

its weak points, it presents reviews on virtually all aspects of nuclear structure and function research. The fact that the material that appears in these three volumes is normally scattered through a variety of sources argues persuasively for the value of the work.

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## Chemical Communication

**Pheromones.** MARTIN C. BIRCH, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. xii, 496 pp., illus. \$42.30. *Frontiers of Biology*, vol. 32.

In 1959, P. Karlson and M. Lüscher proposed the new term "pheromone" to replace and redefine the rather wide concept "ektohormone" of A. Bethe (1932). In their definition "Pheromones are substances which are secreted to the outside by an individual and are received by a second individual of the same species in which they release a specific reaction, for example, a definite behavior or developmental process." Some later authors found the term etymologically incorrect or too narrow, but on the whole it was accepted, not least because research on these substances was starting to flourish on a scale unknown a few years before. The main driving force behind pheromone research in insects was without doubt the expectation that these miraculously effective secretions would be a panacea to overcome the silent-spring effect of an often crude use of insecticides. The other animal groups in which pheromones have been intensively studied are the rodents, some primates, and a few other mammals. Here, pheromones have been found to regulate social life and reproduction.

The present state of pheromone biology is well demonstrated in this book: With insects we know comparatively many pheromones chemically but nearly nothing of their biosynthesis, have some information on the receptor mechanism, are ignorant of the central information processing, and know little of the details of the behavioral effects. With the mammals we know something of the behavior, very little of the pheromone composition, and nearly nothing of the biosynthesis, receptive mechanism, and central processing. Pheromone studies of other animal groups

are few in spite of the reasonable assumption that most animals use the very basic means of chemical communication by pheromones.

The aim of Birch and his 28 co-authors is to present our knowledge of pheromone biology, which has not been well covered in some of the recent books and reviews that have emphasized the chemistry of pheromones. In section 1 of the book, 12 chapters deal with insect pheromone systems, from gland structure and pheromone production to the still-confusing multitude of pheromones and pheromone effects in social insects such as the honeybee. Section 2 treats the vertebrates. A chapter on fright and alarm pheromone responses in fish and amphibians is followed by four chapters on the rodents, one on the primates, and one on the "likelihood of human pheromones" (a reprint of A. Comfort's challenging and stimulating essay first published in *Nature* in 1971). The third and final section, Pheromones in Manipulation of Populations, is a concise treatment of problems of the use of pheromones in the control of agricultural and forest pests. Except in some special cases, the chances of effectively suppressing a pest population by the use of pheromones alone are dim, but the probability of success becomes much greater when pheromones are used as one of several factors in an integrated control program. On the other hand, survey of the development of a pest population, and thus proper timing of a necessary minimum dose of an insecticide, has already been found to be possible.

Birch and his colleagues have written a very useful book. The only major omission is a much-needed overview of the many known or suggested pheromone effects in organisms other than insects and vertebrates, beginning with bacteria, algae, and plant spermatozooids. For a multiauthor book, there is surprisingly little overlap or redundancy. Any investigator who deals with the pheromones will without doubt welcome this book, for it fills a gap in the literature. Pest control agents and perhaps some narrow-minded scientists who for one reason or another press prematurely for a quick and simple biological recipe against pests should try to understand its message: signal production and signal processing in biological systems involve a number of functions. In parallel to biochemical and biophysical research, an analysis of central processing and the details of

behavior is badly needed. For this patient observations and quantitative and analytical studies must be performed. It seems to be difficult to make the trivial fact understood that the study of animal behavior is not a simple branch of biology. This is particularly true with respect to the mammals, whose pheromone reactions are by far less uniform than those in many insects.

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## Polymer Chemistry

**Kinetics and Mechanisms of Polymerization Reactions.** Applications of Physicochemical Principles. P. E. M. ALLEN and C. R. PATRICK. Ellis Horwood, Chichester, England, and Halsted (Wiley), New York, 1974. xvi, 596 pp., illus. \$43.50. Ellis Horwood Series in Physical Chemistry.

The title of this book has already been used, in one form or another, for a fairly large number of books dealing with polymerization chemistry, and it may therefore come as a surprise to the reader to find that this is not "just another book" on this topic. The subtitle more aptly characterizes the book, which is an advanced and sophisticated physicochemical treatment of polymerization reactions. It is apparently intended for the specialist. In this respect, it is almost unique, the only predecessor that comes to mind being Flory's well-known earlier treatise.

The special character of this book is at once apparent from the way in which it is organized. The first two chapters do not deal with polymerization reactions as such, but they review the general physicochemical principles that govern reactions in the gaseous and liquid states, including some references to their applications to macromolecules. The chapters cover such topics as the thermodynamic and kinetic approaches, diffusion, equilibria, and reaction rate theories. They occupy about one-third of the book.

The remaining five chapters deal specifically with polymerization reactions, including such topics as the nature of these chain reactions, the thermodynamics of chain reactions, reactivity theories, and kinetics. There is also a short chapter on the kinetics of polycondensation reactions. Both free radical and ionic mechanisms are treated