BOOKS RECEIVED

Continuous culture in microbial physiology and ecology

By H. VELDKAMP. 1976. *Patterns of progress* (Microbiology) series. Shildon, Co. Durham: Meadowfield Press. Pp. vii and 68. £2.80.

Over the past few years Meadowfield Press has undertaken a programme of publishing short, authoritative reviews of topics in microbiology, the selection of which, so far, has been interesting and thoughtful. Thus, students and professional microbiologists are steadily being provided with a series of extended essays on topics often neglected in the textbook literature or provided in a much less digestible form in the review periodicals. One of the most recent additions to this "Patterns of Progress" series deals with continuous culture and in Professor Hans Veldkamp a lucid and stimulating author has been recruited. The intention has not been to make a comprehensive discussion of continuous culture theory and application, but to introduce the reader to the basic elements—including some helpful practical hints—and highlight the value of the technique in studying the interaction of micro-organisms with their environment.

The book is organised into five chapters, the first of which introduces the reader to continuous culture and prepares him for what is to follow: population kinetics, transformation of energy, responses to a changing environment, and morphology and cell composition. Professor Veldkamp leads the reader into these subjects by succinctly discussing a careful selection of key experiments in microbial physiology and relating the findings to ecology. This approach has worked well. The appropriateness of continuous culture methods for analysing ecological problems is made abundantly clear, and equally important is Professor Veldkamp's caution that continuous culture must only be viewed as an investigative tool in this context; it does not mimic the natural environment.

The 68 pages of this book can be perused very quickly but they are worth, however, much more careful reading, reflecting as they do the author's considerable experience of and contribution to the subject. The text is well referenced so that the reader can gain ready access to the primary literature. One can envisage the book being particularly useful for undergraduate teaching and for all those who require a sound introduction to continuous culture.

A. T. BULL

Continuous culture 6: applications and new fields

Edited by A. C. R. DEAN, D. C. ELLWOOD, G. C. T. EVANS and J. MELLING. 1977. Chichester, Sussex: Ellis Horwood Ltd. Pp. xii and 346. £15.50.

"Continuous culture 6" picks up the story where the "Patterns of Progress" primer on continuous culture by H. Veldkamp leaves off and considers in detail the application of continuous culture philosophy and practice to industrial processes and developing areas of microbiological research. This volume records the plenary lectures presented at the 6th International Continuous Culture Symposium convened in Oxford in July 1975. Since 1958, when a symposium devoted to continuous culture was held in Prague under the aegis of the Czechoslovak Academy of Science, this series of specialist international meetings has played an invaluable role in nurturing the development and proselytising the advantages and acceptance of the technique in microbiology. It is interesting to thumb through the pages of the previous symposia and note the changes that have occurred during the intervening 17 years. One of the most striking features is the widespread adoption of continuous culture methods for research into the whole spectrum of microbiological problems be they physiological, metabolic, genetic, ecological or technological in essence. No longer, it seems, is continuous culture considered a plaything of an enthusiastic few; rather it is an experimental

approach of such fundamental importance that no microbiologist can afford to neglect its advantages.

So to the Proceedings of the 6th Symposium. The book contains 25 contributions, many of which are orientated towards industrial applications; it also indicates to the microbiological world at large the other areas in which exploitation of the technique is proving advantageous. Seven chapters are devoted to aspects of single-cell protein (SCP) production and cover such topics as the use of waste material as fermentation substrates and process design based on mixed bacterial cultures. A particularly stimulating analysis of carbohydrate versus hydrocarbon feedstocks for SCP production is contributed by D. G. MacLennan who develops some compelling arguments for the use of the former based on the criteria of economics and product acceptability. Other matters covered in this applied section are enzyme production and continuous brewing processes. A few chapters are devoted to more fundamental questions of metabolic regulation in micro-organisms, again emphasising the benefits that follow from the use of continuous culture, while a novel feature of this volume is the discussion of continuous culture in the context of microbiology teaching. The final sequence of chapters is concerned with the interaction of micro-organisms and the environment and will be of major interest to microbial ecologists. The topics considered here are diverse and fascinating and include modelling of oral and river populations in chemostats, the utilisation of mixed homologous substrates, and analyses of mixed cultures.

These symposia have also been of immense value in the continuing development and extension of continuous culture theory, and "Continuous Culture 6" is no exception. Two chapters are particularly noteworthy in this context. In the first, Denis Herbert, taking his cue from the design of SCP fermentations, presents an excellent discussion of the stoichiometry of microbial growth. This essay is essential reading not only for those engaged in SCP production but for all microbiologists concerned with basic problems in growth physiology. In a similar way the contribution from Tempest and Neijssel on microbial adaptation to low nutrient environments contains much conceptually important material. The volume concludes with the editors, as is their wont, interpolating a few well-timed ex-cathedra statements on matters such as relative growth rates.

This book is an essential library acquisition and many microbiologists will wish to have their personal copy. Unfortunately its price is disappointingly high, particularly in view of the off-set litho production used and, whereas students could be cajoled into purchasing previous volumes in the series, most teachers will be reluctant to make the attempt with this one. As a final point one is left with the question of how much longer these Continuous Culture Symposia might or should be continued as separate specialist meetings. Has continuous culture eventually arrived on the scene and is it now fully integrated into microbiology as a whole? The contents of "Continuous Culture 6" suggest that we are rapidly approaching a state of affairs in which the answer is in the affirmative.

A. T. BULL

Immunology of the gut

Edited by RUTH PORTER AND JULIA KNIGHT. 1977. Ciba Foundation Symposium 46 (New Series). Amsterdam, Oxford and New York: Elsevier Excerpta Medica. Pp. viii and 376. £18.90.

This is a splendid volume which takes the subject of gastro-intestinal immunology out of the world of near folk-lore to the status of a respectable science. Furthermore, at a time when readers have been inundated with new books on immunology, it achieves the almost miraculous task of saying something novel and timely on an immunological topic. The best parts of the book are those that review the basic immunology of the gut. These include the contributions by Brandtzaeg and Cebra concerning the secretory IgA system and the chapter by Gowans and his colleagues on the physiology of IgA-producing cells. Particularly difficult problems to resolve have been the mechanisms that limit the absorption of immunogenic material, the extent to which absorption occurs in the normal gut and the