BOOK REVIEWS

PHYSICAL CHEMISTRY

THE PROTON IN CHEMISTRY

R.P. BELL

Chapman and Hall, 2nd ed., London, 1973, pp. 310

The first edition of this book was published in 1959. Needless to say the subject matter has evolved tremendously since then. This progress has been the results of the development of new techniques for the study of the usually very rapid proton-transfer processes in solution, rather than from any new fundamental concepts (which had already been laid down by Bronsted and Lewis more than 50 years ago). However, during the last decade there have been theoretical and experimental studies of the hydrogen isotope effect, in particular the application of quantum-mechanical tunnelling correction to rationalize certain kinetic isotope data. The proton tunnelling phenomenon had also been suggested as far back as the 1920's, though without any experimental evidence.

The book is concerned with the thermodynamics and kinetics of protolytic equilibria, both in aqueous and nonaqueous solution. The first six chapters, comprising almost one third of the book, discuss clearly and in details the concept of acids and bases and the role of the proton. This section is suggested reading for those who desire to go beyond just the use of the Henderson-Hasselbalch equation. The next three chapters deal with the kinetics of proton-transfer reactions and its applications to reactions catalyzed by acids and bases. The experimental data obtained from the study of fast reactions are presented here. The final three chapters, the last third of the book, cover topics that are of current interest to the author, namely the relations between equilibria, rates and structures, and the hydrogen isotope effect. Professor Bell is one of the leading authority in this latter field.

All the topics are treated at the phenomenological level, with discussions of experimental results in terms of molecular properties. There is no complicated abstract methematics, though a knowledge of basic chemical kinetics will be needed to follow the arguments used in the setting up and analysis of the various rate expressions. The language is precise and ambiguities or conflicting interpretations are clearly pointed out. SI units are employed, references are current to 1972, and there is an author index in addition to the subject index.

The book is recommended as a critical basic text for research chemists who are interested in or who are already involved in quantitative measurements and interpretations of protolytic equilibria.

It might be mentioned that the following topics are not discussed in the book, though references are given to extensive literature elsewhere; these are hydrogen-bonding, water structure and proton magnetic resonance.

Prapin Wilairat

PHYSICAL CHEMISTRY AND BIOCHEMISTRY

PRINCIPLES AND PROBLEMS IN PHYSICAL CHEMISTRY FOR BIOCHEMISTS

NICHOLAS C. PRICE and RAYMOND A. DWEK

Clarendon Press, Oxford, 1974, pp. 186, 140 baht

Students in biological sciences often wish they had a stronger background in physics and chemistry. Often when they are confronted with biological problems which require the application of elementary principles in physical sciences, they either fail to recognize the fact or can only manage a descriptive, and hence imprecise, account of these principles. Physical biochemistry is a discipline which attempts to bridge the gap between the physical and the biological realms of science. Unfortunately, many classical textbooks in physical biochemistry adopt too rigorous an approach and, while useful to a small number of well-trained scientists in Thailand, are beyond the grasp of most students in biological sciences.

The book presently reviewed adds to a small number of works prepared specifically for novices to the subject. Divided into 11 Chapters and 4 Appendices, the book deals mainly with elementary principles in equilibrium thermodynamics and kinetics, with short treatises on spectrophotometry and isotopes. The emphasis is on problem solving, with numerous worked examples and problems in each chapter following a concise statement of the principles involved. The derivation of equations is generally easy to follow, but presumably due to restrictions in space, many concepts are treated so briefly that it is impossible for students without previous exposure to understand them without seeking more information from other textbooks. For example, the Second Law of Thermodynamics is stated in only two brief sentences, with the change in entropy expressed in terms of heat absorbed, $dS \geqslant dq/T$. A paragraph before this, the students have only been introduced to the concept of entropy in the statistical sense.

Perhaps owing to the lack of space, a few important concepts are missing or passed over very briefly. The reviewer feels, however, that more attention should have been given to fractionation methods than only in two problems at the end of Chapter 5. The concept of co-operativity deserves more than one paragraph in Chapter 4. Some basic symmetry considerations may be useful in the chapter on spectroscopy.

Obviously the value of this short book is not in the comprehensive treatment of various concepts in physical biochemistry, but in the handy summaries and practical problems it offers for routine application. As a paperback of moderate price, the book is recommended for all beginning students in biochemistry, as well as for other biological scientists who are not well acquainted with the physicochemical principles. Physical chemists looking for an entry into biological problems may profit from the book also. However, as the authors themselves caution, "it should be noted that biological systems are in general much more complicated than those dealt with by the chemists. It is therefore often necessary to make drastic simplifications to perform any calculations from fundamental principles, at least at the level of this book."

Yongyuth Yuthavong

CHEMISTRY AND FOOD SCIENCE

THE CHEMICALS WE EAT

MELVIN A. BENARDE

McGraw-Hill Paperback Edition, 1975 LCCN 79-142976 0-07-004424-4, pp. 208, $3.50

On the title page, there is a statement made in 1825 by Brillat-Savarin: "The destiny of nations depends upon the manner in which they are fed". Indeed, this book talks about commercially produced foods, the chemicals added to give them qualities that the consumer desires, how safe these additives are, the standards set by the authorities and future synthetic foods.

The first half conveys the message that foods are chemicals and so are the additives. These additives function as food preservatives, sweeteners, flavour enhancers or potentiators, colouring agents, leavening agents, stabilizers and thickeners, emulsifiers and surface active agents, firming and anticaking agents, antioxidants, sequestrants, acidulants and alkalis, and humectants. Examples are given concerning the gross chemical nature of these chemicals and their roles in some food preparations. Also, right from the start, wholesome and harmful substances present in natural foods are discussed. This is a prelude to the second half of the book which embraces food safety and comsumers' well-being in a world flooded with massproduced foods. Dr. Benarde, who is an authority on food production, safety and our habitat, makes an effort to alleviate fears and anxieties over food additives. The more recent controversies over cyclamate, saccharin and sodium monoglutamate are cited to bring equanimity and sanity back to the public. The take-home message is that one has to be careful but not oversensitive about processes and products because they are usually quite safe; at least as safe as most natural foods, some of which possess inherently dangerous substances. In the last chapter the author attempts to explain the current rash of overreaction to additives by the consumer and suggests ways to assess sensational press reports. In the chapter on foods in future, synthetic foods and food preparations, currently available or being developed and tried out, are discussed. The author sees these synthetics as the answer to world food problems vis-a-vis future demands in terms of population and way of life.

This book blends serious discussions with interesting glimpses into the more mundane things in life, especially American ones. Although the more scientific aspects are occasionally provided, e.g., chemical formulae, plotted curves, LD_{50}, to name but a few, they should not discourage the uninitiated as the presentation is low-keyed. The more down-to-earth aspects are of general interest, eg., what is used to leaven bread, to sweeten soft drinks, to provide body to beer, how producers manage to deceive food inspectors, the chronology of food protection legislation etc. I recommend this book for self-enlightenment of anyone who has a smattering of chemistry and biology and who is interested in foods, food safety and its global impact. The general tone of the book should provide a good counterweight to the hostile sentiments currently taken by the public towards science and scientific products.

Bhinyo Panijpan

BIOLOGY

MAN AND NATURE.
PRINCIPLES OF HUMAN AND ENVIRONMENTAL BIOLOGY

JOHN W. KIMBALL

Addison-Wesley, Reading, Massachusetts 1975, pp. 514

The author, with an already well respected introductory college text in biology, has now produced a book for the "sensitive, concerned public that sought to examine certain aspects of biology as they relate to a single species: man".

It is easy, in my opinion, to review any subject, but it is not easy at all to arrive at a critical comment unless the goal and objectives of the author have been systematically analyzed. Evidence has been proposed for the presence of man on this earth going back nearly four million years. Human survival has depended largely on the successful exploitation of the natural environment in order to meet basic human needs which have varied both in time and space. In this sense, environmental biology is an old science, yet it also is a young science drawing upon recent developments in social science, engineering and biology for integration. During the last six millenia, agricultural revolution followed by industrial revolution caused dramatic changes allowing man to progress rapidly from hunting to farming, from industrialization to a nuclear era, and finally emerging in the present computer era. Improvements in efficiency resulting from science and technology are correlated with size in population and economic growth. Yet no species can survive if resources are exhausted. An optimum population is thus essential for any country's social, political and economic security.

The author's contention is that answers to such problems cannot be given without good data and an understanding of the fundamental physical, chemical and biological principles underlying them. To provide some of this information, Kimball has divided the book into four main parts: the flow of energy and the cycling of matter, reproduction, responsiveness, and evolution. Under the four groupings there are chapters centered around each central theme. For instance, under reproduction are chapters on reproduction of cells, gene expression and human reproduction. The chapters on behavior and immune response are especially clear allowing beginners to readily grasp the basic concepts. A short chapter on the physiology of stress could have been added, but the selection of topics has been marvelously accomplished. As to be expected for an American publication marketed for freshman college students, the book is profusely illustrated with photographs and line drawings.

The book is highly recommended for senior high school students, college students and the concerned citizen.

M.R. Shanawat Devakula