

An Astronomer's Astronomer

By Barry D. Malpas – Special to the Williams-Grand Canyon News – 2014 July

When one is asked to identify a famous astronomer, the names that usually come to mind are men like Galileo, Edmond Halley, or, more recently, Carl Sagan or Neil Degrasse Tyson. Many astronomers have come and gone over the centuries making great contributions to the science. But few have contributed to astronomy, and changed the way modern astrophysicists look at the heavens, as has Cecilia Payne.

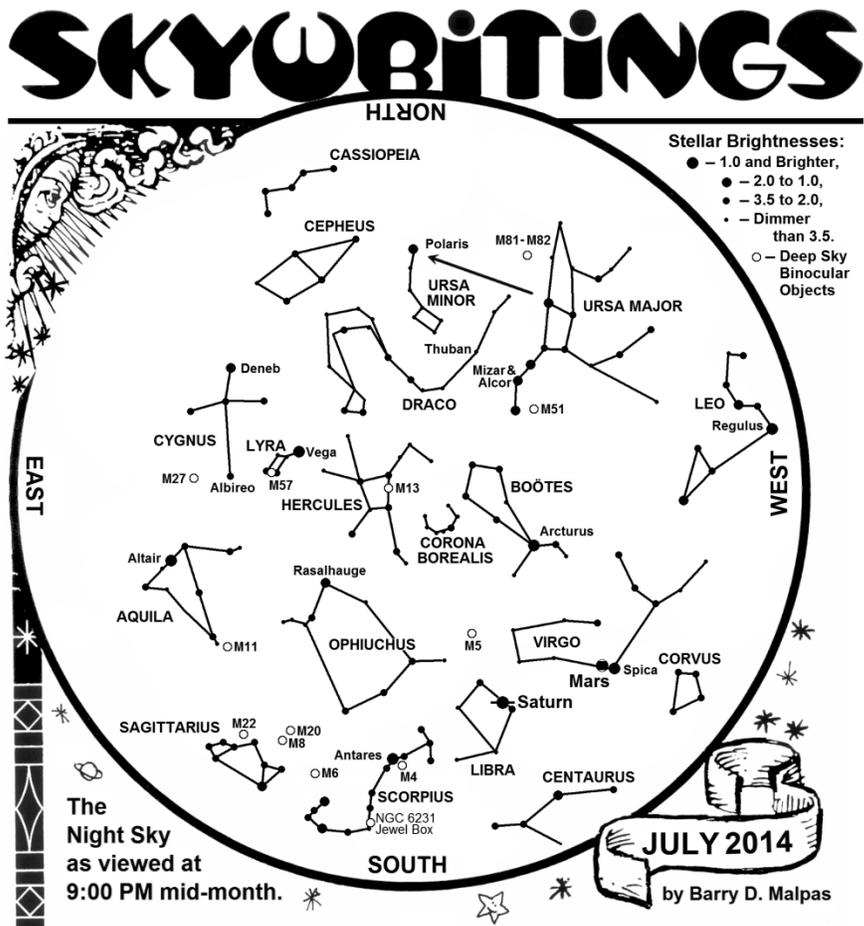
Cecilia was born in Wendover, England, on May 10, 1900. By age 12 she was speaking French, German and Latin, and had a strong education in Botany, Arithmetic and Algebra. She attended a school in London which neglected the sciences, and since she knew she wanted to study nature, she intensely read the works of Newton, Swedenborg, and Huxley on her own.

In 1919 she won a scholarship to Cambridge University and enrolled in as many science courses as possible. But her interest in Astronomy was ignited when she attended a lecture on the subject by Sir Arthur Eddington. Excited, she returned to her room and (exhibiting one of her many talents, a photographic memory) she transcribed the presentation, word for word.

On completion of her undergraduate degree in Astronomy, and being informed that there was little astronomical work available to women in England, she accepted an invitation from Harlow Shapley to join the staff at the Harvard College Observatory, in Cambridge, Massachusetts.

With the encouragement of Shapley, she wrote her doctoral dissertation in 1925, becoming the first person to receive a Ph.D. for work performed at Harvard Observatory. Published as Harvard Monograph No. 1, the title of the work was "*Stellar Atmospheres: a Contribution to the Observational Study of High Temperatures in the Reversing Layers of Stars.*" In this treatise she compared all the relevant data in spectroscopy from laboratory experiments with the spectrographic line intensities that are produced by different elements contained in the atmospheres of stars. At a time when very little was known about a star's environment, Cecilia was the first scientist to provide a relationship that not only gave a measure of the temperature of the different types of stars, but the quantity of each element that was in a star's atmosphere. This scale has changed very little since her pioneering work almost 90 years ago, and is the basis for most of our astrophysical knowledge of stars.

In her second Harvard publication, Monograph No. 2, printed in 1930, entitled "*The Stars of High Luminosity,*" she literally "wrote the book" on defining giant and super-giant stars, the techniques of which have become standard tools in probing the dimensions and make-up of the Universe.



Over the years she also contributed greatly to the studies of variable stars, including those found in the Magellanic Clouds, the two close galaxies in orbit around the Milky Way, as well as in other galaxies. She developed many research techniques, was well published in a variety of areas of Astrophysics, was the first woman to be advanced to the rank of full professor at Harvard, as well as the first woman to become chairman of a department at the university.

Cecilia died on December 7, 1979. Due to her commitment, extraordinary memory, great intellect, and her open-minded approach to her work, the sciences of Astronomy and Astrophysics have been greatly enriched, leaving a legacy few will be able to equal.