



Comparative Approaches to Cognitive Science.

Review Author[s]:
Frank Keil

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cause predators are adapted to nighttime "foraging."

This ecological perspective on sleep clarifies questions such as "do we need to sleep?" or "how much sleep do we need?", questions that Lavie discusses with the aid of much interesting research. The immediate or proximal answers to these questions are broadly "yes" and "about six to eight hours," respectively, and Lavie supplies abundant anecdotal evidence—such as the creeping psychoses that develop under extreme sleep deprivation—to support these answers. But the aberrations that accompany too little sleep or the things that happen during sleep (such as dreams) should not be confused with its causes. Tiredness may be a symptom of too little sleep, but is not why we sleep. Dreams arise because we sleep; we do not sleep to dream. Lavie recounts the story of seventeen-year-old Randy Gardner, who in 1965 stayed awake for 264 consecutive hours (11 days!). After a press conference young Randy slept for 10 hours and 40 minutes, and the next night for just eight.

MARK PAGEL, *Zoology, University of Oxford and Hertford College, Oxford, England*

RED FOX: THE CATLIKE CANINE. *A Smithsonian Nature Book.*

By J David Henry. Washington DC: Smithsonian Institution Press. \$15.95 (paper). iv + 174 p + 8 pl; ill.; index. ISBN: 1-56098-635-2. [Originally published in 1986. This edition has a new preface with updated information on fox research.] 1996.

READINGS IN ANIMAL COGNITION. *A Bradford Book.*

Edited by Marc Bekoff and Dale Jamieson. Cambridge (Massachusetts): The MIT Press. \$30.00 (paper). xv + 379 p; ill.; index. ISBN: 0-262-52208-X. [Selected excerpts from *Interpretation and Explanation in the Study of Animal Behavior* originally published in 1990.] 1996.

This collection of 24 essays is intended as an introduction to the field of animal cognition. It does not attempt to break new ground; indeed, 17 of the essays were previously published in a 1990 volume, now out of print, by the same editors. Only one chapter has not been published previously.

The essays are divided into five conceptual areas. The first section (4 chapters) addresses some basic philosophical issues related to animal cognition. The second section (6 chapters) looks at cognitive and evolutionary explanations and focuses more on methodology than the first section. These are followed by two sections on specific topics in animal cognition: the first is on recognition, choice, vigilance, and play (5 chapters); and the second on

communication and language (4 chapters). Finally, the book concludes on a philosophical note with several chapters that speculate on the nature of animal minds (4 chapters).

In some aspects, this book is similar to the 1991 collection of essays edited by Ristau (*Cognitive Ethology: The Minds of Other Animals*. Hillsdale (NJ): L Erlbaum Associates). However, whereas Ristau's work was primarily a *Zeitschrift* in honor of Donald Griffin, this volume attempts to be a comprehensive and coherent survey of the field. Although not quite succeeding in this regard, it is a commendable effort. Most of the chapters are good, some are excellent. The chapter by Allen and Hauser (Concept Attribution in Nonhuman Animals) and the chapter by Seyfarth and Cheney (Inside the Mind of a Monkey) are two of several articles in the latter category. Other chapters, including one from the first section, cautioning against gender biases in research, and several from the second section are too generic in that, although full of sage advice, they are not tailored to the specific issue of animal cognition. The book is ambitious in its scope but is neither comprehensive nor coherent enough to use as a textbook. It would, however, make an excellent supplement to an upper-level undergraduate or a beginning graduate seminar.

STEPHEN J CLARK, *Psychology, Vassar College, Poughkeepsie, New York*

COMPARATIVE APPROACHES TO COGNITIVE SCIENCE. *Based on an International Summer School held in the Ecole d'Art d'Aix-en-Provence, France, 6-17 July 1992. Complex Adaptive Series. A Bradford Book.*

Edited by Herbert L Roitblat and Jean-Arcady Meyer. Cambridge (Massachusetts): The MIT Press. \$55.00. ix + 533 p; ill.; author and subject indexes. ISBN: 0-262-18166-5. 1995.

Cognitive science has been an area of inquiry centered largely on humans. Even cognitive neuroscience focuses heavily on human cognition; other species are certainly studied, but usually as degenerate or simplified versions of the human case. Yet, a great many animals daily confront problems in which they have to selectively pick up information, retain that information over displacements of time and space, and then act on it appropriately. Roitblatt's introduction to this collection of twenty chapters shows that even those who are most interested in human cognition would benefit greatly from less human-biased comparisons of how animals, and machines, might solve these problems. Four introductory chapters frame the "big" issues and are useful for setting up multiple perspectives for what follows.

A vast range of cases is considered throughout this book: from bacteria to baboons and raccoons

to robots. There is a similar diversity in scholarly approaches, including philosophy, cognitive ethology, artificial intelligence and robotics, and nonverbal cognition in humans.

Five chapters address problems of intentionality and the organization of behavior, all trying in different ways to describe just how belief-like mental states of other animals might be. Dennett's brief essay on whether animals have beliefs nicely states what many in this section maintain. A more forgiving, less linguistically-based, view of beliefs could easily grant them to many creatures, and with large explanatory benefits.

The empirical meat of this volume comes in the next eight chapters concerned with representation, memory and attention, and communication. A wealth of studies are reviewed on topics such as spatial knowledge, memory systems, causal cognition, and attention. Especially valuable reviews are provided by Thompson on concepts and Evans and Marler on language and animal communication. The last four chapters deal with emotion and motivation, not only in humans and animals but more surprisingly, also in machines. These are more speculative but useful ways of embedding cognition in a larger mental context.

One misses the systematic analyses seen elsewhere in comparative biology that carefully contrast different organism/environment configurations in ways that lead to tight predictions; and evolutionary issues need more attention. But, overall, this is a refreshing new perspective on much of cognitive science and is well worth reading.

FRANK KEIL, *Psychology & Cognitive Studies, Cornell University Ithaca, New York*

THE WISDOM OF THE HIVE: THE SOCIAL PHYSIOLOGY OF HONEY BEE COLONIES.

By Thomas D Seeley. Cambridge (Massachusetts): Harvard University Press. \$49.95. xiv + 295 p + 6 pl; ill.; index. ISBN: 0-674-95376-2. 1995.

With several hundred books covering every imaginable aspect of honey bee biology, behavior and evolution, is there really room or a need for one more? Thomas Seeley's book, heavily based on his own 15 years of research, does fill a gap in the available literature. In it, he outlines evidence for the "superorganism" concept of the honey bee—that is, that each colony acts not as a collection of individuals but as an integrated unit, changing and adapting to the needs of the group, rather than the needs of individual members. This is not a new concept, of course, but Seeley's book is devoted to showing, mainly through examples taken from his research on food collection and related activities, that "in the case of honey bees natural selection acts mainly at

the level of the entire colony, rather than the single bee" (p 3).

The book is divided into three sections: a fairly short introduction, a long section titled Experimental Analysis, and a very short Overview or closing statement. The introduction succinctly covers material needed to understand the rest of the book, and the second section slowly builds, in a logical progression of chapters, from how colonies acquire information about food sources to specific mechanisms involved in the regulation of every aspect of daily food and water needs. One potentially useful chapter explains the methods and equipment the author has perfected in his fifteen years of research, and can provide novice or even advanced researchers with ideas on how to design and perform specific studies. In the third section he returns to the superorganism concept, reiterating statements made earlier, concentrating on how bees communicate the colony's needs. I would have expected this section to carry more of the weight of the book (it is only 25 pages out of a total of 265), since Seeley emphasized that one of the major purposes of the work is to argue the superorganism concept, but it does round out his ideas and form them into a solid conclusion.

Exactly who the intended audience is to be is unclear; the book is very detailed in its analysis of honey bee foraging and worker behavior, and would suit a higher-level apidology course or as recommended reading for an insect or animal behavior course. It would also be interesting reading for those interested in honey bee behavior and ethology. It is formatted as a textbook, with very wide margins for notes and for the occasional illustrative figure. Apart from a few typos, it is free of technical errors, and one can forgive the several anthropomorphisms as being the result of Seeley's devotion and enthusiasm for his subject.

MARTIN S DAMUS, *Biology, Queen's University, Kingston, Ontario, Canada*



HUMAN BIOLOGY & HEALTH

THE NEANDERTHAL LEGACY: AN ARCHAEOLOGICAL PERSPECTIVE FROM WESTERN EUROPE.

By Paul Mellars. Princeton (New Jersey): Princeton University Press. \$69.50. xxi + 471 p; ill.; index of sites and general index. ISBN: 0-691-03493-1. 1996.

In this volume, leading "replacement" advocate Paul Mellars spells out in superb detail what he believes to be the major categories of archaeological evidence in support of disjunction over the Middle-