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Animal Cognition: The Mental Lives of Animals. Clive D.L. Wynne. New York: Palgrave, 2001, 213 pages, $69.95 hardcover.

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Animal Cognition: The Mental Lives of Animals, by Clive Wynne, provides a brief exploration of important concepts, methods, and fields of study in the area of animal cognition. Wynne includes information on the history of research into animal minds, and a wide range of data collected from a host of experiments. *Animal Cognition* encourages those interested to join in the much-needed study of animal behavior, and offers a plethora of graphs, illustrations, and photographs to aid readers.

In the first chapter the author discusses central terms and concepts. Wynne acknowledges that people are animals, but complies with convention, using "animal" only as a referent for non-human animals. He cautions against anthropomorphism, and includes, at the start of each chapter, an illustration in which animal heads are placed on human bodies. Such art, Wynne notes, reveals our assumption that other animals have human-like qualities. (Perhaps such art equally reveals an understanding of animalian tendencies in human beings.) Wynne notes that anthropocentrism (our innate tendency to view other animals from our personal point of view — through a human lens) also hinders the scientific process. It is natural that we see things from a human perspective, Wynne points out, but the rigors of science require that we struggle to view the world from the point of view of other animals if we study animal cognition. Only in this way might we hope to gain an understanding of what transpires in the minds of animals.

The first chapter moves on to outline common research methods: behaviorists look only at behavior, ethologists explore animal activity in the wild, and cognitive psychologists use knowledge of biology to reach conclusions that extend beyond observed behaviors. Wynne comments that he does not align with any one tradition, but finds something of use in each.

Before moving to the second chapter Wynne defines "cognition" in non-human animals, and places animal cognition in historic context. He first connects intelligence with behavior, using problem-solving abilities as an indicator. Cognition, he asserts, indicates "the full richness of animal behaviour" (p. 4). Wynne points back

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to Darwin, who "proposed a plausible mechanism" for evolution (p. 4), which included behavior *and psychology* as part of the process of evolution. The author concludes chapter one with a warning that runs throughout *Animal Cognition*: check and recheck experiments, think and read critically, and always seek the most plausible explanation for animal behavior, rather than accept conclusions offered by other scholars.

In the second chapter Wynne focuses on theory of mind, motivation that underlies behavior (p. 15); Wynne lists deceit and imitation as indicators (p. 21). The importance of theory of mind to evolutionary development, Wynne points out, is "knowing who to trust, who to ask for food and who to ignore or avoid" (p. 29). The problem for researchers is to determine specifically what motivates an observed behavior. Wynne cites numerous examples of studies, including a carefully controlled experiment with Japanese quail, which he indicates offers the most dependable evidence of imitation. In this experiment birds imitated peer behavior to a greater extent when they observed beforehand that this behavior produced food.

Associative learning, or linking cause with effect, is the subject of Wynne's third chapter. He distinguishes between Pavlovian conditioning, in which an animal learns that a particular signal indicates what lies ahead, versus instrumental conditioning, in which an animal's own actions bring about a particular effect. For experiments designed to explore cause and effect, Wynne emphasizes the importance of contiguity (proximal in time and space) and contingency (effect necessarily follows cause [pp. 41–42]). Through controlled scenarios that involve food deprivation and electric shock, experimenters gain insight into how animals associate a cause with a particular affect. For instance, "Garter snakes learnt that eating worms treated with a toxin would be followed by a feeling of sickness and were reluctant to attack worms or other pieces of food that had been dipped in worm juice" (p. 39). The association between cause and effect has tremendous adaptive value in a world of predators and prey, Wynne reminds. It is therefore not surprising that conditioning, or associative learning, is one of the most widely spread phenomenon readily evidenced in the animal world, from the simplest organisms to the most complex.

Chapters four and five explore sense perception and concept formation, respectively. Chapter four includes an interesting array of fascinating sense receptors. For instance, pigeons have a visual field of 340 degrees (ours is a mere 200 degrees) as well as an ability to perceive ultraviolet rays and the polarization of light. To our three-color receptors, pigeons have six. Human beings also lack much that might be experienced in the area of sound and smell. With regard to magnetic fields, electrical senses, and sensitivity to air pressure, human beings are even less well endowed. Wynne uses navigation as an apt example of a skill perfected in other animals requiring sense perceptions that human beings lack.

Chapter five explores concept formation, including the topics of permanence, perception, time, and numbers. Wynne provides a wide range of studies demonstrating a variety of methods and contrasting results. He notes that many species find hidden objects in simple displacement experiments, yet few solve similar problems when they cannot see the object being displaced. He concludes that such experiments are less relevant to the natural world of hunting and gathering, of hide and seek entailed in survival. Experiments in the area of concept formation are less conclusive than those exploring the concept of time. Again, Wynne ties this divergence to biology: time is apt to be critical to the daily life and seasonal variation of many wild animals, while concept formation seems of less value. Yet Wynne admits that this reasoning breaks

down — birds and mammals demonstrate the complex skill of counting, which he finds to be of little evolutionary importance for these species.

In "Remembering," chapter six, Wynne explores how memory effects behavior. Consistent with his Darwinian base, he points out that remembering is a common function in the animal world, with obvious evolutionary benefits: those who remember and do not return to dangerous situations, or those who remember where food sources were found, are more likely to survive long enough to reproduce. Wynne's generous inclusion of research samples provides an overview of some of the deficits and strengths in memory that have been recorded in other species. He also offers examples of experiments that demonstrate the pitfalls inherent in human attempts to categorize, quantify, and explain the cognition of other animals. Indeed, the reader sometimes feels that a series of disjointed and bungled experiments in animal cognition have left us more confused than informed with regard to the minds of other animals.

Chapter seven focuses on reason, defined as comparatively complex behavior directed toward a specific end. Wynne describes a variety of experiments designed to detect reason: dogs and cats navigate fences in order to gain access to food in tests of spatial reasoning; birds and hermit crabs use tools to achieve a desired end; capuchin monkeys and cotton top tamarins demonstrate novel insights in response to unusual situations; chimps use analogies to make associations; and animals as diverse as pigeons, rats, and monkeys demonstrate advanced reasoning by placing objects in a particular order. Yet in the conclusion to chapter seven, Wynne focuses on a research example that he admits is counter-intuitive. None the less, he asserts that this experiment demonstrates a "failure to reason appropriately" on the part of vervet monkeys, a comparatively complex species (p. 159). In the experiment a carcass placed in a tree is intended to indicate that a leopard has been in the area — though there has been no leopard in the area. In this experiment, vervet monkeys failed to react with the expected alarm when they awoke to find a carcass placed in a nearby tree. Perhaps these monkeys failed to reason in an appropriate human manner, but is it not more reasonable to assume that these primates did not react because they were well aware that no leopard was in the area? With a less developed sense of smell, human beings are perhaps more likely to reason solely from visual stimulus than vervet monkeys. Perhaps this experiment unwittingly provides yet another apt example of human misunderstandings and shortcomings with regard to research in animal cognition

Chapter eight explores communication, and Wynne again takes the stand of a skeptic. While recognizing early communication studies as misguided because researchers expected chimps to communicate using *human* language, Wynne concludes that we should not be over-hopeful about dolphins because "no serious evidence has been reported of two-way communication with people" (p. 178). Is communication with human beings the ultimate goal and the only worthy proof of "complex" communication? Wynne ends on a more humble note, paraphrasing Wittgenstein, and admitting that whatever communication exists *between* other animals, we are unlikely to understand.

Chapter nine, the final chapter, returns to the topic of evolution, the likelihood of similarities across species, and the difficulties entailed in studying animal cognition. Each "species has adapted over countless generations to thrive in a particular . . . ecological niche [making it] difficult to compare meaningfully the cognitive talents of different species . . . . [E]ach species is well adapted to its

chosen environment and comparisons can be offensive" (p. 181). Wynne explains the problems of assessing cognition via brain size, proportional brain size, and the size of the neocortex. Brain-size studies have not been satisfactory; analyzing the behavior of non-human animals has also been problematic because different species are tested in completely different ways, making it "especially difficult to draw any comparative conclusions . . ." (p. 190). Wynne reiterates the difficulties of establishing an experiment to test cognitive abilities: vast difference in perceptual abilities, the importance and difficulty of creating scenarios that are natural and relevant across species, and motivational differences between individuals. Though in many ways *Animal Cognition* reveals Wynne as skeptical of studies in animal cognition, the author fails to mention that dependable knowledge of *human* cognition is equally scarce. One is reminded of Descartes' decidedly cynical approach to human cognition: we can only know that we exist if we think, which tells us nothing about anyone else.

Wynne's book contains an impressive array of figures and sidebars. For instance, chapter three includes a sidebar titled "Electric Shock," intended to mitigate ethical concerns commonly associated with this research technique. Here Wynne describes electric shock as "the most controllable and therefore the most humane form of mildly unpleasant stimuli" (p. 39). He focuses on mild shocks used to produce a blink reaction, and comments that "exactly the same method can be used on human beings . . ." (p. 39). Unfortunately, many of the experiments Wynne cites throughout his book are clearly not humane. In fact, Wynne refers to a electric shock as a "noxious stimuli" (p. 48), and the vast majority of experiments mentioned in his book, based on the effect they have on the subject, would be illegal if performed on human beings. Yet in this sidebar on electric shock, Wynne accepts such studies on *other* animals because he asserts that there is "value in finding out whether animals can learn about signals that herald unpleasant events" (p. 39). From poisoned garter snakes to lizards that scurry to escape electric shock, many of the studies Wynne describes *cannot* be morally justified simply on the grounds that certain individuals find value in such research. Value for whom, we might ask . . . certainly not for snakes and lizards used in the experiments. His discussion of electric shock aside, Wynne's generous assortment of sidebars adds considerably to the text.

In spite of the author's tendency to be skeptical about current data, Wynne encourages yet more research into the workings of non-human minds: while we may not have a standard scientific format for studying animal behavior, or an accumulation of established and dependable data, Wynne notes that exploring animal behavior, and contributing information to the fledgling field of animal cognition, is something almost anyone can do (p. 191).