



## BEHAVIOR

## ECHOLOCATION IN BATS AND DOLPHINS.

*Edited by Jeanette A Thomas, Cynthia F Moss, and Marianne Vater. Chicago (Illinois): University of Chicago Press. \$115.00 (hardcover); \$45.00 (paper). xxvii + 604 p; ill.; author and subject indexes. ISBN: 0-226-68446-6 (hc); 0-226-79599-3 (pb). 2004.*

This volume is a collection of 73 papers presented at a conference on biological sonars held in 1998. It was the fourth in a series of meetings on that topic that date back to 1966. The introduction by Whitlow W L Au—a review of previous work on both bat and dolphin sonar that compares and contrasts the sonar systems and the environments of the two orders—contains background details that will help nonspecialists understand much of the work in the volume. The papers are grouped into six parts that cover the major areas of current research in biological sonar: Echolocation Signal Production, Feedback, and Control Systems (11 papers); Auditory Systems in Echolocating Mammals (21 papers); Performance and Cognition in Echolocating Mammals (nine papers); Ecological and Evolutionary Aspects of Echolocating Mammals (19 papers); Echolocation Theory, Analysis Techniques, and Applications (eight papers); and Possible Echolocation Abilities in Other Mammals (five papers).

As noted in the Preface, the three previous biological sonar conferences were very influential on the research in that field, and this conference should have a similar effect. The list of authors contains many of the leading researchers, as well as young scientists who will be the leading researchers of tomorrow. This volume would serve as a good introduction to current research on biological sonar for nonspecialists or students, as well as a “must have” collection of papers for biological sonar researchers.

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GENETIC AND CULTURAL EVOLUTION OF COOPERATION. *Based on a workshop held in Berlin, Germany, 23–28 June 2002.*

*Edited by Peter Hammerstein. Published by MIT Press, Cambridge (Massachusetts), in cooperation with Dahlem University Press, Berlin, Germany. \$45.00. xiv + 485 p; ill.; name and subject indexes. ISBN: 0-262-08326-4. 2003.*

In the last 40 years, the field of cooperation has experienced a revolution. Naïve ideals about benefit for the good of species have been supplanted

with a selfish-gene worldview that instructs that cooperation can only evolve under restrictive conditions. But, our understanding of such conditions for the widespread forms of cooperation in nature remains fragmentary. Can a simple set of evolutionary models explain cooperation not just within and between species, but at the intercellular and genomic levels? The book *Genetic and Cultural Evolution of Cooperation* offers an expansive review on this topic, and makes progress toward such a synthesis. This book emerges from the June 2002 Dahlem Workshop that proposed to “elucidate the mechanisms and processes beyond kin selection that promote the emergence of cooperation in systems that range from molecules to societies” (p 1). In light of an ambitious goal, this volume skillfully surveys this complex and often idiosyncratic subject and will be useful to both beginning and accomplished researchers. The book is organized into four blocks of papers, each ending with a group report summarizing findings and highlighting controversial topics. These reports offer readers a most up-to-date view of key questions being studied in fields ranging from cognition and human alliances to cooperation at the levels of genomes, cells, and species.

A worthy example is the group report by Bergstrom et al. that addresses interspecific mutualism. This report describes many key puzzles begging empirical attention and reviews the history of this dynamic field. The theory of this field began with Trivers’s reciprocal altruism model that explained that altruistic acts can be selectively advantageous as long as benefits are later returned to the donating individual. A subsequent paper by Axelrod and Hamilton dominated virtually all thinking in the field, concluding that “tit-for-tat” interactions could stabilize cooperation between individuals with repeated interactions. Contemporary work—some aptly described in this chapter—recognizes multiple mechanisms underlying the evolution of reciprocal altruism. These include partner choice (or biological market) models where individuals preferentially benefit cooperative partners; byproduct models where individuals benefit others as an automatic consequence of selfish actions; and, finally, models in which repeated interactions alone stabilize cooperation (partner fidelity). Although biological market and byproduct models are reviewed in detail, partner fidelity models are not covered.

Once this history is reviewed, Bergstrom et al. make some (admittedly) bold forecasts for the field. They predict that reciprocal altruism will never be observed in interspecific mutualism; that partner sanctions (punishment of noncoopera-

tors) will be found to be rare compared to partner choice (reward of cooperators); and, finally, that mutualism invariably has commensal origins. Although such bold theoretical predictions may spur empirical testing, the first two predictions seem predicated on artificially narrow model definitions. For example, under another view, reciprocal altruism extends (beyond strict assumptions of tit-for-tat cooperation) to any interaction where costly benefits are exchanged between nonrelatives (including all the models above). Similarly, the above distinctions between partner choice and sanctions are perplexing: whenever an individual preferentially benefits a cooperative partner over an uncooperative one (partner choice), the latter is punished merely by exclusion, and under the sanctions models cooperative partners similarly benefit more than those that are punished. Finally, and in contrast to their conclusion, sanctions appear to be a widespread mechanism stabilizing cooperation. Organisms as diverse as legumes and squid can punish uncooperative bacterial symbionts, and yucca plants are known to punish greedy yucca-moth pollinators. It seems clear that the lack of universally accepted terminology remains an unfortunate impediment to synthesis in this field.

The block of papers on genomic and intercellular cooperation explains mechanisms supporting cooperation at these fundamental levels and offers examples of within-organism conflict that may be startling to uninitiated readers. Hoekstra tidily reviews a menagerie of genomic parasites and the proposed mechanisms of their suppression, which range from the general (recombination) to the specific (RNA interference). Blackstone and Kirkwood describe the potential roles of selfish mitochondria in programmed cell death and offer a novel perspective on the evolutionary history of this organelle. Although common themes are evident among these chapters and those on interspecific cooperation, integration of theory among the subjects is not emphasized.

The goal of synthesis seems especially challenging in light of the chapters that highlight human cooperation. Several papers, as well as the group report on human societies, actively separate theory of human cooperation from the models commonly applied to other organisms. Group selection and culture-gene coevolution are invoked, with the justification that cooperation is more important for human evolution than for other life and, thus, requires different models. To make matters more complex, the field of human evolution is inundated by models based on past evolutionary scenarios, and such data are both speculative yet difficult to refute. Although Smith attempts to counter the separatist

approach in his chapter, it is clear that the debate is far from closed.

*Genetic and Cultural Evolution of Cooperation* offers an excellent and timely assessment of a dynamic field. The book will bring readers up to date on studies and theory of cooperation at a variety of levels (i.e., genomes, species, societies). What is missing is an attempt to synthesize the theory of this field. Such a synthesis remains a major challenge to biologists studying the evolution of cooperation.

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## HUMAN BIOLOGY & HEALTH

GENETIC NATURE/CULTURE: ANTHROPOLOGY AND SCIENCE BEYOND THE TWO-CULTURE DIVIDE.

*Edited by Alan H Goodman, Deborah Heath, and M Susan Lindee. Berkeley (California): University of California Press. \$60.00 (hardcover); \$24.95 (paper). xvii + 311 p; ill.; index. ISBN: 0-520-23792-7 (hc); 0-520-23793-5 (pb). 2003.*

Most biologists are unfamiliar with the field known as "social studies of science" (SSS). Those who have heard of it are likely to think badly of it, particularly if their primary encounter is through books by fellow scientists with titles such as *The Flight from Science and Reason* (P R Gross, N Levitt, M W Lewis. 1996. New York: New York Academy of Sciences) or *Higher Superstition: The Academic Left and its Quarrels with Science* (P R Gross, N Levitt. 1994. Baltimore (MD): Johns Hopkins University Press). The book under review, a collection of 14 essays with a general introduction, mainly by anthropologists, other social analysts, and a few by geneticists, should dispel many misconceptions about SSS, not because it is a defense of such work against its critics, but because it contains uniformly first-rate examples of the field in action.

Whatever qualms individual scientists may have about the potential impact of their findings on society and the broader culture, professional societies and industry advocacy organizations hold the fruits of modern biological research to be unalloyed goods, "progress" that should be embraced by all, once they shed their parochial beliefs and get with the program. It is remarkable how different things look when the frame is shifted to include, for example, the interests of a study's subjects (i.e., the Amish, dwarfs, and Icelanders) in