

[Warren Harmon Lewis \(1870-1964\)](#) ^[1]

By: Buettner, Kimberly A. Keywords: [Biography](#) ^[2] [Education](#) ^[3] [Carnegie Institution of Washington](#) ^[4]

As one of the first to work at the [Carnegie Institution of Washington](#) ^[5] Department of Embryology, Warren Harmon Lewis made a number of contributions to the field of [embryology](#) ^[6]. In addition to his experimental discoveries on muscle development and the eye, Lewis also published and revised numerous works of scientific literature, including papers in the *Carnegie Contributions to Embryology* and five editions of *Gray's Anatomy*.

Lewis was born on 17 June 1870 in Suffield, Connecticut, to Adelaide and John Lewis. During his childhood, Lewis's interest in biology began when he acquired an interest in botany from his mother's copy of one of Asa Gray's books. Lewis continued to pursue his biological aspirations when, after receiving his BS degree in 1894 from the [University of Michigan](#) ^[7], he worked as an assistant in zoology. In 1896 he entered the [Johns Hopkins University](#) ^[8] Medical School where he learned from notable professors such as John J. Abel, [William H. Howell](#) ^[9], and Franklin P. Mall. After graduating with his MD degree, Lewis joined Mall's lab where he worked with Ross G. Harrison, [Charles R. Bardeen](#) ^[10], Florence R. Sabin, and [John Bruce MacCallum](#) ^[11].

While in Mall's lab, which contained the largest [collection of human embryos](#) ^[12] in the United States, Lewis undertook his first embryological research endeavor. Working with Bardeen, he published a description of the pectoralis major muscle in 1901 for the *Bulletin of the Johns Hopkins Hospital* ^[13]. The same year, Lewis and Bardeen produced another article together, this time on the development of the limb and trunk muscles for the *American Journal of Anatomy*. This paper continues to stand as the exemplar on the subject. During the summer, Lewis worked at the [Marine Biological Laboratory](#) ^[14] at [Woods Hole](#) ^[15] with [Jacques Loeb](#) ^[16] on the effects of potassium cyanide on the eggs of sea urchins, which sparked an interest in experimental [cytology](#) ^[17] for Lewis.

From 1902–1903, Lewis worked with [Moritz Nussbaum](#) ^[18] at the [University of Bonn](#) ^[19] where he furthered his studies on the eye, particularly the ciliary muscle. During his experimentation with [chick](#) ^[20] embryos Lewis made a new discovery, which was published in 1903: the pigment cells that form the iris originate from ectodermal tissue in the optic cup. Upon returning to Baltimore in 1903, Lewis continued his research on eye development, this time using Hans Spemann's discoveries about [lens development](#) ^[21] as a starting point, and was promoted to associate in the department of anatomy and to associate professor in 1904.

In 1910 Lewis contributed a chapter on muscular system development to the Keibel-Mall *Handbook of Human Embryology*. On 23 May 1910 he married Margaret Reed of Pennsylvania, whom he met while working at the [Marine Biological Laboratory](#) ^[14] at [Woods Hole](#) ^[15] and who would join him in his future research endeavors, including early amphibian [embryology](#) ^[6] and mammalian tissue culture. She was a graduate of [Goucher College](#) ^[22] and held a number of research positions, including working in Max Hartmann's lab in Berlin with Rhoda Erdmann in 1908 on tissue cultures and as an assistant to [Thomas Hunt Morgan](#) ^[23] at [Bryn Mawr College](#) ^[24] and [Columbia University](#) ^[25]. She also taught physiology and biology at New York Medical College, Barnard College, and Miss Chapin's School. After their marriage, the Lewises published a number of papers annually on regeneration in [crayfish](#) ^[26] and early amphibian [embryology](#) ^[6].

In 1917, after the death of Franklin P. Mall, George L. Streeter invited the Lewises to join the Carnegie Institution of Washington's embryological laboratory. At the Carnegie lab they continued to work on improving tissue cultures and began to study the importance of pH in the success of tissue cultivation. In 1929 [Warren Lewis](#) ^[27] began to use film to record his observations and was able to see the early development of [rabbit](#) ^[28] embryos, from the first [ovum](#) ^[29] cleavage to the [blastocyst](#) ^[30] stage. In 1931 Lewis captured the process of cell pinocytosis using time-lapse film, a process far too slow to be observed with the unaided eye.

Throughout his career [Warren Lewis](#) ^[27] held a number of leadership positions, including president of Mt. Desert Island Biological Laboratory, American Association of Anatomists, and International Society of Experimental Cytology. He was also elected to the [National Academy of Sciences](#) ^[31] in 1936 and to the [American Philosophical Society](#) ^[32] in 1943. In 1958 the Pathological Society of Philadelphia jointly awarded him and his wife the William Wood Gerhard Gold Medal, and in 1960 [Warren Lewis](#) ^[27] received the Triennial Ross G. Harrison Prize of the International Society of Cell Biology, which he received with great honor as a reminder of his friendship with Harrison. Lewis died on 3 July 1964 in Philadelphia, at the age of ninety-four. He was survived by his wife and research partner Margaret Reed Lewis and their three children.

Sources

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Subject

[Lewis, Warren H. \(Warren Harmon\), 1870-1964](#) ^[34]

Topic

[People](#) ^[35]

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[Articles](#) ^[36]

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Links

- [1] <https://embryo.asu.edu/pages/warren-harmon-lewis-1870-1964>
- [2] <https://embryo.asu.edu/keywords/biography>
- [3] <https://embryo.asu.edu/keywords/education>
- [4] <https://embryo.asu.edu/keywords/carnegie-institution-washington>
- [5] <https://embryo.asu.edu/search?text=Carnegie%20Institution%20of%20Washington>
- [6] <https://embryo.asu.edu/search?text=embryology>
- [7] <https://embryo.asu.edu/search?text=University%20of%20Michigan>
- [8] <https://embryo.asu.edu/search?text=Johns%20Hopkins%20University>
- [9] <https://embryo.asu.edu/search?text=William%20H.%20Howell>

- [10] <https://embryo.asu.edu/search?text=Charles%20R.%20Bardeen>
- [11] <https://embryo.asu.edu/search?text=John%20Bruce%20MacCallum>
- [12] <https://embryo.asu.edu/search?text=collection%20of%20human%20embryos>
- [13] <https://embryo.asu.edu/search?text=Johns%20Hopkins%20Hospital>
- [14] <https://embryo.asu.edu/search?text=Marine%20Biological%20Laboratory>
- [15] <https://embryo.asu.edu/search?text=Woods%20Hole>
- [16] <https://embryo.asu.edu/search?text=Jacques%20Loeb>
- [17] <https://embryo.asu.edu/search?text=cytology>
- [18] <https://embryo.asu.edu/search?text=Moritz%20Nussbaum>
- [19] <https://embryo.asu.edu/search?text=University%20of%20Bonn>
- [20] <https://embryo.asu.edu/search?text=chick>
- [21] <https://embryo.asu.edu/search?text=lens%20development>
- [22] <https://embryo.asu.edu/search?text=Goucher%20College>
- [23] <https://embryo.asu.edu/search?text=Thomas%20Hunt%20Morgan>
- [24] <https://embryo.asu.edu/search?text=Bryn%20Mawr%20College>
- [25] <https://embryo.asu.edu/search?text=Columbia%20University>
- [26] <https://embryo.asu.edu/search?text=crayfish>
- [27] <https://embryo.asu.edu/search?text=Warren%20Lewis>
- [28] <https://embryo.asu.edu/search?text=rabbit>
- [29] <https://embryo.asu.edu/search?text=ovum>
- [30] <https://embryo.asu.edu/search?text=blastocyst>
- [31] <https://embryo.asu.edu/search?text=National%20Academy%20of%20Sciences>
- [32] <https://embryo.asu.edu/search?text=American%20Philosophical%20Society>
- [33] <https://embryo.asu.edu/search?text=Cambridge%20University>
- [34] <https://embryo.asu.edu/library-congress-subject-headings/lewis-warren-h-warren-harmon-1870-1964>
- [35] <https://embryo.asu.edu/topics/people>
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