

Cytochrome Oxidase – A Synthesis

by M. Wikström, K. Krab and M. Saraste
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xii + 198 pages. £14.60

Books featuring cytochrome oxidase as a major topic appear with surprising frequency. The authors of the present volume cite about ten published since 1976, but each represents conference proceedings. Except in one (*Cytochrome Oxidase*) coverage of this enzyme is patchy. Also, human nature being what it is, the interval between conference and publication is often much longer than was originally envisaged. Coverage in this book is thorough and extensive, and though 60 000 words may seem a lot to devote to one enzyme the text is for the most part concise. Publication has been rapid: there are references to numerous works published in 1981. 'Synthesis' in the title is used in a figurative sense – a synthesis of ideas. Though more arresting than, for example, Progress Report, I consider it unfortunate in the title of a discourse on enzyme chemistry.

After two introductory chapters the subject matter can be briefly summarized as follows:

- Ch. 3. Purification of cytochrome oxidase; composition of subunits; assembly of subunits in the 7-unit, transmembrane, monomeric complex containing 4 redox centres (2 haem, 2 Cu);
- Ch. 4. Structures of haem- and Cu-centres; ligand binding; haem–haem interactions;
- Ch. 5. Redox properties of metal centres;
- Ch. 6. Catalytic mechanisms and kinetics; reduction of oxygen to water; intermediates between fully oxidized and fully reduced enzyme; role of Cu-centres;
- Ch. 7. Dimeric oxidase as foundation of redox-linked, proton-pump mechanisms.

The primary function of cytochrome oxidase is the transfer of electrons from cytochrome *c* to dioxygen. The aims of this book are to explain:

- (i) What progress has been made towards understanding how this transfer takes place;

- (ii) How this might be linked energetically to a proton pump mechanism.

The authors deserve congratulations for accepting the formidable challenge of preparing a consensus of opinions from the melting pot of ideas on the nature and mechanism of the enzyme.

Though most of this book is clearly written there are lapses. Use of English deteriorates in parts of ch. 3 and in the latter part of ch. 4. Occasional portions of text are missing, or may appear to be missing when the style is obscure. The clearest part of the text is from ch. 5 onwards: this will be the part of major interest to more knowledgeable readers. Greater care in reading of typescript and proofs would have paid dividends. The authors' misuse of words, and sometimes their unlucky choice of prepositions, means that readers will need to pause and study the context for clues. For example: 'imminent' where 'real' was intended, locate (assign), contention (concept), explanation to, normal of. Random interchange of haem *a* and haem A for the one substance is irritating especially because 'a', in various typographic forms, is used for other purposes. 'Data' appear (appears!) in many guises – hard, raw, strong and even hampered – all of which reveal a misunderstanding of a once useful word. Better words were available to the authors in many instances.

These occasional shortcomings do not significantly detract from the authors' achievements. They have produced a very valuable account of the experimental work and the hypothesis-building of recent years. Their own contributions to hypothesis-building will no doubt have their critics. But hypotheses are expendable: their value cannot be measured by their degree of 'rightness' but by the extent to which they provoke fellow workers to initiate new experiments leading to better hypotheses.

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