



## BIRD BEHAVIOR

*Bird Brain: An Exploration of Avian Intelligence.* By Nathan Emery, 2016. Princeton University Press. (ISBN: 978-0-691-16517-2). 192 pp. Hard Cover. \$29.95.

Calling someone a birdbrain typically is not meant as a compliment. In fact, the dictionary defines a birdbrain as a stupid person. Calling a person a dodo also signifies stupidity but is more accurate, since dodos were actually known for the stupidity that eventually led to their extinction. Traditionally, humans have not credited birds as being particularly intelligent and have assumed that their behaviors were directed by instinct. This fascinating volume puts those ideas to rest.

Although the anatomy and physiology of the avian brain have been well studied, few birds have been studied with respect to learning abilities. In the past few decades, scientists have learned that at least some birds demonstrate memory, tool-making, multitasking, and linguistic abilities. Research has shown these and other characteristics to be related to brain structure, and avian brain structure in many ways parallels mammalian brain structure. For example, the prefrontal cortex of mammalian brains is the site of executive functions such as planning, flexibility, and waking memory; an avian brain section, the caudate lateral area of the nidopallium, shows similar functions.

Birds possess remarkable navigational capabilities, whether attempting to locate food they have cached or finding their way to parts of the world that may be up to 30,000 kilometers (18,600 miles) distant from where they begin.

Migratory birds possess tools that are the “the equivalent of compasses, satellite navigation and GPS.” Spatial memory is an important component of navigational abilities. The hippocampus of the bird brain is central to spatial memory and navigation, and the more it is used, the more its size increases because of the growth of additional neurons. Several thought-provoking experiments revealing birds’ navigational abilities are explained, giving the reader reasons to respect bird intelligence.

Communication in birds depends on a brain that can take in information from the bird’s surroundings, process it, and then produce visual or auditory signals that can be decoded by the brain of another bird as a message requiring a particular behavior. Among the most interesting aspects of avian communication are bird calls and songs. All birds send out calls, but only certain birds, members of the Order Passeriformes, are songbirds. Principally, it is the males who sing, as the song is involved in attracting females. The young male bird is taught its song by its father or a neighboring male. The members of one group of birds are born with the ability to sing, with birds of both genders possessing this ability. Some birds, such as mockingbirds, are able to mimic songs of other birds, and birds such as parrots are actually able to mimic human speech. Bird brains have three neural networks involved in the complex actions of song perception and production.

Socially, birds tend to live in groups, giving them several advantages such as locating food, finding mates, and resisting predators. Social behavior is controlled the same way in all vertebrate brains. Two networks, the Social Behavior Network (SBN) and the Mesolimbic Reward System (MRS), are involved in evaluation of the significance of social stimuli. Studies also show that an extra neural system may be involved in processing social stimuli.

Some birds, typically those with larger brains or a larger cortex, are able to use tools. The tools are often simple objects such as stones and twigs. But some birds, like the woodpecker finches of the Galapagos Islands, actually modify their tools. To get into holes and under the bark of trees, they use cactus spines and twigs, modifying them by shortening the long cactus spines and removing side branches and leaves from twigs. Several experiments testing birds’ abilities to make and use tools are described. One especially clever experiment involved a task based on the Aesop fable, “The Crow and the Pitcher.”

The birds being tested were successful in the fable’s task and even compared with children given the same task.

Additional observations, studies, and experiments depicted in this book include whether birds have a sense of self, recognize themselves in mirrors, possess a sense of the future, protect food caches, demonstrate empathy, experience emotions, and much more. The author concludes that “this is a very exciting time not only because we know so much, but because we recognize how much more there is to find out.”

An incredible amount of information is packed into this fascinating book. The author is thorough, creative, and uses wonderful examples, including exciting descriptions of experiments and research, most of which have been accomplished relatively recently. Each of the seven chapters consists of an introductory page or pages, followed by several double-page narratives on a particular theme. Each two-page story is accompanied by striking colorful illustrations. Skillfully detailed descriptions of avian brains and their activities are accompanied by schematic diagrams that help clarify the complex processes involved in bird behavior.

The book would be appropriate at the college level in courses such as ornithology, animal behavior, and neuroscience. Advanced high school students with a good grasp of biological concepts and the ability to understand sophisticated language would also benefit from this book. Included in the book are a glossary, a list of references, suggestions for further reading, and an index.



Richard Lord, retired  
Presque Isle High School  
Presque Isle, ME 04769  
rmlord@aol.com

ELIZABETH COWLES teaches introductory biology, biochemistry, and entomology at Eastern Connecticut State University. She has taught at the undergraduate and graduate college levels for over 20 years. Her interests include insect toxicology, protein characterization, and astrobiology. Cowles holds degrees in biology and biochemistry from Cornell University and Michigan State University. Her address is Department of Biology, ECSU, 83 Windham St., Willimantic, CT 06226; e-mail: cowllese@easternct.edu.