

One of Stebbins's "basic assumptions" is that "chromosomes are much more than strings of DNA molecules. They are organelles that, in addition to housing genetic information, provide mechanisms for releasing and regulating the transmission of this information during development according to a carefully adjusted programme." The book itself provides ample justification for this assumption—and for its rider, that one of the principal advantages of the chromosomal organization is that through a variety of devices it can "provide for perpetuating and transmitting as units combinations of genes that interact with each other in adaptive fashion," while still offering the capacity for sensitive response to selection and so for evolutionary advance.

The introductory chapters summarize some features of the chromosome as an organelle. The problem in a work of this kind is always to know how far to take the biochemistry; Stebbins is cursory, but his treatment will mostly be sufficient to provide some orientation for the student reader in need. The coverage of chromosome chemistry is perhaps too brief, for the problem of how DNA is organized in the chromosome barely emerges as the pressing one it is. The paragraphs concerned also contain a few erroneous or misleading statements. Chromomeres are described as one form of heterochromatin, and little indication is given of their likely nature as regions of persistent coiling of the chromonema. As for the chromonema itself, one passage seems to imply that the structure seen light-microscopically is the same as the elementary 200- to 300-Å fibril seen with certain preparation procedures electron-microscopically—hardly an acceptable equation without further explanation. And the DNA molecule is certainly not "far below" the resolving power of the electron microscope, as many recent publications illustrate.

The main part of the book is devoted to several of Stebbins's favorite themes—chromosome morphology, chromosome mechanics, and the ecological and evolutionary significance of changes in chromosome structure and number. The versatility of the chromosomal system in plants is illustrated with a wealth of examples in the sections concerned with structural changes and their effects on linkage patterns, recombination, and karyotype morphology. The explanatory diagrams provide a valuable adjunct, although the various errors in figure 4.2 will indeed make it a puzzle for the student reader. In the chapters on poly-

ploidy, hybridization, and plant geography and evolution, Stebbins interweaves evidence and interpretation in a continuously moving panorama in a way which certainly carries the reader along as one plausible hypothesis follows upon another. Yet, although the style is attractive, not always does it allow the presentation of "both sides of the case in question" as the preface promises. Thus the familiar arguments for the restricted evolutionary importance of apomixis appear, without mention of the evidence that at least one major group, the subfamily Panicoideae of the Gramineae, contains so high a proportion of genera with similar forms of facultative apospory as to allow no denial that a balanced sexual-apomictic system is quite compatible with a long and successful evolutionary history.

With a work of so small a compass it is perhaps carping to complain of omissions, but one point should be made. A policy of referring largely to reviews instead of original research papers may be economical of space, but it is not one that can give a proper historical perspective to a reader. Many of the cardinal ideas in this book are paraded without direct reference to their proper parentage—which is a pity, for it means that some of the major names in the development of plant cytogenetics are given no mention.

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Life Strategies

Parasitic Insects. R. R. ASKEW. Elsevier, New York, 1971. xx, 316 pp., illus. \$11.50.

In 1968 Askew proposed a mechanism for the rapid speciation of small parasitic wasps (Chalcidoidea) based on a detailed consideration of sperm production, mating behavior, gregarious feeding, synchronous development, and spatial relationships within a population. This detailed ecological approach provided a convincing hypothesis. Therefore when his book was published I expected, and found, fascinating accounts of parasitic insects based on ecological details which enable the reader to gain a broad comprehension of the life system of each taxon treated.

The book was designed for undergraduate and graduate students specializing in entomology, economic entomology, ecology, parasitology, and associated subjects, and it is well suited

for these readers. Agriculturalists and veterinarians will also find the book valuable. The applied aspects are allotted only two relatively short chapters, on parasitic insects as vectors of human disease and on biological control, but the fund of biological information in the remainder of the book, supported by an extensive bibliography, makes it an important reference for anybody dealing with parasitic insect control.

The treatment of the insects varies according to the taxonomic diversity within the group to which they belong. For those belonging to large, diverse groups such as the wasps and flies, detail has had to be sacrificed. Therefore the chapters that are most successful in presenting a broad picture of the ecological relationships of organisms are those on such groups as lice and fleas. Taxonomic treatment is nicely adjusted to be informative but inconspicuous, so that the emphasis remains on the major attributes of organisms as parasites—life history, especially adaptations for obtaining food, host specificity, and sexual apparatus and behavior. The exposition is clear, and many detailed and pleasing illustrations, the majority by the author, amplify the text.

Askew points out that no single book has covered parasitic insects before. Though perhaps this is surprising initially, when one considers how different are the two modes of parasitism described it becomes more understandable. Section 1 of Askew's book covers insects that are parasitic as adults: lice, fleas, blood-sucking flies, louse and bat flies, and a few bizarre earwigs, beetles, and moths. These insects are classically the concern of medical entomologists. The larger section 2 involves "protelean parasitic insects," which are parasitic, usually on other insects, only as larvae and are free living as adults. These are the organisms important in the natural control of insect populations and in applied biological control. The word "parasitoid" has been increasingly used over the past ten years for insects of the latter group. Askew avoids the term, for he thinks it embraces too wide a range of phenomena to be useful. From an ecological viewpoint, however, there are some valid differences between the two modes of life which I think should be stressed. Unlike the organisms of the first group, which normally only sap energy from the host, those of the second eventually cause its death. Their effect on a population, therefore, is similar to that of a conventional predator.

Askew limits his treatment to parasites of animals, legitimately restricting the book's size. Whether a parasite exploits plant or animal food the basic feeding strategy is the same, however, and this treatment may lead to some misconceptions. The classification of Hymenoptera Askew uses includes, in the suborder Apocrita, the division Parasitica, in which he states that the superfamilies Chalcidoidea (chalcid wasps) and Cynipoidea (gall wasps) contain "many" and "some" parasitic species respectively. Actually, almost all the species of these superfamilies are parasitic, some feeding on plant tissues and others on animal tissues.

It is clear that parasitic insects and parasitoids play an important role in natural populations and in human ecology. Askew has helped us focus attention on this 10 percent of all animal species. He concludes, "I doubt if any group of animals can exceed the scope offered by parasitic insects to the diligent researcher. The field is wide open, the prospect inviting." I can only concur, and in endorsing this fine book I hope others will come to this realization.

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Worms

The Behaviour of Nematodes. Their Activity, Senses and Responses. NEIL A. CROLL. Saint Martin's, New York, 1971. x, 118 pp. + plates. \$8.25.

Among nematodes there are harmless inhabitants of soil and water as well as dangerous parasites of plants, animals, and man. The damage caused by plant parasites alone is estimated at over \$1.5 billion in the United States. Although the negative aspects of the nematodes have given rise to many investigations and publications, as yet no survey of their behavior has been available. Croll's book is a contribution to the closing of this gap. Its appearance is therefore to be welcomed. It must, however, be borne in mind that the study of nematode behavior is, to use the author's words, still in its infancy. We may only mention that no electrophysiological investigations exist in this field.

The first three chapters of Croll's book are concerned with "Approaches to nematode behaviour," "Movement," and "Activity, aggregation and swarm-

ing," the following six with responses to light, temperature, chemicals, electricity, gravity, and mechanical stimuli, and the last two with "The mechanism of orientation" and with "General considerations." Responses to hatching stimuli are unfortunately not included. On the other hand, all nematode groups—zooparasitic, phytoparasitic, and non-parasitic—are referred to. The presentation has the character of a review, chief importance being attached to completeness of literature coverage rather than to elaboration of general statements and theories. It is in fact striking how few clear statements can be made on certain matters, either because only a few investigations are available or because many have been carried out without clear premises. This holds, for instance, for the effects of light, gravity, and temperature on behavior. The author presents the many gaps and contradictions, and herein lies one of the book's main merits. It is to be hoped that it will indeed help to "form a background to more sophisticated and exact experimental work," one of its declared aims. Many blanks have yet to be filled in on the map of nematode behavior.

The existence of several misprints as well as errors in the literature list must be mentioned. In addition, German names of authors are written consistently without an umlaut, which might lead to confusion. A more serious objection concerns the author's use of the term "klinokinesis," which was coined by Gunn but later rejected by him.

In spite of these objections, Croll's book will render good service to those interested in nematodes and their behavior.

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Termites as Ecological Agents

Termites and Soils. K. E. LEE and T. G. WOOD. Academic Press, New York, 1971. x, 252 pp., illus. \$11.50.

In the tropics the termites replace earthworms as the chief decomposers of litter and turners of the soil. Although the two groups are often viewed as ecological analogs in this special sense, the authors of *Termites and Soils* establish that profound differences exist in their modes of action. The termites, being well-organized social insects, select soil grains preferentially

for transport to the surface and other parts of their nests. They penetrate more deeply into the soil (according to one Soviet report, to as much as 70 meters), and they typically cement soil particles into hard casements that are very resistant to erosion. Being dependent on plant remains for nutrition, they concentrate calcium, magnesium, and potassium in and around their nests. These various activities alter the vegetation locally, render biotopes more patchy in distribution, and set off other, ramifying ecological effects that extend up the food chains all the way to the mammals.

The authors, who are soil scientists employed by the Australian government at Adelaide, have drawn these and many other interesting conclusions from their own recent studies and those of previous researchers. In addition they provide detailed and careful reviews of the food habits, nest architecture, and economic importance of termites, only parts of which overlap related chapters in the well-known 1969 treatise *Biology of Termites* (volume 1) edited by Kumar Krishna and Frances M. Weesner. *Termites and Soils* will prove useful not only to specialists on social insects but also to pedologists and biologists interested in the tropical and subtropical land environments.

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Books Received

Acute Cholecystitis. Clarence J. Schein. Harper and Row, New York, 1972. xvi, 310 pp., illus. \$17.50.

Advanced Calculus with Linear Analysis. Joseph R. Lee. Academic Press, New York, 1971. xiv, 218 pp., illus. \$8.50.

Advances in Cell Biology. Vol. 2. David M. Prescott, Lester Goldstein, and Edwin McConkey, Ed. Appleton-Century-Crofts, New York, 1971. xii, 330 pp., illus. \$19.95.

Advances in Control Systems. Theory and Applications. Vol. 8. C. T. Leondes, Ed. Academic Press, New York, 1971. xvi, 260 pp., illus. \$15.

Advances in Genetics. Vol. 16. E. W. Caspari, Ed. Academic Press, New York, 1971. xlii, 394 pp., illus. \$18.

Advances in Geophysics. Vol. 15. H. E. Landsberg and J. Van Miegheem, Eds. Academic Press, New York, 1971. x, 332 pp., illus. \$18.

Anger. Leo Madow. Scribner, New York, 1972. x, 132 pp. \$6.95.

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(Continued on page 924)