

mental genetics of pattern formation, eugenics, the origin and maintenance of polymorphism, the evolution of sex and three historico-philosophical articles on evolution, time and history. For me, the most exciting chapter is the first, a previously published essay, in which Maynard Smith introduces a wholly new concept in evolutionary theory, the *evolutionarily stable strategy*. He shows how the apparatus of game theory, which previously appeared to be useless in evolutionary studies except as a metaphor, can now be made to generate important predictions by use of this new concept. The applications of this new theoretical advance are certain to be much wider than the behavioural problem discussed by Maynard Smith in his essay.

On Evolution is the only collection of scientific essays I have ever read that made me stop on page after page and say to myself "What an interesting idea. I never thought of it that way before". I wish I had written it myself.

R. C. LEWONTIN

Electron Transfer

Electron and Coupled Energy Transfer in Biological Systems. Edited by Tsao E. King and Martin Klingenberg. Vol. 1. Part A. Pp. xiii+324. Part B. Pp. x+325-729. (Marcel Dekker: New York, 1971.) Part A, \$19.75; Part B, \$28.50.

ONE of the central processes of biological systems is the mechanism of energy transduction. Of general interest in this respect is the way in which the free energy liberated by electron transfer reactions (oxido reduction chain) is transformed into "energy rich" covalent chemical bonds.

This book intends to give a treatise of electron transfer processes and coupled energy transduction in biological systems. It contains twelve selected topics, each written by known specialists actively working in the field of electron transfer and oxidative phosphorylation. The book is therefore a collection of twelve different reviews for special problems which do not provide a general insight into the fundamental problems of the energy transducing mechanism. It is mainly restricted to mitochondrial processes (except for three chapters), so that the title of the book seems to be not correct.

Chapter 1 (by R. Lumry) reviews the physicochemical (especially thermodynamic) properties of globular proteins. It provides a good insight into the complexity of the factors which govern protein structure and function and their interrelationships. After this the reader would expect in the next chapter the application of these general considerations on the special case of

energy transducing systems, their structural and functional properties within the membranes of biological systems. In the same way the reader will be disappointed by the lack of physicochemical considerations concerning the fundamental process of energy transduction (thermodynamics and kinetic aspects, models for the energy coupling mechanism).

The book presents in chapter 2 a short review (by Wang) of chemical model systems in homogeneous solution. On the basis of these results a model for phosphorylation *in vivo* is proposed in terms of the chemical hypothesis.

In chapters 3-6 and 8 the nature of some mitochondrial enzyme complexes is discussed (DPNH-dehydrogenases by Huennekens and Makler; NADH-ubiquinone reductase by Sanadi *et al.*; choline and α -glycerophosphate dehydrogenase and electron transfer flavoproteins by Frisell and Cronin; the b-group cytochromes by Sekuzu; and by Wilson and Dutton the redox-potential changes which are connected with the mitochondrial energization, the cytochrome oxidase system by Sekuzu and Takemori).

In chapter 7 (by Kamen *et al.*) the properties and the functional role of cytochromes in biological systems are described; chapter 10 (by Crane and Sun) summarizes the role of lipids in mitochondria (a small part includes other systems like autotrophic bacteria and chloroplasts). Special oxidative phosphorylation systems are reviewed in chapters 11 and 12 (invertebrates by Tappel, microbial systems by Brodie and Gutnick). A more general description of the physical and chemical properties of metalloprotein-enzyme systems (excluding haem proteins) is given by Palmer and Brintzinger in chapter 9. This review provides a good insight into the powerful tool of spectroscopic methods.

The book seems to be more valuable for researchers who want to become familiar with these special topics than for readers who are interested in a more general point of view about the central problems of energy transducing systems.

Essential points of these mechanisms are not discussed. The very important phenomena of ion transport and electrical field generation which are necessarily coupled to each anisotropic electron transfer in membrane systems are not reviewed; the current hypotheses about the coupling of electron transport systems with the energy transducing enzymes are not presented.

Because of these facts the book does not provide a complete picture of our present knowledge about the subjects discussed, but gives only partial and selected topics.

G. RENGER

Biochemical Spectra

Biochemical Applications of Mass Spectrometry. Edited by George R. Waller. Pp. xiv+872. (Wiley: New York and London, June 1972.) £19.75.

PROFESSOR WALLER has edited a remarkable book. As the title implies, the bulk of this work is concerned with the biochemical applications of mass spectrometry. These are included in section III and comprise chapters on fatty acids; complex lipids; steroids; bile acids; carbohydrates; terpenes and terpenoids; amino-acids; amino-acid sequence in oligopeptides; nucleic acids and derivatives; antibiotics; vitamins and cofactors; hormones; drug metabolism; tetrapyrroles; clinical use of mass spectrometry; pesticides; alkaloids; flavour compounds, and seriochemicals. There are also articles on the use of stable isotopes, negative ions, mass spectrometry in the detection of life on other planets, determination of the structures of organic molecules and qualitative analysis with field ionization mass spectrometers, and chemical ionization mass spectrometry. Other sections cover instrumentation and the interpretation of mass spectra. All the articles in this book are written by experts in the appropriate fields. Each subject is accompanied by an adequate bibliography and the whole work is completed by a subject index. There is an introduction as well as two essays, one of which is an appraisal of the work of Professor Rittenberg.

All sections are of a high standard and, moreover, they often represent a relatively new assessment of a chosen subject. This is noticeably true of the contributions on seriochemicals which extend the range of the mass spectrometer, and on the automation of scientific inference which seeks a routine method for structure determination based largely on the mass spectrum, surely one of the most urgent and rewarding of problems.

This book represents a comprehensive survey of the available information and as such is an invaluable reference work for researchers in this and cognate fields. It will also prove essential reading for anyone wishing to enter mass spectrometry.

It is remarkably free from misprints and those I noticed are mainly trivial and should not confuse the careful reader. The most serious is probably the formula of retinal (page 501) where a ring methyl group has been omitted.

The publishers have produced a very pleasing book which is clearly printed with good and profuse illustrations. It represents a major work of scholarship. The publishers, the editor and the contributors are to be congratulated on their effort, for this work must surely become a standard reference for many years.

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