

Cecilia Payne-Gaposchkin

(1900 - 1979)

Discovered What Stars Are Made Of

Cecilia Payne began her scientific journey at the University of Cambridge. Here, she decided to become an astronomer, inspired in part by a lecture by Sir Arthur Eddington, who also encouraged her to pursue opportunities in the United States. Payne was offered a fellowship to study at the Harvard College Observatory in 1923 where she began her PhD in astronomy. Payne's PhD thesis was described by some of her fellow astronomers as "*undoubtedly the most brilliant Ph.D. thesis ever written in astronomy*". Harvard did not grant doctoral degrees to women at this time so her PhD was awarded by Radcliffe College.



Main image: Cecilia Payne-Gaposchkin (Fair Use, Smithsonian Institution Archives).
Background: Galaxy (Public Domain).

Payne's 1925 thesis on the elemental composition of the atmospheres of the sun and stars began a revolution in astrophysics. Before her work, it was believed that the elements in these atmospheres were similar to those of the earth's crust. Payne determined that indeed, silicon, carbon and other common metals were present in approximately the same proportions as the Earth. But she also found that helium and hydrogen were extremely abundant (by a factor of 1 million in the case of hydrogen). Her thesis established that hydrogen was the most abundant element in the Universe.

When astronomer Henry Norris Russell reviewed Payne's controversial findings he disagreed with her conclusions because they contradicted the prevailing view. But four years later he conceded she had been correct and acknowledged her work in a short paper. Despite this, Russell alone is often credited with the discovery.

Payne continued her pioneering work at Harvard, studying the structure of the Milky Way and Magellanic Clouds, greatly expanding the understanding of how stars evolve. For much of this time she served as a technical officer because Harvard denied advancement of women to professorial positions. Eventually she was awarded the title of Astronomer, and became the first woman to be appointed to full Professor within the Faculty of Arts and Sciences, and the first to be a Head of Department.

