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.

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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.

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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