Determinants of Behavior

Biological Bases of Human Social Behaviour. R. A. HINDE. McGraw-Hill, New York, 1974. xvi, 462 pp., illus. Paper, $7.95.

Students of animal behavior who attempt to explain the biological bases of human activities tend to fall into two camps. Exponents of an evolutionary philosophy of man (see for example R. D. Alexander, *R. Soc. Victoria Proc.* **84**, 99 [1971]) stress the significance of ultimate factors, our evolutionary history and the action of natural selection, in shaping and constraining our behavioral attributes. The second group, which adheres to what might be called a developmental philosophy of man, feels that an understanding of proximate factors, the genetic, physiological, and especially the developmental mechanisms, that underlie our behavior holds the best hope for helping us understand ourselves. These two viewpoints can be complementary rather than antagonistic, and some animal behaviorists are able to integrate them. Nevertheless, I believe the dichotomy to be real and important in affecting attitudes and approaches. For example, members of the first group tend to be tolerant of speculations about the influence of our past history as a species on our present-day capabilities; the "developmentalists" less so. Proponents of the developmental philosophy are inclined to stress the role of individual experience in shaping behavior and are hostile to the use of the phrase "innate behavior"; the "evolutionists" are less disposed to an environmentalist position and more likely to feel that it is possible to use the concept of an instinct in a useful manner.

Because Robert Hinde is a highly respected representative of the developmental position, his latest book will be important to readers of both viewpoints. As might be expected, he focuses on research dealing with the immediate underlying causes of behavior, especially on the role of experiential factors in behavioral development—although he does not completely omit material on the evolution and ecological significance of human activities.

Hinde's discussion of human aggression is perhaps the most valuable section of the book. His approach to this topic is typical of the book as a whole. He begins by examining in some detail the difficulties of defining what is meant by "aggression" and what should be included in this category. Subsequently, he reviews the literature on lower animals, showing that this research has uncovered many different causes of aggressive acts. Shifting to humans, he demonstrates in a similar scholarly survey that a host of factors may affect the development and expression of aggression in man. For example, in four pages of text (288–291) Hinde lists no fewer than 16 possible environmental influences in childhood that may promote later aggressive tendencies, among them frustration experienced by the child, a lack of self-esteem by the mother, observation of aggression in others, and, in a male child, failure to identify with the father. Given the bewildering diversity of the evidence presented, it is perhaps not surprising that Hinde's conclusions are largely negative (for example: there is no single cause of aggression; previous motivational models of aggression are not supported by some of the available data).

The difficulty here is the author's reluctance to advance new hypotheses as well as reject old ones. Perhaps because the developmental process is so complex and because there are so many possible environmental influences on behavioral development, adherents of the developmental approach tend to be exceptionally cautious about making positive generalizations. Hinde, in acknowledging that his book is largely about the behavior of nonhuman primates, goes so far as to suggest that his role is merely "to present the data" on lower animals, allowing psychologists, anthropologists, and sociologists to interpret their significance for human beings. It may well be that teachers in a variety of disciplines could, by taking up Hinde's challenge, create a stimulating seminar for advanced undergraduates. Nevertheless, the effect of his decision is to limit detailed presentation of his views on human social behavior to just three issues: individual aggression, nonverbal communication, and mother-infant interactions. Hinde makes only the briefest comments on many other intriguing human social activities, including sexual behavior, warfare, "territoriality," dominance relations, and most aspects of human cooperativeness. It would have been useful to have Hinde apply the developmental approach to these and other topics that have been discussed extensively from an evolutionary viewpoint.

Hinde's cautiousness may also stem from an inherent feature of the developmental approach, which is a lack of a unifying principle to organize and make biological sense of the diversity in animal behavior. For evolutionary biologists the principle of natural selection generates an enormously valuable primary question, which is, "Why might this behavioral trait help maximize the reproductive success of an individual?" Hinde notes in passing that recent theoretical work derived from this simple question provides "a new perspective from which to view early social behavior" (p. 206). As one who identifies with an evolutionary philosophy of man, I feel that Hinde misses an important opportunity to integrate the developmental and evolutionary approaches by evaluating and structuring findings on many of the proximate causes of behavior from this new perspective.

Therefore, although *The Biological Bases of Human Social Behaviour* provides useful examples of a developmental approach to human behavior, it is clearly not meant to be the whole story either in terms of the number of issues examined or the perspectives offered.

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Stimuli and Performance

The Processing of Information and Structure. WENDELL R. GARNER. Erlbaum, Potomac, Md., 1974 (distributor, Halsted [Wiley], New York). xiv, 204 pp., illus. $10.95. Experimental Psychology Series.

This book contains the second Paul M. Fitts Memorial Lectures delivered at the University of Michigan in 1973. Garner uses the occasion to put into perspective the research that he and his colleagues have conducted during the past ten years. As the book's title suggests, Garner's work is related to the branch of experimental psychology that has come to be called the information-processing approach. This approach originated in work that experimental psychologists in Britain and the United States did during and immediately after World War II in search of ways to reduce human error in such tasks as flying airplanes, monitoring radar scopes, and the many other man-machine interactions required in modern warfare. Their research produced the realization

that performance was limited by the fact that the human operator could process only a relatively small portion of the information available to him. As a result, investigation turned to how the human allocates his limited resources among different informational inputs.

One important early influence on these studies was the development of information theory by Shannon and Wiener in the 1940's. Experimental psychologists hoped that the theory of selective information would provide them with a universal metric for specifying the amount of information in various stimulus displays. As it turned out, however, the development of cybernetics and the related discipline of artificial intelligence had a greater influence on the information-processing approach, whose practitioners have gone on to create many ingenious experimental arrangements for isolating and operationally specifying the mental structures and operations ("routines" and "subroutines") that the human employs to accomplish a variety of tasks.

Garner's work has followed a different path. He was in the forefront of those experimental psychologists who sought to exploit the possibilities of an information metric. His earlier book *Uncertainty and Structure as Psychological Concepts* (1962) presents the culmination of that approach. Since its appearance experimental psychologists, including Garner, have generally abandoned the information metric as an independent variable. But in doing so the information-processing psychologists have lost sight of the real contribution of information theory. At the end of his lectures, Garner makes this telling point (p. 190):

> As much as I generally like the information-processing approach to the study of perception, I do at times worry that the stimulus, that which provides the information part of information processing, is being neglected too much. We must understand the nature of information if we are to understand its processing.

Garner repeatedly emphasizes that the lesson of information theory is that the information is carried not by what the stimulus is but by what it could have been. One message of these lectures is that the information-processing approach cannot reach its full potential until it recognizes and acts upon this lesson. Garner's own work focuses on the stimulus rather than on the processor. In his system, a stimulus can be characterized by its values on a number of dimensions. All the combinations of values generated by the dimensions defines the *total set* of stimuli of which the particular stimulus is an instance. The informational properties of the stimulus can be determined only in relation to its total set. So one of Garner's major independent variables is the size of the total set. This much of his system is what was standard in the early applications of information theory.

But Garner adds the important concept of the *inferred subset*. The perceiver deals with the stimulus not only in terms of the total set but, more importantly, in terms of the subset to which it belongs. The smaller the inferred subset, the more the stimulus corresponds to a "good figure" in the sense of Gestalt psychology. So another of Garner's independent variables is the size of the inferred subset. Subsets by definition contain redundant stimuli. Subsets of the same size from a given total set all have the same amount of redundancy but can differ significantly in the form it takes. And, as Garner amply demonstrates, the form of the redundancy, or the structure, is crucial in its effects upon the human processor. Garner is at his best in demonstrating that redundancy per se is neither good nor bad but that its effects upon performance depend on the kind of redundancy in relation to the kind of stimulus dimensions and the task requirements.

Garner is widely recognized as one of today's leading experimental psychologists. So far as I can tell, those psychologists who are at the forefront of the contemporary information-processing approach readily concede that his research is important and provocative. Yet they seem at a loss about how to connect it with their own work. Along with the difference in orientation toward processor and stimulus go differences in experimental strategies and in ways of conceptualizing and talking about the data. Information-processing psychologists organize their experiments and discussions around concepts that refer to internal mental entities—mental structures and mental operations. Garner organizes his around stimulus properties, on the one hand, and a variety of experimental tasks, on the other. The information-processing psychologist uses different stimulus materials and a variety of tightly constrained tasks to focus upon a single mental structure or process. Garner exhaustively analyzes a stimulus structure by varying tasks in which it is used over a wide range of constraints and mental operations. Garner is inductive in his approach. He employs converging operations to allow the concepts to emerge and be explicated. The information-processing psychologist is more deductive. He postulates models of the mechanism under study, derives testable consequences, and devises his experiments to test these consequences.

Garner and his associates are thus actively pursuing a creative and productive program of research that so far has had little impact on information-processing psychology. It seems obvious that the two approaches should complement one another. Certainly, as Garner says in his concluding lecture, we need to understand what both the environment structure and the perceiver contribute to the actual performance, and Garner has many important things to tell us about how performance may be understood or partially accounted for by a more sophisticated treatment of the stimulus. It is to be hoped that either Garner or the information-processing psychologists will soon find a way to bridge the gap between them.

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Lipid Biochemistry

Form and Function of Phospholipids. G. B. ANSELL, J. N. HAWTHORNE, and R. M. C. DAWSON, Eds. Second edition. Elsevier, New York, 1973. xiv, 494 pp., illus. $45. B.B.A. Library, vol. 3.

This is the second edition of a work that was first published in 1964. The intervening ten years have seen marked increases in our knowledge about phospholipids. We now have a rather complete picture of their chemical structures and an understanding of most of the enzymatic reactions involved in their biosynthesis. Moreover, a picture of the physical arrangement of phospholipids in membranes and the different modes of their interaction with membrane proteins has emerged. All these developments have been incorporated into the revised edition, with the result that for all purposes it is a new work.

The editors have compiled 15 chapters, some written by them and some by other experts in lipid biochemistry, that cover almost every conceivable