Easter Ellen Cupp was the daughter of J.H. Cupp, a contractor, and Blanche Cross Cupp. The family lived in Neola, Iowa where Cupp was born on Easter day, March 30, 1904. Cupp was one of four children; her siblings were Blanche Cupp Avery, Florence Cupp Starkey and Leland A. Cupp. The family moved to Whittier, California in October 1910.

Cupp graduated from Whittier High School. She received an A.B. degree from Whittier College in Los Angeles in 1926, and a master's degree in zoology from the University of California, Berkeley in 1928. Cupp worked closely with Professor S.F. Light in Berkeley. She moved to La Jolla in 1928 to begin doctoral research, and she published several papers on diatoms between 1930 and 1934. She received a Ph.D. in 1934 in Biological Oceanography from the University of California for her work at the Scripps Institution of Oceanography. She worked closely with Professor Winfred Emory Allen at La Jolla. Her dissertation was entitled, A Critical Study of Certain Distinguishing Characters in Three Closely Allied Plankton Species of the Diatom Genus Nitzschia and their Relationship to Certain Environmental Conditions.

Easter Ellen Cupp was the first American woman to receive a doctorate in oceanography. Cupp conducted research on plankton as a research assistant to her advisor Winfred Emory Allen. Cupp remained at Scripps as a research associate from 1934-1937 and instructor from 1937-1940.

Her book, Marine Plankton Diatoms of the West Coast of North America, published by University of California Press in 1943, is a classic in the field. Dr. Cupp was an avid photographer and personally prepared all the illustrations as well as the text of the book.
Cupp left Scripps in 1940 at the behest of Scripps Director Harald Sverdrup who told her that depression financial pressures and changes in the research program of the institution made it impossible to create a new position for her after the completion of her degree.

In his 1939-40 budget report to the President of the University of California, Sverdrup wrote,

I beg to inform you that I have requested Dr. E.E. Cupp to seek other employment from the beginning to the next academic year. This action is by no means intended to reflect on her ability or the manner in which she has conducted her work at the Institution, but has been dictated by consideration of the general scientific program of the Institution. Unfortunately the financial situation does not warrant the creating of a new position and much to my regret I found it necessary to discontinue the services here of Dr. Cupp in order to begin studies which at the present time appear to be of greater importance.

Sverdrup specifically commended Cupp as a conscientious and industrious worker and commented that his decision was no reflection on her ability as a scientist. Dr. Cupp felt that her gender was an element in this decision. There is some textual and anecdotal evidence to support her point of view. Sverdrup used the instructor billet vacated by Cupp to employ Marston Sargent, a biologist studying marine algae, which was not a new research program at Scripps. Financial pressures did not prevent Sverdrup from retaining the services of two other young post-doctoral students, Walter Munk and Roger Revelle.

After leaving Scripps in 1940, Cupp served as assistant biologist for the Naval Biological Laboratory in San Diego until 1943. When that assignment ended, her lifelong friend, housemate and Whittier classmate Dorothy Rosenbury told Cupp that a teaching job was available at her school. Cupp taught science and English at Woodrow Wilson Junior High School in San Diego until her retirement in 1967. She was very proud to have taught a number of students who became scientists.

Dr. Cupp died in San Diego at the age of 95 on August 27, 1999. She never married. Scripps biologist John McGowan noted in her obituary, "Easter Cupp's monograph on West Coast diatoms was, and still is, a major contribution to our understanding of the biology of the California Current. It is accurate; it is precise, and was about 20 years ahead of its time. It will be in use for at least another 50 years."