

detector and small detector — are explored in great detail, though if I have a criticism of the book, it is here: the authors are so familiar with the difference between these modes (Type 1 and Type 2 or confocal microscopy) that they have not, I think, realized that this distinction may not seem so important to newcomers.

That apart, the book covers all of the principal aspects of scanning optical microscopy: the many detector modes and special operating conditions, depth discrimination and depth of field, ultra-high resolution, practical details of the optical elements of the SOM, applications to semiconductors and some newer non-linear techniques. There is also a chapter on a scanning microscope which, ironically, mimics the fixed-beam instrument by furnishing the signals from the individual pixels almost simultaneously but which re-

tains the attractive features of the confocal arrangement.

This is the first book to be devoted entirely to the SOM and it is remarkably successful. A vast amount of material is presented very readably within its 200 or so pages, and practising microscopists — many of whom do not yet know what scanning, particularly scanning combined with electronic or computer image enhancement, has to offer them — will find it very helpful. The analysis of image formation will also be of some interest to students of the STEM, though the analogy between the two families of instruments is richer and more complex than is indicated here. □

P.W. Hawkes is Maître de Recherches at the Laboratoire d'Optique Electronique du CNRS, Toulouse.

Flying tonight

P.A. Racey

Bats: A Natural History.

By John E. Hill and James D. Smith.
*British Museum (Natural History)/
University of Texas Press: 1984. Pp. 243.
£15, \$24.95.*

The Lives of Bats.

By Wilfried Schober.
*Croom Helm/Arco: 1984. Pp. 200.
£13.95, \$24.95.*

The past decade has seen a burgeoning of research interest in the second largest order of mammals, the Chiroptera, or bats. Such research is now serviced by international conferences and symposia, as well as by several newsletters, one of which has recently evolved into a dedicated journal. There is a certain sense of urgency about current work, to discover more about these mammals as outstanding examples of evolutionary development and adaptation before they decline in numbers even further. Bats are under pressure throughout the world — the use of agricultural insecticides, loss of natural roosts in caves and deciduous trees, and more recently the increasing application of remedial timber treatments in houses used as roosts have all contributed to a drastic fall in populations.

Accompanying recent activity among scientists has been a similar rise in public enthusiasm for bats. So it is appropriate that two general books on the subject should now appear at the same time.

Hill and Smith's *Bats: A Natural History* contains a wealth of up-to-date information on the world's bats in a well-written and easily assimilated form. The publisher's blurb commends the book to both the amateur naturalist and the serious student of zoology. While the treatment somewhat varies in depth, my own feeling is that it will be particularly useful as an introductory account for professional

biologists as well as for students.

The book goes well beyond the natural history approach implied by the title, as the authors have taken every opportunity to include physiological information in their reviews of thermoregulation, reproduction, echolocation and flight. Surveys of food habits and feeding, and population ecology, are also included, together with a systematic treatment of all bats at the family level. Hill and Smith are both systematists, and in their essay on the origin and evolution of bats they put forward the controversial theory that the Megachiroptera and Microchiroptera are not closely related, and that wings and flight have developed independently in these two groups of flying mammals. A chapter on man and bats contains a fascinating section on folklore, superstitions and legends, and includes a great deal of hitherto unpublished material. By contrast the authors are at their least engaging when writing about form and function.

The text is illustrated with excellent line diagrams, although several of the photomontages are of poor quality and are not closely related to the text. But overall this is a very useful book, even if it lacks that unbridled enthusiasm for all aspects of bat biology and a concern about their plight that is so evident in Wilfried Schober's *The Lives of Bats*.

Schober is a neurobiologist who has studied bats all his professional life. His account of their general biology is as authoritative as it is readable, and is ideally suited to the increasing number of amateur bat enthusiasts looking for an introduction to the subject. It has been sympathetically translated from the original German by Sylvia Furness, and revised by Tony Hutson, and is well illustrated with colour and half-tone plates which Schober has collected from colleagues around the world. □

P.A. Racey is a Senior Lecturer in Zoology at the University of Aberdeen.

Molecular orbitals: into the age of computer graphics

Jeremy K. Burdett

A Pictorial Approach to Molecular Structure and Reactivity.

By Robert F. Hout Jr, William J. Pietro and Warren J. Hehre.
Wiley: 1984. Pp. 404. £46.20, \$99.95.

W.L. Jorgensen and L. Salem's classic work, *The Organic Chemist's Book of Orbitals*, was published by Academic Press in 1973. It is a mark of changing times that whereas that volume included only rather crude, wire-frame drawings of orbitals, the present one contains glossy, computer-generated, Daliesque visions of the molecular orbitals of simple systems.

Indeed this is quite an unusual book altogether. It is largely composed of photographs of orbitals, with a couple of dozen pages of supporting text. For those of us who construct molecular orbital diagrams by doodling on the back of envelopes, it is pleasing to see how the shapes of the orbitals we sketch really look, and that *ab initio* computations confirm the general results that we get from simple ideas. Some of the photographs in this enormous undertaking are somewhat murky, while others are very complicated and resemble a piece of small intestine. But overall the pictures are remarkably effective in depicting the shapes of orbitals as they really are. Surely the age of computer graphics has arrived!

For the chemist who has an understanding of how the level structures of these molecules arise, some interesting points arise in the book. The differences in the shapes of the orbitals of the isoelectronic sequence CH_3 , NH_3 , OH_3^+ and PH_3 , for example, are really very striking. The spectrum of chemical behaviour shown by these species is much easier to understand with the assistance of these pictures than with the information provided by a conventional energy-level diagram.

I have one main criticism of the book. Although there are indeed nuggets of wisdom in the text supporting the pictures, there is just not enough in the way of chemical comment. For example the orbitals of ferrocene (the *bête noire* of *ab initio* theorists) command six pages of pictures and a measly four lines of text. There is much more to be said of the chemistry associated with the pictures than the authors give us here. Although in this sense the book does not live up to its title, it is by no means an unworthy successor to Salem and Jorgensen. □

Jeremy K. Burdett is a Professor in the Department of Chemistry at the University of Chicago.