

### Animal Behaviour

*The Behaviour of Animals: an Introduction to its Study.* By Dr. E. S. Russell. Pp. viii+184+6 plates. (London: Edward Arnold and Co., 1934.) 10s. 6d. net.

THIS small book is a model of its kind, providing, as it does, an excellent summary of the existing knowledge of animal behaviour, and being full of suggestions with regard to further profitable experimentation. But it is more than a pleasantly written résumé, compiled by a man who obviously knows his subject and is intrigued by the many problems in this field which seem to defy human understanding. It is a challenge to zoologists.

With very few exceptions, animal behaviour is a study sadly neglected by professional zoologists in Great Britain; so neglected that its territory has been claimed by the physiologist and psychologist. In this fact danger lurks, for, as Dr. Russell argues, quite commonly the proper place for the study of animal behaviour is not the laboratory, and since the physiologist and psychologist are not necessarily naturalists, as the zoologist must needs be, the manner in which an animal lives and maintains itself in Nature has been almost completely disregarded.

Dr. Russell is perfectly justified in his view that shepherds, fishermen, fanciers and sportsmen have much of importance to tell the biologist, for those of us who know these men and have captured their interest are greatly indebted to them. They have vast stores of accurate information which, properly examined, and freed from anecdote and conjecture, can be made to reveal matters of profound scientific value. It is true that their interpretations may not, and usually do not, coincide with our own, but the extent of their knowledge of the habits of the commoner beasts and birds is astonishing. They may know nothing of mechanisms, but they do know a great deal of the animal as a whole. Thus it is that Dr. Russell finds himself happy in their company, for he strenuously revolts against the purely mechanistic view and pleads for a return to the Aristotelian approach, according to which life and mind are regarded as continuous one with the other, the basis of the zoological system being the form and the behaviour of the animal as a single entity.

The author strongly emphasises the value to science of recording as fully as possible the normal everyday activities of animals, especially in the wild; of describing the objective facts in the simplest and most comprehensive way, disregarding all speculation about the animal's inner life, and studying only the overt and visible actions.

Dr. Russell teaches that behaviour is always directed toward some definite end, and is largely determined by its result, the action continuing until the goal is reached; that behaviour is often active or spontaneous in the sense that it is not a reaction to external stimuli, and that animals perceive an external world of their own. Thus, in studying animal behaviour, the first question to be asked is: What is the animal trying to do? The second: To what exactly does it respond, that is to say, what does it perceive? The third: How does its behaviour develop through maturation and through experience? Finally: Is the animal's behaviour modifiable or adaptable?

The book considers these matters in some detail and illustrates the methods of simple, direct observation without theory and without analysis. It leaves all questions on mind and matter to the philosophers. It is addressed to students of biology and to the general public, and to these it can be strongly recommended. Reading this book, one is driven to the conclusion that no zoological curriculum can be regarded as being complete unless it includes a course of animal behaviour given by someone with Dr. Russell's knowledge and devotion to his subject.

### Embryology and Genetics

*Embryology and Genetics.* By Prof. T. H. Morgan. Pp. viii+258. (New York: Columbia University Press; London: Oxford University Press, 1934.) 15s. net.

ONE of the most serious gaps in the whole structure of theoretical biology is the lack of connexion between the concepts of genetics and of embryology. Both sciences have a peculiar importance for biology because they both deal with their subject matter in a particularly objective way. The organism is not analysed along any of the lines worked out by the older physical sciences, but the path of analysis grows directly out of the reactions which are observed. In this respect, genetics has been conspicuously successful, so that we can now, theoretically at least, represent an organism symbolically as a set of genes. In practice, we cannot give a completely sufficient representation of an organism in this way, but we can often state precisely the way in which it differs from its fairly near relatives. It is as though we knew the active groups of a complex organic molecule, but not the molecular nucleus.

In genetics, one gene stands symbolically for a whole series of developmental stages, so that it may be said to determine a red eye at one stage, for example, and a black eye at another, like some of the genes discovered by Huxley and Ford in