

BOOK REVIEWS

Hemoglobin and Oxygen Binding

CHIEN HO, EDITOR

Elsevier Biomedical, Amsterdam, 1982, 486 pp., \$86.50

This is the first of two volumes that cover a symposium held at the Airlie House, Virginia, on April 13–17, 1980. The second volume is entitled "Electron Transport and Oxygen Utilization." The meeting was held in honor of Nobel Laureate Max F. Perutz, who was retiring as Director of the MRC Laboratory of Molecular Biology in Cambridge, England. The symposium was truly one of the highest caliber, bringing together biochemists, biophysicists, chemists, crystallographers, physicists, and theoreticians from around the world. The list of contributors reads like a Who's Who list for hemoglobin and heme protein research. The conference had a unique feature of having introductory plenary lectures before each of seven poster sessions, where the majority of the work was presented. The poster sessions were followed by a lengthy discussion period. The three session topics covered in this volume are: Heme-Oxygen Bonding, Origins of Cooperative Oxygen Binding by Hemoglobin, and Dynamics of Oxygen Binding.

The book has more than adequately covered the science and the flavor of the meeting. The discussions were well-documented and accurately transcribed. The history of the birth of protein crystallography and molecular biology are eloquently outlined in the after dinner program by Vernon M. Ingram, Dorothy Crowfoot Hodgkin, Jeffries Wyman, and Max Perutz. The plenary lectures and poster presentations appear in the volume as well-manicured papers with high quality reproductions of figures, structures, and stereo diagrams.

If one starts with the first paper by Martin Karplus, and progresses systematically through each session to the last paper by Antonini, Brunori, and colleagues, one cannot help but be amazed at the amount of study that has taken place in trying to explain and understand the molecular, kinetic, thermodynamic, and steric properties of one protein, hemoglobin. Jeffries Wyman referred to hemoglobin as "hemoglobina for it brings out all her feminine and unpredictable and interesting qualities."

The only major negative criticism that I could make about the book is that it has taken too long in being published. Much has happened since that meeting. Hemoglobin is still a prize to be studied and fully understood, and continues to have ever changing battlefronts. The prophetic after dinner remarks by Vernon Ingram have come true. He stated "and I would urge people to have a Perutz Symposium every couple of years, to take advantage of the many scientific things that Max is going to do in the future. Although he is supposed to be retiring, we all know perfectly well that he is going to continue pouring out some really important work which could form a focus for a future conference on molecular biology." Max has done just that. It was at this retirement meeting for Max Perutz that this reviewer approached him about using hemoglobin as a model for drug design studies. Max said "Sure, come to Cambridge." The last four years of intense work by Max and colleagues have opened up another field of study for hemoglobin, that being in the area of molecular pharmacology of drug action and drug design.

Since the meeting we have also seen significant advances in the techniques used to measure the kinetic properties of hemoglobin in solution and in whole cells and some interesting properties of new and old hemoglobin mutants have appeared in the literature. We will need a new symposium as Vernon Ingram suggested, and a new book soon to update this one. As for this volume, anyone or group interested in hemoglobin research would do well to procure a copy for their shelves.

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Biotechnology of Industrial Antibiotics

E. J. VANDAMME, EDITOR

Dekker, NY, 1984, 808 pp., \$105

This book aims, to quote its editor, "to fill . . . a gap in industrial fermentation." It promises to accomplish this by providing up-to-date information on the chemistry, biosynthesis, microbiology, fermentation, and mode of action of industrial antibiotics. *Traditional* biotechnology is mostly presented, whereas recombinant DNA technology is covered in the short last chapter. This may disappoint some readers, since biotechnology has lately come to mean enzyme and genetic engineering.

The 29 chapters of the book are grouped into six sections: an introductory one, four each dealing with antibacterial, antifungal, antiviral/antitumor, and agricultural antibiotics, and a concluding section on future trends.

In the opening chapter, Vandamme summarizes the status of antibiotic production. Unfortunately, the chapter is only a little more than a compilation of antibiotics, and one not thoroughly updated or accurate enough to be used as a handy reference. For example, teichomycin and nikkomycin are not included in the antibiotic list. Only amphotericin and nystatin from the several polyenes listed as medically important are in fact so.

The second chapter is an overview on biological aspects of antibiotic production. It is less ambitious but more successful. The well-treaded teleology of secondary metabolism is covered here in a clear and succinct fashion. Minor shortcomings are the absence of any references to Bu'Lock in the discussion of trophophase and idiophase, and of Zahner's speculation on the emergence of secondary metabolism as sort of a playground for evolution (p. 34).

The introduction on penicillins in the third chapter is somewhat parochial. More importantly, the explanation of the mode of action of penicillins is confusing. Although it is generally agreed that penicillin acts at the level of cell-wall biosynthesis, this is not clearly stated. Instead, a pot-pourri of data is given, some more relevant than others, including a minority view that penicillin acts on phospholipids. The discussion is further confused by typographical errors, such as ATPase instead of TPase, and an abbreviation for transpeptidase that is used without definition (p. 111). In fairness though, the main focus of this and the following chapter is on fermentation.

The chapter on cephalosporin C is written more as a research paper and covers work done mostly by the authors. The editor should have insisted that it conform in style to the other chapters.

The applications of enzyme technology are highlighted in the fifth chapter. Owing to the relatively simple mechanistic requirements (hydrolysis or peptide synthesis) of semisynthetic penicillins and cephalosporins, these compounds have enjoyed the greatest application of this technology. A discussion of the enzymatic syntheses of amino acids used in these semisynthetic antibiotics is also included.

The rest of the chapters, except for the last two, are written in the format: properties—biosynthesis—fermentation. Coverage is more or less complete in the various chapters, with emphasis reflecting a particular author's competence in the different disciplines involved. Fermentation is treated in great detail in some chapters, with some overlap in the basics.

The last two chapters, on immobilized cells and microbial genetics, might have been better integrated in the appropriate antibiotics chapters, they spotlight the newer technologies that might be applied to antibiotics preparation. A number of interesting things have been done, but the achievements remain miniscule compared to what has been achieved in fermentation with conventional genetics. Thus great opportunities lie ahead in the application of recombinant DNA technology to the antibiotics area.

The groupings in the descriptive chapters on antibiotics have been handled somewhat unevenly. There are chapters on tetracyclines, aminoglycosides, and macrolides, but instead of anthracyclines we have daunorubicin/adriamycin and instead of polyether antibiotics, salinomycin. Also, there should have been a chapter on the industrially important glycopeptide antibiotics—vancomycin, teichomycin, and ristocetin. The chapter on blasticidin S could have been deleted, since this compound is not industrially important.

Finally, some comments on the editing. There are many instances where data are reproduced from the literature in their entirety where just a reference might have sufficed. In a few cases specifics are cited twice—in the text and in tables. Thus, there could have been better shortening of chapters, tightening of text, deleting of overlapping sections, cross-referencing (and including more references beyond 1980), and uniformity of style. In addition, a couple of chapters could have benefited greatly from outside reviewers.

Despite these shortcomings, the book contains a great deal of useful information for microbiologists, biochemists, and fermentation scientists. It thus fills a gap in industrial fermentation, for the moment, until a better book on the subject is published.

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