ARTICLE

Oscar Riddle's Science, a Special Bird, & the Founding of the NABT

NABT BioClub RECOMMENDATION

FRANCES S. VANDERVOORT

Abstract

Oscar Riddle, born in Indiana in 1877, was an ardent evolutionist and a key player in the founding of the National Association of Biology Teachers in 1938. He studied heredity and behavior in domestic pigeons and doves with Charles O. Whitman of the University of Chicago, received his Ph.D. in zoology in 1907, and in 1912 began a long career at the Carnegie Institution. He is best known for his 1932 discovery of prolactin, the "mother love" hormone. Whitman founded and directed the Marine Biological Laboratory at Woods Hole and cared for Martha, the world's last passenger pigeon, who died in the Cincinnati Zoo in 1914.

Key Words: *Ethology; evolution; extinction; NABT history; orthogenesis; passenger pigeon; prolactin.*

On January 1, 1936, Dr. Oscar Riddle of the Carnegie Institution addressed a group of zoologists at a meeting of the American Association for the Advancement of Science in St. Louis, Missouri. In his bold speech, "The Confusion of Tongues," he chastised the nation's schools for failing to provide the science education necessary for modern society (Riddle, 1936; Figure 1). He pointed out that biological science had not improved its status in the nation's schools for more than 30 years. "The question," he said, is "whether the case and the course of civilization is to be guided by knowledge or by the dead hands of the past…." In the audience was the president of the Union of American Biological Societies, who urged Riddle to form a committee "of and for high school teachers of biology" to address these problems. Riddle did so, and in June 1936, the newly formed committee went to work. The first issue of *The American Biology Teacher* was published in October 1938; the lead article, "Biology teachers begin to pull together," was written by none other than Riddle himself (Riddle, 1938). The National Association of Biology Teachers (NABT) was on its way.

Oscar Riddle was born on September 27, 1877, in a log house near the village of Cincinnati, Indiana, 20 miles southwest of the university town of Bloomington (Corner, 1974). Oscar's father, Jonathan Riddle, raised crops and livestock and kept a racehorse on the family farm. When Jonathan Riddle died in 1882, Oscar and his brothers pitched in on the farm and worked at odd jobs at neighbors' farms and in shops in town. Oscar's father was never active in any religious group, and his mother did not join a church until after her husband's death.

Early on, Oscar enjoyed watching birds and mammals on the family property. He found shells and fossils of sea creatures embedded in the sandstone and limestone beds of nearby streams and wondered how such creatures could have ended up in southern Indiana. One day, Oscar's brother brought home a friend, Francis Price, from the University of Indiana. Price was studying with Carl H. Eigenmann, a zoologist who later became a member of the National Academy of Sciences. Price gave a talk at a local church, using a collection of fishes preserved in alcohol to illustrate principles of evolutionary adaptation and natural selection. The thrill of this experience never left young Oscar – he determined to become a biologist.

Early on, Oscar enjoyed watching birds and mammals on the family property.

The Special Birds

In 1914, twenty-four years before the founding of NABT and two years after Oscar Riddle had assumed a research position at the Carnegie Institution's Cold Spring Harbor Laboratory on Long Island, the world's last passenger pigeon, Martha, died in the Cincinnati Zoo (Skutch, 1991; Cokinos, 2000). This sad event was a wake-up call for how humans can affect the world's biological systems. Charles O. Whitman, the University of Chicago's first professor of zoology, raised, cared for, and studied pigeons, including passenger pigeons, for most of his life (Figure 2). He kept his birds in small cotes around his home on Chicago's south side, where he tended Martha and hoped to find a mate for her among the dwindling numbers of her species. Whitman had given several passenger pigeons, including Martha, to the Cincinnati Zoo in the early 1900s, but by 1910, all birds but Martha had died. After the death of her last companions, Martha lived alone in her cage in the unfathomable solitude of being

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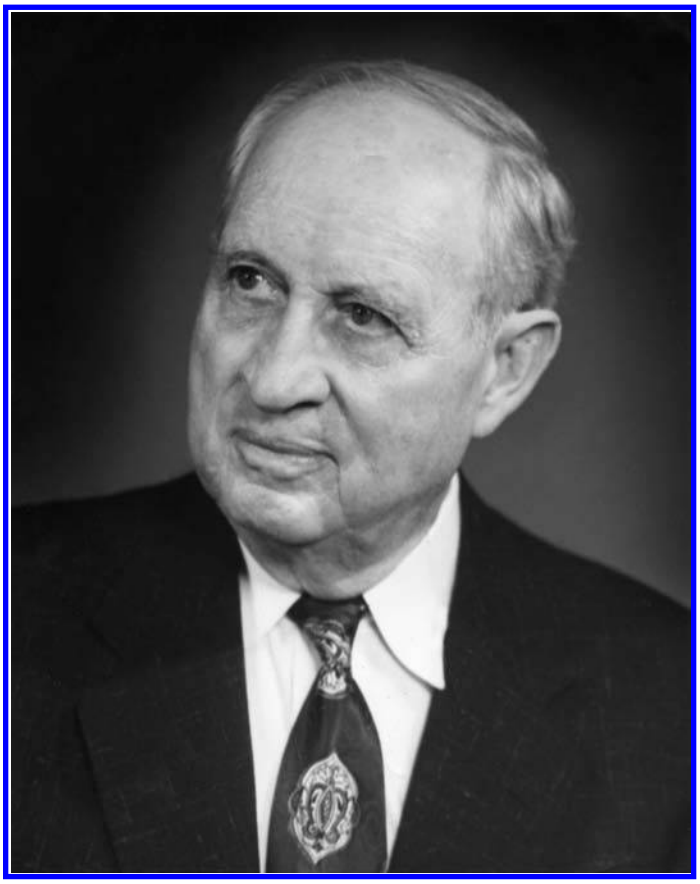

Figure 1. Oscar Riddle (file photo from American Humanities Association).

Figure 2. Charles O. Whitman feeding his pigeons and a visiting flicker (reproduced with permission of the Special Collections Research Center of the University of Chicago).

the very last of her species. Her once powerful wings had never plied the sky, nor had she partaken of the wild foods that had nourished her species in North American forests. After she died, her body was frozen in an ice block and shipped to the Smithsonian Institution, where she was stuffed and placed on display, forever the symbol of greed, loss, and all that can go wrong with wildlife management.

In 1910, Charles Whitman died at age 68 from pneumonia contracted while moving his beloved birds to winter quarters during a sudden cold snap.

○ Oscar Riddle, Scientist & Educator

After graduating from high school in 1896, Oscar Riddle enrolled at the University of Indiana at Bloomington. He took courses in biology, engaged in field work at university research sites, learned Spanish, and taught classes in biology and chemistry in San Juan, Puerto Rico. He worked in Cuba and, in 1901, made a scientific expedition at his own expense to the Orinoco River delta of Venezuela.

In 1902, he enrolled as a graduate student at the University of Chicago. In addition to courses in zoology and embryology taught by Professor Whitman, Riddle attended lectures by famed physiologist Jacques Loeb and was disappointed when Loeb left for the University of California later that year. After taking his Ph.D. under Whitman's supervision in 1907, he taught courses in zoology at the university. He left for research and travel in Europe and was abroad in early December when he was devastated to learn of Whitman's sudden death. Riddle rushed back to Chicago to save what he could of Whitman's research records. Whitman was not a prolific writer and left at his death three unfinished volumes documenting his research on pigeons. Riddle obtained minimal funding from the Carnegie Foundation to complete the volumes; they were published by the foundation in 1919 (Riddle, 1919a, b; Carr, 1919).

Riddle's life was further complicated when he was told that he had lost his teaching job at the University of Chicago. The department of zoology, now under the leadership of Professor Frank R. Lillie, had undergone major reorganization, with the result that Riddle's teaching position was closed. Whitman's strong commitment to the antiquated theory of orthogenesis and his rejection of Mendelian genetics and the mutation theory put forth by Dutch biologist Hugo de Vries seemed to have worked against both men. According to paleontologist Stephen Jay Gould, the theory of orthogenesis held that evolution proceeded in a straight line that natural selection could not regulate. This is an oversimplification of Whitman's interpretation but makes the point that although not teleological, orthogenetic evolution is driven by internal mechanisms not subject to environmental influence (Gould, 1977). In later years, Riddle commented that he had relied too much on conversations with Whitman (about orthogenetic explanations for pigeon coloration). Also, although he made voluminous and lasting contributions to science, Riddle acknowledged that when younger he tended to be dogmatic and overly reliant on uncertain authority (Corner, 1974).

In 1912, Riddle accepted the position of salaried research associate at the Carnegie Institution's Cold Spring Harbor Laboratory (CSHL). Except for two years of military service in Europe shortly after World War I, he worked at CSHL until his mandatory retirement in 1945. At CSHL he specialized in physiology, endocrinology, and genetics, mainly of pigeons. In 1932, he isolated the "mother love" hormone, prolactin, produced by the anterior lobe of the pituitary gland, and he would use it in much of his subsequent research. His success in this endeavor landed him on the cover of *Time* magazine in January 1939.

Riddle, an active member of the American Humanist Association, was named Member of the Year in 1958. Riddle wholeheartedly embraced humanism, which holds that humans are capable of

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Pigeons Past & Present

Miocene fossil records indicate that pigeons, members of the family Columbidae, have been around for some 20 million years. Versatile, adaptable, and excellent fliers, pigeons are found in every region of the Earth except Antarctica and the ice-clad north. Most of the 255 species of pigeons are native to tropical regions. Aside from transgressors from the tropics visiting the nation's southern fringes, only two species of these birds – the mourning dove (*Zenaida macroura*), which ranges from coast to coast, and the band-tailed pigeon (*Patagioenas fasciata*), native to western states – make their homes in any portion of the continental United States. All pigeons of both sexes produce crop milk to nourish their young (Skutch, 1991; Cokinos, 2000).

Pigeon fanciers collect and raise pigeons for pleasure, show, sport, or to sell. Homing pigeons carry messages safely and securely between lines of enemy combatants in tiny containers attached to a leg. Wild (feral) rock pigeons (*Columba livia*), whose incessant cooing, roosting, and messy habits either fascinate or repel the public, were first brought to the United States by early settlers from across the Atlantic who sought to improve simple fare by adding fat squabs to the table.

Two species of pigeons symbolize all that can go wrong with game management. The dodo (*Raphus cucullatus*) was a large, flightless relative of the common (feral) pigeon that lived exclusively on the island of Mauritius in the Indian Ocean. It weighed as much as 18–20 kg (40 lbs or more), and stood as much as 1 m tall. It was fat, slow, tasty, and easily caught by Dutch seamen en route to the Netherlands East Indies. The first recorded sighting of a dodo was in 1598; the birds had totally disappeared by 1662.

It's difficult to think of passenger pigeons (*Ectopistes migratorius*; Figure 3) except in the plural. Vast fly-bys of millions of birds could last for hours, even days. The accumulated weight of the birds splintered tree branches, which were then stripped bare of leaves and nuts by hungry birds seeking sustenance for their travels.

The dodo suffered the fate of many island species. With underdeveloped wings and the fearlessness of a bird that never had to escape from anything, it became prey to rats and deliberately introduced domestic animals such as cats and pigs. The passenger pigeon's extinction was caused by fragmentation of native broadleaf forests by early settlers seeking farmland, the development of land for cities and towns, and by human insensitivity and greed.

We shouldn't leave the discussion of pigeons without mentioning "stool pigeons" – birds tied by their legs to a stool or box. Professional "pigeoners" would fasten a passenger pigeon (or other bird) in place by loosely tying its legs to the top of a box or stool, which was then placed on a large net that could be drawn shut in an instant by pulling a special "net rope." Grain and other food items then were scattered about on the net. The pigeoner would startle the stool pigeon into flying as far as the tethering cord would allow, attracting birds flying overhead, who would then alight on the net and, in the wink of an eye, be caught by the pigeoner. The average catch was 50 to 60 birds, but catches of 150 birds or more were not unusual. Slaughtered birds were packed in barrels of 300 or more and shipped to points south and east. Passenger pigeons in Ohio, Michigan, and Wisconsin were especially vulnerable to this technique. After 1880, there were essentially no birds left to trap (Brewster, 1889).

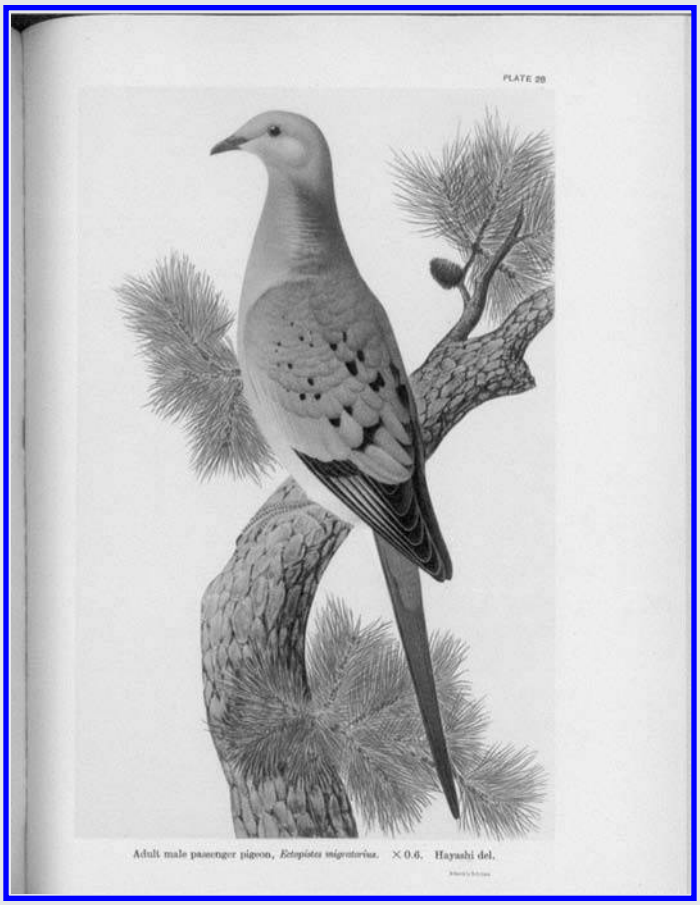

Figure 3. Male passenger pigeon (Riddle, 1919b).

solving their own problems by applying courage, vision, reason, and the scientific method.

Riddle's first known involvement in science education was a short article in *School Science and Mathematics* in 1906 based on his teaching experience in Puerto Rico. His commitment to improving science education grew over the next three decades, culminating in his fiery address to the 1936 meeting of the AAAS, described at the beginning of this article, and shortly thereafter the founding of the NABT.

Riddle wrote as forcefully as he spoke. He never backed down in the face of criticism from religious or political groups. After retiring from his position at the Carnegie Institution in 1945, he spent four years writing his last book, *The Unleashing of Evolutionary Thought*. Likely intimidated by the political and social climate of the time, ten prominent publishers rejected the book before it finally was published by Vantage Press in 1954. Riddle would have played a major role in today's controversies about evolution, global climate change, and environmental management. He would have found television a great ally in addressing these issues and would have considered Bill Nye, the Science Guy, a true comrade in arms.

Riddle surprised his friends by taking a wife, Leona Lewis, a music teacher, in 1937 at the age of 59. After his retirement, the couple moved to their new home in Plant City, Florida, where Riddle spent his remaining years lecturing and writing on subjects dear to

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his heart – science, religion, and the need for freedom in the teaching of biology. His health began to fail at age 87; he died of pancreatic cancer in 1968 at the age of 91. His wife died shortly thereafter.

A Personal Note

I've taken a peculiar satisfaction in preparing this article. In an odd, somewhat disjointed way, I have been a part of this story, and this story is a part of me. George Zahrobsky, a true friend of biology teachers in Illinois and beyond, inspired me to join the NABT in 1970. At a national convention in Denver, I even gained a passing acquaintance with NABT icons H. Bentley Glass and Jerry Lightner.

In 1961, I began a graduate program in zoology at the University of Chicago, registering for "Biopsychology," a course all about ethology, a term totally new to me. Within a week, I had learned how Charles Whitman, Whitman's best-known student, Wallace Craig, Oskar Heinroth, and other pioneers had helped found the new science of ethology. All were predecessors of famous European ethologists Konrad Lorenz and Niko Tinbergen. I joined the research group of Professor Eckhard H. Hess, a close colleague of Lorenz and other German ethologists, and studied the behavior patterns of two species of small fish from the Amazon basin. Appropriately, my fish tanks were in the greenhouse of the Charles O. Whitman Laboratory. Not long ago the Whitman Lab was razed to make room for a new research center, but I can still visualize the old lab's red brick walls, gracefully arched windows, and the annex where fish and other small animals, including an ill-tempered raccoon named "Supi," were harbored.

My husband, our two young sons, and I spent 1967–1968 at the University of Leiden in The Netherlands, where my husband had a senior research grant in astronomy. I was accepted as a volunteer in the laboratory established by Niko Tinbergen before he headed to Oxford University in 1949. Every morning, from the window I would see a red mail truck pull up in the street below, the color of which released a frenzy of aggressive "zig-zag dancing" in male three-spined sticklebacks (*Gasterosteus aculeatus*). My project was to inject male sticklebacks with tiny amounts of prolactin – Oscar Riddle's discovery – to see if this potent hormone would affect the fishes' parental behavior as they tended nests constructed from tiny strands of aquatic vegetation. Results were inconclusive, but I learned a lot and made some good friends in the Dutch ethological community.

The writing of this article has been prompted by the upcoming 100th anniversary of the extinction of the passenger pigeon. I often recall that Martha, the very last passenger pigeon to live on Earth, was cared for by Professor Charles Otis Whitman, a brilliant, committed, tender researcher who inspired his students to seek perfection, and who lived with his pigeons just a few blocks from my Chicago home. Dr. Oscar Riddle's rich, complex career began in Chicago with Professor Whitman. He recognized that we must not let our lives be defined by radical conservatism. Although he spent little time in the classroom, he was an educational leader in every sense of the word.

The demise of the last passenger pigeon and the founding of the science of ethology by Charles Whitman and Wallace Craig will be commemorated with a major exhibit in the main lobby of the John Crerar Science Library of the University of Chicago in 2014.

What is Ethology?

Whitman's research, and that of his best-known student, Wallace Craig, laid the groundwork for the science of ethology. Ethology is sometimes called natural history (an oversimplification) or comparative psychology (much too clinical) or even glorified bird watching. Simply stated, ethology is the biological study of animals in their natural world. Details of this fascinating science are beyond the scope of this article, but more information about the history, practice, and applications of ethology can be found in Burghardt (1985), Burkhardt (2005), and Dewsbury (1985).

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FRANCES S. VANDERVOORT taught biology and environmental science in Chicago public high schools for 25 years and is currently developing interactive activities for nature trails in Chicago parks. E-mail: vandersand@sbcglobal.net.

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