

di-*p*-bromobenzenesulfonates little if any driving force is supplied by the poorly nucleophilic neighboring group even in the *trans*-position.

When the carbon atom being substituted is of a structural type more favorable for something approximating a carbonium ion mechanism, the effect of a neighboring bromine atom is more nearly given by consideration of the inductive effect alone. From our solvolysis rates of dibromides, relative reactivities are: $C_6H_5CHBrCH_3$ ^{2a} 1000, $C_6H_5CHBrCH_2Br$ 1.00 in ethanol at 55°; $(CH_3)_2CBrCH_3$ ^{2b} 6000, $(CH_3)_2CBrCH_2Br$ 1.00 in 80% ethanol at 25°. In fact, in the case of isobutylene dibromide the neighboring bromine

(2) (a) Hughes, Ingold, *et al.*, *J. Chem. Soc.*, 899 (1940); (b) Cooper and Hughes, *ibid.*, 1183 (1937).

atom is similar in effect to that of the chlorine atom in isobutylene dichloride, for which Kharasch and co-workers³ have estimated a retarding factor of 4000 at 79°.

With these latter structural types and also with substances such as the very unreactive cyclohexyl compounds we still have little stereochemical evidence regarding participation.

We shall publish a detailed discussion and account of this work as soon as circumstances permit.

(3) Brown, Kharasch and Chao, *THIS JOURNAL*, **62**, 3435 (1940).

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RECEIVED NOVEMBER 17, 1945

NEW BOOKS

The Bacterial Cell in its Relation to Problems of Virulence, Immunity and Chemotherapy. By RENÉ J. DUBOS. George Fabyan Professor of Comparative Pathology and Professor of Tropical Medicine, Schools of Medicine and Public Health, Harvard University. Member of the Rockefeller Institute. With an addendum by C. F. ROBINOW, Strangeways Laboratory, Cambridge, England. Harvard University Press, Cambridge, Massachusetts, 1945. xix + 460 pp. Illustrated. 21.5 × 15 cm. Price \$5.00.

During the course of years a large number of observations have been accumulated concerning the physical, chemical and biological properties of bacteria. Dr. Dubos' purpose in this book is to correlate these largely unrelated observations made during the study of practical problems, in order to obtain an insight into the nature and properties of "cellular structures which cannot be recognized by microscopical observation" and "to interpret the phenomena of infectious processes in terms of the biochemical architecture of the bacterial cell." A quotation from Claude Bernard placed at the beginning indicates that it is the author's intention to prepare an architect's plan into which the bricks of individual observations will fit.

The impression of the reviewer is that Dubos has eminently succeeded in his purpose. There is no other book in which the actual results of individual studies are better presented for the understanding of general problems. The successive chapters of the book lead us through the cytology of bacteria and their physicochemical and staining properties, the analysis of cellular structures by biochemical and biological methods, such as the action of enzymes, antibodies and bacteriophage, the variability of bacteria, the nature of bacterial virulence, immunity, and the bacteriostatic and bactericidal agents. The discussion of these subjects is sufficiently complete for those who are not specialists in any particular field and gives an excellent summary of the present status of research. The discussion of the general aspects of these subjects should appeal to the specialists. References covering 70 pages furnish bibliography for further reading.

The reviewer was most impressed by the keen perception of the biological nature of bacteriological problems. It is pointed out in the introduction that many bacteria which

were thought to be the simplest living organisms build up from inorganic material the complex organic substances and most of the enzymes and accessory substances which are present in higher plants and animals. The recognition of the probably insoluble complexity of biological phenomena puts our problems and the knowledge we possess into proper perspective. The chapters on the virulence of bacteria, immunity and chemotherapy are especially illuminating in the manner in which they present the little that is known against the background of the complexity of the problems. The most important practical discoveries, in chemotherapy for example, were made without any understanding of the basic principles on which they depend. It is evident that the increase of our knowledge concerning these principles would further more than anything else the study of practical problems.

The book is delightful reading for those who are interested to know how the general problems of his science appear to an eminent investigator. It is hoped that by stimulating interest in these problems it will be a very useful book.

LOUIS DIENES

Wood Products for Fertilizer. Report of Conference at Orono, Maine, June 29, 1945. Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Conn. 72 pp. 15 × 23 cm. Price, \$1.00.

The Northeastern Wood Utilization Council was organized in 1942 for a concerted attack on the problem of low grade wood and wood waste. It is concerned with applied research. The foreword to this Report also states, "—In view of the fertilizer requirements of the Northeast and the possible use for this purpose of lignin and other forms of wood waste, a special meeting—was held—in coöperation with the University of Maine—". The report gives the full text of the following papers and a summary of the discussion: "Fertilizer Requirements of the Northeast," "The Value of Wood Ashes as Fertilizer," "The Use of Lignin in Potato Fertilizer," "The Use of Sawdust, Shavings and Superphosphate with Dairy Manure," "Comparisons of Sawdust and Wheat Straw for Bedding," "Action of Soil Bacteria on Wood Products," "Fundamentals of Lignin Chemistry as Applied to Fertilizer," "Research on

Lignin as a Soil Builder." In an appendix is given, "Comparison of Various Methods of Sulfite Pulping from the Point of View of Waste Liquors."

The foreword ends with the statement, "It is published as a contribution to the subject and as a basis for further research."

H. C. HAMILTON

Surface Active Agents, Theoretical Aspects and Applications. By C. B. F. YOUNG, Ph.D. and K. W. COONS, Ph.D. Chemical Publishing Co., Inc., Brooklyn, N. Y., 1945. 362 pp. Price, \$6.00.

This book was written, as stated in its preface, to present information as to origin, effects and utilization of surface tension phenomena in a diversity of industrial fields. Part I is devoted to a discussion of the theory of surface tension, its determination and the structure of wetting agents and specific surface tension agents. Part II covers such topics as emulsions, metal cleaning, cosmetics, leather, flotation, inks, textiles, cutting oils, adhesives, foods, lubrication and soldering.

The first chapter is devoted to a review of the theoretical considerations pertaining to surface tension as can be found in any good textbook on colloid chemistry. In the discussion of the determination of surface tension, the authors have seemingly misinterpreted the work of Harkins and Brown, who developed the drop weight and not the drop number method. The authors classify rubber latex as a protective colloid (p. 162). The authors seemingly have overlooked the fact that rubber latex itself is a protected dispersion. The chapter on cosmetics (p. 186 *ff.*) uses a terminology which certainly is beyond the scope of this book and will, therefore, stun many a reader. The chapter on flotation (p. 214 *ff.*) also contains several misleading statements. In the case of galena, the air does not displace the water, but the hydrophobic property of its surface prevents wetting.

Rubber latex (p. 321) can certainly not be classified as adhesive in the sense this term is normally used.

These are just a few examples picked at random, but what is most deplorable is the title, because it is misleading. Only Chapter III actually deals with the structure of agents which reduce the surface tension of a system, and only such compounds can be classified as surface active agents.

This rather high-priced book may be of value to someone who wants to get a quick survey of the fields discussed, but anyone who is interested in their fundamentals will not get what he has been looking for.

ERNST A. HAUSER

Recent Advances in the Chemistry and Biology of Sea Water. By H. W. HARVEY, Sc.D., F.R.S. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y., 1945. vii + 164 pp. 14 X 22 cm. Price, \$2.75.

The chemistry of sea water falls into three somewhat distinct parts; the analytical description of its components, their special physical chemistry and the changes in concentration which occur in the case of those substances which are consumed or produced as the result of biological activity.

The so-called major constituents, sodium, potassium, magnesium, calcium, strontium, chloride, sulfate and boric acid, occur in almost constant proportions, their concentrations changing primarily as the result of gains or losses in the water content of sea water. Recent advances have been directed toward determining these proportions more precisely. In addition, sea water contains small quantities of many other elements, the sum of which probably does not exceed 0.025% of the major consti-

tents. The determined concentrations of thirty-one minor constituents are listed, almost all having been ascertained since 1930.

The special physical chemistry of sea water has been concerned primarily with the description of the carbon dioxide equilibrium. The naturally occurring variables which affect this equilibrium are the range of temperatures which occurs in the sea, the variation in ionic strength and in the concentration of excess base which result from the degree of dilution of the sea with fresh water, and alterations in the carbon dioxide content correlated with biological activity and exchanges with the atmosphere. This system now appears to be rather thoroughly defined, and Dr. Harvey's summary of it will be useful. The closely related problem of the solubility of calcium carbonate is of especial interest because this substance is critically close to and apparently is frequently in excess of saturation in natural sea water. Among minor problems is the state in which iron occurs in the sea since this element is found in quantities which greatly exceed the solubility of its ions.

A number of components of sea water enter to such a degree into biological processes that their concentrations can only be interpreted in relation to the living population of the water. These components are oxygen, carbon dioxide, phosphates, combined forms of nitrogen (ammonium, nitrite and nitrate) and silica. A systematic description of the concentrations of these materials as they vary with depth and geographical position is gradually being built up. Studies of the composition and metabolic peculiarities of marine animals and plants, and of the bacterial processes which result in the decomposition of organic matter, are advancing. With the aid of an increasing knowledge of the internal movements of the sea, interpretations of the distribution of the bio-labile constituents are emerging. This in turn is throwing light on the underlying conditions which determine the fertility of ocean waters.

Dr. Harvey has been unusually successful in recording clearly and concisely the data which has accumulated during the years immediately preceding the war and in stating the ideas which emerge. Progress in the investigation of the subject has been so great, comparatively, that its review gives a very adequate picture of our whole state of knowledge of the chemistry of the sea.

ALFRED C. REDFIELD

BOOKS RECEIVED

JANUARY 10, 1946-FEBRUARY 10, 1946

H. W. HARVEY. "Recent Advances in the Chemistry and Biology of Sea Water." The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 164 pp. \$2.75.

C. A. JACOBSON, Compiler and Editor. "Encyclopedia of Chemical Reactions." Vol. I. Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, N. Y. 804 pp. \$10.00.

M. G. MELLON. "Colorimetry for Chemists." The G. Frederick Smith Chemical Company, 867 McKinley Avenue, Columbus, Ohio. 133 pp. Bound copies, \$1.00. Paper copies free on request to publishers.

FOREST RAY MOULTON, Editor. "A. A. A. S. Research Conference on Cancer, Gibson Island, Maryland, July 31-August 4, 1944." Publication of the American Association for the Advancement of Science, Smithsonian Institution Building, Washington 25, D. C. 333 pp.

C. B. F. YOUNG and K. W. COONS. "Surface Active Agents." Chemical Publishing Company, Inc., 234 King Street, Brooklyn 31, New York. 381 pp. \$6.00.