vice from a veteran." The chapter contains potentially useful information for someone new to these problems and it is very enjoyable reading. I found most of the advice to be sound and intuitively useful, although I am uncertain about Douglas' recipe for dealing with poor alternators: simply "dump them" (p. 149).

This book is recommended for those interested in animal learning and behavioral neuroscience, and perhaps may be a useful guide in graduate seminars focusing on a single issue. I found minor problems when in several chapters an attempt is made to relate SAB to foraging research; statements such as the "obvious survival value of SAB" (p. 39) clearly add only confusion both about the explanation of SAB and about the nature of the concept of adaptation. It is also not clear to me why it would be optimal for the animals to alternate; seeking novelty is not probably a "goal" in itself, in an evolutionary sense, and, in fact, alternation (and win-shift) may be more related to resource depletion than to other aspects of the environment (Kamil, 1978). In any case, the authors are to be congratulated on an excellent book which illustrates how far comparative psychologists venture when pursuing the understanding of a behavioral phenomenon.

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Cognitive ethology: The minds of other animals, edited by Carolyn A. Ristau. Lawrence Erlbaum Associates, Hillsdale, NJ, U.S.A., 1991, XX + 332 pp.

When we study animals either in their natural environment or in the laboratory, what does their behavior tell us about their mental

functioning? What can be inferred from behavioral data about their mental life? How should we approach and study consciousness and mental states of animals? Should we engage in such an enterprise at all? These problems, that have been matters of increasing debate and controversy for the last two decades or so, are at the very heart of Carolyn Ristau's book. The volume is dedicated to Donald Griffin and presents ideas and researches that have been inspired by his work. However, it is not just a collection of contributions supporting Griffin's ideas, but rather a lively array of different views, representative of a developing new field: cognitive ethology. The papers originate from a symposium on animal cognition held at the *Animal Behavior Society* meeting in June 1987.

The book includes two sections. The three chapters in Part 1 are concerned with theoretical perspectives and basic assumptions in cognitive ethology. The ten chapters in Part 2 present experimental evidence from both the laboratory and the field. However, theoretical aspects emerge continuously in the second part.

Donald Griffin begins Part 1 of the volume by outlining the main concerns of cognitive ethology. He suggests that animals might well have simple thoughts about things that matter to them. His working definition of consciousness assumes the presence of internal representations and simple beliefs and desires about objects and events; it does not necessarily include self-awareness and thinking about the process of thinking itself. Griffin explores some lines of evidence for the presence of consciousness and considers possible functions consciousness might serve. Cognitive ethology, and in general the study of animal cognition, he argues, "should certainly include, but not be limited to, information processing in animal brains."

The ethologist Colin Beer traces the historical and conceptual evolution of philosophical ideas central to cognitive ethology, providing a summary of so called "folk psychology" and other views in the philosophy of mind bearing upon the study of animal minds. Finally, the philosophical foundations of the intentional accounts of behavior, i.e., explanations based on mental states like beliefs and desires, are examined by the philosopher Jonathan Bennett. He develops the belief-desire-behavior approach to include an emphasis on the context and environment.

Different aspects of animal cognition are discussed by several contributors in Part 2. Ristau describes her field work on the injury-feigning behavior of plovers as well as other antipredator acts which suggest considerable cognitive ability. Gordon Burghardt focuses on reptile cognition and examines the death feigning of hognose snakes in the laboratory. Both Ristau and Burghardt explore the advantages and disadvantages of applying a belief/desire approach in research on animal behavior.

Communicative behavior is an interesting subject for studying the minds of nonhuman animals, and provides a potential window into problems of intentionality. Peter Marler, Stephen Karakashian, and Marcel Gyger describe their experiments on the effects of different audiences on the communication of chickens. The impact of social context on the production of signals with external referents like danger and food is of particular interest if one considers the possibility that animals may be intending to communicate, as opposed to merely emitting vocalizations in the presence of certain classes of eliciting stimuli. The focus is on one limited aspect of intentionality, namely the desire to communicate. The possibility for deception in animal communication is investigated by Dorothy Cheney and Robert Seyfarth, who discuss deceptive behavior of vervet monkeys and other species. They note that not all animal communication provides accurate and reliable information to recipients, but some signals provide others with false information (their functional definition of deception). The authors examine factors constraining the ability of animals to deceive each other. W. John Smith discusses critically the work by Marler and his colleagues and examines, in more general terms, the messages and meanings of animal signals, the nature and limitation of playback experiments, and the conclusions to be drawn from these. Finally, Irene Pepperberg advocates the usefulness of artificial communication systems in investigating cognitive and communicative abilities of animals, and describes her work on a parrot.

Alison Jolly reviews laboratory and field studies of primate behaviors that suggest consciousness, discussing instances of self-recognition, planning, symbolic behavior, and deception in chimpanzees.

Sonja Yoerg and Alan Kamil outline the limits of cognitive ethology, and argue that its definition as put forward by Griffin is "impractical and unproductive," because it focuses on unobservable conscious mental events. They claim that current cognitive ethology is virtually atheoretical and therefore no meaningful predictions can be made; furthermore, it is almost untouched by recent developments of human and animal cognitive psychology. They suggest that cognitive ethology should comprise the best of cognitive science and the best of ethology.

George Michel, a developmental psychologist, argues against "folk psychological" concepts by considering difficulties in their application to developmental psychology.

Finally, Ristau provides an overview of the book together with some critical comments about the papers and the state of the art. It turns out that the study of other minds is difficult and problematic for a number of reasons. More empirical data are necessary, as well as caution in their interpretation. However, entertaining possibilities of consciousness or thinking in animals led to the design of experiments

not otherwise likely to be undertaken. I fully agree with this statement and would extend it to the field of animal cognitive psychology. At least, the picture of animal behavior that has emerged in recent years from both cognitive ethology and animal cognition is by far more interesting, intriguing and complex than previously imagined.

As a whole, the book is extremely interesting and up to date, in that it provides a complete overview of current perspectives in its field. In my opinion, it is a stimulating source of ideas for new research. Certainly comparative and experimental psychologists, ethologists, and cognitive scientists can all profit from reading it.

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