

Together, these 10 chapters provide a valuable reference source to what is known on the topic, and a handy compilation for mammalian researchers who can afford it. The price seems prohibitive for personal use in spite of the low-quality paper, and the book is likely to end up on a few institutional library shelves. A book such as this can be produced today for one-tenth of the price with standard desk-top publishing software and a local printer, and could easily be marketed by the editor on a nonprofit basis to his colleagues in the field. It is regrettable that for the publication of such volumes scientists still team up with publishers aiming for small sales and high retail price.

Griffin, D. R. 2001: Animal Minds: Beyond Cognition to Consciousness.
University of Chicago Press, Chicago. 355 pp., 0 figs, 0 tables, Hb \$27.50,
£17.50, ISBN 0-226-30865-0.

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Griffin's revised book is an impressive, informative and readable survey of evidence for complex and flexible animal cognition garnered primarily from ethological studies. Students of animal cognition whose work is concentrated in the laboratory will enjoy the rich accounts of behavior in natural settings, and many field workers reading the book will learn new details of familiar behaviors. The book encourages us to strive even harder to expand verifiably the boundaries of animal cognition, but many will find that the facts presented fall predictably short of compelling the thesis expressed in the title.

Griffin's evocative prose makes up for the lack of figures. Particularly enjoyable are accounts of the interactions of lions and gazelle, beaver dam building and maintenance, and the construction of the glorious bowerbird bowers. A recurrent topic is the behavior of invertebrates, through which Griffin convincingly argues that these animals are capable of complex information processing. Less convincingly, he also suggests that they may be conscious of the information they process.

As indicated by the title, arguments are made for the importance and feasibility of the study of consciousness in nonhuman animals. Scientists studying animals should investigate 'the distribution and content of conscious awareness—subjective emotions, desires, beliefs, and behavioral choices intended to achieve certain results or avoid others' states Griffin (p. 23). In promoting these goals, he criticizes 'inclusive behaviorists'—those scientists who study mental representations, information processing, communication, or any other aspect of modern animal behavior—but remain either agnostic towards, or in many examples cited, opposed to, the existence of subjective conscious states in nonhuman animals. Griffin does not denigrate the work of such scientists; in fact he cites the work as supporting the existence of consciousness in nonhuman animals. But he does argue that inclusive behaviorists are unjustifiably inhibited by a taboo against making inferences about consciousness, and that if this taboo were ignored our science would progress more rapidly. Some readers might rather argue the reverse: that a preoccupation with the private *subjective* states of nonhuman animals, states often thought undetectable, is a distraction from the real business of science. That business, it can be argued, is to carefully document the *objective*, publicly verifiable properties of behavior and to make inferences about the information-processing machinery necessary to account for behavior. This approach has been extremely productive and is well documented in Griffin's book.

Conspicuously, the causal contribution of consciousness to behavior is never stated. Griffin argues that it is premature to do so, given that we know so little about it. Instead of directly indicating what a conscious organism should be able to do that an unconscious one could not do, the statement that some behaviors are 'suggestive' of consciousness is frequently repeated. The reader can distil from these indirect references that Griffin believes that consciousness is at work when animals learn, when they communicate, and when they respond to changing conditions in flexible ways. In a representative example, Griffin contrasts the 'simpler and more parsimonious explanation...that the beaver thinks consciously in simple terms about its situation, and how its behavior may produce desired changes in its environment' with a 'genetically determined program [that] requires that we postulate special subprograms to cover numerous special situations' (p. 112). This and other similar comparisons are false dichotomies that misrepresent mainstream interest in how information is represented and processed in animals' brains, with or without consciousness. Modern inclusive behaviorists posit the existence of mental representations of past experiences, of conspecifics, of food and predators, and argue that these mental representations are subject to various kinds of manipulations that give flexibility to behavior. It may not be clear how Griffin's invocation of consciousness simplifies an account of the information processing necessary to account for behavior.

Griffin rightly discusses the ethical implications of the status of consciousness in nonhuman animals. Even if it is the case that we can find no scientific method for detecting consciousness, even if it were

determined that consciousness plays no causal role in behavior, still we should be interested in the distribution of consciousness for ethical reasons. Surely there is a relationship between the capacity for subjective experience and the capacity for pain and suffering, and our treatment of animals would therefore ideally be informed by an understanding of the conditions under which subjective experiences occur. Griffin's book urges us to determine what guidance, if any, science can provide in this moral arena.

In the concluding chapter animals are described as different from all other organisms in that 'they do things spontaneously, on their own' (p. 271). In some sense this sort of statement is agreeable—we all regard animals as more active than fungi. But is Griffin suggesting that consciousness is a special sort of causal agent—one that has no antecedent cause, and is therefore spontaneous? Is his argument with the inclusive behaviorists that they are 'mechanomorphic', treating animals as biological machines that deterministically process information? Isn't a mechanistic approach a prerequisite for science? If so, what mechanistic role might consciousness play in behavior?

Perhaps most inclusive behaviorists will ultimately be unmoved by Griffin's argument for the study of consciousness in nonhuman animals. But all readers will likely be moved to reexamine a persistent and deep mystery, and in the process will be taken on a lively tour of animal behavior and cognition that can be appreciated from many points of view. Even if we are not taken far beyond cognition by Griffin's book, the cognition itself is fascinating.

BOOK SUMMARIES

Jolly, A. 2001: *Lucy's Legacy: Sex and Intelligence in Human Evolution*. Harvard University Press, Cambridge, MA. 528 pp., 2 line illus., cloth US\$ 29.95, £20.50. ISBN 0-674-00069-2; paper US\$ 18.95, £12.95, ISBN 0-674-00540-6.

Originally published in 1999, this book is now available in paperback. Its central premise is that cooperation and interdependence played a major role in the evolution of human intelligence and culture. Writing from a female and sociobiological perspective, Jolly explores a host of subjects, ranging from the evolutionary pressures facing early bacteria to the future of human culture. Jolly draws on research in biology, primatology, sociobiology and evolutionary psychology, and presents material in an easily digestible style, making this book suitable for a wide audience.

Mealy, L. 2000: *Sex Differences: Developmental and Evolutionary Strategies*. Academic Press, San Diego, CA. 499 pp., (xix + 480., figs and tables, cloth, US\$ 79.95, £49.95, ISBN 0-12-487460-6.

In this text, Mealy explores sex and gender differences using a comparative life-history approach. Chapters are organized by topic, and cover subjects such as sexual differentiation, evolution of sex differences, human and nonhuman male and female sexual strategies and mating systems, marriage, parenting, and sexual politics. The focus of the text is on human sex and gender differences, but approximately one-third of the material is devoted to such issues in nonhuman populations. This book is designed as a graduate-level text for courses in sexual differences, and would also provide useful material for advanced courses in evolutionary biology, evolutionary psychology, or other aspects of animal behavior and psychology.

Stanford, C. B. 2001: *The Hunting Apes: Meat Eating and the Origins of Human Behavior*. Princeton University Press, 262 pp., 3 tables, 3 line illus., cloth US\$ 35.00, £22.95, ISBN 0-691-01160-5; paper US\$ 16.95, £10.95, ISBN 0-691-08888-8.

In this book, originally published in 1999 and now available in paperback, Stanford reviews research related to the behavior of nonhuman primates, ancestral humans, and modern hunter-gatherer societies to support his argument that meat hunting and particularly meat sharing significantly shaped the development of human intelligence and social systems. Written in an easily accessible manner, this book is appropriate for students of anthropology and evolutionary biology and psychology, as well as anyone interested in human evolution.