Book Reviews

The Ethology of Homo sapiens

Man and Beast. Comparative Social Behavior. Papers from a symposium, Washington, D.C., May 1969. J. F. EISENBERG and WILTON S. DILLON Eds. Smithsonian Institution Press, Washington, 1971. 402 pp., illus. $11.50. Smithsonian Annual 3.

Ethology is commonly defined as the biology of behavior. In contradistinction to psychology, however, it might be called the evolutionary biology of behavior. In *Man and Beast* evolutionary biology in its broadest and most modern sense is applied to man's behavior. The contributions are written by specialists, but they all seem to have taken pains to present their subjects in a style that is more readable than their usual technical papers. Most of the authors avoid the extremes of popularizing and dramatically one-sided claims which characterize the well-known best-selling books on the subject.

The range of subjects that are competently surveyed is greater than could be covered by any single author, and starkly opposing viewpoints are included. Yet the book suffers less than might be expected from the lack of organization that characterizes group-authored volumes. This benefit seems to stem from careful planning of the conference and an editorial prologue (by Eisenberg) to each section.

The contributions are grouped to relate to four main questions. The first asks, "What are the biological bases for social behavior?" Answers are attempted on three levels, population genetics, neurobiology, and development. W. D. Hamilton explains some fascinating implications of his theoretical formulations on the genetic and evolutionary bases of aggressive and altruistic behavior. D. Ploog presents a brief but inclusive account of the neural basis of social behavior in a selected primate, the squirrel monkey, in which he summarizes a large amount of experimentation on the primate brain, much of it done in his laboratory. The nature-nurture problem is explained once again for the benefit of those few poor souls who still are either confused or narrow-mindedly one-sided about it. Apparently one of the contributors must be included in this group, for he implies the existence of a nature-nurture dichotomy, perhaps unconsciously, as follows: "Explanations in terms of . . . instincts are no longer satisfactory. And if we are prevented from relying on such traditional answers, we immediately turn to experiential factors, such as learning and reinforcement."

The second question is "What are the basic mechanisms of social behavior in animals and man?" The answering essays concentrate on describing various types of competitive and cooperative behavior in a variety of animals, mostly primates, and on explaining their evolutionary and developmental history. E. O. Wilson presents a stimulating and ecologically sophisticated discussion of competitive and aggressive behavior in social species. His redefinition of territoriality should be useful to both ethologists and ecologists: "Territory is an area occupied more or less exclusively by animals or groups of animals by means of repulsion through overt defense or advertisement." J. H. Crook surveys cooperation in primates and finds its developmental and evolutionary origins in kinship groups and competition for various social roles in the group. H. Kummer describes spacing patterns and processes in selected primates. A theory of development of social attachment through "mere repeated exposure of an individual to a given stimulus object" in animals including man is advanced by R. B. Zajonc.

Question three is the old familiar "Is man unique?" The usual answers are reiterated and discussed with style, gusto, and sophistication. R. Fox brings a fervor worthy of a Bible-belt preacher to his sermon that man's uniqueness is explicable in the same way as the uniqueness of every other species, namely, through natural selection. I. DeVore uses material on ecology and behavior of nonhuman primates to sketch some probable features of australopithecine life. S. K. Langer, in contrast, "has tried to show how deep the division between beasts and men goes." She describes what might be conceived as a boundary line between them and how it was crossed. I am no more convinced by her 15 pages of jargon and definitions than I would be by someone who tried to explain to me precisely where on a continuum of grays the boundary line between black and white lay. Ethologists might be amused by her scathing charge that they are guilty of "scientific malpractice" in the use of terms. They might also be taken aback by her arguments that "speech is not derived from animal communication" and that practically nothing directly applicable to man can be learned from studying animal communication. J. Jaynes and M. Bressler caution us that popularized ethology is full of pitfalls and they attempt to show us how the job of relating man to nonhuman primates should be done by the use of various "universals."

For readers at the level to which it is directed, somewhere between the intelligent layman and the professional ethologist, *Man and Beast* should be valuable. Perhaps it will also find appreciative readers among social scientists and others who are attempting to weave ethological concepts into the fabric of their work with *Homo sapiens*.

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Chemical Zoology

Communication by Chemical Signals. Papers from a meeting, Auburn, Mass., June 1968. JAMES W. JOHNSTON, JR., DAVID G. MOULTON, and AMOS TURK, Eds. Appleton-Century-Crofts, New York, 1971. xii, 472 pp., illus. $21. Advances in Chemoreception, vol. 1.

This book should impress on the reader that chemical communication is ubiquitous in the animal world. Attention is focused on insects, fish, and reptiles. A penetrating analysis by Burghardt of definitions of "communication" in an early chapter dispels at least some of the semantic confusion that is inevitably generated when an international group of specialists attempts to integrate new information in their fields—which in this case include insect physiology, mammalian

endocrinology, herpetology, experimental psychology, animal behavior, and natural products chemistry. Burghardt's definition states that "communication is the phenomenon of one organism producing a signal that, when responded to by another organism, confers some advantage (or the statistical probability of it) to the signaler or his group."

Butler's chapter on insect communication, emphasizing social insects, is comprehensive. Biologists certainly should take note of the chapter by Bedoukin, who presents convincing examples of the pitfalls encountered during the manipulation of chemical pheromones.

Rare insight and objectivity are shown by Stuart in his discussion of the complex social communication of termites. He ably points out some of the fallacy of attempts to classify chemicals precisely according to the type of induced behavior without regard to the other environmental stimuli that are acting concurrently.

The physiologist will appreciate Stürckow's painstaking and critical study of olfactory and gustatory cells as they control chemoreception in insects. Stürckow's comments on interactions among neural elements within single sensilla may persuade more researchers to consider the specificity of the entire sensillum, instead of individual neurons, as a basic sensing unit.

Ant trail and alarm pheromones are catalogued in extensive tables. Ants surely must have the most complex chemical communication system of any insects.

Chemoreception and chemical communication in fish, reptiles, and mammals provide an interesting contrast to those phenomena in insects. Terminology developed to describe invertebrate behavior is not always applicable to higher animals; for example, the "releaser" concept.

Most of the chapters are followed by frank and sometimes critical discussion. Many interesting questions are raised that will make some researchers more cautious. It is suggested, for instance, that distilled water used in many laboratories has contaminants in quantities sufficient to cause behavioral responses.

The layman will find some satisfaction in realizing that the contributors did not reach complete agreement concerning some of their own definitions. This is as it should be. Overall, the book is replete with excellent information that biologists and chemists alike can utilize in research and teaching. Indexing is adequate and bibliographies are comprehensive. Serious students and scholars will treasure this book as a reference on communication by chemical signals in diverse animal groups.

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Modeling on a Grand Scale

World Dynamics. JAY W. FORRESTER. Wright-Allen, Cambridge, Mass., 1971. xiv, 142 pp., illus. $9.75.

This book has one important message to deliver and delivers it excellently in five lines of page 123: "From this book the reader should glimpse the nature of multi-loop, non-linear feedback systems, a class to which all our social systems belong. The book has shown how these systems can mislead us because our intuition and judgment have been formed to expect behavior different from that actually possessed by such systems." Beyond that one perceptive statement, the book is blatant and insensitive advocacy for unsubstantiated model building on a very large scale—a scale larger even than the author has advocated in two earlier books, *Industrial Dynamics* (1961) and *Urban Dynamics* (1969). At least the latest in the series, *World Dynamics*, is mercifully short.

Forrester sees the world as a feedback system not far different from a complex RLC circuit in electrical engineering—as a system that is easy to describe but hard to compute (except for him and those who follow his advice). What we never find out from his three versions of almost the same book is that, unfortunately, many of the component parts of behavioral systems are extremely difficult to describe, let alone measure. What is the book for? Its behavioral-scientific content is virtually zero. Its engineering-scientific content is well known and has been said before, by Forrester and by others (for example A. Tustin in *The Mechanism of Economic Systems*, Heineman, 1953). It amounts to applying electrical engineering and servomechanism principles to social systems. But if that is to have any worth, it must depend on the validity of the behavior of the models as representations of social systems. And Forrester's insights and observations on political, social, economic, or bureaucratic processes are negligible. None of his books has any empirical content, yet the operation of all his models calls for large numerical inputs.

Forrester is an extremely energetic and gifted man, and one cannot completely dismiss the work that he has been doing for the last 15 to 20 years. What are the positive features of this and his previous books? The Dynamo language is a nice, easy computer language that is intuitively attractive and suitable for obtaining graphical output displays of the type that are so impressive in top-level briefings and that appear in all his books. Furthermore, Forrester and his disciples appear to be willing to model anything. They have no hang-ups. This is probably good, because the challenge they have offered to econometricians and economists is healthy for all concerned. Forrester argues, though not so much in this book, that econometricians act in an almost anal-compulsive manner, being afraid to try to model anything that they cannot measure with considerable accuracy. He himself adopts the courageous attitude that it is better to guess at the values of important parameters that are hard to measure than to leave them out of the model.

Forrester's dynamic models are certainly no worse than most mathematical economic models of growth. The major difference between Forrester and the growth-model economists lies not in the simplicity of the models but in how their authors use them. Most behavioral scientists even when they want to be "relevant" are not completely satisfied with a criterion of validation that amounts to no more than acceptance by top decision makers or use by those in power. Such a criterion can fast lead to a Lysenko style of science. And it appears to be the one that Forrester accepts.

Responsible behavioral scientists know that not all variables and parameters in the world are simultaneously dominant in guiding the dynamics of a complex system. They know that it is important to locate the few variables to which the system is sensitive and to measure the relationships that count. Forrester knows this too, but leaves this work to lesser men. He sees important difficulties, such as urban decay, industrial cycles, the vagaries of population growth, and the instability of