Carl Richard Moore (1892-1955) [1]

By: Drago, Mary Keywords: Parthenogenesis [2]


Moore was born on 5 December 1892 to Sara Frances Harris and Jonathan Newton Moore on a farm near Brookline, Missouri. On the farm, Moore learned to hunt and fish [9], and fishing remained a life-long pastime. Moore's family moved to Springfield, Missouri when he was nine years old. There he completed his elementary and secondary education and enrolled in Drury College in Springfield, Missouri as a premedical student.

At Drury College, Moore took a biology course with Charles Haddon Spurgeon, who encouraged Moore to study biology and influenced Moore’s later teaching methods. Moore graduated in 1913 with a BS degree in biology. Unable to afford medical school, Moore accepted a position as assistant instructor in biology at Drury College for the salary of one hundred dollars per year, where he continued to work and study with Spurgeon. Moore earned his MS degree in biology from Drury College in 1914. The summer before completing his MS, Moore took summer classes at the University of Chicago [10] in Chicago, Illinois. Having used Frank Rattray Lillie's textbook Development of the Chick in his undergraduate classes, Moore visited the Zoology Department at University of Chicago [10] where Lillie was chairman. Because Lillie spent summers at the Marine Biological Laboratory [11] in Woods Hole [12], Massachusetts, Moore did not meet him during that summer session.

Upon completion of his graduate degree from Drury College, Moore enrolled in the University of Chicago [10]'s Zoology Department. During his studies, Moore took summer classes at the Marine Biological Laboratory [11], where he met Lillie. With Lillie's mentorship, Moore investigated the effects of sea urchin [13] sperm [6] on urchin eggs once they began to develop without fertilization [14], a form of reproduction called parthenogenesis. Moore reported that once parthenogenesis began, whether artificially or naturally induced, the introduction of spermatozoa [15] had no effect on the egg [16], even if penetration of the egg [16] by a spermatozoon occurred. Detailed in his thesis, "On the Superposition of Fertilization on Parthenogenesis [17]," Moore argued that his results challenged Jacques Loeb [18]'s hypothesis that fertilization [14] of sea urchin [13] eggs is dependent on chemicals introduced by sperm [6]. Loeb, a member of the Rockefeller Institute [19] of Medical Research in New York, New York, had shown in the early 1900s how manipulated sea urchin [13] eggs so that they developed via parthenogenesis. Moore received his PhD in zoology from the University of Chicago [10] in 1916.

After his PhD, Moore worked as an associate in the Zoology Department at University of Chicago [10] from 1916 to 1918. He became an instructor in 1918, a full professor in 1928, and by 1935, he chaired the Zoology Department.

In his early years in Chicago, he divided his time between research and teaching embryology [20] to medical students. His second paper, "On the Capacity for Fertilization after the Initiation of Development," returned to the sea urchin [13] to again challenge one of Loeb's hypotheses. Contrary to Loeb's results, Moore found that the cell division of sea urchin [13] eggs, once artificially arrested, was not re-activated after spermatozoa [15] were introduced into their environment.

In 1916, Moore's research interest turned to sex differentiation [5] after Lillie suggested that Moore try to create freemartins in the laboratory. Born with a male twin, a freemartin [21] is a sterile cow [22] with external female genitalia and internal male gonads. Lillie theorized that the freemartin [21] was a female whose sex differentiation [5] was suppressed or antagonized by her twin's release of male hormones [2] via their shared blood circulation. Lillie's study of freemartins in 1916 led to the theory that gonadal sex hormones [23] were causes for hermaphroditism, or the condition in which both male and female reproductive organs [23] are present. During this research, Moore married one of his laboratory students, Edith Naomi Abernethy on 1 July 1920. They had three children, two of whom survived, Ellen Abernethy and Harris Mason.

Between 1916 and 1955 Moore experimented to make freemartins in the lab. He introduced male hormones [24] into female rats through testicular grafts, and then he bred them. He also grafted testes [8] in-utero on rat [24] and guinea pig [25] fetuses; injected male hormonal extracts through the placental walls of fetuses; and finally, applied male or female sex hormones [9] to opossum.
Despite extended hospital stays and failing health beginning in 1948, Moore continued to chair the Zoology Department at the University of Chicago[26]. He received the Medal of Award of the Endocrine Society in 1955.

Moore authored or co-authored at least ninety articles between 1916 and 1954. As a professor at the University of Chicago[10], he mentored fifteen master's students and thirty-three doctoral students. Moore's influence extended beyond his laboratory. He was managing editor of the journal the Biological Bulletin[27] from 1926 to 1929; he was on the US National Research Council[28] as a member of the Committee for Research in Problems of Sex, the Committee on Growth, and the Committee on Human Reproduction between 1938 and 1955; and a member of the US National Academy of Sciences[29] in Washington, D.C. from 1944 to 1955.

He received the Francis Amory Award of the American Academy of Arts and Sciences[30] in 1942 for his work on the physiology of sperm[8] and the male reproductive tract, and an honorary doctorate from Drury College in 1948. Moore was also the first recipient of the Medal of Award of the Endocrine Society in 1955.

Despite extended hospital stays and failing health beginning in 1948, Moore continued to chair the Zoology Department at the University of Chicago[10]. Moore died on 16 October 1955 at the age of 62.

**Sources**


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Carl Richard Moore was a professor and researcher at the University of Chicago in Chicago, Illinois who studied sex hormones in animals from 1916 until his death in 1955. Moore focused on the role of hormones on sex differentiation in offspring, the optimal conditions for sperm production, and the effects of vasectomy or testicular implants on male sex hormone production. Moore's experiments to create hermaphrodites in the laboratory contributed to the theory of a feedback loop between the pituitary and fetal gonadal hormones to control sex differentiation. Moore showed that the scrotal sac controls the temperature for the testes, which is necessary for sperm production. He also helped distinguish the hormones testosterone, and androsterone from testicular extracts.

Subject

Topic