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Digital Access to a Sky Century at Harvard
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Harvard: Honoring Henrietta Swan Leavitt

CAMBRIDGE, Mass. -- One hundred years ago, in November 1908, Henrietta Swan Leavitt created the period-luminosity law for variable stars (a star's brightness depends upon the length of its period). Her discovery was honored on November 6, 2008, at the Harvard-Smithsonian Center for Astrophysics with a series of talks from author George Johnson and various scientists. The Center is loaded with rows of cabinets containing more than 500,000 photographic plates of the stars, some of which are the very plates Leavitt used to study.

A photographic plate showing the Small Magellanic Cloud

Beginning in 1893, Leavitt worked at the Harvard College Observatory, hovering over photographic plates, hunting for stars that changed in brightness over time. She was able to determine the magnitude of stars by placing a "flyspanker," or a tool calibrated to estimate brightness, on the plates. It was a lot of hard work searching through hundreds of tiny dots, but Leavitt accomplished the work with grace; she discovered 1,777 variable stars within the Large and Small Magellanic Clouds.

The Great Refractor

The Harvard College Observatory was founded in 1839 and contains a telescope veneered in mahogany, dating from 1847. The Great Refractor, as it is called, is massive: it is over twenty feet long and fifteen inches in diameter. The telescope is perched atop an 11-foot, 11-ton granite mount and is further supported by a 43-foot base, of

which 23 feet lies underground. Not surprisingly, for twenty years after its installation, the telescope was the largest in the United States. The Great Refractor was primarily utilized for photometry, but it is no longer active; instead Harvard has been restoring it.

To observe with such a big telescope, an observing chair, which has been newly reupholstered, was used. It rolled on a track around the telescope, propelled by a hand crank on the seat. The lapstrake dome is thirty feet high, plated with copper, and was supposedly built by a shipwright. The dome not only contains the telescope, but other artifacts as well, such as a student transit telescope from 1897 and a chronograph from 1900.

Scientists have come a long way since Leavitt's time. The observatory now has two other telescopes—one is robotic and can be controlled from anywhere. Additionally, in the basement of the astrophysics center is a photographic plate scanner, which will digitize all of the plates collected between 1885 and 1993. A separate, conventional digital camera will also photograph the plate jackets and a collection of daguerreotypes from 1849 to 1885. The scanner photographed its first plate—an image of Rho Ophiucus from 1899—on November 21, 2005. The observatory hopes to scan the entire collection within five years.

This amazing machine has a powerful CCD camera that can scan two plates at a time in a matter of 92 seconds. The photographs are stored on two servers which hold a total of 33 terabytes of information. In order to protect the plate stacks from earthquakes, there is five feet of solid concrete beneath the floor, while the scanner rests on an air cushion to prevent it from transmitting vibrations to the rest of the building.

The DASCH plate scanner

The purpose of digitizing the plates is to make them available to astronomers around the world via the computer. Harvard describes this fascinating project as "a new look at the temporal universe," and indeed, astronomers have certainly changed the way in which we observe space since Henrietta Leavitt.

More on Henrietta Swan Leavitt

July 4, 2008, commemorated Henrietta Swan Leavitt's 140th birthday. Though Leavitt is not well known for her contribution to astronomy, she was a very important character in the study of the universe. Born in 1868 in Lancaster, Massachusetts, Leavitt was the eldest child in a large Puritan family, and she was intelligent, excelling in the maths and sciences. In 1893, Edward C. Pickering introduced Leavitt to the Harvard College Observatory where she worked as a "computer," studying photographic plates of the stars and calculating stars' locations and luminosities. For hours, she sat at her desk next to the other computers looking at variable stars, or stars that wax and wan in brightness over a period of time.

In the midst of her observations, Leavitt noted a special kind of variable star, located in the Large and Small Magellanic Clouds. These stars, which are today known as Cepheids, were first discovered in 1784, but Leavitt devised a new law using these variable stars. In her 1912 paper announcing the discovery, she said that "A straight line can readily be drawn among each of the two series of points corresponding to maxima and minima, thus showing that there is a simple relation between the brightness of the variables and their periods." This became known as the Cepheid yardstick, meaning that distances in space could be measured according to the relative distances between stars. One could not, however, know the distance of a particular star from the earth.

Leavitt's law launched astronomers such as Edwin Hubble into a quest to measure the universe. Using a mathematical process, called triangulation, astronomers used the sun as a baseline and began measuring. Leavitt would have continued her research in this area, but she was suffering from hearing loss and poor health and could no longer be as involved. She tried to keep working over the photographic plates when she passed away in 1921. In 1925, though Leavitt was nominated for a Nobel Prize and did not win, she did have a lunar crater named for her. While she seems undervalued for her work, Henrietta Leavitt was a wonderful woman and is still an important figure in astronomy.