

reader were to gain the impression that AIDS research is pleasantly free from controversy.

A more subjective but critically presented review of similar completeness is provided by *AIDS 1991*. This is the latest volume in a now well established and popular series of annual reviews that form a supplement to the journal *AIDS*. It is certainly the route to take into the literature of any specific topic, whether it be basic molecular biology or more social topics such as the role of law in AIDS policy. For each of the five main topic areas chosen (virology; epidemiology; vaccines and immunology; clinical treatment; social, cultural and political aspects), chapters are contributed by many of the most respected workers and are united by an editorial overview. Each chapter reviews the primary literature in a readily accessible way, making further investigation easy. This is certainly the reference volume that will prove of greatest value to the researcher.

Even the most conscientious conference devotee is hard pressed to attend all the relevant, often concurrent, sessions — especially when the conference is in Florence. *AIDS 91 Summary* provides an opportunity for those who attended to compensate for areas they missed and the chance for those who were not at the conference to review the proceedings. For others just entering the field or realistic enough to admit that, much as they would like to follow many more areas in depth, time rarely permits them to do so, the volume provides a useful all-round summary, albeit on a fairly superficial and uncritical level. If interest is sparked and further depth required, however, it is reassuring to have on hand review editions such as *AIDS 1991*. Of course, it could be argued (especially by lovers of David Lodge's novels such as *Small World*) that these review volumes may provide hard-pressed grant-giving bodies with a persuasive argument for keeping eager conference goers at home, rather than allowing them to sample the splendours of cities such as Florence. To counter such an outrageous suggestion, it is important to point out that in Science, as in Art, it is infinitely more instructive to view Michelangelo's *David* at first-hand rather than to be forced to assess its merits second-hand from a guide book. □

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■ *Acquired Immune Deficiency Syndrome: Biological, Medical, Social, and Legal Issues* by Gerald J. Stine is a new overview volume that was received too late for inclusion in the above review. Aimed at health professionals, educators and university students, the book is published by Prentice Hall, price \$40.

## Love potions

David Crews

**Chemical Communication: The Language of Pheromones.** By William G. Agosta. W. H. Freeman: 1992. Pp. 179. £17.95, \$32.95.

LOVE is the best known pheromone language, with males or females, or both, producing compounds that signal their readiness to mate. The message can be exceptionally subtle. A change in a single chemical bond can nullify an otherwise aphrodisiac odour or a particular arrangement of atoms can keep two closely related individuals from mistakenly mating as they pass in the night. But the chemical senses communicate much more; pheromones can identify individuals, communicate danger, serve as navigational aids to animals and cells, signal the appropriate time to hatch or regulate development, impart where to live and when to aggregate, and even deceive.

A once popular distinction was that animals communicate by sights and sounds whereas cells communicate by chemicals. We know now that many animals can sometimes sense a few molecules of a particular odour produced by another individual and that these chemicals can dominate interactions and regulate physiology. In just 50 years, the study of pheromones has developed into one of the great success stories of biology. An enormous amount has been learned about the manufacture of pheromones, their physical structure and functional properties, as well as how pheromones are perceived and exert their actions. These advances have had a considerable effect on pest control, given us clues about bonding between mothers and infants, aided in fertility research and, of course, motivated the perfume industry. William Agosta neatly summarizes our understanding, capturing the excitement of pheromones without oversimplifying the complexity of this interdisciplinary field.

The chemical senses of humans have been assumed to be poorly developed, yet the recent discovery that adult humans possess a sensory structure known as the vomeronasal organ raises new questions about this generality. The rapid advances in this new field are due to its allure to organic chemists, physiologists, behaviourists, ecologists and, most recently, molecular biologists. Pheromone research is therefore not done by individuals so much as by teams of scientists often representing a mixture of talents as complex as the ingredients of the compounds they study.

Blending the information in an enjoy-

able synthesis, Agosta introduces the reader to this fascinating field of inquiry. Work began, and continues to focus, on glandular products. But some pheromones saturate the skin and have no specific glandular source. Here J.-M. Jallon has recently shown how the sexual mosaics produced for molecular genetics can be used to locate the source of cuticular pheromones in fruitflies.

Another fascinating problem is the relation between pheromones and hormones. One school of thought holds that pheromones served initially as communicators between single-celled organisms and, with the evolution of multicellularity, became hormones. Others have argued persuasively that pheromones were hormones first and only later assumed secondary functions as communicators between individuals because they accurately reflected specific physiological states. Both have probably occurred. An example is provided by the elegant work of N. Stacey with goldfish, showing how chemicals serve as both hormones and pheromones. In the goldfish, two reproductive hormones, one a steroid and the other a prostaglandin, assume roles as pheromones as they are excreted by the female. As the male detects these compounds, milt production is increased and courtship behaviour elicited. So pheromones can have several different actions, serving to activate specific behaviours (releasing pheromones), determine how an individual will develop and regulate physiological processes (priming pheromones) or communicate motivational state (signalling pheromones).

*Chemical Communication* is written and presented in the style of *Scientific American* articles that feature a single topic and are rich in detail with fascinating examples and handsome illustrations. Agosta shows how pheromones are molecular messages that are woven into a language in a species and even, occasionally, between species. It is informative and enjoyable and written so as to appeal to everyone from advanced high school or undergraduate students to specialists in the field. □

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### New in paperback

■ *Last Animals at the Zoo: How Mass Extinction Can Be Stopped* by Colin Tudge. Reviewed in *Nature* **354**, 195 (1991).

■ *The Shadows of Creation: Dark Matter and the Structure of the Universe* by Michael Riordan and David N. Schramm, with a forward by Stephen Hawking. Reviewed in *Nature* **352**, 677 (1991).

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