

## Book Reviews

**Tetrapyrrole Biosynthesis and its Regulation.** By JUNE LASCELLES, Microbiology Unit, Department of Biochemistry, University of Oxford. W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1964. xii + 132 pp. 16 × 23.5 cm. \$7.00.

The porphyrins or tetrapyrroles are at the heart of the energy metabolism of cells. They are essential in both the making of food-stuffs by photosynthesis and in the oxidative metabolism of these foods. The study of the biosynthesis of these pigments, which include the chlorophylls and the hemes, has led to a striking example of uniformity and conservation in evolution. All forms of life use the same biosynthetic pathway for the formation of these porphyrins as far as we know. Interestingly, this common pathway involves highly reduced intermediates, the porphyrinogens. The first enzymes in the formation of the porphyrins are most active under reducing conditions. Possibly this pathway developed under reducing conditions at an early stage in the origin of life. The conjugated porphyrins which chelate metals and absorb visible light, thus functioning widely in biology, presumably were formed by disproportionation or ultraviolet-sensitized reactions.

June Lascelles's book is a good introduction to and review of porphyrin biosynthesis and its cellular regulation. Her economically written monograph begins with a brief introduction to the chemical structures and physical properties of the naturally occurring porphyrins. This serves mainly to acquaint the student with the rather picturesque names associated with these colorful molecules.

A good description of the distribution and function of the heme proteins and chlorophylls follows. The animal hemoglobins and their odd relatives which occur in microorganisms and root nodules of leguminous plants are compared. The amounts of cytochromes and of chlorophylls involved in aerobic and anaerobic metabolism and in photosynthesis are tabulated. The author points out the interesting fact that vitamin B<sub>12</sub>, which is structurally related to a precursor of uroporphyrinogen III, is found in the strict anaerobes, *Clostridium*, which do not form other porphyrins.

There is a thorough description of the biosynthesis of the hemes. The details of the enzymology of the steps in the biosynthetic pathway appear to be remarkably similar for all organisms studied thus far. Our knowledge of the details of chlorophyll biosynthesis is far less complete. This ignorance is particularly evident in view of Woodward's brilliant synthesis of this baffling molecule. The unsettled relation between chlorophyll synthesis and chloroplast fine structure is outlined.

The regulation of porphyrin biosynthesis, *i.e.*, the integration of this system into the myriad other systems which make up a living cell, is reviewed and discussed. Evidence is given for enzyme inhibition and repression of enzyme synthesis by negative feedback. The product of the sequence inhibits or represses the first enzyme in the sequence. The author has contributed a good part of our knowledge to this field. She poses the possibility of multiple forms of the initial enzyme in porphyrin biosynthesis,  $\delta$ -aminolevulinatase. These enzymes would, under separate control mechanisms, form either cytochromes or pigments.

An epilogue, or prologue for research, underlines some of the larger gaps in the knowledge of this subject. To mention only some chemically oriented problems, Fisher's "Duality of the Porphyrins," or the isomer problem, is still with us. The mechanism of formation of the most random isomer, number III, from a single pyrrole precursor is still unresolved. The formation of the fifth ring, E, of chlorophyll, which has hypnotized many investigators in photosynthesis, remains obscure. Even the source of the hydrogens in ring D of chlorophyll is unknown.

This small book covers a wide variety of subjects from chloroplast structure to the breathing of animals. It is notably free of that biochemical habit termed "mammalian chauvinism." Valuable comparative aspects of porphyrin biosynthesis and its regulation are stressed. In all areas the treatment is selective rather than complete. The book is brief but readable and it sticks closely to experimental facts. The literature through most of 1963 is covered. The index is excellent and only a minor number of misprints were noted. The spectra and comments on pages 11-14 should be taken as qualitative. The compound mentioned on page 67 should be 2(or 4)-vinyl-4(or 2)-(1-hydroxyethyl)deuterporphyrin. The abbreviation  $\mu$ m-mole is confusing and undefined. The three photographic reproductions are poor. That of a chloroplast (p 77) is a disaster. The student sees a caricature of a variety of modern art instead of the intriguing detail available in the original literature. Also, electron micrographs should include size scales.

This monograph would be useful to anyone wishing an introduction to and review of this field. Its possible use as side reading in a biochemistry course is marred by a failing on the part of the publisher. This book and the other in the series are not available in paperback form, thus inhibiting the professed editorial aim of reaching graduate students.

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**Periodic Correlations.** By RONALD RICH, Bethel College. W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1965. xiii + 159 pp. 16 × 23.5 cm. \$8.00.

In this highly concentrated monograph the author brings out, on the basis of various forms of the periodic table, a wealth of correlations between electronic configuration and physical-chemical properties of the elements. The first four chapters ("Electron Configuration," "Atomic Radius," "Ionization Energy, Electron Affinity, and Electronegativity," and "Polarization and Some Thermodynamic Properties") present the more physical of these correlations and constitute a basis for the discussion of the more chemical correlations in the last four chapters ("Acidity and Basicity," "Oxidation State and Redox Potential," "Color and Redox Reactivity," and "Reactivity in Precipitation and Complexation").

The author has obviously gone into his subject with thoroughness and enthusiasm. He has added many new correlations and interesting personal points of view to the already immense field of periodic correlations. However, communication between author and reader is hampered by a style which is too condensed and often obscure. Many of the tables and figures are very hard to decipher because of insufficient captions. There are groups of figures distributed between several pages, with one number and one brief title under the last one. The baffling but specially important "Table 6-1 Redox Potentials" certainly demands a more expanded title and a more detailed description than what is provided by the short paragraphs in the text.

This book, with proper development and editing, could well be transformed into a great work.

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