

reviews

The Social Behaviour of the Bees: A Comparative Study. By Charles D. Michener. Pp. xii+404. (The Belknap Press of Harvard University: Cambridge, Massachusetts, July 1974.) \$25.00.

THE conspicuous social behaviour of bees has undoubtedly been the main reason why they have always stimulated much attention, and continue to do so, with the result that they are kept in the forefront of entomological research. It is indeed a challenging task to attempt to synthesise the accumulated research findings on social bees, and it is one which Professor Michener has ably and brilliantly fulfilled. This book is timely and appropriate and the wealth of recent knowledge gleaned from many sources and many studies is interwoven skilfully around the recurring theme of the origin and evolution of social life to produce a masterly and fascinating exposition. Readers are especially fortunate that Professor Michener's deep and wide knowledge of his subject enables him to put current or fashionable ideas into an objective perspective.

The arrangement of the subject matter of the book into three parts is unusual but effective. Part I is a useful introduction for those unfamiliar with bees. It includes background material about their development, discussion of the features that seem to be involved especially in social behaviour (for example, mouthparts, sting, pollen collecting apparatus and various glands), evolution and classification, and the terminology commonly used.

Bees are unique among social insects in exhibiting a broad spectrum of stages illustrating the evolution of social behaviour. In Part II—the largest part of the book—the types and levels of bee societies and the origins and growth of aggregations and colonies are discussed. Several topics are then taken in turn and for each topic bees exhibiting different stages of social organisation are considered. These topics include the nest and its contents, control of the physical environment within the nest, control of male and female production and sex ratio, caste differences and caste determination, division of labour, colony multiplication, orientation to the nest and food sources, foraging behaviour and communication and colony defence.

I found the chapters on the social



Stephen Dalton

Social organisation of bees

significance of the nest and its contents and on the handling and transfer of materials within the nest to be the most absorbing because from these two chapters one obtains a vivid evolutionary picture of how a series of relatively simple stimuli, and the flow of food and pheromones between the members of a colony, can result in the co-ordinated activities of many thousands of individuals. These subjects have recently undergone intensive research and it is only by a complete and proper understanding of them that we will be able to discover the reasons for population fluctuations and changes in foraging intensity. Such an understanding will, incidentally, help us to use the honeybee more effectively both as a producer of honey and as a pollinator of crops. For example, Professor Michener's initial discovery that the activity of each halictine bee diminishes with an increase in the size of the colony concerned has been extended to other social bees, including the honeybee, for which it has important practical applications. Readers will, however, be fascinated equally by the chapters on caste determination—a subject that is currently attracting much attention—and on the dance language of bees, the interpretation of which has recently been the subject of a controversy that is summarised skilfully and objectively.

The last chapter in Part II, which is devoted exclusively to the origin and evolution of social behaviour, is in many ways the hub of the book. There, Professor Michener discusses the prerequisites necessary for a species to evolve a social behaviour and the

characteristics associated with different levels of social organisation. He also considers how selection could operate to establish various social attributes paying particular attention to kin selection and the role of altruism.

Part III entitled "Natural History" is an account of the locations, architecture and contents of nests, and a discussion of the general biology, life history, behaviour and social status of each of the main groups of social bees, including the semi-social and eusocial halictine bees, euglossine bees, allodopine bees, bumblebees and the stingless and true honeybees. Professor Michener recommends that readers seeking information on a particular group of social bees should read the relevant section of Part III before checking the index for material in Part I and II. Because of the efficient index this system works well in practice, but Part III could, in effect, have preceded Part II. The book is illustrated liberally; the diagrammatic sketches of nest structure and architecture are especially worthy of attention. There is a glossary, and a useful appendix aimed at relating the up-to-date nomenclature used in the book to any older nomenclature the reader may encounter. The book is documented throughout: half of the 700 or so references were published during the past decade and over 80% during the past two decades, reflecting the current interest and progress in the subject.

The entomologist who studies social insects may well find that other insects are somewhat dull by comparison. Readers of Professor Michener's book will appreciate why. **John B. Free**