

The book uses many ad hoc comparisons between animal behaviors and humans. Many are explained with statements such as: “there must be a reason for it” (p. 64); “[i]f you think about it, it makes perfect sense” (p. 131); and “[t]his means that there is actually a biological reason” (p. 119). These statements may be criticized as “just-so stories” or “evolutionary spandrels,” however, their purpose is to inspire thought about why we behave the way we do, not to dogmatically state the literal truth.

The book invites comparisons to Olivia Judson’s *Dr. Tatiana’s Sex Advice to All Creation* (2002. New York: Metropolitan Books), another volume that uses animal courtship and mating to educate a general audience about reproduction, sex, and behavior. Judson’s volume is slightly more technical from a biological standpoint, but relies a great deal on trying to evoke emotional reactions. *Wild Connection*, on the other hand, is more relatable, as the author writes as a partner in conversation rather than as an all-knowing, unimpeachable expert. The current book would probably work better as a point from which to start classroom discussions.

The main conclusion that one draws from the volume is that humans are animals, but by being aware of our animalistic proclivities we can better understand ourselves. The format, switching between facts and observations of animals and humorous accounts of romantic misadventures works well to maintain the interest of readers. It also challenges misconceptions of human mating and romantic behavior, like the “Cinderella Myth” or that men are wired to be more promiscuous than women. I found the book to be enjoyable and a relatively quick read.

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#### ANIMAL COMMUNICATION THEORY: INFORMATION AND INFLUENCE.

*Edited by Ulrich E. Stegmann. Cambridge and New York: Cambridge University Press. \$99.00. xviii + 452 p.; ill.; index. ISBN: 978-1-107-01310-0. 2013.*

Do animal signals contain information and have meaning, like words in a language, or are they potent stimuli that influence the sensory systems and behaviors of intended recipients? This book debates the role of information in animal communication by presenting opinion and evidence from diverse disciplines, such as evolutionary biology, ethology, linguistics, and neurophysiology. It also includes valuable philosophical contributions about the nature of information and

meaning, although these are overused and consequently somewhat distracting.

The volume includes an introduction and 18 contributed chapters organized into five parts: information-based communication; communication based on influence and manipulation; case studies; evolutionary perspectives on animal communication; and the relationship between animal signals and human language. The core of the debate is in the first two parts, which, in my opinion, should appear in reverse order, since most chapters in the first section are in part responses to arguments presented in the second. Regardless of their order, the chapters throughout this book are engaging, and are made even more so by their appended commentaries. These are critique-and-defend-style exchanges between other authors from the volume and those of the focal chapter. They reveal the passion of the authors and the tension among them, but they also highlight points of contention that were not apparent following the book’s general introduction.

The volume includes many excellent chapters advocating an information-based approach. When considered collectively, however, multiple notions of information emerge, which seems to diminish its utility for the scientific study of animal communication. At the same time, opponents of the information-based approach provide a compelling alternative based on influence and manipulation. The outstanding chapter by Drew Rendall and Michael J. Owren articulates the problems inherent in the information-based approach. It shows how pervasive these problems are in the literature, and provides an alternative framework for how researchers can proceed. Michael J. Ryan’s chapter, which in my opinion was the highlight of the book, implements this new framework by applying it to a classic biological system, the túngara frog (*Engystomops pustulosus*). In doing so, he provides a comprehensive understanding of a wonderfully complex communication system that is grounded in sensory biology, ecology, and evolutionary history.

The book’s value for animal communication researchers might have been greater if there had been a general conclusion that summarized the state of the debate and provided future direction. For example, on which issues do the authors generally agree and disagree? How prevalent are the information and influence views within the field of animal communication? Are there unique predictions for information- and noninformation-based communication that could help distinguish between these alternatives? Even without such a conclusion, the volume has value because it will encourage researchers to describe animal communication more

precisely, either by avoiding vague terms such as *information*, or by specifying which of the many definitions of *information* they are using. More fundamentally, this book will help to refine animal communication theory by prompting researchers to reconsider whether information is relevant at all.

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THE SPIRIT OF THE HIVE: THE MECHANISMS OF SOCIAL EVOLUTION.

By Robert E. Page Jr. Cambridge (Massachusetts): Harvard University Press. \$39.95. xiv + 226 p.; ill.; index. ISBN: 978-0-674-07302-9. 2013.

An enduring wonder of social insects is how individual actions are shaped by and shape the whole. Maurice Maeterlinck called this force “the spirit of the hive” and Page seeks the genetic, physiological, and behavioral mechanisms behind this spirit. Drawing from 30 years of research, he offers an elegant answer: the complex social behavior of honey bees arises from genetic and regulatory mechanisms found in their ancestors, solitary insects. Essentially, bee ovaries are a major agent in structuring their behavior and determining how they respond to environmental stimuli. The resulting behaviors provide local environmental feedback, altering the stimuli that nestmates respond to.

Page’s approach is distinguished by its emphasis on using honey bee breeding and evolutionary population genetics to explore the question of what regulates individual and colony behavior. He focuses less on the ecology and behavioral ecology of honey bees. However, Karl von Frisch would have appreciated the attention given to behavioral mechanisms. The author begins by reflecting on one of Darwin’s dilemmas: how sterile social insects castes evolved when these castes do not normally reproduce. This leads him to consider how the colony works in the absence of central control, Maeterlinck’s mysterious agent, the spirit of the hive. Page then presents a “stone soup” model of behavior and multiple case studies, all designed to show that coordinated behavior is an inescapable emergent property of bees responding to stimuli that they encounter and produce.

A major focus is how greater genetic diversity in workers has benefits and consequences. This diversity is facilitated by high honey bee recombination rates and by queen polyandry. Increased genetic diversity leads to a greater assortment of response thresholds, which in turn yields a more finely graded response to environmental changes. However, a honey bee queen can mate with more than 20 males. Why has such a high degree of polyandry evolved? The author explores three hypotheses in

detail and favors the sex determination hypothesis, that polyandry increases brood viability because homozygosity creates sterile males. He reviews evidence that multiple mating is not very costly for queens, which may also not have complete control over how many times they are mated.

Having established the benefits of genetic diversity and how honey bees increase it, Page introduces the pollen hoarding syndrome, the results of 20 years of selective breeding and the centerpiece of his research. By selecting for colonies that stored more pollen, “pollen hoarders,” the author generated bees with distinctive behavioral traits such as age of first foraging, individual foraging preferences, and altered sensitivities to multiple environmental stimuli such as nectar sugar content, pollen, light, and brood presence. Pollen hoarding is central to the theme of feedback between environmental stimuli and bee responses. From here, he returns to genetics by mapping the intricate gene network underlying the pollen hoarding syndrome. The architecture is complex and leads him to finally call for understanding the ecology of genes: how gene expression and the complex network of gene interactions can be understood at multiple levels, particularly the view from “10,000 meters” where broader patterns emerge. Likewise, this bigger picture is what I most appreciated about Page’s book, the holistic treatment of his work that is couched in language for specialists and the general audience, an understanding of how a soup stewed over 30 years has arrived at its depth of flavor.

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THE ART OF MIGRATION: BIRDS, INSECTS, AND THE CHANGING SEASONS IN CHICAGOLAND.

Paintings by Peggy Macnamara; Text by John Bates and James H. Boone; Foreword by John W. Fitzpatrick. Chicago (Illinois): University of Chicago Press. \$25.00. xx + 203 p.; ill.; no index. ISBN: 978-0-226-04629-7. 2013.

The popular appeal of observing migrating birds and insects has never been as pervasive as it is today. In her delightful book, *The Art of Migration*, Peggy Macnamara uses her talent as a watercolorist to depict, in often strikingly beautiful and vibrant colors, snapshot scenes in the seasonal passage of birds and insects in the Chicago area. Interested readers should know that the book is not, nor does it claim to be, a field guide nor does it provide a scientific treatment on the biology of migration. Her coauthors provide some scientific realism to the watercolors by giving concise and usually engaging summaries on the natural history of the