and shape it to assist their replication.

Later he speaks of the

image of a turmoil of selfish replicators, battling for their own survival at the expense of their alleles, reaching unimpeded through individual body walls as though these walls were transparent, interacting with the world . . .

The extended phenotype is certainly a big idea and it is pressed hard in dramatic language. But does it help to view genes as active agents, manipulating, reaching, battling? I think it only obscures the essential feature of living organisms which distinguishes them from all other complex natural systems and which gives them the capacity for evolution. It is that they are propagated by passing on not themselves but an internal representation of themselves in their genes. Exactly how this correspondence is implemented is what most biologists study; knowing it must be important if only for understanding what genetic variation can generate. To a molecular biologist, all the stuff around the genes is anything but transparent; it is hard to see the replicators through the fog of complicated machinery, nor do they reach out so easily as Dawkins wants them to.

Dawkins still has to come grips with this central issue. In a section on the poverty of preformationism he would like to make a distinction between the central dogma of molecular genetics and that of embryology. The former states that information in protein cannot be translated back to nucleic acids: the equivalent in development is that "bodily form and behaviour may not be translated back into proteins". I think we agree that the former is a fact, not a question of principle, but why does Dawkins want to make the latter a principle and not simply an equivalent fact? After all, in the end we shall need to explain the effects of genes on bodily form and behaviour in terms of proteins; that is the only way for us to reach into organisms and for genes to reach out into the world. The molecular, cellular and organismic grammar connecting genes and phenotypic effects is the heart of the matter and the only way to explain how random changes in DNA can produce all the sense we observe in the living world.

Organisms exist. Even Dawkins realizes that he needs to bring back individual organisms. His extreme position has forced him into calling the organism a "phenomenon that needs explanation", and he offers only a summary sketch on the last page. He says:

It has paid replicators to behave gregariously. The phenotypic power by which they ensure their survival is in principle extended and unbounded. In practice the organism has arisen as a bounded local concentration, a shared knot of replicator power.

Sounds terrific, but what does it mean?

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The whys (and wherefores) of behaviour

Aubrey Manning

Ethology: Its Nature and Relations with Other Sciences. By Robert A. Hinde. Pp.320. Hbk ISBN 0-19-520370-4; pbk ISBN 0-00-636237-0. (Oxford University Press/Fontana: 1982.) Hbk £9.20, \$15.95; pbk £2.95.

ETHOLOGISTS are no longer a distinctive breed; indeed the days when one could recognize them from their background and framework of theory were quite short. Large parts of the original theory built up from Lorenz's dichotomizing between the "innate" and the "acquired" in behaviour, and the energy model of drives, have been abandoned. What has endured is an approach to the animal in its natural environment which is highly productive and infectious. When Lorenz and Tinbergen built up their schools following the Second World War, ethology came as an invigorating breeze across the arid fields of so much of the white rat experimental psychology of the day. Its influence has persisted and spread widely into other areas of behavioural science.

Robert Hinde's book sets out to give an account of modern ethology and to examine this influence. He succeeds well and this is both a useful and a stimulating book. I particularly liked the brief historical introduction to each section. Since modern ethology only goes back about 30 years and Hinde himself has been a highly influential figure over most of this period, we get a direct picture of an emerging discipline as it interacts with others already established.

The plan of Hinde's opening section on "core ethology" derives from Tinbergen's classic paper of 1963, "On the Aims and Methods of Ethology". This was a landmark in the history of the subject and it represented a clear break of approach between Lorenz, who then had just published a reaffirmation of his own unchanging views on innate behaviour, and Tinbergen, who saw far more clearly that the old dichotomies (nature or nurture etc.) would no longer do. Tinbergen enunciated four types of question in relation to behaviour: those concerning its immediate causation, its development, its function (in the sense of survival value) and its evolution. Hinde has chapters covering each of these topics — he calls them ethology's four "whys". In fact they form a very good introduction which both covers some of the classic ethological studies and is also right up to date.

There is no introduction to this new *Masterguides* series itself and I am uncertain what audience they seek. Other titles include *Religion, Law and Social Anthropology*, so I imagine that "the educated layman" is once more in mind. Hinde is certainly not writing at an elementary level, nor can he bear to let

first-stage simplifications stand. Readers without some behavioural background will find parts rather heavy going and there are one or two over-complex diagrams. References to the literature abound on almost every page, and no doubt or inadequacy of the evidence is left unexposed. Just these latter qualities, of course, will commend the book to the serious student. Its main body is Hinde's assessment of the influence which ethology has had upon related fields in biology and the human social sciences. They cover a huge range, from ecology to psychiatry, and are consistently illuminating. Hinde's coverage of the literature is extraordinary and he provides good linking passages so that an overall picture of the inter-relationships of these fields is built up.

Within the biological sciences Hinde includes comparative and experimental psychology whose interactions with ethology were often stormy. The personalities, as well as the scientific achievements, of people such as Schneirla, Lehrman and Beach were of great importance in determining the course of the interchanges and Hinde gives enough of the history to make us fully aware that science is a human activity. The influence of ethology in the human social sciences has also met with opposition. The contributions it can provide are, first, the comparative method, revealing the human species as one amongst many which may share certain attributes, and secondly a secure descriptive method for the early stages of behavioural analysis. Neither of these appealed to those social scientists who emphasized the uniqueness of the human species or who concentrated solely on the cognitive and perceptual aspects of human behaviour.

Such extreme positions are rarer now. The study of non-verbal communication, of the attachment between mothers and infants and of the effects of maternal separation have all very obviously gained from ethological techniques and concepts. Hinde himself has made valuable contributions in these areas and his sharp and revealing focus is clearest in these sections of the book. The critical edge is somewhat blunted when dealing with the biological approach to anthropology where some of the wilder shores of sociobiology are dwelt upon rather too gently, but all is brought back into balance in his concluding remarks.

This book will be of great value to students and teachers in other fields who want to broaden their ethological horizons. It also provides a liberal education in these other fields for more biologically based ethologists. □

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