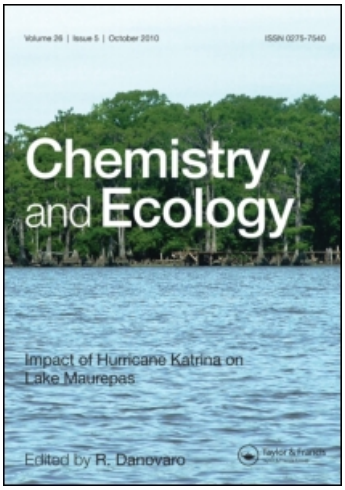

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Book Reviews

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Book Reviews

METHODS FOR ASSESSING THE EFFECTS OF MIXTURES OF CHEMICALS—Report of IPCS Joint Symposium 6, SCOPE 30 and SGOMSEC 3
edited by: V. B. Vouk, G. C. Butler, A. C. Upton, D. V. Parke, S. C. Asher
published by: J. Wiley and Sons, Chichester
price; £99.00
ISBN 0 471 91123 2

This is the published report of an international workshop held at the University of Surrey, Guildford, August 15–19, 1983. The objective of the workshop was to facilitate the exchange of ideas on methodological problems of chemical safety assessment.The book comprises two parts: the first (169 pages) is the joint report of the workshop with a text covering the environmental transfer of chemicals and mixtures, indicators of human exposure, including metabolism and biochemical mechanisms, testing of complex mixtures, and assessment of effects on non-human systems. The second part (701 pages) contains 41 papers contributed by participants of the workshop, covering a wide diversity of style, topics, and views; inevitably their standard is also diverse.

The book thus allows the reader to encompass the principles, the accepted methods of observation and assessment, and the overall conclusions, as conceived by a distinguished group of scientists, without too great a labour; the extensive supporting material can be mined by those seeking greater detail, complexity and range of examples. Both parts are referenced.

Inevitably the focus of the analysis lies with human toxicology and work-place exposures, partly since this is "the proper study of mankind", but also because so much more detailed and systematic analytical study has been devoted to the effects of occupational exposure of man, and to the mechanisms by which effects become

manifest. Study of other organisms and their communities, especially in the terrestrial environment, is much less well developed, and conclusions hard to derive. The point is made that estimations of exposure to non-human biota are not appreciably different in principle, and that the same limitations apply, but that the heterogeneity of species and their environments is greater, making risk assessment and other interpretations much more difficult. The other major distinction is, of course, that community or multi-species interactions at ecosystem level may be of overwhelming importance, even for very low exposures—this is recognized, but there is little development of the theme.

It has to be admitted, however, that there is much to be learned from the epidemiology of human exposures that might be applied to non-human communities. In man, disease clusters reflect the complex interplay of more than a single causative agent acting on a single, specific target, and the quantitative attribution of "cause" to each of the factors implicated can be analysed, but may be more conceptual than real in the current state of knowledge and scarcely ready for extrapolation to other species.

One of the strengths of this volume is the way in which it exemplifies the chain of analysis from observations on environmental samples, target organism tissue or body fluid samples, tests on function at various levels of organisation and by epidemiological analysis through to techniques of risk assessment. It is evident, nonetheless, that the link between the standard bioassay exposures and the assessment or estimation of environmental damage or risk is tenuous, sometimes even misleading. A strong need can be seen for the development of suitable, environmentally realistic, methods for the toxicological evaluation of chemicals, both singly and in combination with environmental factors, and as mixtures—these methods need to include short-term ("acute"), and episodic as well as longer-term exposures to low concentrations of chemical agents, possibly over whole life-times. Much work remains to be done, also, to explore the diversity of dose-response relationships—the commonly adopted linear function may appear to be conservative or "fail-safe", yet is often demonstrably unrealistic; it may prove to be unnecessarily limiting as a regulatory tool.

The book also touches on the applicability of models as an alternative to test systems, such as bioassay exposures on organisms

or microcosms, as a method of risk assessment. At present there are no suitable models for the assessment of mixtures of chemicals although some agencies empirically apply an additive or similar procedure. As the text states, a model ideally has generality, realism and precision, yet these goals are often mutually incompatible, even if only that reality has to be sacrificed to the need to simplify. Nonetheless, there is value in developing models which use data from laboratory exposures as a basis for validation by field observations or experiments.

Overall, this is a stimulating and well-produced book which attempts to bridge the gap between the epidemiologist and human toxicologist and "environmental scientists". Of course it does not succeed on a grand scale—the contributed papers are very much individual reports and do not yield a coherent, consistent or integrated picture. No doubt the great hope was to produce a definitive work and the book fails in this respect, but it is a useful starting point for future assessments. Perhaps greater success could be achieved by selecting for more intensive examination a more limited set of chemical agents where there is human as well a ecological interest.

Individuals will find it hard to justify the cost of the volume, but libraries should provide it for detailed study. The decision to publish both the report and the supporting papers as a single volume is to be applauded—the report alone would be unconvincing without documentation, and the individual papers are too diverse to be published in a single journal and would be difficult to access if scattered. The general standard of typographical presentation is excellent, and errors are few. It is a pity, but probably inevitable, that it takes 4 years for such a work to become freely available.

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1 June 1987

PHEROMONES OF SOCIAL BEES, by John B. Free, London: Chapman & Hall 1987. £17.50

As the role of chemical stimuli in moulding the behaviour of insects is increasingly appreciated, the manipulation of chemical signals to reduce pest damage becomes an increasingly attractive prospect.

Moth sex pheromones were among the first components of the insect chemical language to be interpreted and they still attract the lion's share of research. This book explores the pheromonal repertoire of bees, particularly honeybees, and offers a perspective refreshingly different from the usual moth-centred view. Many different messages are conveyed by pheromones in the intimate darkness of the honeybees' hive and some of their complexity is revealed by this review. Honeybee pheromones are multi-component mixtures, in which the several individual components may elicit different responses. Pheromones from more than one gland may be released together. The value of experimental results depends critically on the design of bioassays appropriate to the behavioural context. One of the great strengths of the author's own work is his ability to design simple and elegant bioassays that give clearcut answers to relevant questions.

The book focuses on the honey bee *Apis mellifera* on which most work has been done, but also mentions other species of *Apis* and bumblebees and stingless bees. It reviews findings on the origin, composition, and behavioural and physiological effects of honeybee pheromones, giving attention to bioassay methodology and to the ecological significance of the responses. It highlights uncertainties and areas where further research is needed, and lists aspects of honeybee biology in which pheromones have not yet been implicated but seem likely to be involved. Each chapter ends with a section dealing with beekeeping applications, showing how understanding of the role of pheromones is, or could be, used to manipulate bee behaviour to improve the performance of hives in honey production and in the pollination of crops. Synthetic Nasonov pheromone is already in commercial production as a lure that encourages swarms to occupy hives. Many other applications are suggested. The decrease in responsiveness to a pheromone after long exposure to it is exploited in the use of alarm pheromones in the hive to reduce agressiveness, but may complicate other applications of pheromones. The manipulation of honeybee pheromonal responses offers a much wider range of possibilities than those conventionally associated with the use of moth sex pheromones—trapping or prevention of mating.

The author succeeds in integrating a substantial body of research, much of it his own, to produce an attractive and readable book

which is well illustrated with his own excellent photographs. This book draws together for the first time work on the pheromones of honeybees and other social bees. In doing so it provides a comprehensive picture of an impressive research effort, and provides both a platform for viewing what has already been achieved and a launching pad for further research and development. As a compendium of research already done and a stimulus for future advances in the understanding and utilisation of pheromones, this book should be on the shelves of those involved with beekeeping and its development or with bee behaviour; but its interest will extend beyond those concerned only with bees. Insights about the operation of pheromone systems in general will emerge from this synthesis. As an example illustrating the complex nature and role of chemical communication in the biology of one well studied group, it will also interest insect pheromone biologists and general insect ecologists.

SARAH A. CORBET

THE CONSERVATION OF ECOSYSTEMS AND SPECIES, by Gareth E. Jones, Croom Helm (1987), ISBN 0-7099-1463-6, 277 pp. £27.50 hbk; pbk—not available

This is one of the very best books on conservation I've ever seen. A particular strength is the way in which Jones approaches the subject of conservation from so many different angles. Anyone involved with conservation will know some of what is in this book but few will know half as much as is contained here. Insights and approaches from geography, land economy and other disciplines are used as well as from ecology and other branches of biology. A short chapter on the "Development of the Conservation Ethic" introduces the notion of 'Environmental Impact Assessment' (EIA) about which Jones subsequently enthuses. EIA is a collection of aims, objectives and techniques which together allow the effects of a proposed anthropogenic action on the biosphere to be evaluated *before* the action has formally taken place.

Other strengths of this readable and well-written book are the cosmopolitan nature of the examples chosen, the breadth and

comprehensiveness of the references, which are up-to-date, and the pragmatic chapters on "Conservation and Planning" and "Conservation, Ideology and Politics" which, *inter alia*, consider in detail economic justifications for conservation.

It is true that on reading any book on conservation one feels a little like someone in a priceless library perusing a learned volume on book preservation while huge chunks of the library around one are simultaneously being wantonly destroyed. Nevertheless, Jones' book is a valuable work which should be consulted by anyone working in environmental conservation and read by many undergraduates, politicians and business people.

Having waxed enthusiastic, it is disappointing to have to relate that the book is very unattractively produced. The type appears to have been reproduced from a wordprocessor rather than being printed and there are no photographs. These features might have been excusable if a low-cost volume had resulted, but at £27.50, few individuals can be expected to purchase it, which is a pity.

MICHAEL J. REISS