

Book Reviews

THE ANIMAL MIND AT 100

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To celebrate the 100th anniversary of the publication of Margaret Floy Washburn's (1908) The Animal Mind: A Text-book of Comparative Psychology, the book is reviewed and compared to contemporary comparative texts. Although considerable advances have been made with respect to topics, methods, and findings, of course, the original text remains remarkably relevant, both as an introduction to animal psychology and as a marker of changes in the discipline that spanned the book's four editions.

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Margaret Floy Washburn¹ (1871–1939) was a remarkable psychologist, best known for being a pioneer for her gender in our discipline. Besides being the first American woman to receive a PhD in psychology (from Cornell University, 1894), she was also the second woman elected president of the American Psychological Association (1921) and the second woman welcomed into the National Academy of Sciences. In truth, she was a pioneer in our discipline regardless of gender, reflecting the exciting time in which she lived in the history of psychology, combined with her aptitude, interest, and determination (as described in her delightful autobiography, numerous excellent biographies, and several stirring obituaries, e.g., Dallenbach, 1939, 1940; Furumoto & Scarborough, 1987; Martin, 1940; Pillsbury, 1940; Scarborough, 2000; Scarborough & Furumoto, 1987; Stevens & Gardner, 1982; Viney & Burlingame-Lee, 2003; Washburn, 1930; Woodworth, 1948). Convinced that the new field of experimental psychology offered the opportunity to pursue her interests in science and philosophy (Washburn, 1930), Washburn studied for a year at Columbia University with Cattell before moving to the

1 Notwithstanding identical last names and common interests in the mental competencies of animals, including humans, the present author is not (so far as I know) related to Margaret Floy Washburn. Given how frequently I am asked the question, and inspired by two new courses that I taught this year (a graduate history of psychology course and an undergraduate honors seminar called "Animal Minds"), the present review was undertaken to mark the centennial anniversary of Professor Washburn's most influential publication by recommending it to the new generation of comparative-cognition researchers.

Sage School of Philosophy at Cornell to work with Titchener—just 4 years her senior but freshly arrived from Oxford, Leipzig, and his own training with Wundt. Doubtless, the development of Titchener's structuralism benefited much from the contributions of his first graduate student, with her affinity for chemistry and the tenacity that is so obvious from her writings. Nevertheless, the theoretical orientations of Titchener and Washburn would diverge as their careers grew and Washburn articulated her own movement-based framework. Her contributions to the discipline spanned a wide range of empirical and theoretical topics (see Kambouropoulou, 1940, and Mull, 1927, for bibliographies of Washburn's writings, and see Martin, 1940, for a review of her contributions). A prolific scholar, Professor Washburn was also an early leader in undergraduate research, as about one third of her 200+ publications were coauthored by undergraduate students from Vassar College, where she spent 34 years of her career.

Much of this empirical work with undergraduates was summarized, along with a state-of-the-literature review of psychological research with animals, in Washburn's most enduring contribution: *The Animal Mind: A Text-book of Comparative Psychology* (1908). The book reflected Washburn's interest in animals and their behavior, cultivated at Cornell just a few years prior to the book's appearance (Washburn, 1930). Although Washburn herself lamented the volume's selectivity (Washburn, 1908, preface), the book is impressive in its coverage of topics that are consistent with contemporary definitions of comparative psychology and comparative cognition research. It seems that Washburn's selectivity led chiefly to her slighting the extensive literature on animal sensory capabilities that apparently existed at the time. Although these sensory systems are certainly relevant to the theme of Washburn's book, "the animal mind as deduced from experimental evidence" (Washburn, 1908, pg. v), she can hardly be criticized for focusing on topics like learning, memory, imagery, and attention that had been less exhaustively studied. Indeed, in comparison to contemporary texts, the number of pages devoted by Washburn to sensory phenomena is vast, bordering on excessive for a book not specifically focused on sensory discrimination.

Equally impressive is the range of animal species discussed by Washburn (1908). Beach's (1950) lament that comparative psychology is too focused on the laboratory rat would certainly not have applied to this early textbook of comparative psychology. Washburn's 13 chapters include discussion of not fewer than 100 species, including ants, bees, caterpillars, cats, chickens, chubs, clams, cockroaches, cows, crabs, crayfish, dogs, dragonflies, earthworms, elephants, flies, frogs, goldfish, grasshoppers, guinea pigs, horseshoe crabs, jellyfish, lancelets, leeches, mice, minnows, monkeys, pigeons, pike, planarians, potato beetles, raccoons, salamanders, sea anemones, sea-urchins, shrimps, silkworms, snails, spiders, tortoises, wasps, water beetles, and (yes) rats. An entire chapter is dedicated to "the mind of the simplest animals" (Chapter 3)—amoebas and paramecia—and four other chapters have specific sections devoted to amphibians, annelids, birds, crustaceans, fish, insects, mollusks, and spiders. In these chapters, vertebrates are lumped together in sections, providing a sharp contrast with the subsequent chapters in *The Animal Mind*, and certainly with contemporary comparative books and their focus on vertebrate cognition.

Washburn's (1908) first chapter feels as relevant and contemporary today as it must have a century ago. In this chapter, she addressed the challenges to

comparative psychology and the empirical methods by which these challenges can be tackled. Of the difficulties, Washburn wrote, "If my neighbor's mind is a mystery to me, how great is the mystery which looks out of the eyes of a dog, and how insoluble the problem presented by the mind of an invertebrate animal, an ant or a spider!" (p. 2). And yet Washburn dared the reader to explore the animal mind, the possibility of consciousness and imagination, and the nature of ideas through careful inference from observed behavior. Her criticism of the anecdotal method was clear and fair, and her endorsement of the "Method of Experiment" (p. 9) was balanced by acknowledgment of the risks to ecological validity associated with experimental control. As Viney and Burlingame-Lee (2003) described it, "Washburn the philosopher was in constant dialogue with Washburn the experimental psychologist" (p. 78) throughout this discussion.

Particularly noteworthy in this introductory chapter is Washburn's description of methods for interpreting the empirical data from experiments:

As we have seen, the interpretation is often confused with the observation, especially in the making of anecdotes; but theoretically the two problems are distinct. And at the outset of our discussion of the former, we are obliged to acknowledge that *all psychic interpretation of animal behavior must be on the analogy of human experience*. We do not know the meaning of such terms as perception, pleasure, fear, anger, visual stimulation, etc., except as these processes form a part of the contents of our own minds. Whether we will or no, we must be anthropomorphic in the notions we form of what takes place in the mind of an animal. (p. 13)

Such bold statements would be much at home in more recent and much-criticized books on the animal mind that advance the perspective of cognitive ethology (such as those by Griffin, 1994, 2001); accordingly, they seem quite surprising for what was arguably the standard textbook for comparative psychology through four editions and at least three decades of the discipline's history. Nevertheless, Washburn defended the position: "We know not where consciousness begins in the animal world. We know where it surely resides—in ourselves; we know where it exists beyond a reasonable doubt—in those animals of structure resembling ours which rapidly adapt themselves to the lessons of experience. Beyond this point, for all we know, it may exist in simpler and simpler forms until we reach the very lowest of living beings" (p. 37).

But this interpretive stance of anthropomorphism should not be confused with a lack of skepticism or rigor. Washburn's (1908) point was merely that the scientific study of mental activity is necessarily inferential, whether the target of study is a human or some other animal. Washburn clearly endorsed behavior as the basis of our science, and contended that interpreting those data via probabilistic inferences is no less justifiable (and more risky) in the study of nonhuman animals than in the study of human ones. She acknowledged, "Certain precautions are necessary when we infer the state of our neighbor's mind; certain added precautions are necessary when we infer states in the mind of an animal, and our assertions should certainly diminish in dogmatism as we go down the scale of animal life" (p. 23). Indeed,

it bears noting that Washburn devoted considerable and generally favorable discussion to C. Lloyd Morgan and his famous canon that was published the year that Washburn received her PhD. Of this maxim, Washburn argued,

The fact is that Lloyd Morgan's principle serves to counterbalance our most important source of error in interpreting animal behavior. It is like tipping a boat in one direction to compensate for the fact that some one is pulling the opposite gunwale. We must interpret the animal mind humanly if we are to interpret it at all. Yet we know that it differs from the human mind, and that the difference is partly a matter of complexity. Let us therefore take the least complex interpretation that the facts of animal behavior will admit, always remembering that we may be wrong in doing so, but resting assured that we are, upon the whole, on the safer side. (pp. 25-26)

Thus, Washburn argued that although the simplest interpretation might not be the correct one, simplicity is the strategy that best checks the human tendency to overinterpret animal (including human) behavior in terms of its significance, while still allowing scientists to make progress in explaining the animal mind.

The topics beyond the introductory portion of *The Animal Mind* are organized by four broad experimental paradigms, each slightly more complex than its predecessor. Washburn first considered animals' responses to various forms of stimulation (chemical, auditory, visual, spatial), and what could be inferred by modification of these responses as a function of experience. Emphasized in these discussions are the notions of sensitization and habituation, although these now-familiar labels were not used in the 1908 text. Organisms' increasing or decreasing responsiveness to stimulation is typically covered only briefly in contemporary comparative psychology or psychology-of-learning textbooks, so the contrast with Washburn's detailed treatment is a sharp one. In candor, I confess to have declined in responsiveness to her stimulation well before the discussion of these topics was ended. I believe that most readers today would probably be similarly satisfied with a cursory review of this information, particularly because Washburn concludes that such adaptations lack the character that might more confidently be termed "mind."

From changes in responsiveness to stimulation, Washburn (1908) went on to discuss the dropping away (what we would call extinction) of useless responses, as studied with "the Labyrinth Method" (p. 219). Maze studies with a wide range of species were described, in which animals became more efficient in their solutions as a function of experience. This, in turn, segued into a discussion of "the Puzzle-box Method," in which, again, the animals' behavior changes with experience such that useless or unproductive movements become less frequent. Note that Washburn's interpretation of these phenomena is more adaptive than associative. While invoking the terminology of *pleasant and unpleasant states*, Washburn's emphasis was primarily on the behaviors that drop away rather than on the solution-responses that remain.

From this detailed consideration of changes in responsiveness to neutral stimuli, such as an alley of a maze or a treadle of a puzzle box, Washburn turned her attention to modification of behavior involving inhibition of

responses to particular stimuli. These studies involve animals' making choices between successive or simultaneous stimuli, at least some of which are associated with instinctive responses. These "method of choice" studies permit assessment of the existence of ideas, representations, and memories. Whereas the book has breadth with respect to the species discussed as well as with respect to the topics covered, it is this chapter that provides a general and cohesive picture of animal minds in the connection of species and competencies. Washburn (1908) concluded on the basis of evidence and reason that the behavior of simpler animal forms "can be fully explained without supposing that the animals concerned ever consciously recall the effects of a previously experienced stimulus in the absence of the stimulus itself" (p. 270). In contrast, other animals must certainly respond on the basis of mental representations of physical stimuli. She wrote,

Despite the difficulty of proving that animals have memory ideas, it is not likely that any such gulf separates the human mind from that of the higher animals as would be involved in the absence from the latter of all images of past experiences. That ideas occur in far less profusion and with far less freedom of play in the animal mind that possesses them at all than in the human mind; that even the highest animal below man lives far more completely absorbed in present stimulations than does the average man, seems also practically certain. (pp. 272-273)

Throughout this 1908 discussion, the beginnings of what would become Washburn's motion theory of learning are evident. For Washburn, the association of movements provides the explanatory thread that knits together the literature on comparative psychology. It explains habituation, the increased efficiency with which a mouse repeatedly runs a maze, the trial-and-error learning evidenced by a cat in a puzzle box, and the way that a monkey learns to select the red rather than the green stimulus.

In consideration of "The Memory Idea" (Chapter XII), this framework gets articulated clearly. What distinguishes humans from other animals, and perhaps what distinguishes so-called higher nonhuman animals from lesser forms, is the capacity to represent movement and thereby to learn in the absence of overt action. "The great advantage of man over most of the lower animals is not so much in the fact as in the method of learning" (p. 284), Washburn summarized.

Critical to Washburn's motor theory is the role of attention, which both allows an organism to respond to mental representations rather than physical stimulation and determines which movements get associated together (Washburn, 1930). The final chapter of *The Animal Mind* is consequently a consideration of attention, and I found this section to be particularly interesting and relevant to contemporary theory. For Washburn, attention is itself an action that permits an organism to respond to one important stimulus rather than others, regardless of the relative intensities of the competing stimuli. In part, this selection of important stimuli is accomplished by "a state of suspended reaction" (p. 291), or an inhibition of any response for a period that allows opportunity for less prepotent stimuli to be processed. Many aspects of this perspective are echoed in contemporary attention theories, including the understanding of attention as a multiply-determined (e.g., Yantis, 2000) skill (e.g., Spelke, Hirst, &

Neisser, 1976) related to self-regulation (e.g., Sheese, Rothbart, Posner, White & Fraundorf, 2008) for biasing the selection of competing stimuli (D. Washburn & Tagliabata, 2006), such that salient events can be learned (Rumbaugh & Washburn, 2003). Indeed, in light of recent research on the frontal and prefrontal brain regions associated with attention (e.g., Posner & Peterson, 1990), it was interesting to read Washburn's century-old statement that the frontal lobes have been "*long regarded* [italics added] as the seat of the neural processes underlying attention" (p. 292).

As mentioned above, *The Animal Mind* was an influential volume that was updated as a second edition in 1917, considerably expanded in 1926 for the third edition, and even more extensively modified in 1936's fourth edition. With each publication, dozens of new findings were reviewed, and in the third and fourth editions, new chapters were added (discussing, among other topics, the new studies from researchers like Kohler). The prose from the 1908 volume survived each revision. By sampling random paragraphs from each chapter of the 1908 edition and looking in the fourth edition for the corresponding text, I estimate that about 80% of the original text can be found in the final edition, although of course it constituted a much smaller proportion of the entire volume by 1936. The four editions of *The Animal Mind* also serve as interesting historical landmarks for the bigger debates that characterized psychology across the three decades—from the struggles of structuralism versus functionalism in the early editions, to Washburn's prediction in the fourth edition that the behaviorist perspective was losing strength within the field. The writing is beautiful, if at times conceptually dense, and Professor Washburn's personality is evident in many places. The book, and particularly its first and latter chapters, is a wonderful read for anyone interested in animal cognition. Although the book is seldom cited in contemporary writings, and Dr. Washburn's movement theory was never influential, *The Animal Mind* still merits consideration for substantive as well as for historical reasons.

In recent years, there has been a proliferation of books on the mental or cognitive competencies of nonhuman animals (e.g., Bekoff, 2008; Griffin, 2001; Hauser, 2001; Page, 2001; Rumbaugh & Washburn, 2003; Tomasello & Call, 1997; Wynn, 2002). Although many of these books are outstanding and important pieces of scholarship by influential researchers, it seems too much to hope that any can have the enduring relevance and influence a century hence that can be claimed today for Margaret Floy Washburn's *The Animal Mind*.

References

- BEACH, F. A. (1950). The snark was a boojum. *American Psychologist*, 5, 115-124.
- BEKOFF, M. (2008). *The emotional lives of animals: A leading scientist explores animal joy, sorry, and empathy—and why they matter*. Novato, CA: New World Library.
- DALLENBACH, K. M. (1939). Margaret Floy Washburn. *Science*, 90, 555-557.
- DALLENBACH, K. M. (1940). Margaret Floy Washburn: 1871-1939. *American Journal of Psychology*, 53, 1-5.
- FURUMOTO, L., & SCARBOROUGH, E. (1987). Placing women in the history of comparative psychology: Margaret Floy Washburn and Margaret Morse Nice. In E. Tobach (Ed.), *Historical perspectives and the international status of comparative psychology* (pp. 103-117). Hillsdale, NJ: Erlbaum.

- GRIFFIN, D. R. (1994). *Animal minds*. Chicago: University of Chicago Press.
- GRIFFIN, D. R. (2001). *Animal minds: Beyond cognition to consciousness*. Chicago: University of Chicago Press.
- HAUSER, M. (2001). *Wild minds: What animals really think*. New York: Holt Paperbacks.
- KAMBOUROPOULOU, P. (1940). A bibliography of the writings of Margaret Floy Washburn: 1928-1939. *American Journal of Psychology*, 53, 19-20.
- MARTIN, M. F. (1940). The contributions of Margaret Floy Washburn. *American Journal of Psychology*, 53, 7-18.
- MULL, H. K. (1927). A bibliography of the writings of Margaret Floy Washburn: 1894-1927. *American Journal of Psychology*, 29, 428-437.
- O'CONNELL, A. N., & RUSSO, N. F. (1983). *Models of achievement: Reflections of eminent women in psychology (Vol. 1)*. New York: Columbia University Press.
- PAGE, G. (2001). *Inside the animal mind: A groundbreaking exploration of animal intelligence*. New York: Broadway.
- PILLSBURY, W. B. (1940). Margaret Floy Washburn (1871-1939). *Psychological Review*, 47, 99-109.
- POSNER, M. I., & PETERSON, S. E. (1990) The attention system of the human brain. *Annual Review of Neuroscience*, 13, 25-42.
- RUMBAUGH, D. M., & WASHBURN, D. A. (2003). *Intelligence of apes and other rational beings*. New Haven, CT: Yale University Press.
- SCARBOROUGH, E. (2000). Washburn, Margaret Floy. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 8, pp. 230-232). Washington, DC: American Psychological Association.
- SCARBOROUGH, E., & FURUMOTO, L. (1987). *Untold lives: The first generation of American women psychologists*. New York: Columbia University Press.
- SHEESE, B. E., ROTHBART, M. K., POSNER, M. I., WHITE, L. K., & FRAUNDORF, S. H. (2008). Executive attention and self-regulation in infancy. *Infant Behavioral Development*, 31, 501-510.
- SPELKE, E., HIRST, W., & NEISSER, U. (1976). Skills of divided attention. *Cognition*, 4, 215-230.
- STEVENS, G., & GARDNER, S. (1982). *The women of psychology: Vol. I. Pioneers and innovators*. Cambridge, MA: Schenkman.
- TOMASELLO, M., & CALL, J. (1997). *Primate cognition*. New York: Oxford University Press.
- VINEY, W., & BURLINGAME-LEE, L. (2003). Margaret Floy Washburn: A quest for the harmonies in the context of a rigorous scientific framework. In G. A. Kimble & M. Wertheimer (Eds.), *Portraits of pioneers in psychology* (Vol. 5, pp. 73-88). Mahwah, NJ: Erlbaum.
- WASHBURN, D. A., & TAGLIALATELA, L. A. (2006). Attention as it is manifest across species. In T. Zentall & E. Wasserman (Eds.), *Comparative cognition: Experimental explorations of animal intelligence* (pp. 127-142). New York: Oxford University Press.
- WASHBURN, M. F. (1908). *The animal mind: A text-book of comparative psychology*. New York: McMillan Company. Reprinted by Whitefish, MT: Kessinger Publishing (2008).
- WASHBURN, M. F. (1930). Margaret Floy Washburn. In C. Murchison (Ed.), *History of psychology in autobiography* (Vol. 2, pp. 333-358). Worcester, MA: Clark University Press.
- WOODWORTH, R. S. (1948). Margaret Floy Washburn, 1871-1939. *Biographical Memoires, National Academy of Sciences*, 25, 275-295.

- WYNN, C. D. L. (2002). *Animal cognition: The mental lives of animals*. New York: Palgrave Macmillan.
- YANTIS, S. (2000). Goal-directed and stimulus-driven determinants of attentional control. In S. Monsell & J. Driver (Eds.), *Attention and performance* (Vol. 18, pp. 73-103). Cambridge, MA: MIT Press.