BOOKS: ANIMAL BEHAVIOR

Only Unthinking Intelligence?

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Consider the following two examples of bird behavior. When a pair of monogamous white-fronted bee-eaters (*Merops bullockoides*) loses its brood, it frequently abandons further breeding attempts and begins to help a closely related pair to rear its brood. If helpers have two or more broods available to assist, they almost always choose to help the more closely related brood. Fathers occasionally coerce their sons into helping them by disrupting their breeding attempts (*1*).

If a Lion Could Talk
Animal Intelligence and the Evolution of Consciousness
by Stephen Budiansky
Free Press, New York, 1998. 255 pp. $25, C$36. ISBN 0-684-83710-2.

Every autumn, individual Clark's nutcrackers (*Nucifraga columbiana*) store pine seeds in as many as 7500 different locations. Mexican jays (*Aphelocoma ultramarina*) also store seeds, although they are less dependent than nutcrackers on stored food and less accurate at remembering cache locations. Nutcrackers live alone or in small family groups, whereas Mexican jays are more gregarious. When given the opportunity to observe other individuals storing food, nutcrackers are significantly less accurate at retrieving such caches than they are at retrieving caches they have created themselves. Mexican jays, however, are as accurate at retrieving caches they have observed being created as they are at retrieving their own (*2*).

What mechanisms underlie these behaviors? Is kin recognition in bee-eaters based solely on interaction rates, or can the birds differentiate between close and more distant kin even when frequencies of interactions are held constant? What prompts fathers to disrupt their sons' breeding attempts? If, as seems likely, they do so only when ecological conditions are harsh and they need help themselves, how do they assess these conditions? What mechanisms underlie the different sorts of spatial memory in nutcrackers as compared with jays? Why should a species that displays prodigious memory of its own behavior be less adept at attending to and remembering the behavior of others? Are differences in observational learning due to differences in sociality?

Unfortunately, questions such as these are not addressed by old-school treatments of animal cognition. Such treatments typically begin with an evangelical admonition against succumbing to the temptations of George Romanes (who interpreted feats of cleverness in terms of conscious reasoning), throw in a few analogies between animal minds and computer programs, flog poor dead Clever Hans (the cue-conscious horse), caution against comparisons with humans, and conclude that animals can't possibly think like humans because they lack language and consciousness. *If a Lion Could Talk* epitomizes this approach to animal cognition.

Budiansky targets a lay audience, using examples drawn largely from laboratory studies in which animals are trained and reinforced to solve human-designed tests. (Indeed, fewer than 15 percent of the papers cited in the bibliography deal with animals that were not trained in some way by humans.) In much of his analysis, Budiansky takes a behaviorist's perspective, which argues that learning consists primarily of the strengthening or weakening of particular associations or response tendencies. He largely eschews a more cognitive approach, which posits that animals have mental representations of objects and events in their environment and are capable of flexibly manipulating and applying knowledge to novel contexts.

Aggressive recruiting. Bee-eaters sometimes coerce young sons into helping raise subsequent offspring.

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There is no consistent pattern, however, in Budiansky's acceptance or rejection of simple associative mechanisms. For example, he cites a well-known study in which capuchin monkeys (*Cebus apella*) that were taught to classify slides into "person" and "non-person" categories appeared to do so not according to a concept ("person"), but rather according to the presence or absence of certain cues (including, oddly, the color red). In this instance, Budiansky implies that the monkeys' classifications are based solely on discrete perceptual features. But later he states that monkeys "have no trouble spontaneously mastering mental representations of social relationships," implying that monkeys also classify stimuli according to abstract criteria such as "same" or "closely bonded." Which is it to be?

Similarly, in a chapter on communication, Budiansky concludes that animal vocalizations are largely instinctive manifestations of arousal, while responses to calls are the product of learned associations. At the same time, however, he argues that animal calls have evolved to exploit and manipulate the actions of recipients. Much of the evidence offered in support of this argument is factually wrong—for example, there is no consistent correlation between the pitch of alarm calls and type of danger, nor do alarm calls create pandemonium in listeners. Not mentioned at all are results that would offer stronger support for his hypothesis, such as the considerable flexibility in call production and response that occurs in many species.

Although some areas of animal cognition remain bogged down in debates about the strength of associative accounts as a unitary explanation for behavior, others have made considerable progress by adopting a more ecological and evolutionary approach. When gathering food for their young, for example, starlings (*Sturnus vulgaris*) base their decisions about when to return to the nest both on rates of return at their current feeding patch and travel time to the nest (*3*). In so doing, they solve the marginal value problem first devised by economists. How do they do it? Attempts to model and explain such behavior have benefited from a profitable partnership between behavioral ecologists and experimental psychologists, whose experiments on timing and counting have shed considerable light on the ways that animals might calculate rates under natural conditions (*4*). Studies such as these indicate clearly that there is considerable explanatory ground between the anthropomorphism of Romanes and the single-process accounts of behaviorists. It can only be hoped that research on concept formation, social behavior, and communication will soon follow suit.

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