

copy of Rittmann's important work may find it worth while acquiring this attractively produced, though somewhat expensive, new edition.

Prof. Kirkaldy's *Study of Fossils* is a short discourse on palaeontology intended specifically for biologists, though it may well serve others as a guide to the varied information which geologists derive from the examination of fossils. The first two chapters deal with the geological background, without which the significance of fossils cannot be appreciated. Two succeeding chapters discuss the nature and state of preservation of the organic remains, designated 'fossils', found in rocks, and the life succession which they illustrate. In the next three chapters the use of fossils as time markers, and as indicators of environmental conditions and palaeoclimates, is dealt with. The final chapter discusses the evolutionary aspects of fossil remains. The book is adequately and clearly illustrated by a series of line diagrams.

*Minerals and Rocks*, in colour, is an elementary handbook on rocks and minerals, the chief merit of which is that 266 specimens are illustrated in colour. These were chosen, originally, to illustrate a book, *Stenar i färg* (Stones in Colour), by H. Lundegårdh, published in Stockholm in 1960, and were selected from Scandinavian museums. The colour photographs, made by Folke Johansson, have been used by Prof. Kirkaldy for his own book. On the whole, the colour reproductions are extremely good, and, no doubt, would serve to show a beginner the great variety in colour and texture that is encountered in rocks and minerals. They may serve to stimulate an interest in geology and mineralogy, but they cannot adequately take the place of actual specimens. The text that accompanies the plates has been entirely written by Prof. Kirkaldy. It attempts to compress within the compass of about 100 pages the essentials of the subject-matter of mineralogy, petrography and petrology. Unfortunately the book bears evidence of somewhat careless editing, the principal defect being that, in the index, the reference numbers given to specimens illustrated do not correspond with those given on the actual plates.

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## METAZOAN PARASITISM

### The Nature of Parasitism

The Relationship of Some Metazoan Parasites to Their Hosts. By W. P. Rogers. (Theoretical and Experimental Biology: an International Series of Monographs, Vol. 2.) Pp. ix + 287. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1962.) 7.50 dollars.

MANY biologists would consider the nature of parasitism too complex to be discussed adequately in such a small book as this, even when attention is focused on helminths and Protozoa are excluded from consideration. Prof. W. P. Rogers has selected nematodes for special treatment for various reasons and not least because his own researches have long been concerned with their physiology. From the evolutionary point of view, the group has been remarkably successful and, while some thousands of species have become parasites of animals or plants, many more have retained a free-living mode of life. Yet all roundworms have a comparatively simple morphological organization which suits various types of environment; reproductive processes are somewhat standardized, life-cycles not unduly complex and there is little apparent physiological specialization. In many respects, therefore, nematodes lend themselves to the study of a kind of parasitism in which adaptation has often shown little modification of structure and function.

The book consists of four parts and eleven chapters, each of which has its own list of references to the original literature and most of which carry a short summary, and physiological interest is sustained throughout. This has been a handicap for the author, because physiological

knowledge of the group is fragmentary and incomplete. Although deficiencies in our knowledge are evident, however, hypothesis has been used to guide the reader through the intricacies of functional speculations. Prof. Rogers's avowed aim has been to try to stimulate research rather than to summarize existing knowledge. The first two chapters are devoted to speculations on the host-parasite relationship and the point is soon made that it is important to know what is meant by 'infectiousness', that is, the capacity of the organism to infect the host and to furnish its parasitic existence with a system of metabolic processes which are distinct from, but in harmony with, those of the host. The earliest stage of infection often involves the removal of a protective outer covering such as the shell of the egg, the wall of the cyst or the sheath of the larva, and sometimes a ciliated epithelium which serves as a dispersal mechanism in trematode miracidia. The environmental components which facilitate the establishment of the infective agent as a true parasite need not be highly specific but must ensure that protective properties are not lost until entry has been made into an environment which will support a closer and more intimate relationship between host and parasite and may entail moulting, migration and metamorphosis.

Free-living roundworms undergo a series of moults during their life-cycle and infection by parasitic forms is preceded by a moult, after which development is suspended until an appropriate host has been acquired. The infective stage is thus a resting stage which forms a 'bridge' by which the parasite passes from the environment of one part of the life-cycle to a new environment in another part of the cycle. In considering a physiological basis for the nematode life-cycle, Prof. Rogers suggests that the action of the environment is always indirect and that metamorphosis is evoked by internal secretions which are produced as a result of stimuli from the environment acting on the receptor organs of the parasite. In arthropods, moulting is controlled by internal secretions and it is possible that similar control occurs in roundworms. Infection with eggs or larvae of certain nematodes is 'triggered' by certain physical factors and chemical agents in the intestinal contents of the host, mainly dissolved carbon dioxide or undissociated carbonic acid but also *Eh*, *pH* and temperature. The consequent stimuli evoke the secretion of hatching or exsheathing liquids and, possibly, affect more cryptic developmental mechanisms. This is a theme which Prof. Rogers, in collaboration with Dr. Sommerville<sup>1</sup>, has developed in greater detail since the book was published, mechanisms of moulting and metamorphosis being regarded as closely analogous in parasitic nematodes, insects and amphibians.

*The Nature of Parasitism* contains the groundwork of many other important considerations. In Part 2 the discussion of problems of infectiousness is continued in chapters on life-cycles and infection, the physiology of free-living stages and the physiology of infection. The free-living stages of nematodes are considered in relation to food reserves, oxygen requirements, metabolism and its end-products, and infection covers entry by way of the intestines or through the surface of the body. In Part 3 the author is concerned with the lives of parasites in separate chapters dealing with the physiology of the parasitic stages, including intermediary metabolism, muscle-nerve physiology and osmoregulation, and with the oxygen requirements and nutrition of parasites. Part 4 has separate chapters dealing with the propagation of parasites, their specificity in various stages and their evolution. So far as knowledge goes it has been discussed succinctly and well documented in this small book, which deserves to succeed in its object of stimulating research and bringing it into line with other developments in modern biology.

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<sup>1</sup> Rogers, W. P., and Sommerville, R. I., in *Advances in Parasitology*, edit. by Ben Dawes, 1 (Academic Press, 1963).