Chemistry Popularization

Chemistry for the Modern World. George Porter. Barnes and Noble, New York, 1962. ix + 116 pp. Illus. $2.

This small book is one of three that constitute the "Science for the Modern World" series. Of the other two, that by E. N. da C. Andrade presumably treats physics in the way that this treats chemistry and the third volume, on biology, is by C. H. Waddington. All of them are intended as introductory volumes for laymen who have not studied the subject before.

In view of its briefness, *Chemistry for the Modern World* accomplishes its objective reasonably well. The author begins with a description of a small number of the most important elements, moves quickly on to atomic structure and chemical combination, and finishes with chapters on organic chemistry, energy sources, and industrial chemicals. An amazing amount of factual material is compressed into eight short chapters. Surprisingly, for so short a book, the development is very logical and the descriptions are clear. The only inaccuracies that I noted are on page 99 where the author confuses Chile saltpeter with potassium nitrate and where he gives the impression that nitrogen is still fixed by the arc process. Of course, a great deal of oversimplification is inevitable in an elementary book of this sort.

This book presents nothing new for those who have had a secondary school or college course in chemistry. For the youth or the adult who has had neither, this is a well-balanced and well-written introduction.

AARON J. IHDE
Department of Chemistry,
University of Wisconsin

Civil Engineering

Groundwater and Seepage. M. E. Harr. McGraw-Hill, New York, 1962. xv + 315 pp. Illus. $12.50.

A thorough discussion of the seepage problems encountered in designing dams, canals, and drainage structures is contained in this book, but calculations of well discharges, familiar to most Americans interested in groundwater, are not treated in detail. Although the book is directed primarily to civil engineers, it will also be useful to pedologists, petroleum engineers, hydrogeologists, and others concerned with broader aspects of the flow of fluids through natural material. Introductory sections on hydrodynamic equations, boundary conditions, nonisotropic media, and conformal mapping should be of particular interest. The presentation has been carefully planned so that many of the important parts can be understood by those who have only a nominal background in college mathematics.

A unique aspect of this book is the inclusion of the results of modern Russian research in fluid flow. With the exception of a translation of P. Ya. Palubarinova-Kochina's classic *Theory of Groundwater Movement* (Princeton University Press, 1962), little of this material is available in English. Harr has also covered much of the older German literature, thus making his book a valuable secondary source of European knowledge about groundwater flow.

In reading this book, one cannot help commenting on the lack of uniform terms for use in the general field of fluid flow in porous media. *Permeability* is used by some writers to indicate that property of a medium which determines the ease with which fluids can pass through the medium. Others include effects of fluid density and viscosity as well as the gravitational field within the definition of permeability. Harr uses *physical permeability* and *coefficient of permeability*, respectively, to properly differentiate between the two concepts. Authors of other recent books have used *intrinsic permeability, specific permeability, fluid conductivity*, or simply *permeability* for the first concept and *fluid conductivity, hydraulic conductivity*, or simply *permeability* for the second concept. Still other authors have used some of the terms interchangeably, greatly adding to the confusion. The problem also extends to other terms such as *discharge velocity*, which is dimensionally but not physically a velocity in the sense that Harr uses it. For this reason, others have used *specific volume discharge* or *volumetric flux*. Although Harr threads his way through the modern babel with some skill, his choice of terms is not necessarily the best.

The bulk of the book is suitable for use as a general reference or as an advanced textbook in soil engineering and related courses. Ample illustrations, numerical examples, and sets of problems, as well as the clear style of the book, suggest that it should be in wide use for many years.

STANLEY N. DAVIS
Department of Geology,
Stanford University

Parasites

Ticks and Disease. Don R. Arthur. Pergamon, London, 1961; Harper and Row, New York, 1962. xvi + 445 pp. Illus. $14.

The ticks are members of a homogeneous group of acarines, which is comprised of about 600 species distributed in three families and about 15 genera. All are parasites of vertebrates, and a number are serious pests of man and animals in their own right. Because they transmit pathogenic microbes of various types, ticks are recognized as the most damaging parasites of domesticated animals, and, with the exception of mosquitoes, they are the most serious vectors of disease to man. They loom large in the history of medical entomology, for the discovery that Texas cattle fever was transmitted by ticks, reported by Smith and Kilborne in 1893, was the first demonstration of an arthropod as the vector of disease agents. *Ticks and Disease* is a review of the author's concept of the current general knowledge of ticks, to which he has appended a brief account of the diseases known to be transmitted by ticks and a short chapter on control of ticks, mostly on domestic animals.

The book has value primarily as an introduction to a knowledge of the structure, physiology, classification, distribution, ecology, behavior, and disease-carrying potential of the economically more important species of ticks. With rare exceptions, the type of detailed information needed for coping with specific problems in specific areas is not given. A few peculiar statements are made, for example: "Among the better known examples [of viruses transmitted by arthropods] are yellow fever transmitted by tsetse flies, dengue by *Phlebotomus* and Colorado fever by ticks." These do not detract importantly from the book,

which is the best currently available on ticks in general. Parasitologists, health officers, and medical entomologists, as well as people in related academic fields will find the book particularly helpful as a summary of the knowledge of ticks and to a lesser degree, as a source of information on diseases that ticks transmit to man and his domestic animals.

G. W. WHARTON
Department of Zoology and Entomology, Ohio State University

Regulation of Growth

Regeneration. Dorothea Rudnick, Ed. Ronald, New York, 1962. v + 272 pp. Illus. $9.

These papers, which were prepared for the 1961 symposium on growth, reflect the importance of control mechanisms in the regulation of growth. Each paper emphasizes how the components of regeneration, including morphogenesis, differentiation, dedifferentiation, proliferation (and even reproduction) are complex processes that cannot be left to chance. It is natural, therefore, that hypothetical growth-regulating factors should be postulated. It is abundantly obvious that such factors are easier to speculate about than to identify.

However, one group of such agents has been chemically characterized—the plant hormones. Stonier, for example, describes how the application of auxins in appropriate doses to decapitated tobacco plants will elicit shoot outgrowths from wound tissues that are otherwise incapable of regeneration. Yet not all plant systems are so obliging, for Steeves stresses the importance of elucidating the nature of hypothetical "morphogenetic substances" presumably responsible for determining whether an isolated fern leaf primordium will become a shoot apex or a leaf.

Zoological systems confront the investigator with equally perplexing phenomena. Rasmont analyzes asexual reproduction by gemmule formation in sponges, and concludes that gemmulation rate is a function of the increasing population density of archeocytes in relation to the number of differentiated cells. But how one translates concepts of size and population densities into chemical and physiological terms remains to be demonstrated. In another chapter, Burnett treats the reader to a lucid account of how the hypostome of the hydra stimulates growth in the subjacent region, which in turn provides cells to the rest of the organism. This contantly regenerating creature must possess a variety of control mechanisms if it is to remain a recognizable hydra. Thus, cells induced to proliferate under the influence of growth stimulators are themselves the source of a growth-inhibiting substance that suppresses proliferation elsewhere in the body. A similar interplay of inducing and inhibiting influences is proposed by Wolff to explain the sequence of interdependent events that occur in planarian regeneration. It is encouraging that at least one of these hypothetical influences has gained some substance as a result of the demonstration that brain extracts can induce regeneration of eyes in planaria.

There may be comparable mechanisms operating in vertebrate regenerating systems. This is most clearly illustrated by Reyer's account of the proposed stimulatory effect that the neural retina exerts on lens regeneration from the iris of the newt eye, an influence also responsible for the remarkable polarized orientation of the regenerated lens. (More problematical is the status of an inhibitory effect of the original lens on the lens-regenerating cells of the dorsal iris). The regenerating amphibian limb still challenges the experimentalist to explain in theoretical terms the controlling mechanisms of its morphogenesis, as Rose's contribution emphasizes. Hay's impressive investigations with the electron microscope have gone far to dispel much of the confusion that once surrounded the phenomenon of cellular dedifferentiation. Clearly, dedifferentiation of chondrocytes and muscle fibers occurs as a prelude to blastema formation; what the implications are in relation to the potentialities of subsequent blastema cell differentiation is an important problem yet to be solved.

If we can extrapolate from these examples of current interests and achievements in the field of regeneration, we may confidently expect the experimental demonstration of many more growth-regulating factors in the future. But unless greater emphasis is placed on modern biochemical approaches, so conspicuous by their absence in this volume, the eventual chemical characterization of such factors will be inexcusably delayed.

RICHARD J. GOSS
Department of Biology, Brown University

Reinitzer's Crystals

Molecular Structure and Properties of Liquid Crystals. G. W. Gray. Academic Press, New York, 1962. vii + 314 pp. Illus. 63s.

Liquid crystals, discovered in 1888 by Reinitzer, comprise several states of matter intermediate between ordinary liquids and true crystals, for they are capable of flowing, much like liquids, but they are optically anisotropic. Most scientists probably learned of these crystals as a result of Lehmann's book *Flüssige Kristalle,* or of the 1933 symposium sponsored by the Faraday Society on liquid crystals and anisotropic melts. This is the first book in English on this subject.

There are ten chapters: "Introduction" (16 pages); "Smectic, nematic and cholesteric mesophases" (38 pages); "The identification of mesophases and the determination of mesomorphic transition temperatures" (11 pages); "Molecular arrangement and order in the nematic mesophase—the swarm theory and the distortion hypothesis" (14 pages); "X-ray, ultra violet and infra red spectroscopic and proton magnetic resonance studies on the mesomorphic states" (17 pages); "Other physical characteristics of the mesomorphic states" (28 pages); "Liquid crystalline behavior of mixtures" (14 pages); "The mesomorphic behavior of compounds and their chemical constitution" (58 pages); "The regular trends of mesomorphic transition temperatures for homologous series" (42 pages); "The effects of substituents and of steric factors on mesomorphic thermal stabilities" (61 pages).

The first chapter is a general introduction to liquid crystals, for which a better name is Friedel's term *mesophase.* The *mesomorphic state* is known only among organic compounds that have more or less elongated molecules. Such a compound may, in general, exist in more than one mesomorphic state, in addition to the crystalline and liquid states. A typical compound might pass through these states successively when heated, with the mesomorphic states occurring between the crystalline and the liquid states. There are three distinct categories of mesomorphic states, smectic, nematic, and cholesteric. In chapter 2 some characteristic properties of these phases are described. In