Book Reviews

Ciba Foundation Symposium 180 – The Biosynthesis of the Tetrapyrrole Pigments. Chairman: Duilio Arigoni. Wiley: New York, 1994, 350 pp., hardback £ 47.50. ISBN 0-471-93947-1.

This book arises from the Ciba Foundation's 311th symposium on the biosynthesis of the tetrapyrrole pigments. This symposium was held in London in 1993 (30 March–1 April) in honor of Professor Sir Alan Battersby FRS for his contribution to the Foundation as well as to bio-organic chemistry, in particular to the elucidation of the alkaloids and vitamin B_{12} biosynthetic pathways. The book contains the collection of the sixteen oral presentations given during this meeting and the minutes of the discussions which followed each talk. It is organised with a logical progression and can be divided into three parts:

The first five presentations deal with biosynthesis of uroporphyrinogen III. They are devoted to 5-aminolaevulinic acid synthase through the C_5 pathway and the Shemin route, 5-aminolaevulinic acid dehydrase, porphobilinogen deaminase and uroporphyrinogen III cosynthase. This section provides an updated presentation of our current knowledge on the mechanism of action of the relevant enzymes at the molecular level. A sixth contribution presents the structural and mechanistic information gained from the X-ray cristallographic analysis of porphobilinogen deaminase.

The biosynthesis of chlorophylls is reviewed with three chapters: the conversion of uroporphyrinogen III into protoporphyrin IX is described in the first one with a discussion of the plausible mechanisms for each enzymic reaction. The second one presents the current experimental evidence in support of the multibranched chlorophyll a biosynthetic pathway, and the third one presents the most recent results obtained *in vitro* on Mg-chelatase and cyclase in the conversion of protoporphyrin IX to protochlorophyllide. A presentation of recent studies carried out on phycobilin biosynthesis in *Cyanidium caldarium* is also included.

Then follows the B_{12} branch of tetrapyrroles with one presentation on coenzyme F_{430} (biosynthesis and regulation of biosynthesis) and one on haem d_1 (synthesis, synthesis and biochemical properties of haem d_1 analogues). Three chapters are devoted to the recent developments in the genetics and enzymology of B_{12} biosynthesis in *Pseudomonas denitrificans* and *Salmonella typhimurium*, and the discovery of new intermediates along the pathway to the corrin macrocycle. In the last presentation, throughout a brief summary of the synthetic work carried out at the ETH after the non-enzymic synthesis of vitamin B_{12}, A. Eschenmoser proposes his personal view regarding the way mechanistic hypotheses, model studies and experimental research in B_{12} biosynthesis have mutually influenced.

The book is well balanced and clearly organised. It is a good source of important references. The reader will appreciate the consistency of presentation and the very high quality of illustrations. The presence of a subject index is also warmly acknowledged. The book is particularly indispensable for scientists interested in biosynthetic questions not simply for the valuable information that the reader can find in a concise form, but also for the discussions following each talk. Particularly the personal view experts in this field have on several questions (such as why porphyrinogens of type III ? or the role of biomimetic models on the course of research) are very exciting. One can regret, however, that this meeting was held a little too early during a still very prolific period for research on vitamin B_{12} biosynthesis, thus precluding any discussion of the ring contraction mechanism based on intermediates which have been identified since that time.

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Phase-Transfer Catalysis – Fundamentals, Applications and Industrial Perspectives. By C. M. Starks, C. L. Liotta and M. Halpern. Chapman & Hall: New York, 1994, 668 pp., hardback £ 69. ISBN 0-412-04071-9.

After Dehmlow's and Dehmlow's "Phase Transfer Catalysis" published in 1993, the second important voluminous book, written by three well-known chemists, appeared. Apart from the inevitable overlappings, both books are written in their own styles, emphasize various issues, cover

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them with different scope and depth, and are thus competitive to a small extent, only.

Nearly half of the reviewed volume deals with basic concepts, fundamentals of PTC and PT catalysts. Explanation of the phenomenon and such important factors like anion transfer and activation, liquid-liquid and solid-liquid variants of PTC, soluble and insoluble catalysts, are exhaustively described. This is followed by a very useful chapter which helps to choose correct conditions if PTC process is designed for application in laboratory and/or industry.

The second half of the book covers the application of PTC to organic synthesis. Particular types of reactions, including displacement reactions with simple anions, reactions carried out in the presence of strong bases, polymerization and polymer modification, oxidations, reductions, syntheses of chiral compounds, and reactions cocatalyzed by transition metal derivatives, are described. Chapters on the use of PTC in analytical chemistry, and on evaluation of PTC in present and future industrial processes, bring the book to an end.

The first half of the book is written very clearly, introduces the Reader to the problems step by step, and is equally suitable for the chemists who are not very aquainted with PTC as well as for the "veterans", whom the book supplies with new data, and helps to systematize the knowledge. I have to stress a very thorough and critical description of mechanisms of PTC, largerly based on the consideration of kinetic data.

On the other hand, I am less enthusiastic about this part of the book which deals with the application of PTC to organic synthesis and is based on arbitrarily selected literature. First of all, the papers which significantly contribute to the subject, or those which describe procedures at least equally efficient as cited, are omitted [e.g. papers by M. Makosza and coll., J. Org. Chem., **50**, 3722 (1985) and M. Fedorynski, Synthesis 783 (1977), should be cited in Chapters 10.I and 8.F.3, respectively]. Some parts are written rather schematically, by simple counting of known reactions (e.g. Polymer Synthesis, Chapter 9.B), or it is hardly to recognize which conditions are favourable for the reaction under consideration (e.g. C-Alkylation, Ketones, Chapter 8.A.2).

Also, I have found errors in the text, both essential (e.g. ethyl malonate cannot be called β-diketone, p.385; data in ref.224 on p.425 were proved to be incorrect; reaction of cyclopentadiene given on pp.428 and 429 is not PTC; vinyl acetate and imines are not Michael acceptors, p.430), in chemical structures (e.g. on pp.98, 137, 397, 509, 604, 617), in references (e.g. ref.39 in Table 4-9 on p.138 is incorrect; on pp.443 and 618 the same references are cited twice: 58 and 60, 2 and 9, respectively; in Chapter 12 are cited references 40, 41 and 50 which do not exist), and in spelling. All these mistakes are too numerous to be specified here.

The artistic impression of this book is not very strong. Wide variety of formats are used for the presentation of reaction schemes, tables and diagrams, chemical structures are leveled (ie. CH2Cl2 instead of CH_2Cl_2 , Fig.8-4, p.388). Next edition requires careful proof-reading, indeed.

Finally, I must emphasize that this is the first book which goes into a matter of industrial applications of PTC. That is why such topics like insoluble catalysts, regeneration of catalysts or designing of industrial PTC reactions, are comprehensively treated.

In the light of the reasons given above, I think the reviewed book will prove to be useful for both university and industrial chemists.

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