"Zoology of the Twentieth Century:" Charles Davenport's Prediction for Biology

Mark A. Largent

Introduction

Historians generally remember Charles Davenport (1866-1944) best for his role in the American eugenics movement. Eugenicists drew analogies between animal and human breeding and sought to improve the overall genetic quality of humans by encouraging legislation that would direct human reproduction with the knowledge generated by evolutionary scientists and geneticists. Their work fell into disrepute in the mid-twentieth century, and Davenport's aggressive promotion of eugenic research earned him the same disdain that recent authors have shown most eugenicists. As head of the Station for Experiment Evolution (SEE) in Cold Spring Harbor, Davenport certainly did exercise significant influence over eugenics in the United States, which has been well-documented by a variety of historians.[1]

Despite his substantial contributions to the American eugenics movement, remembering Davenport as only a eugenicist obscures his many other contributions and distorts his historical significance to both biological science and American culture. Davenport founded the SEE, one of the nation's largest and best funded biological research stations, and directed it for over thirty years. He served on dozens of scientific and governmental committees and distributed millions of dollars in research grants. Davenport, a born organizer, founded the Long Island Biological Association, the Gallton Society, the Aristogenic Association, the Eugenic Research Association, the Tax-Payers League, and the Cold Spring Harbor Whaling Museum. He was president or vice president of ten of

[1] For an overview of Davenport's role in the American eugenics movement, see for example Daniel Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Cambridge: Harvard University Press, 1985): pp. 41-56.

the sixty-four societies in which he was a member and was on the editorial boards of eight scientific journals. Davenport also contributed substantially to the emerging sciences of genetics and evolutionary biology, and he was one of the most prominent proponents of the adoption of mathematical methods by biologists. From 1900 until his death in 1944, Davenport was one of the best known and most influential biological scientists in the world. As one of his colleagues, Oscar Riddle, argued, "Davenport was unquestionably one of the leaders of biology in his generation; and his generation was one in which biology made phenomenal advances."[2]

Historians have so strongly emphasized the role of eugenics in Davenport's career that his many other influences have gone unexplored. Beyond slighting his historical legacy, this oversight creates problems for historians of science who study early twentieth century, some of which are evident when we examine a paper that Davenport presented at the 1901 meeting of the American Association for the Advancement of Science (AAAS).[3] In it, he predicted several major developments in twentieth-century American biological science, including the widespread adoption of experimental and quantitative techniques by biological scientists as well as the rise of the behavioral sciences and ecology. How did Davenport, a man known for little more than his aggressive promotion of eugenics, construct such an good prediction of biological science? Davenport's amazingly accurate prophecy for biology in the twentieth century was not merely a prediction; it was his agenda for the profession. As Davenport's career took shape, the fulfillment of his predictions was increasingly ensured by the dominant position he assumed in the American scientific community. The predictions he offered at the 1901 AAAS meeting were his cleverly disguised research agenda for the biological sciences.

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[2] Oscar Riddle, "Charles Davenport," *Biographical Memoirs of the National Academy of Sciences* 25, p. 86.
[3] Charles Benedict Davenport, "Zoology of the Twentieth Century," *Science* 24 (1901): pp. 315-324. Originally presented as the Address of the Vice-President of Section F, Zoology, at the American Association for the Advancement of Science, Denver Meeting, August 1901.

Charles Benedict Davenport, Biologist

Charles Benedict Davenport was born in 1866 at his family's farm in Stamford, Connecticut.[4] At the age of thirteen his parents enrolled him in the Polytechnic Institute of Brooklyn, where he received a B.S. in civil engineering. After a short stint working for the railroad survey, he began graduate work in zoology at Harvard College, earning an A.B. and then in 1892 a Ph.D. under E. L. Mark. Davenport entered the profession at a time when jobs were exceptionally difficult to secure, even for men like him with Ph.D.'s from the nation's most prestigious universities. Davenport's wife, Gertrude Crotty Davenport was also trained as a biologist and helped him find an assistant professor position at the University of Chicago by scanning the death notices in each week's edition of *Science*.

Davenport made good on his wife's investment. By the turn of the century, the thirty-five year old biologist was the director of the summer school of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor, an assistant professor at the University of Chicago, and the author of thirty papers and five books on evolution, variation, development, and morphology. In 1904, Davenport secured substantial funding from the Carnegie Institute of Washington to open the Station for Experimental Evolution (SEE) at Cold Spring Harbor and a few years later the Eugenics Record Office with funding from Mrs. E. H. Harriman. The SEE was "richly budgeted and equipped" and the envy of the world's leading biologists as well as a "warm-weather watering hole for many able biologists."[5] It was, as Philip Pauly explained, "one of the dream projects of American academic biology."[6] As director of the SEE, Davenport led the development of biology in America during a time of explosive growth in both funding and

[4] The most often cited source for biographical information on Davenport is E. Carleton MacDowell, "Charles Benedict Davenport, A Study of Conflicting Influences," *Bios* 17 (1946).
[5] Kevles, *In the Name of Eugenics*, p. 48.

knowledge, collecting money from public and private sources and publicizing the results of the station's work whenever possible.

Davenport's "Zoology of the Twentieth Century"

At the AAAS meeting in 1901, three years before he had obtained the funds for the SEE, Davenport offered his colleagues a prediction for zoology in the next one hundred years, titled "Zoology of the Twentieth Century." He began by arguing that history could be employed to formulate predictions of the future and offered a positivistic history in which scientific development always began with description and progressed to comparative activities. He described the nineteenth century as "the morphological century," as systematic zoology demanded careful anatomical studies that eventually gave way to comparative anatomy, and comparison became "a fundamental zoological method." Embryology, he argued, was likewise born a descriptive science that eventually gave birth to comparative histology and comparative physiology. The widespread acceptance of "the evolution doctrine" furthered this trend, and zoology had become "immensely more complex, due to its developing in many lines, and that the new lines are largely interpolated between the old and serve to connect them."

Extending his history of nineteenth century zoology into the twentieth century, Davenport foresaw three lines of advancement. First, biological scientists would continue to use old methods to study old problems. While he was careful not to "belittle the old subjects, even when pursued in the old way," Davenport declared that he "would wish to blot out" those zoologists "whose reckless naming of new 'species' and 'varieties' serves only to extend the work and the tables of the conscientious synonomy hunter." He predicted that systematists would continue to revise genera

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[6] Philip J. Pauly, *Biologists and the Promise of American Life* (Princeton: Princeton University Press, 2000): p. 220.

and families, anatomists would explain structures in greater detail, comparative anatomists and embryologists would better understand the relationships between animals, and cytologists would add to the knowledge of inheritance by their "study of centrosomes, asters and chromosomes." "All these subjects," he concluded, "have victories in store for them in the new century."

The second development Davenport envisaged lay in the introduction of new methods for studying old subjects. As the nineteenth century faded into the twentieth, Davenport explained, "the descriptive method has developed into a higher type – the comparative; and of late years still a new method has been introduced for the study of processes – the experimental." Morphologists and cytologists would make great advances in the twentieth century by taking up experimental techniques. Davenport also predicted that future zoologists would abandon "the rough language of adjectives" and adopt quantitative and statistical methods for both research and description. The Linnaean system, he argued, was doomed and would be replaced by a decimal system that delineated an organism's evolutionary relationship to other organisms as well as its habitat and special adaptations.

Finally, Davenport predicted that new problems would be explored by new sciences, like comparative physiology and the study of animal behavior, which were both currently in their infancies and "hardly worthy of the name of a science." Each would enter "an era of precise, critical and objective observation and record," which would make them true sciences. Future zoologists would also achieve significant breakthroughs in their ability to control biological processes, such as growth rates, cell division, color, and sex. "The direction of ontogeny and of phylogeny will be to a greater or less extent under our control." Davenport also envisaged significant gains for the emerging science of animal ecology, which had long been "the pastime of country gentlemen of leisure." He chastised his colleagues for their disdain of animal ecology, saying, "When zoologists fully awaken to a realization of what a fallow field lies here this reproach will quickly be wiped out."

While Davenport wrote only one paper on ecology during his lifetime, he was keenly interested in the subject, and two of his students became highly influential ecologists, C. C. Adams and V. E. Shelford.

Davenport used the study of evolution to illustrate the course of scientific development that he predicted zoology would follow in the twentieth century. He declared, "It seems to me that the signs of the times indicate that we are about to enter upon a thorough, many-sided, inductive study of this great problem [of evolution], and that there is a willingness to admit that evolution has advanced in many ways." Davenport believed, as did many other biologists of his day, that evolutionary scientists needed to depart from speculative methods and ask specific questions about variation, heredity, selection, and environmental influences. To this end, he predicted that evolution would be studied with "comparative observation, experimentation and a quantitative study of results," like the work done by the Englishman William Bateson. Davenport devoted over one-third of his address to a detailed example, drawn from his own work, of how experimental and statistical methods would be brought to bear on evolutionary questions. Describing his work on Pecten irradians, a bivalve mollusk that inhabited the Cape Cod coast, he showed how he used statistical methods to study variation in living and fossilized Pecten shells.

Davenport concluded his forecast for twentieth-century zoology with the familiar call for increased funding. As zoology became entwined with other specialties, future zoologists would be expected to have even broader bases of knowledge, and Davenport argued that zoology would need greater financial resources to attract quality students. He feared, "Our best students slip from our grasp to go into other professions or into commerce because we can offer them no outlook but teaching, administration, and a salary regulated by the law of supply and demand." For the United States to contribute its share to the advance of zoology in the twentieth century, he believed that colleges and corporations would have to provide better financial support for the biological sciences.

Davenport's interest in predicting the future for zoology was the product of his desire to promote experimental and statistical techniques to his colleagues, and he cleverly disguised his agenda as an enthusiastic prophecy for zoology in the twentieth century. We see this as much in his praise of experimental and quantitative analysis as we do in his calls for increased funding for zoological research. His professional aspirations, combined with the dominant position that Davenport assumed when he secured substantial funding from the Carnegie Institution of Washington, led to the development of zoology along many of the same lines that he predicted in his 1901 address. When he offered his forecast, Davenport was only three years away from the opening of the SEE, which he directed for the first three decades of its existence. As director of SEE, Davenport hired young experimental biologists, supported their work, and arranged for the publication of their findings. His predictions for zoology in the twentieth century were largely correct because he set about to make them come true.

While Davenport's predictions were accurate for the first half of the century, they did not include major developments that occurred after his death in 1944. His 1901 address offered no discussion of the rising influence of biochemistry or the incredible technological advances that brought about entirely new fields, nor did it mention the increasing importance of the biological sciences to medicine. Also absent from his prediction was the rise of genetics and molecular biology, which transformed the biological sciences in the second half of the twentieth century. These later events were not listed among his predictions because they went beyond his agenda, although they were clearly encouraged by his earlier work. In cases where Davenport's predictions did not come true, such as with the replacement of the Linnaean system with a decimal system, he was unable to exert the influence needed to bring about changes. Nonetheless, his predictions accounted for much of what he was intellectually and administratively capable of bringing to fruition during his lifetime.

What about Eugenics?

Most conspicuously missing from Davenport's predictions for zoology in the twentieth century was eugenics. Why did Davenport, perhaps the most renowned eugenicist in American history, fail to mention eugenics in his forecast? While Davenport is generally remembered as a eugenicist, in 1901 he was still several years away from becoming a vocal advocate of eugenics. Davenport did not turn his interest to eugenics until sometime around 1905, after his wife, Gertrude Crotty Davenport, persuaded him that eugenics was a viable biological research program and he became increasingly involved with the newly founded American Breeders' Association, the first American organization to sponsor the investigation and promotion of eugenics.

Gertrude Crotty Davenport's role in her husband's career and interest in eugenics has been almost completely overlooked by historians. Her papers, which have been absorbed into his, are found at the American Philosophical association and offer some suggestions about her influence on Charles Davenport, especially on the development of his interest in eugenics. For example, a 1905 letter from David Starr Jordan to Gertrude Crotty Davenport answers her questions about the "Tribe of Ishmael," a Midwestern ethnic group generally associated with Romanian gypsies and a common research subject of American eugenicists.[7] Likewise, in a 1907 letter from Gertrude Crotty Davenport to B. K. Bruce she explained, "Somewhat under the auspices of Carnegie Institution I am making a scientific study of human inheritance. It has seemed to me that I would get the most reliable and obvious statistics from studying the behavior of strongly contrasting characteristics when brought in conflict as they are when different races of peoples intermarry." Therefore, she

[7] David Starr Jordan to Gertrude Crotty Davenport, December 12, 1905, Charles Davenport Papers, American Philosopical Society. Jordan suggested that she look at his *Footnotes to Evolution*, in which he extracted information from Oscar McCulloch's study on the "Tribe of Ishmael." See David Starr Jordan, *Footnotes to Evolution* (New York: Appleton, 1898).

continued, she was collecting data regarding the qualities exhibited by children of interracial marriages and hoped that Bruce would help her secure some information. She concluded, "The investigation is a purely scientific one looking only for the laws of human inheritance if indeed it is possible to discover such laws."[8] Both of these letters precede Charles Davenport's interest in eugenics, contain research questions with which he later became involved, and suggest that his wife played as powerful of a role in his increasing interest in eugenics as she did in helping him secure his first academic position at the University of Chicago.

Lacking a more nuanced understanding of Davenport's career and significance, historians have overlooked a number of interesting and informative problems. While he is almost always included in general histories of eugenics, Davenport's biography has not yet been written. No historian has addressed questions like the relationship between Davenport's institution-building activities and his interest in eugenics, instead they have generally explained it as part of a widespread racist or classist mentality. Why did Davenport show no interest in eugenics until he was over forty years old? What role did his wife, a trained biologist and active participant in his career, have in his decision to begin promoting eugenics? Moving beyond eugenics, what was the relationship between Davenport's many institutional and political interests and his scientific work? Perhaps most importantly, a better understanding of Davenport will help us understand how he used his connections with social and political leaders to advance biology and bring to fruition many of his predictions for zoology in the twentieth century.

[8] Gertrude Crotty Davenport to B. K. Bruce, February 24, 1907, Charles Davenport Papers, American Philosophical Society.