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### Title

Early Women PhDs in Zoology at UC, 1902-1927

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# Early Women PhDs in Zoology at UC, 1902–1927

by Sheila M. Humphreys



Marine Biological Association of San Diego in La Jolla, 1905.  
Photo: Special Collections and Archives, UC San Diego Library

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## Women PhD Zoology Graduates 1902–1927

Year of PhD	Name	Undergraduate Institution	Employment
1902	Alice Robertson	UC Berkeley 1898	Professor, Wellesley College
1910	Edna Earle Watson (Bailey)	UC Berkeley 1906	Professor, UCB School of Education
1912	Myrtle Elizabeth Johnson	UC Berkeley 1908	Professor, San Diego State University
1915	Olive Swezy	UC Berkeley 1913	Researcher, Scripps Institution
1916	Irene Agnes McCulloch	University of Kansas 1913	Professor, University of Southern California
1917	Christine Elizabeth Adamson (Essenberg)	Valparaiso University 1911	Conchologist; researcher, Scripps Institute; school director
1922	Margaret Campbell Mann (Lesley)	University of Oregon 1915	UC Citrus Experiment Station, Riverside
1921	Helen Redfield (Schultz)	Rice University 1920	Genetics researcher, Stanford, Research Fellow, Columbia, Cal Tech, Cancer Institute
1928	Helen Esther McDonald (Steinfeld)	Butler College 1921	Genetics researcher, psychoanalyst
1928	Hildegarde Howard (Wylde)	UC Berkeley 1924	Avian paleozoologist; curator, Natural History Museum of LA County
	Annie Montague Alexander	Lasell Seminary no degree	Naturalist; founder, Museum of Vertebrate Zoology and Museum of Paleontology

## Introduction

This essay was prepared for the celebration of women at the University of California, Berkeley since 1870, as part of 150W History Project (<http://150w.berkeley.edu>). It traces ten women doctoral graduates in the field of zoology during the twenty-five years following the university's award of the first PhD in zoology to a woman in 1902. The accompanying table gives the names of women zoology PhD graduates through 1927. Curiously, not one of these women appears in the "History of Zoology at the University of California, Berkeley," written by Professor Richard Eakin, who recorded the Zoology Department's history from 1869 to 1956.<sup>1</sup> No women were appointed in tenure-track faculty positions in zoology until the 1970s. Several of the women who earned zoology PhDs in the 1920s are not profiled because of insufficient information. In comparison, Annie Montague Alexander, a self-taught field biologist who did not earn a college degree, is included because of her very significant contributions to zoology and paleontology at Berkeley over a period of five decades.

The study of zoology figured prominently in the first course offerings and graduate degrees granted at UC Berkeley. Inaugurated in 1868 by Professor Joseph LeConte, zoology was part of a natural history curriculum that included zoology, botany, and geology. LeConte's zoology course included comparative anatomy, physiology, and classification, using his Harvard instructor Louis Aggasiz's textbook *Principles of Zoology*.<sup>2</sup> By 1887, zoology achieved the status of a separate academic department.<sup>3</sup> LeConte led the discipline until 1890. He recruited a young scientist from Wisconsin, William Emerson Ritter, to become the first chair of zoology. At the time Ritter had only a bachelor's degree. Over the next decade, Ritter led the effort to establish a marine laboratory in Southern California "to survey the waters of the Pacific adjacent to the coast of Southern California." As early as 1892, Ritter conducted a first summer course in marine zoology on Catalina Island. Members of the Department of Zoology explored various sites on the Pacific coastline in search of a likely spot for a permanent seaside laboratory. "Imperfectly as had any of the fields of zoology in Western America been cultivated," wrote Ritter, looking back some twenty years later, "the least studied of all had been the teeming life of the great ocean on whose margin the University is located. This consideration was of itself a strong incentive to marine investigations." A group of interested citizens in San Diego founded the Marine Biological Association and raised money to construct a small laboratory in La Jolla Cove, and Ritter was named as its scientific director. By 1907, La Jolla was the permanent location of the station. The major benefactor of the marine biology lab was a San Diego heiress to a newspaper fortune, Ellen Scripps, for whom the lab was named.

Ritter directed the marine lab until 1923 and was succeeded by Charles Atwood Kofoid, who became the second chair of zoology in 1909. Ritter and Kofoid laid the foundation for what became the Scripps Institution of Marine Biology in 1909 in La Jolla. Relevant to this essay,

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<sup>1</sup> Richard M. Eakin, "History of Zoology at the University of California, Berkeley," *Beta Biological Society*, vol. 27, no. 2 (May 1956).

<sup>2</sup> Eakin, "History of Zoology at the University of California, Berkeley," 68–69.

<sup>3</sup> The Department of Zoology was merged into the new Department of Integrative Biology in 1989, when the biological science departments were massively reorganized into Integrative Biology, Molecular and Cell Biology, and the College of Natural Resources.

Ritter and Kofoid mentored many women graduate students and sustained collaborative relationships with them long after they completed their degrees.

### Early Days at the Marine Biology Colony

The faculty and students in the colony lived in tents during the first several summers with a portable lab and enjoyed a congenial community. “It was good life for those who liked the out-of-doors, with ample opportunity for hiking and swimming. In addition, a tennis court had been built soon after the institution had located on ‘Biology Beach’ and it was maintained as a permanent feature of the colony for years. Before and after the commons building was erected there were numerous joint activities among the colony families. Often they all got together for Thanksgiving or Christmas dinners, and beach parties centered around a huge pot of fish or clam chowder were a frequent and popular pastime.”<sup>4</sup> Children of the colony attended school on the property in a one-room schoolhouse. An informal Scripps Institute community newsletter reported the comings and goings of faculty, their families, and students.<sup>5</sup>



July 25, 1906: The “Loma”: the Marine Biology research boat was run aground near the Point Loma lighthouse after being caught by the breakers and carried onto a rocky ledge. Photo: Special Collections and Archives, UC San Diego Library.

Each of the women profiled was a pioneer in her field, making significant research contributions. The first five women who attained zoology doctorates were marine biologists. In 1902, Alice Robertson became the first woman to earn a PhD in zoology from UC Berkeley. Four more women had earned doctorates at UC Berkeley in zoology by 1916. These students conducted research at the fledgling seaside station in Southern California. The success of these early students is likely due to the mentorship and research advising of Professor William Ritter. Ritter married Dr. Mary Bennett, a progressive medical doctor who became the university physician for

<sup>4</sup> A detailed history of the first fifty years of Scripps Institute may be found in Helen Raitt and Beatrice Moulton, *Scripps Institute of Oceanography: First Fifty Years* (Los Angeles: Ward Ritchie Press, 1967), <https://escholarship.org/uc/item/63p6h1tq>.

<sup>5</sup> Scripps Institution of Oceanography Archives Collection 201-81, University of California, San Diego.

women students at Berkeley. On their wedding trip, Ritter took his bride on a sailboat to Point Loma to collect goby fish specimens; their boat famously capsized, and they had to be rescued. Mary Ritter's sympathy for women students and her views on women clearly influenced her husband. After William Ritter and his wife moved down from Berkeley in 1909 to live in San Diego full time and direct the marine biology research laboratory at La Jolla, he continued to conduct research and collaborate with former doctoral students such as Alice Robertson and Myrtle Johnson. They joined his staff in summer at the Marine Biology Lab in its earliest stage and also spent periods at the marine laboratory at Woods Hole, Massachusetts.



Alice Robertson. Photo: Special Collections & Archives, UC San Diego Library.

**Alice Robertson** (1849–1922) became, in 1902, the first woman to earn a PhD in zoology at Berkeley. Her Scottish parents, a Baptist minister and his wife, immigrated to Philadelphia in 1847. Alice's very late entry to college, graduate school, and academia is astonishing. Robertson entered Berkeley *after spending twenty-two years* teaching in various neighborhood schools in Harrisburg, Pennsylvania. At the age of forty-four, she moved west and began her undergraduate degree at Berkeley. She earned, first, a BS degree in natural sciences in 1898, then an MS degree in 1899, and then in 1902 was the only woman student to earn a doctoral degree conferred by Berkeley in any field that year. She went on to make significant contributions as a Bryozoan taxonomist. (Bryozoa, microscopic aquatic invertebrates, are commonly called "moss animals.") Her dissertation, entitled *The Embryology and Embryonic Fission in Cyclostomatous Bryozoa*, was advised by William Ritter. During her student years, Robertson traveled to the Southern California coast to conduct field studies with him and other students at various temporary camps. Evidence of her field work is found in the annual report Ritter filed of the summer research conducted in 1901.

After graduation, Robertson's first position was not in zoology; instead, she worked as an assistant in hygiene from 1902 to 1904, teaching a class required of women students at Berkeley with Dr. Mary Ritter, her adviser's wife. Robertson was then employed as an assistant in zoology, but she soon left Berkeley to seek better opportunities at Wellesley College. Robertson wrote to UC President Wheeler expressing her regret at the difficulty that academic women faced in trying to advance at Berkeley. Before leaving, she published two significant papers on

Bryozoa. Robertson held a professorship of zoology at Wellesley College from 1906 to 1918 and chaired the Zoology Department there for nine years. She taught courses at all levels, from the introductory freshman class *The Biology of Animals*, to *Advanced Invertebrate Zoology*, as well as advanced classes for master's students. A fire in Wellesley's College Hall in 1914 destroyed the zoology labs and all of Robertson's scientific materials, including two important manuscripts she had been working on. Robertson was described by colleagues as "one of the most scholarly members of [the Zoology Department's] staff." The most detailed account of her life and scientific contributions is given in a 2009 monograph, *Alice Robertson: Educator and Marine Biologist*.<sup>6</sup> Specimens that Robertson identified are included in collections of the California Academy of Sciences, the Smithsonian Department of Paleobiology, the Museum of Comparative Zoology at Harvard, and UC Berkeley's Museum of Vertebrate Zoology.



Edna Watson Bailey. Photo: UC Berkeley Yearbook, *Blue and Gold*, 1906.



Edna Watson Bailey. Photo: Special Collections & Archives, UC San Diego Library.

**Edna Earle Watson (Bailey)** (1883–1973) became, in 1910, the second woman to earn a PhD at Berkeley in zoology; hers was a joint degree, with philosophy. Following high school, Watson taught in a one-room schoolhouse in the Black Hills of South Dakota for a year before entering Berkeley in 1902. As an undergraduate, she held a scholarship funded by Phoebe Hearst and graduated Phi Beta Kappa in the Berkeley class of 1906. She was elected to membership in the Prytanean Honor Society for women, a group founded at Berkeley in 1900.

Watson worked with both Professors William J. Ritter and Charles Kofoid at the new marine biology station in La Jolla. She became a lifelong friend of Ritter and his wife and lived with them for a time. Watson married a physician who also a Berkeley alumnus, Dr. Bailey, and had two children. In 1919 her husband died, leaving her to raise two young daughters. In midcareer, her interests changed from marine biology to early childhood education, an emerging field. She formulated the method of observing individual children in a natural setting. Bailey worked to develop a teacher training program. She joined the faculty of the Berkeley School of Education

<sup>6</sup> Mary A. B. Sears and Robert M. Woollacott, "Alice Robertson: Educator and Marine Zoologist," in *Annals of Bryozoology 2: History of Research on Bryozoans*, ed. P. Wyse Jackson and M. Spencer Jones, 305–345 (Dublin: International Bryozoology Association, 2009).



in 1927, where she introduced the emphasis on the *individual* development of children. She is quoted as saying of educators in her time that “men know very well how to shape the child in a common mold . . . but how to release the gifts of each individual for the good of all, himself included, is not yet well known or practiced.”<sup>7</sup> She established one of the first parent-cooperative nursery schools in the country in Berkeley and worked with the Federal Emergency Nursery School program to serve working mothers. In 1926 she was among the founders of the Institute of Child Welfare (now the Institute of Human Development) at UC Berkeley.

All the while Bailey continued to work closely with Professor Ritter, who entrusted her to serve as the literary executor of his unpublished research papers. She edited his manuscripts and in 1954 compiled them into a single volume, *Charles Darwin and the Golden Rule*.<sup>8</sup>



Edna Watson Bailey and Myrtle Johnson, circa 1910. Photo: Special Collection & Archives, UC San Diego Library.

**Myrtle Elizabeth Johnson** (1881–1927) contributed significantly to marine biology as a researcher, author and science educator at both the pre-college and college level. The daughter of two teachers, Johnson was raised in a small-town South of San Diego. After high school, she spent two years earning an elementary teaching credential at San Diego State Normal School and taught biology in grade schools near San Diego for three years before entering Berkeley. She earned bachelor’s degrees in math and zoology at Berkeley in 1908 and master’s degrees in mathematics and zoology in 1909. Her master’s thesis was titled “Development of the Salpa Chain in *Salpa fusiformis runcinate*.”<sup>9</sup> That year she was granted a secondary school teaching credential in mathematics and zoology. She earned her zoology doctorate in 1912 at Berkeley with a minor in botany. Her thesis, “The Control of Pigment Formation in Amphibian Larvae,” directed by William Ritter, was published by the Berkeley Zoology Department in 1913.<sup>10</sup>

<sup>7</sup> William A. Brownell, Jean Walker Macfarlane, and Mary Cover Jones, “Edna Watson Bailey,” *University of California: In Memoriam*, March 1976.

<sup>8</sup> William Ritter, *Charles Darwin and the Golden Rule* (Washington, DC: Science Service, 1954).

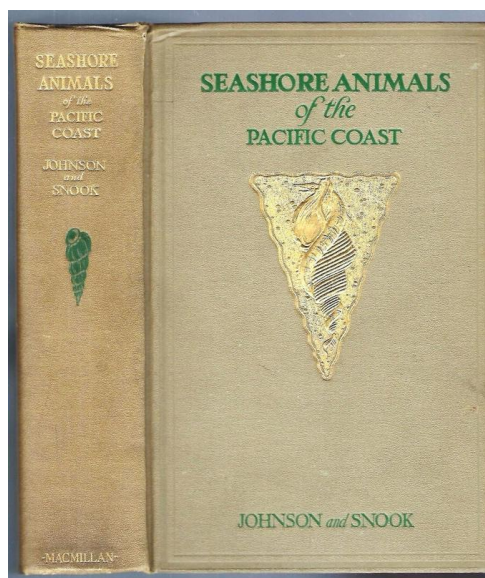
<sup>9</sup> *University of California Publications in Zoology*, vol. 6, no. 7 (1910): 145–176.

<sup>10</sup> *University of California Publications in Zoology*, vol. 11, no. 4 (1913): 53–58.



Myrtle Johnson. Photo: “The Biological Colony.” Scripps Institution of Oceanography<sup>11</sup>

Johnson continued teaching at the secondary level from 1911 to 1921, before she joined the faculty of San Diego Normal School (later San Diego State University). In 1912 she was listed as a “non-resident officer” of the Scripps Marine Biology Laboratory while she was teaching high school biology in Pasadena. Johnson was the first and only woman on the faculty at San Diego Normal for many years and taught there for twenty-five years, from 1921 to 1946. Johnson’s gift for teaching earned her many accolades during her career.



*Seashore Animals of the Pacific Coast* by Myrtle E. Johnson and Harry J. Snook  
(New York: Macmillan, 1935).

Johnson investigated the marine life of the Southern California intertidal seashore. From her beginning as a new professor she worked for twelve years researching her seminal book,

<sup>11</sup> *The Biological Colony*, 25, Scripps Institution of Oceanography, 1902 (compiled for SIO Centenary)  
[https://scripps.ucsd.edu/sites/scripps.ucsd.edu/files/communications-content/field\\_attachment/2014/The\\_Biological\\_Colony\\_V7n1.pdf](https://scripps.ucsd.edu/sites/scripps.ucsd.edu/files/communications-content/field_attachment/2014/The_Biological_Colony_V7n1.pdf).

*Seashore Animals of the Pacific Coast*. She began the book in 1915 with a fellow high school biology teacher and her junior coauthor, Harold James Snook. She said they collected “at dawn’s early light . . . gathering material on the invertebrates most commonly found on the western beaches.” Published in 1927, this classic was reprinted four times.<sup>12</sup> Johnson explained the need for a book focusing on the Pacific: “Available books on marine invertebrates dealt with Atlantic coast species almost entirely so we felt the need for a book with scientific names for our species and information on their habits and distribution.”<sup>13</sup> This text was considered an indispensable guide to Pacific coast biology for thirty years. Like other marine biology alumnae of her era, Johnson collaborated with her Berkeley adviser, William Ritter, and his former student Harry Beal Torrey. Ritter clearly acknowledged Johnson’s scientific contributions to his research even when she was still an undergraduate: “Miss Myrtle Johnson, one of my students, but for whose dissections and sketches, no such extensive examination . . . of the species would have been practicable.” Ritter also acknowledged her role in his publications, including her scientific illustrations: “I am glad to acknowledge the helpfulness . . . for the efficiency and patience of Doctor Myrtle E. Johnson in making dissections, rough sketches, and finished illustrations.”<sup>14</sup>

Johnson wrote two books about the seashells of California that were designed to instruct schoolchildren and the public.<sup>15</sup> Former students praised Dr. Johnson as an inspirational, thoroughly prepared, and an always interesting classroom teacher. The National Association for Research in Science Teaching presented her the Fifteenth Science Education Recognition Award as “an Outstanding classroom teacher of science and a teacher with the highest professional ideals” in 1959.



Olive Swezy. Photo: Smithsonian Institution Archives, Accession 90-105, Science Service Records, Image No. SIA2009-3991

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<sup>12</sup> Myrtle E. Johnson, *Seashore Animals of the Pacific Coast* (New York: Macmillan, 1927).

<sup>13</sup> Quoted in Clarence M. Pruitt, “Myrtle Elizabeth Johnson, 1857–1967,” *Science Education*, vol. 51, no. 5 (December 1967): 426.

<sup>14</sup> Robert Jan “Roy” van de Hoek, *Myrtle Elizabeth Johnson, Forgotten Marine Biologist, Ascidiologist, Educator: Notes Toward a Biography of a California Woman Scientist and Teacher* (Los Angeles: Ballona Institute, 2008).

<sup>15</sup> Myrtle Johnson, *West Coast Marine Shells* (Sacramento: California Department of Education, 1954).

**Olive Swezy** (1878–1963), born in Shohola, Pennsylvania, was both an undergraduate and a graduate student at Berkeley. She earned a BS in 1913 and an MS in 1914. Her Berkeley PhD in zoology was granted in 1915. Her thesis was entitled “The Kinetonucleus of Flagellates and the Binuclear Theory of Hartmann.” After graduation Swezy continued to conduct research with Charles Kofoid, the second chair of zoology. Swezy was hired as an assistant in Berkeley’s Zoology Department before moving to the new Marine Biological Laboratory at La Jolla, where Kofoid served as the assistant director under William Ritter. It is evident that Olive Swezy was a major contributor to many of Kofoid’s varied research projects. Swezy’s correspondence with Ritter reveals that she struggled to define her role as a scientist rather than a part-time librarian at Scripps. She asserted from the beginning that she preferred not to be called a librarian. In negotiating for her position in 1917, Olive stated, “The title of librarian misrepresents my position and work to the institution, hence does not properly belong to me.”<sup>16</sup> A Western Union telegram confirming her agreement to her appointment reads “Will accept proposed fifteen hundred per year with title zoologist. Olive Swezy.”<sup>17</sup>

She began research on *Dinoflagellata* at Scripps for Charles Kofoid about 1917, although he had studied the topic since 1901 with other students. Kofoid had an infinite capacity for work and was known to push his students relentlessly. “His actual research work was only one facet of his activity, in spite of the fact that his printed output was immense. This was made possible in part by the nature of his work which, being very much of the cataloging type, permitted extensive use of collaborators and paid assistants.”<sup>18</sup> Olive Swezy was one of those paid assistants. This description of Kofoid’s research style sheds light on how Olive Swezy’s contributions were overshadowed by his. Swezy was named coauthor with Kofoid of a 583-page volume entitled *The Free-Living Unarmed Dinoflagellata*, published in 1921 and culminating his twenty years of research.<sup>19</sup> In their annual report to the president of UC, the Zoology Department called the book “the outstanding single progressive event” of the year. A National Academy of Sciences biographical memoir of Charles Kofoid points to the key role of the productive collaboration between Swezy and Kofoid in his career: “His most important contributions to the morphology of the protozoa were made during his association with Olive Swezy.”<sup>20</sup> Olive Swezy continued to publish papers with Kofoid through the 1920s, on a range of topics associated with Kofoid’s various projects in applied zoology. She wrote and coauthored a series of papers on parasites and intestinal amoebae.<sup>21</sup>

Swezy also worked with prominent anatomist Herbert McLean Evans, who is best known for discovering vitamin E and human growth hormone. They collaborated in research on human chromosomes in the 1920s, in an era when the exact number of chromosomes per cell was still

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<sup>16</sup> Olive Swezy to W. S. Ritter, June 18, 1917.

<sup>17</sup> Western Union Telegram, May 14, 1917, Olive Swezy to Professor Ritter. Courtesy Special Collections and Archives, University of California, San Diego.

<sup>18</sup> Richard Goldsmith, *Charles Atwood Kofoid: Biographical Memoir* (Washington, DC: National Academy of Sciences, 1951), 124.

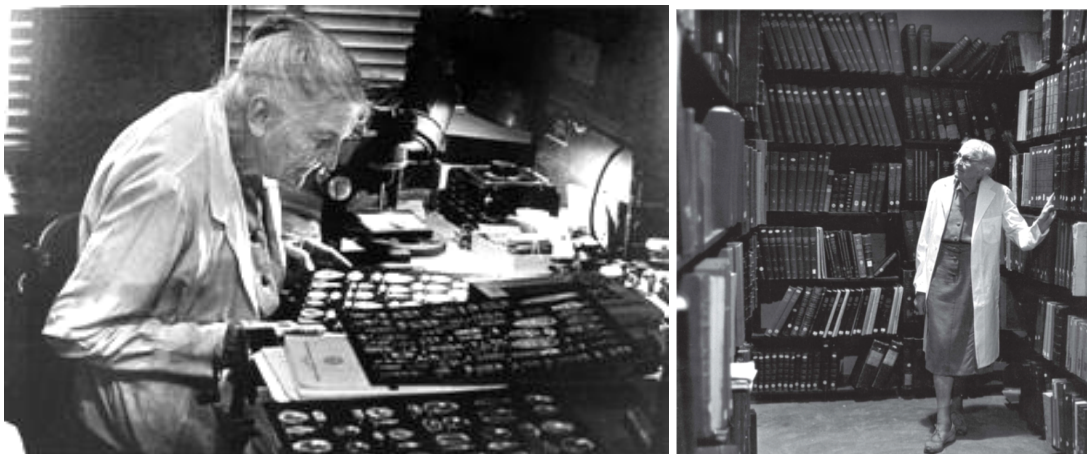
<sup>19</sup> Charles Kofoid and Olive Swezy, *The Free-Living Unarmed Dinoflagellata* (1921): “It is the result of observations made by Prof. Kofoid and his pupils over a series of years from 1901 onwards at the marine laboratories of the University of California and the more both by work at sea off the coast of Southern California and by investigation of the beach sands.”

<sup>20</sup> Goldsmith, *Charles Atwood Kofoid*, 124.

<sup>21</sup> Charles A. Kofoid, and Olive Swezy, *Karyamoeba Falcata: A New Amoeba from the Human Intestinal Tract* (Berkeley: University of California Press, 1924).

unknown.<sup>22</sup> “For this study Evans personally obtained exceptionally well-preserved material by attending, at San Quentin prison, executions of criminals whose bodies were not to be claimed by relatives. Swezy did most of the counting, from thin serial sections.”<sup>23</sup> In the 1930s, she coauthored several papers with Evans, such as *Ovogenesis and the Normal Follicular Cycle in Adult Mammalia*.<sup>24</sup>

In June 1940, Swezy wrote a letter to the *Oakland Tribune*, “The Hour Is Late,” in which she warned of the dangers of Nazism. In 1942, President Franklin D. Roosevelt issued Executive Order 9066, which authorized the forced evacuation of all persons of Japanese descent, including U.S. citizens, to internment camps. Swezy protested this injustice and wrote an article affirming the patriotism of Japanese Americans and their essential contributions to California agriculture. Swezy is listed in the 1944 edition of *American Men of Science* with an address in Carmel, California. No publications by Swezy appear after the war.



Irene McCulloch, 1960. Photo: *USC Dornsife* magazine.

*We wanted to know what is in the Pacific Ocean.* – Irene McCullough

**Irene Agnes McCulloch** (1885–1987) came west from Kansas, where she had earned a BS and a teaching certificate in 1908 at the University of Kansas. Directed by Professor Charles Kofoid, she received a PhD in zoology in 1916 from Berkeley. Her dissertation compared the life cycle of *Crithidia* and *Trypanosoma* within invertebrate hosts.<sup>25</sup> After graduating, she worked at Berkeley as a research assistant in zoology for eleven years. McCulloch taught briefly at Tulane University and Occidental College before she enjoyed a lengthy, distinguished career as a professor of marine biology at the University of Southern California (USC). When she arrived at

<sup>22</sup> Herbert McLean Evans and Olive Swezy, *The Chromosomes in Man: Sex and Somatic* (Berkeley: University of California Press, 1929). McLean erroneously thought there were twenty-nine instead of twenty-eight chromosomes.

<sup>23</sup> George W. Corner, “Herbert McLean Evans,” *Biographical Memoirs of the National Academy of Sciences*, vol. 45 (1974), 157–187.

<sup>24</sup> Herbert M. Evans and Olive Swezy, *Ovogenesis and the Normal Follicular Cycle in Adult Mammalia* (Berkeley: University of California Press, 1931).

<sup>25</sup> Irene Agnes McCulloch, “A Comparison of the Life Cycle of *Crithidia* with That of *Trypanosoma* in the Invertebrate Host,” *UC Publications in Zoology*, vol. 19, no. 4 (1919): 135–190.

USC in 1923, the available equipment was limited to a single skiff, a lecture hall, and an outdated lab from the 1880s. A history of USC's program of oceanographic research explains how McCulloch was able to obtain financial support for oceanographic research by engaging George Hancock, an eager and interested benefactor. Hancock's financial support made it possible for McCulloch to establish the George Allen Hancock Foundation for Marine Research at USC.<sup>26</sup> McCulloch coauthored with her adviser Charles Kofoid a monograph called "On *Trypanosoma triatomae*, a New Flagellate from a Hemipteran Bug from the Nests of the Wood Rat *Neotoma fuscipes*."<sup>27</sup>

An active woman, McCulloch continued to enjoy mountain climbing and attending USC athletic contests in retirement. She was a fan of the Trojan football, basketball, and track teams. Her USC obituary states that "each year she would memorize the names of all the players in these sports, often sending them or their coaches written comments on their latest performances."<sup>28</sup> On Irene McCulloch's hundredth birthday in 1985, the USC vice president for financial affairs, Carl Franklin, described the zoologist as a "star of this university." A mantis shrimp, *mculloughiae*, is named for her.

After retirement, McCulloch also continued a robust research career in marine biology. Her final book, on single-celled ocean organisms called *foraminifera*, took her twenty-five years to prepare and was published when she was ninety-four. Commenting on her life's work, she said, "We wanted to know what is in the Pacific Ocean. We always stressed practical application. We looked for rare minerals and natural resources. But our primary thrust was: What's in the ocean?"

In 1969, a group of McCulloch's former students and colleagues established the Irene McCulloch Foundation for Research and Education in Marine Biology at USC in honor of her more than forty-five years of teaching and research. The foundation's long-range goal has been to support the types of research and education that McCulloch advocated—specifically, the application of faunal studies to problems associated with marine resources, conservation, and pollution.<sup>29</sup>

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<sup>26</sup> Richard Brusca, "The Allan Hancock Foundation of the University of Southern California," *ASC Newsletter*, vol. 8, no. 1 (1980): 1–7.

<sup>27</sup> Charles Kofoid and Olive Swezy, "On *Trypanosoma triatomae*, a New Flagellate from a Hemipteran Bug from the Nests of the Wood Rat *Neotoma fuscipes*," *University of California Publications in Zoology*, vol. 16, no. 10 (1916): 113–126.

<sup>28</sup> Obituary of Irene McCulloch, *University of Southern California News Service*, June 1, 1987.

<sup>29</sup> "Irene McCulloch, 101; Marine Biologist," *Los Angeles Times*, June 6, 1987.



Marine Biology Laboratory, 1925. Photo: “The Biological Colony.” Scripps Institution of Oceanography<sup>30</sup>



Mrs. Christine Essenberg. Photo: Valparaiso University Yearbook, 1911.

**Christine Elizabeth Adamson (Essenberg)** (1876–1965), an oceanographer known for her expertise in conchology and plankton studies, was born of Swedish parents in Livonia, in the Baltic provinces. After teaching for several years in St. Petersburg, she immigrated to the United States. Essenberg attended Valparaiso University in Indiana, where she followed a “Scientific Course of Study” for one term and studied zoology and botany. She graduated in 1913. Called “Mrs. Essenberg” by the registrar, she married Jacob Essenberg in 1910 in Valparaiso but later divorced. How she made her way to Berkeley is unknown. At some point, she became a U.S. citizen. She earned a master’s degree at Berkeley in zoology, followed by a doctorate in zoology in 1917, which she obtained at the age of forty-one. Her thesis was titled “The Factors Controlling the Distribution of the Polynoidae on the Pacific Coast” and was supervised by Charles Kofoid. She worked at the Scripps Institution of Oceanography carrying on zoological research in collaboration with Professor Kofoid. She also assisted him in their small library on the campus part-time to earn money.<sup>31</sup> Describing her research, she said, “About half of my time

<sup>30</sup> *The Biological Colony*, 27, Scripps Institution of Oceanography, 1902 (compiled for SIO Centenary).

[https://scripps.ucsd.edu/sites/scripps.ucsd.edu/files/communications-content/field\\_attachment/2014/The\\_Biological\\_Colony\\_V7n1.pdf](https://scripps.ucsd.edu/sites/scripps.ucsd.edu/files/communications-content/field_attachment/2014/The_Biological_Colony_V7n1.pdf)

<sup>31</sup> Although both Olive Swezy and Christine Essenberg were described as part-time librarians by historians of Scripps, they were in fact serious researchers.

is devoted to scientific research in problems of Marine Zoology, especially in plankton studies. . . . In this connection the actual individuals as well as the environmental and the physical conditions of the ocean such as temperature and other factors have been considered.”<sup>32</sup>

In a letter to Professor Ritter in 1921, Essenberg expressed doubt about her future: “In regard to my future, I have not made up my mind definitely what I shall choose. . . . At any rate, whatever laboratory research I decide to do I would like to do some experimental work on the side so as not to be obliged to sit at the microscope all the time.” She worried about continued funding and mentioned that “I am not at all sure but that I may go into teaching sometime in the future . . . where I can earn more in 9 months’ work.”<sup>33</sup>

In 1922–1923, Essenberg embarked on an ambitious year-long trip to visit marine laboratories in Europe to further her research in plankton studies. Essenberg requested one year away from Scripps for travel “to learn new methods of work . . . and to get new ideas by personal conversations and observations with the most prominent workers in my line of research.” She outlined her visits to biological stations at Woods Hole; to Plymouth Marine Laboratory in England; to the Fort Erin Marine Laboratory on the Isle of Man; and to visit the German authority on *Appendicularians*, Dr. Lohman in Naples. Throughout the year, Essenberg wrote to Ritter about her travels. On her return to the Scripps lab, Dr. Essenberg began studying the transparent, tadpole-like *appendiculariae*. She published a number of papers in the 1920s on a variety of topics with Kofoid, who undertook many projects.

Changing her focus, whether because of financial necessity or for other reasons, Essenberg next developed an interest in the education of women. She spent a sabbatical in Turkey in 1924 and taught biology for nine months at the Constantinople Women’s College. She became preoccupied with the education of young Muslim women, with whom she came into contact at Damascus. She gave up her position as teacher in Constantinople and on October 5, 1925, formally opened the American School for Girls, in Damascus, Syria, in response to Arab, Jewish, and Christian parents’ desire for a nonsectarian school for their daughters. The school offered Arabic, which was taught through a special arrangement with local sheikhs. A great majority of students enrolled were Muslim, along with some Jews and Christians. A teacher at the school reported that Essenberg organized a gymnastics class for the mothers of pupils and married women “who are impatient with their prison life.”<sup>34</sup>

Dr. Essenberg traveled to the United States several times on fundraising trips. In 1934, she toured many cities to raise funds for her school, which suffered during the Depression. As reported in the local paper in Ocean Grove, New Jersey, “the story of Dr. Essenberg’s early years and her increasing interest in the field of education is an interesting one. . . . The harem idea still prevails in ancient Syria and the lives of its women are especially narrow.” She explained that her purpose was not religious conversion of the students; instead, she said, “my primary objective is to teach hygiene—to educate the women in the elementary laws of sanitation within their homes,” thereby helping to eliminate the threat of typhoid and malaria, still widespread at

<sup>32</sup> Christine Essenberg to William Ritter, December 6, 1921, Special Collections and Archives, University of California, San Diego.

<sup>33</sup> Christine Essenberg to William Ritter, May 2, 1921, Special Collections and Archives, University of California, San Diego.

<sup>34</sup> Frances Klein, “Physical Education for Women in Syria,” *American Physical Education Review* (1928), 476–477.



the time.”<sup>35</sup> On the same trip, Essenberg was honored by the California Academy of Science in San Francisco and the American Association of University Women.

During World War II, the building housing the American School for Girls suffered during the French bombardment of Damascus in 1945. Dr. Essenberg remained in Damascus through the war. “Essie” used part of the school as a recreation area for Allied servicemen and women. In 1946, the school was still in operation, with noted Harvard astronomer Harlow Shapley serving as chair of the board. “The school has graduated hundreds of girls of Arab, Christian and Jewish faiths. Many of its graduates have become successful teachers in the Arab lands. Others of course are married and have taken into their houses the strong influence of American culture given them by Dr. Essenberg.”<sup>36</sup> By 1947, Essenberg was on another tour, and the *San Francisco Examiner* reported that Dr. Essenberg, “aged 71 but hale and full of vital energy,” had worked at her school without a salary for twenty years.<sup>37</sup> The education of Muslim women at the American School for Girls in Damascus may indeed be Dr. Christine Essenberg’s principal legacy. She died in San Francisco in 1965.



Margaret Campbell Mann Lesley. Photo: Smithsonian Institution Archives, Accession 90-105, Science Service Records, Image No. SIA2008-5268

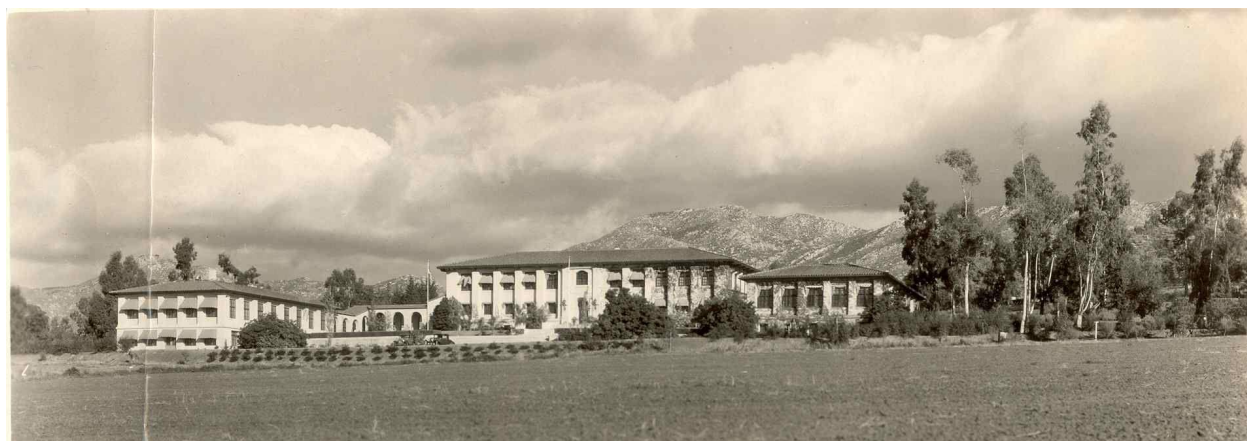
**Margaret Campbell Mann (Lesley)** (1891–1988) was born in Michigan and attended the University of Oregon, graduating in 1915. At Berkeley she earned an MS in zoology in 1918 and a PhD in genetics in 1922. Her dissertation was titled “Observations on an Inbred Strain of *Drosophila Melanogaster*, Part 1: The Occurrence and Hereditary Behavior of Two New Dominant Mutations; Part 2: A Demonstration of the Stability of the Genes Under Experimental Conditions.” After graduation, she was employed as a researcher at the Citrus Experiment Station in Riverside, California, where she met her British husband James W. Lesley, also a Berkeley doctoral graduate in genetics. They married in 1924 and remained in Riverside, where they raised two daughters. The couple’s primary work focused on cytological analyses of tomatoes and citrus. Colleagues of Professor James Lesley acknowledged his wife’s role in his *In*

<sup>35</sup> Anne Weiss, “Education Removes Veil of Darkness for Moslem,” *Pittsburg Press*, February 19, 1934.

<sup>36</sup> C. Adamson, Testimony to U.S. House of Representatives, Committee on Foreign Affairs, 1946, 71.

<sup>37</sup> “San Francisco Sidelines,” *San Francisco Examiner*, May 4, 1947.

*Memoriam*: “Many of his [James Lesley’s] studies were done in collaboration with his wife Dr. Margaret M. Lesley. . . . She was for many years an Associate in the Experiment Station at Riverside and carried out most of the cytological portions of their studies of the tomato.” Margaret Lesley also published her work independently. For example, in 1925, her essay “Chromosomal Chimeras in the Tomato” was published in *The American Naturalist*.<sup>38</sup> Margaret Lesley was an active research assistant to Howard B. Frost (1881–1969), an associate plant breeder at the Citrus Experiment Station. They published articles in 1924 and 1927 in *The American Naturalist* and in the journal *Genetics*.<sup>39</sup> The Lesleys were together honored with the L. H. Vaughan Award from the American Society for Horticultural Science in 1959 in recognition of their joint work on production of hybrid tomato plants.



1907 Riverside Citrus Experiment Station. Photo: University Archives at UC Riverside.



Helen Redfield at Woods Hole, Massachusetts, Marine Biological Laboratory. Photo: American Philosophical

<sup>38</sup> Margaret Mann Lesley, “Chromosomal Chimeras in the Tomato,” *American Naturalist*, vol. 59, no. 665 (1925): 570–577.

<sup>39</sup> Howard B. Frost and Margaret C. Mann, “Mutant Forms of *Matthiola* Resulting from Non-Disjunction,” *American Naturalist*, vol. 58, no. 659 (November–December 1924); Margaret Mann Lesley and Howard B. Frost, “Mendelian Inheritance of Chromosome Shape in *Matthiola*,” *Genetics*, vol. 12, no. 5 (September 1, 1927): 449–460.

Society Library.

**Helen Redfield (Schultz)** (1900–1988) was known for her work in the genetics of *Drosophila melanogaster* (the fruit fly). She studied biology at the Rice Institute (which became Rice University), graduating in 1920. There, she was introduced to new developments in genetics by future Nobel prizewinner Hermann J. Muller and his colleague Edgar Altenburg.<sup>40</sup> She became fascinated by their fruit fly work even though she was acting as an assistant in mathematics at the time. Muller and Altenburg encouraged her to carry out simple experiments using the sex-linked lethal genes they had been studying, and she was ultimately able to show the maternal inheritance of a sex-linked lethal effect. She went to UC Berkeley for graduate work in the Department of Zoology, receiving the PhD in 1921 under the direction of Samuel J. Holmes, who was noted for his studies on the genetics of animal behavior. She taught briefly at Stanford University but received a three-year National Research Council Fellowship to study genetics at Columbia University, where she joined the group led by Professor Thomas Hunt Morgan in 1925. His lab was known as the Fly Room.

At the Columbia laboratory, Redfield completed a study of the maternal inheritance of a sex-limited lethal effect. She embarked on new studies on crossing over in triploids. The younger researchers in the group were known to be remarkably congenial. She met a graduate student there named Jack Schultz, who shared with her an interest in the study of the crossing over phenomenon. Their interests were closely aligned, and consequently they began collaborative work on interchromosomal effects on crossing over that lasted for many years. They married in 1926, although she maintained her maiden name.

Redfield and Schultz had two children, a boy and a girl. The National Academy of Sciences Memorial Biography of Jack Schultz states that Redfield preferred to work part-time while rearing their children.<sup>41</sup> Jack Schultz became a prominent geneticist whom Redfield followed to his successive academic posts. In 1929, she was working as a teaching fellow at New York University. She held two research posts after 1939, in Pasadena and Philadelphia, both in laboratories where her husband was employed. In 1937, the Schultz family spent two years in Sweden. From 1939 to 1942, Redfield worked as a geneticist at the Kirchoff Laboratory at California Institute of Technology. In 1942, during World War II, Redfield was employed as a lab scientist at Cold Spring Harbor Laboratory during the summer. Ten years later, from 1951 until 1961, she served as research associate at the Institute for Cancer Research in Philadelphia, where her husband headed the Division of Biology. The role she played in her husband's career is not precisely evident but was probably substantial.

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<sup>40</sup> Muller worked for a time with Morgan at Columbia before taking the position at Rice. Muller received the Nobel Prize in Physiology or Medicine in 1946 for work done on the fruit fly.

<sup>41</sup> Thomas F. Anderson, *Jack Schultz, 1904-1971: Biographical Memoir* (Washington, DC: National Academy of Sciences, 1975).



Helen Esther McDonald. Photo: Butler College Yearbook, *The Drift*, 1921.

**Helen Esther McDonald (Steinfeld) (1899–1978)** came from Anderson, Illinois, and graduated from Anderson High School. She earned a bachelor’s degree at Butler College in Indianapolis in 1921. Then she received an MS at the University of Wisconsin before coming to Berkeley. As a graduate student, Helen was married to Lester Albert Steinfeld (1885–1935). In 1927, Helen McDonald Steinfeld conducted dissertation research that demonstrated that by simply removing the gut bacteria from fruit flies (*Drosophila*), she could extend their life spans by 14 percent. Her thesis was entitled “Length of Life of *Drosophila melanogaster* Under Aseptic Conditions.” Since the era of Louis Pasteur, the question whether bacteria are essential to life had been the topic of debate. Steinfeld was awarded her PhD at UC Berkeley in zoology and physiology in 1928. The *Indianapolis Times* featured her discovery in 1928: “Hoosier Gains Deep Interest of Scientists.”<sup>42</sup> Steinfeld asserted that “bacteria are not essential to life.” In 2018, a group of biologists, some at Berkeley, published a paper citing Steinfeld’s 1928 thesis, and extended her work.<sup>43</sup> The role of intestinal bacteria in health and disease is highly topical at present. A UC Berkeley alumni directory lists Helen Steinfeld as a psychoanalyst in the 1940s, so it is assumed that after a promising start, she changed careers.

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<sup>42</sup> “Hoosier Gains Deep Interest of Scientists,” *Indianapolis Times*, May 15, 1928, 8.

<sup>43</sup> Alison Gould, Vivian Zhang, Lisa Lambert, Eric W. Jones, Benjamin Obadia, Nikolaos Korasidis, Alex Gavryushkin, Jean M. Carlson, Niko Beerenwikel, and William B. Ludington, “Microbiome Interactions Shape Host Fitness,” *PNAS* (December 3, 2018): 201.



Hildegarde Howard sorting avian fossils in the museum basement and standing with a specimen.  
Photos: Natural History Museum of Los Angeles County Archives.

**Hildegarde Howard (Wylde)** (1901–1998) is well known as a foremost expert in avian paleontology who dominated the field of paleornithology in the twentieth century. Howard was raised in Los Angeles, where she attended the Southern Branch of the University of California (the future UCLA), a two-year school. She became fascinated by biology because of her instructor, Miss Pirie Davidson. In that era, women were banned from field trips. Davidson helped Hildegarde to get a part-time job in the basement of the Los Angeles Museum of History, Science and Art, sorting fossil bones from the Ice Age asphalt beds or tar pits of Rancho La Brea.<sup>44</sup> Howard was mentored by two prominent paleontologists: Professor Chester Stock, a mammalian paleontologist, and Professor Loye Miller, chair of biology at the Southern Branch. Howard transferred to Berkeley to complete her BA degree. Loye Miller hired Howard to do part-time work right after her college graduation in 1924. He assigned her to carry out research on the extinct California turkey (*Meleagris (Parapavo) californicus*), which became the basis of her master's thesis at Berkeley. Howard completed the doctoral degree in 1928, advised by Professor Joseph Grinnell. Her dissertation, "The Avifauna of Emeryville Shellmound," was a popular and authoritative work, frequently referenced until the 1979 publication of *Nomina Anatomic Avium*, an annotated dictionary of birds. Kenneth Campbell explains why her dissertation was so impactful: "One of the reasons for its influence was a series of drawings illustrating the bones of a bird skeleton, with clearly labeled osteological features. For the first time avian osteologists and paleontologists had a standard terminology, a clear point of reference."<sup>45</sup>

While they were each examining fossils of sabertooth cat teeth in the basement of the Los Angeles Museum, Howard met her future husband, Henry Anson Wylde. Later Wylde, whom

<sup>44</sup> Rancho La Brea is the site of Pleistocene-era fossils preserved in natural asphalt beds in the city of Los Angeles. The site was given to the Los Angeles County Museum for excavation by George Allan Hancock in 1923.

<sup>45</sup> Kenneth Campbell Jr., "In Memoriam, Hildegarde Howard: 1901–1998," *The Auk*, vol. 117, no. 3 (2000): 777.

she married in 1930, held the position of chief of exhibits at the museum for forty-three years. The couple had no children.

First hired as a “junior clerk” at the Natural History Museum of Los Angeles County in 1928, Howard in fact functioned from the start as a curator, a title she did not receive until 1938. She advanced to the position of avian paleontologist in 1944. In 1951, she became chief curator of science, the first woman to hold such a position. The use of carbon dating enabled Howard to ascertain the different ages of various excavations or pits at La Brea and to analyze avian evolution going back forty thousand years. A second path of Howard’s research focused on the Tertiary marine birds of southern California. Bird fossils of the Miocene and Pliocene strata were exposed during the urban development of the region. Howard wrote about the evolution of the flightless diving geese and seabirds belonging to the Pelecaniformes order and the Pleistocene birds of Fossil Lake, Oregon.

Howard published 150 papers on avian paleontology, curation, and science. She was known to wait for absolute certitude before naming new taxa. At the age of ninety-one, she produced her last paper on fossil birds. Among her accomplishments was the identification of three families, thirteen genera, and fifty-seven species over sixty-nine years. Howard also wrote articles about fossil birds to educate the public. Her 1945 review of the fossil birds of La Brea, aimed at a general audience, was revised and expanded in 1955 and in 1962.<sup>46</sup> In 1953, Howard was the first woman to be awarded the distinguished Brewster Medal of the American Ornithologists Union for outstanding research in ornithology, given to “authors of an exceptional body of work on birds of the Western Hemisphere.” In a testament of their admiration, the Natural History Museum’s staff and trustees honored Howard in 1977 by dedicating to her the Hildegarde Howard Hall of Cenozoic Life.



Annie Alexander posing with a rifle. Photo: UC Museum of Paleontology.

**Annie Montague Alexander** (1867–1950) is best known in the history of UC Berkeley as the benefactor who established both the Museum of Vertebrate Zoology and the Museum of Paleontology on the campus. She supported the research of both institutions until her death in

<sup>46</sup> Hildegarde Howard, *Fossil Birds, with Especial Reference to the Birds of La Brea* (Los Angeles: Los Angeles County Museum, 1945).

1950 but adamantly spurned public acknowledgment of her gifts. Less well recognized is Alexander's role as a significant collector of both flora and fauna. She made major contributions of specimens she collected over four decades of expeditions to the two museums she funded and to the University Herbarium. Alexander's life and work are well documented, particularly in Barbara Stein's 2001 biography *On Her Own Terms: Annie Montague Alexander and the Rise of Science in the American West*, an authoritative source for a detailed account of all Annie Alexander's collecting activities.<sup>47</sup>

Alexander's father, Samuel Alexander, owned a large sugar plantation in Hawaii, from which he accrued a substantial fortune.<sup>48</sup> The family lived in Maui, Hawaii, and moved to Oakland when Annie was thirteen. Annie disliked city life in Oakland and the expectations of society for a wealthy young woman of her position. Before she found her true passion in natural history, Annie attended Lasell Seminary for young ladies near Boston for two years, traveled extensively with her father, and studied painting in Paris. Restless and feeling she lacked a purpose, Alexander discovered her life's work when she audited a course at UC Berkeley.

In 1900, at age thirty-two, Annie enrolled in a course in paleontology taught by a Berkeley professor of geology, John Merriam; her imagination was captured immediately. One of her first field experiences was accompanying UC paleontologists on a fourteen-mile hike up nearby Mount Diablo in search of Miocene shells. Merriam encouraged her interest and her patronage. She began funding Professor Merriam's research and soon wrote to him about her wish to organize her own independent research expeditions. Merriam guided her in the planning of an expedition to Fossil Lake in south central Oregon. With the agreement that Alexander would donate the specimens she found to the university, Merriam provided logistical planning, equipment, and two research assistants. The expedition was a great success.

In 1904, Samuel Alexander invited his daughter to undertake a safari with him to hunt and photograph big game in East Africa. During the journey, her father was tragically killed when a boulder fell on him. His sudden death left Annie Alexander unemployed, unmarried, and bereft, but heir to a handsome fortune. Returning to Oakland, Alexander accepted Professor Merriam's invitation to sponsor two digs in Shasta County to seek fossils of *Shastasaurus*, a land-dwelling reptile of the Triassic period. To her delight, Alexander discovered three important ichthyosaur skeletons in very good condition. Based on the fossils, Professor Merriam named the reptile *Shastausaurus alexandrae*.<sup>49</sup>

In 1905, Alexander embarked with five others to the American Canyon in the Humboldt Range in Nevada on the Saurian Expedition in search of ichthyosaur fossils. Using picks and shovels, the crew worked to extract fossils from a limestone outcropping. Some fossils were buried in blocks of stone weighing five hundred pounds and were transported back to camp on a horse-drawn cart. In two months, the crew excavated twenty-five ichthyosaur specimens. Alexander described the process of extracting the fossils: "Pure grit, pluck, dogged perseverance—whatever you call it."

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<sup>47</sup> Barbara Stein, *On Her Own Terms: Annie Montague Alexander and the Rise of Science in the American West* (Berkeley: University of California Press, 2001).

<sup>48</sup> Samuel Alexander and Henry Baldwin founded a successful sugar cane refining company, predecessor of C&H Sugar.

<sup>49</sup> Stein, *On Her Own Terms*, 31.



“For two days I watched with fascinated eyes the work of excavation” at the Saurian Hill, Humboldt County, Nevada (from Alexander’s field notes). Photo: UC Museum of Paleontology.

Fortuitously, in 1907, Alexander met Joseph Grinnell, an evolutionary biologist with whose vision she felt completely aligned. Grinnell devised a system of field practices requiring extensive and detailed field observations, which influenced generations of field biologists. Alexander followed Grinnell’s practices, which “aimed to facilitate the investigation of natural history as an objective scientific discipline.”<sup>50</sup> Their goal was to provide a complete history of California’s fauna and research materials for paleontologists. Alexander donated \$7,000 to establish the new Museum of Vertebrate Zoology at UC Berkeley and continued her support until she died. She chose Grinnell to direct the museum, for which together they planned every detail. In 1926, Alexander wrote to Grinnell, “I am gratified that the Museum has its contribution to make to the solution of the great problems of evolution. That is the ultimate, if not the only goal, is it not, of our special kind of scientific work?”<sup>51</sup> Alexander worked harmoniously with Grinnell until his untimely death in 1939.



“Eating lunch over Dr. Merriam’s specimen” during the Saurian Expedition, 1905 (from Alexander’s field notes).  
*Left to right: Eustace, Annie, and Edna.* Photo: UC Museum of Paleontology.

<sup>50</sup> Stein, *On Her Own Terms*, 83.

<sup>51</sup> Quoted in Stein, *On Her Own Terms*, 313.



Women were discouraged from participating in “unladylike” fieldwork, a vitally necessary part of training in zoology and critical higher-level research positions. It was considered improper for a woman to join an expedition without a female companion. Thus, Alexander was accompanied by several women on digs before forming a lifelong partnership with Louise Kellogg (1869–1967). A native of Oakland, Kellogg graduated from Berkeley in classics in 1901, and taught primary school in Oakland.<sup>52</sup> The two were introduced by Kellogg’s cousin, UC Professor Martin Kellogg.<sup>53</sup> Louise Kellogg accepted Alexander’s invitation to join a collecting expedition to Alaska in 1908. The two proved to be compatible collecting partners, hiking in rugged terrain, camping in harsh conditions, hunting fossils, trapping mammals and small birds, and preparing specimens in remote camps. Devoted companions, Alexander and Kellogg spent four decades doing fieldwork on months-long collecting expeditions throughout the West, Alaska, and Mexico. Academic colleagues appreciated the meticulous quality of Alexander and Kellogg’s preparation of specimens, accompanied by their detailed field notes, with maps and photographs.



Annie Alexander (*left*) and Louise Kellogg, date unknown. Photo: Museum of Vertebrate Zoology, UC Berkeley.

Alexander was a passionate and prolific collector. Alexander and Kellogg amassed more than six thousand specimens for the Museum of Vertebrate Zoology and more than twenty thousand fossils for the Museum of Paleontology. After thirty years, the physical demands of trapping birds and small mammals, carrying and setting out dozens of wooden traps every night, and hiking for hours caught up with the pair. Alexander and Kellogg shifted their collecting from vertebrates to plants, which required only a notebook for recording data and a satchel for the plants. They left the plant presses and blotter paper in camp. The rapid disappearance of the native plants Alexander had observed decades earlier, when she had begun collecting, added a sense of urgency to the work. The University Herbarium recorded a total of 17, 851 botanical sheets donated by Alexander and Kellogg. Together they collected fauna and flora of the American West from 1908 until 1949. (Seventeen taxa were named in honor of Annie Alexander, despite her wishes to the contrary.) In her eighty-second year, Alexander was still collecting. After months in a coma following a stroke, Annie Alexander died in 1950. Kellogg continued collecting and volunteering in the UC Herbarium until her death in 1968.

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<sup>52</sup> “Louise Kellogg,” *Women in Natural History*, Museum of Vertebrate Zoology, <https://mvz.berkeley.edu/announcement/150w-louisekellogg/>.

<sup>53</sup> Martin Kellogg was president of the university from 1893 to 1899.



Monument stone for Annie Alexander at the University of Colorado campus. Photo: ReBecca Hunt-Foster, Wikimedia Commons.

### First women Zoology faculty hired at Berkeley

In 1969 women were only 3.6% of the Berkeley faculty. The highly publicized *Academic Senate Report of the Subcommittee on the Status of Women on the Berkeley Campus*<sup>54</sup> published in 1970 statistically illustrated discrimination against women at Berkeley in hiring and promotion and generated pressure for departments to appoint women. Zoology had not hired a woman since its founding. However, the Zoology Department had been trying to hire a woman in the decade of the 1960s. Two prominent zoologists were approached for faculty posts without going through a standard faculty search process: Libbie Hyman and Dorothy Pitelka. Libbie Hyman, a researcher at the American Museum of Natural History and author of the authoritative six-volume treatise *Comparative Vertebrate Anatomy*, declined the offer, stating that she wanted to remain doing full-time research.

A few years later, Dorothy Pitelka, a full-time Research Scientist in Zoology's Cancer Research Laboratory, was similarly asked whether she would accept an offer to switch to the faculty track. Pitelka had earned her PhD at Berkeley in 1948. A distinguished protozoologist and cancer researcher, she was the mother of three children and wife of Zoology Chair Frank Pitelka. She preferred to remain in her full-time position as a Research Scientist, stating that she had the right balance of a full-time position, being a faculty wife and raising children. However, in 1970, Pitelka had been given the title of adjunct professor of zoology in addition to research zoologist, in recognition of her distinguished record as a mentor to graduate students and postdoctoral fellows and as the supervisor of the electron microscope facilities in the Department of Zoology.

In 1971 Frank Pitelka hired Mary Lou Pressick, a marine ecologist, the first woman on the tenure track. Unfortunately, Pressick did not receive tenure. Then in 1973 Dr. Marvalee Wake, who was recruited to Berkeley with her husband to the Zoology faculty, was hired as a Lecturer

<sup>54</sup> Elizabeth Scott, Elizabeth Colson, et al. *Academic Senate Report of the Subcommittee on the Status of Women on the Berkeley Campus*.

<https://files.eric.ed.gov/fulltext/ED042413.pdf>

and soon "regularized" as an Assistant Professor in Zoology and the Department of Instruction in Biology. Wake had earned her PhD at University of Southern California in 1968. She was therefore the second ladder-rank woman hired in Zoology. Wake rapidly advanced to Associate Professor in 1976, thus becoming the first woman to gain tenure in Zoology (and later the Chair of Zoology and of the new Department of Integrative Biology). In 1974, following a search for a vertebrate morphologist, Thelma Rowell was appointed as assistant professor. She had accompanied her husband, Hugh Rowell, a senior ecologist/taxonomist, to Berkeley. Rowell received tenure but she wasn't able to do the field research in Africa that was essential to her program. Rowell left Berkeley and continues to conduct behavioral research on in her native Yorkshire, England. Professor Mimi Koehl was hired as an Assistant Professor in 1983. Following her appointment, the number of women hired increased progressively. In academic year 2022-23, the percentage of women faculty in Integrative Biology is 30% (10/34).

### **Conclusion**

Each of the women profiled in this essay was a pioneer in her field, making significant contributions to natural history, biology, zoology, oceanography, genetics, and paleontology. Many took advantage of higher education only after spending years teaching at secondary schools before attending Berkeley. These women discovered, classified, and preserved new specimens; wrote scientific articles; and coauthored seminal texts in their areas of specialization. As a group, they were highly conscious of the ongoing disappearance of biodiversity, even in their era. Their research accomplishments led to appointments to faculty posts and leadership positions at universities and colleges, and as curators and researchers at private and public institutions such as Wellesley College, the University of Oregon, the College of Santa Barbara, San Diego State University, and the University of Southern California, as well as at museums. The majority of these women continued their research well after retirement. Three of them published books in their ninth decade. A remarkable legacy endures.

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November, 2022