Problems in Energy Metabolism

In a highly personalized, but no less scholarly, series of lectures published under the title **Mechanisms in Bioenergetics** (Academic Press, New York, 1965. 271 pp., illus. Paper, $3.45; cloth, $6.50) Efraim Racker has set forth the fruit of his years of study of a series of problems related to energy metabolism.

His discussions of the formation of adenosine triphosphate in soluble systems are quite conceivably the last word in this matter. The student will readily grasp the history of the problem and the manner in which insight into the pertinent mechanisms was painfully gathered by the author and many other investigators at home and abroad. The second section of the book comprises eight lectures devoted to the phenomena involved in mitochondrial oxidative phosphorylation. These constitute a thoughtful summary of the status of this field at the time the book went to press. To me the only disturbing aspect of Racker's review of one of the cardinal problems in current biochemistry is the degree to which concepts gained through the study of the triose phosphate dehydrogenase reaction dominate his considerations of the probable mechanisms of oxidative phosphorylation in particulate systems. The conclusions and tentative mechanisms presented are entirely plausible if one accepts Racker's unstated postulates. But little room is left for alternative approaches such as the "chemi-osmotic mechanism" which has been gathering increasing support from many quarters.

In the final section Racker presents in detail his own remarkable contributions to the formal demonstration that a process considered to be promoted in vivo by a multienzyme system can be satisfactorily reproduced when substrate is offered to a reconstructed system all the components of which are previously purified enzymes admixed in appropriate proportions. Such formal, capping proof is all too rare in biological scholarship. The student of biology will find many useful lessons, both conceptual and technical, in this small work. Not the least of his rewards will be his encounter with the wit, wisdom, and insight of Efraim Racker.

PHILIP HANDLER
Department of Biochemistry, Duke University, Durham, North Carolina

Theory and Technology of Autoxidation

Oxygen, which bathes all substances exposed to the atmosphere, is the most ubiquitous of chemical reagents: through combustion and respiration it provides us with most of our available energy, and its ready availability makes it one of our cheapest raw materials. On the other hand, its steady attack leads to the gradual deterioration of plastics, lubricants, foodstuffs, and, in fact, most organic materials exposed to its action. It is chiefly to this aspect of the behavior of oxygen that **Atmospheric Oxidation and Antioxidants** by Gerald Scott (Elsevier, New York, 1965. 540 pp., illus. $26) is addressed.

As in most branches of technology, the urgent need for solution of practical problems has led to a great volume of Edisonian research and the development of empirical correlations, without waiting for the prior growth of detailed theory. Extensive theory and reasonably detailed understanding of the basic radical chain mechanisms of autoxidation processes now exist, and the goal of Scott's book is to bring the two approaches together and to show how comprehension of the fundamental reactions involved can lead to understanding of present technology and can guide future work.

To this end, the first four chapters (after a brief historical introduction) are devoted to a review of peroxide chemistry, the mechanisms of autoxidation processes, and the mechanistic role of antioxidants, both as chain breakers and as preventives for chain initiation. The result is a clear and well-written summary of our knowledge of these processes as of about 1961, the cutoff point for references.

The remaining five chapters take up the measurement of deterioration in oils, rubbers, plastics, and other materials and the evaluation of antioxidants, all, as far as possible, in terms of the principles developed earlier. This is a difficult feat, and Scott's success is impressive. The appreciable number of cases where results and techniques are still largely empirical attest to gaps in our knowledge of principles and the equivocal nature of theories which sometimes provide enough parameters to accommodate almost any observation, real or fallacious. The consequence of this synthesis is a book which should be of real value to anyone involved in the technical problems of preventing oxidative deterioration of organic products. As a model exposition of the interrelation between the technological and scientific approaches to a common problem, it should also make interesting reading to the academic student of reaction mechanisms, particularly if he doubts that technology provides problems of real scientific interest.

CHEVES WALLING
Department of Chemistry, Columbia University, New York City

Encyclopedia for Chemists

Of all the types of chemists, one of those most likely to benefit from an encyclopedia is the analytical chemist in modern industry, for, as Foster D. Snell and Clifford L. Hilton write, in the volume here reviewed, "Changes in the structure of the chemical industry have been characterized by a trend towards increased diversification. . . . This trend towards diversification has transformed the industrial analytical laboratory from an entity with a specialized and limited service to an institution which has to operate on a broad scale."

The **Encyclopedia of Industrial Chemical Analysis** [Interscience (Wiley), New York], of which *Volume 1, General Techniques, A–E* (1966. 779 pp., illus. $45; by subscription $35), edited by Snell and Hilton, is now available, aims "to give a comprehensive coverage of the methods and techniques used in industrial laboratories throughout the world for the analysis and evaluation of chemical products" and to "discuss all methods that may be of importance in development, control and testing laboratories."

Considering the tremendous amount of progress made during the past decade or two in the variety and sophistication of analytical methods, these objectives are indeed ambitious. The plan is to present two parts, the first to consist of three volumes on general techniques and the second of a series of volumes devoted to the analysis of specific materials.

The topics covered in the first volume range from time-honored techniques such as acid-base titration and colorimetric analysis, through

modern techniques clearly recognizable as analysis such as activation analysis and electron-probe microanalysis, to methods that fit only a broad definition of the field of analysis, such as critical constant determinations. The articles are primarily aimed to show "*how* a method or technique works, not *why* it works." Nevertheless, many of the articles contain basic information on the principles underlying the methods and will serve as an immediate guide as to the applicability of the procedures.

Often a critical step in the efficient solution of an analytical problem is the choice of the best approach in view of the personnel and facilities available. This encyclopedia should perform an important function in alerting the industrial analytical chemist to a wide range of possible attacks on his problems. The editors and authors are to be commended for an important contribution to the literature of analytical chemistry.

H. A. LAITINEN
Department of Chemistry and Chemical Engineering, University of Illinois, Urbana

Sharks and Swimmers

The formation of the Shark Research Panel of the American Institute of Biological Sciences in June 1958 has stimulated research on elasmobranch biology and the shark hazard problem. Since then several books of varying quality on sharks and shark attacks have appeared which are intended to inform swimmers and divers about the dangers. David H. Davies, who was killed in an automobile accident late in 1965, authored one of the better of such books, **About Sharks and Shark Attack** (Hobbs, Dorman, New York, 1966. 237 pp., illus. $6.95). In six years of research on the sharks of South Africa, during which he gathered original information, he found only 83 instances of unprovoked attacks, an indication that, though they must be regarded as an ever-present hazard for swimmers, their frequency is not great.

The first of the 10 chapters gives general background information on sharks, discussing their anatomy, classification, evolution, reproduction, physiology, migration, and habits. The remainder of the book discusses the shark-attack problem in the waters of South Africa, where, among 24 kinds of sharks, only six are dangerous. They are the Zambezi shark, *Carcharinus leucas*; the ragged-tooth, *Carcharias taurus*; the tiger shark, *Galeocerdo cuvieri*; the blue pointer, *Carcharodon carcharias*; the mako, *Isurus glaucus*; the hammerhead, *Sphyrna*. Detailed documentation of 19 attacks, largely investigated by the author, is given, including color illustrations of massive wounds of the victims. (These gruesome photographs seem to me to be suitable for a medical journal but out of place in this book, which is written for the general public.) Anti-shark-attack measures used in South Africa to protect swimmers are discussed and illustrated. These include mechanical barriers, protective shark nets, meshing, beach patrols, and reduction of the shark population by fishing. A chapter is devoted to advice to swimmers and divers on the kind of action to take in the event of an attack or to help avoid attack. Mention is made of further research in progress on the biology of sharks and on anti-shark-attack measures, such as barriers and electric, sonic, and chemical repellents.

This book was written by a man with a broad scientific background and is quite dependable. I recommend it highly.

LEONARD P. SCHULTZ
Smithsonian Institution, Washington, D.C.

Human Maladies

In **History and Geography of the Most Important Diseases** (Hafner, New York, 1965. 224 pp., illus. $5.50), Erwin H. Ackerknecht, formerly professor at the University of Wisconsin and now at the University of Zurich, provides an English version of his work published in German by Enke Verlag in 1963. The book was originally prepared because the pertinent literature was either partially outdated or out of reach; and, for the first time, it brings together this complex story in a highly condensed yet critical form. The presentation is clear and matter-of-fact in tone. No concessions are made to a "popular" audience; but the text should be very interesting reading to those who appreciate the importance of the subject. It will also be useful as a reference work, providing brief accounts of particular diseases. Laymen may need a medical dictionary or other aids at some points in the narrative, but such supplementary reading will do no harm. Typographical errors appear here and there, the most serious of which result in a garbling of parts of George Rosen's preface.

Despite brevity, the study is a comprehensive one covering some 38 diseases as now recognized. The author first sets up eight classes, such as acute communicable, deficiency, and "chronic diseases of unknown origin" —the latter a difficult category to handle. Under each heading, from three to 20 entities are discussed; and this is done, wherever possible, in terms of symptoms, history, geography, and the growth of understanding. The range of Ackerknecht's knowledge revealed here is remarkable. Historical statements are usually quite specific, and this is also true of the geographic, except for references to so vague a location as "South America."

Quite naturally, more space is given to diseases which have been widespread and often fatal—particularly those now subject to some control—than to less serious or less well-known ones. One may raise questions as to why some particular disease entity, or group of related entities, is or is not brought into the picture. The omission of heart and vascular ailments is striking, and no explanation for it is offered. But the author necessarily gives us his own judgment as to what types of illness were most "characteristic" of a given category in his nosology; and most readers will accept the classification and examples chosen as providing a meaningful panorama of diseases.

The author draws interesting conclusions from his sweeping survey, and it is in this connection that historians may differ at some points. He says, for example, that diseases "seem to be caused always by . . . infection, wear and tear, and new growth." True as this usually is, one wonders whether the statement can be applied, for example, to the food deficiencies (avitaminoses). Questions can be raised also about the view that the "predominance" of major diseases had little or no influence on a given society at a given time. Can it be proved one way or the other, for example, that combined malnutrition, malaria, and hookworm infection had nothing to do with the so-called "laziness" of workers in the southern states of the U.S.A.? On the other hand, this view offers a desirable correction to exaggerated claims that whole cultures declined