the virus substance and brings information in this field up to date. He stresses, as he has in previous writing, the differences found in the product that result from the use of different host plants, conditions of growth, and methods of preparation. This meaty essay is seasoned with an occasional salty comment.

In "Effects of non-ionizing radiations on viruses," A. Kleczkowski first briefly describes the physical aspects of non-ionizing radiations. His discussion of their effects on plant, animal, and bacterial viruses provides a valuable source of information in this field of study.

Each article begins with an outline of its contents and ends with its own list of references, arranged alphabetically. Three of the articles are accompanied by glossaries. Indexes of authors and subjects increase the value of these volumes as reference works. In addition to its usefulness to virologists, this book will be of value to other biologists, especially those whose interest is at the cellular level.

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New Books

Principles of Microbiology. Charles F. Carter and Alice L. Smith. Mosby, St. Louis, ed. 3, 1957. 665 pp. $5.

The Infectious Diseases of Domestic Animals. With special reference to etiology, diagnosis, and biologic therapy. William A. Hagan and Dorsey W. Bruner. Comstock Div., Cornell University Press, Ithaca, N.Y., ed. 3, 1957. 988 pp. $10.50.

Magnetic Removal of Foreign Bodies. The use of the alnico magnet in the recovery of foreign bodies from the air passages, the esophagus, stomach and duodenum. Murdock Equen. Thomas, Springfield, Ill., 1957. 101 pp. $4.50.

Plant Classification. Lyman Benson. Heath, Boston, 1957. 702 pp. $9.

Organic Chemistry. H. Harry Szmant. Prentice-Hall, Englewood Cliffs, N.J., 1957. 815 pp. $7.95.

Concepts of Force. A study in the foundations of dynamics. Max Jammer. Harvard University Press, Cambridge, Mass., 1957. 277 pp. $5.50.

Mathematics and Statistics for Use in Pharmacy, Biology and Chemistry. L. Saunders and R. Fleming. Published under the direction of the Council of The Pharmaceutical Society of Great Britain. Pharmaceutical Press, London, 1957. 267 pp. 27s. 6d.

College Chemistry. William H. Nebergall and Frederic C. Schmidt. Heath, Boston, 1957. 796 pp. $6.75.

Techniques of Guidance. Arthur E. Traxler. Harper, New York, rev. ed., 1957. 387 pp.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, *but to the publisher or agency sponsoring the publication.)*

Irvington House Conference on the Rheumatic Child and His World. 13 November 1956. Irvington House, New York, 1957. 68 pp.

A Revision of the East African Nasutitermitinae (Isoptera). Bulletin of The British Museum (Natural History), Entomology, vol. 5, No. 1. W. A. Sands. 29 pp. 10s. *On Spelaeogriphus, a New Cabernicolous Crustacean from South Africa.* Bulletin, Zoology, vol. 5, No. 2. Isabella Gordon. 19 pp. 6s. *Expedition to South West Arabia 1937–8.* vol. 1, Nos. 27–33. 79 pp. £1. *Fossil Mammals of Africa.* No. 12. *A New Miocene Rodent from East Africa.* D. G. MacInnes. 36 pp. £1. *Fossil Mammals of Africa.* No. 13. *Insectivora and Chiroptera from the Miocene Rocks of Kenya Colony.* P. M. Butler and A. Tindell Hopwood. 35 pp. 15s. *The Cracherode Shell Collection.* Bulletin, Historical Series, vol. 1, No. 4. Guy L. Wilkins. 64 pp. 21s. The British Museum (Natural History), London, 1957.

Second Tissue Homotransplantation Conference. Annals of the New York Academy of Sciences, vol. 64, art 5. 339 pp. $4.50. *Mercury and Its Compounds.* vol. 65, art 5. 295 pp. $3.50. *The Pharmacology of Psychotomimetic and Psychotherapeutic Drugs.* vol. 66, art 3. 424 pp. $5. *Anesthesiology and Related Problems.* vol. 66, art. 4. 182 pp. $4. Otto v. St. Whitelock, Ed. New York Academy of Sciences, New York, 1957.

California Wasps of the Genus Oxybelus (Hymenoptera: Sphecidae, Crabroninae). Bulletin of the California Insect Survey, vol. 4, No. 4. Richard M. Bohart and Evert I. Schlinger. University of California Press, Berkeley, 1957. 40 pp. $0.75.

Multichannel Pulse Height Analyzers. Proceedings of and informal conference at Gatlinburg, Tennessee, 26–28 September 1956. Nuclear Science Ser. Rept. No. 20. Publ. No. 467. H. W. Koch and R. W. Johnson, Eds. National Academy of Sciences–National Research Council, Washington 25, 1957. 205 pp. $2.