Vector–parasite

Invertebrate Immunity: Mechanisms of Invertebrate Vector–Parasite Relations. Edited by Karl Maramorosch and Robert E. Schope. Pp. x+365. (Academic: New York and London, June 1975.) $16.50; £7.90.

THIS is a collection of 24 papers by 29 authors given at a 'workshop' held in Bethesda, Maryland, in April 1974. It does not provide a complete or a balanced account of the present state of invertebrate immunology, but some of the contributions are useful as quarries for information or because they attempt a judicious review of particular topics.

Seven papers are grouped under the heading "Invertebrate Gut as a Barrier to Invading Parasites", an excellent subject, worthy of fuller discussion than it gets. A preliminary account of the midgut epithelium loses its way among electron micrographs of cell junctions, but T. C. Orihel shows how the peritrophic membrane of Diptera can limit infection by microfilariae and trypanosomes. All the other papers are concerned with viruses, particularly with factors affecting virus infection of the gut wall of vectors, principally insects. There is valuable material here for the specialist, but some of it is difficult to extract from the language. A surprising gap is the absence of any account of the fate of ingested bacteria.

"Analysis of Invertebrate Immunity" is not a appropriate heading for the next seven papers, some of which contain much that need not have been said again. An admirable contribution is that of R. S. Anderson, who reviews biochemical and other characteristics of phagocytosis by invertebrate cells *in vitro* and compares them with vertebrate systems. A. R. Barr discusses evidence for the genetical control of invertebrate (mainly mosquito) immunity to microfilariae and plasmodia.

Part III, comprising five papers on components of the haemolymph, includes a useful review by M. R. Tripp on humoral factors in molluscan immunity, and another by G. R. Wyatt on some biochemical features of insect and arachnid blood. J. S. Chadwick gives a detailed account of changes in the haemolymph related to infection or to induced immunity.

Another odd heading, "Vector Destruction", groups the last five papers. They include a largely pictorial account of encapsulation and melanisation in insects by A. J. Nappi, and a discussion by L. M. Riddiford of some of the available evidence about hormones of insects in relation to their parasites.

Like most publications of its sort, this book is very uneven. Much that is important and useful is brought together in some of the contributions but the volume contains a lot of dead wood. Even specialists will have to use it circumspectly. The strong bias towards insects and molluscs as hosts and towards viruses, microfilariae and protozoa as parasites sorts ill with the claim that: "This book provides the first modern, integrated presentation of phenomena and mechanisms pertaining to immunity in invertebrate animals". All three adjectives can be challenged.

George Salt

Catalytic bodies

The Mathematical Theory of Diffusion and Reaction in Permeable Catalysts. By Rutherford Aris. Volume 1: *The Theory of the Steady state.* Pp. xvi+444. £13 net. Volume 2: *Questions of Uniqueness, Stability and Transient Behaviour.* Pp. xiv+217. (Clarendon: Oxford; Oxford University: London, 1975.) £8 net.

IN spite of the steady progress that is being made in improving the performance of catalysts, the problem of predicting the behaviour of a permeable catalyst, in which diffusion plays a role, remains an unpredictable and sometimes costly occupation. It is timely, therefore, that an excellent text on the mathematical theory, and its applications in chemical engineering and biology, should appear. Volume 1 deals comprehensively with the steady state behaviour of a catalytic body. Volume 2 establishes the links between uniqueness, stability and transient behaviour of reacting systems in which diffusion is involved.

Chapters 1 and 2 lay the physicochemical basis of the theory and derive the general equations of diffusion and reaction, assuming the catalytic body to be a homogeneous continuum. This assumption has been called into doubt recently and there is a need for further experimental work to test the mathematical models.

Chapter 3 considers the single reaction in an isothermal catalytic body. There are two particularly interesting sections concerning the development of approximate solutions based on singular perturbation analysis and variational methods. Chapter 4 extends the study to non-isothermal behaviour. After a brief survey of numerical methods, the main theme, which deals with the complex interactions of diffusion and reaction, unfolds beautifully and we are left quite breathless with the staggering prospect of possibly an infinite multiplicity of the steady state, although thankfully the conditions are rather extreme in practice. The concluding section on asymmetrical solutions is also potentially very important.

Chapter 5 is perhaps more low key but nevertheless focuses on the important area of multiple reactions. There is certainly much scope for ingenuity here in formulating non-uniform catalysts to improve yield. Chapter 6 deals with questions of existence and uniqueness of the steady state, followed by an outstanding discussion on stability in which important theoretical results are presented. The concluding chapter presents several fascinating aspects of the transient behaviour, such as deliberate periodic operation to improve selectivity, catalyst decay and so on.

The main objective of this book, which is to bring together many results on the theory of diffusion and reaction, is achieved with a style and grace which we have all come to recognise as pure Rutherford Aris. These two volumes should certainly be on the bookshelf of any aspiring chemical reaction engineer. His predictions may still be wayward but now at least he has the doubtful consolation of a hundred and one possible explanations.

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