

# PIONEERING FEMALE ASTRONOMERS



Caroline Herschel  
(1750 - 1848)

## Caroline Herschel (1750 - 1848)

In addition to assisting brother William in his work, she discovered several celestial objects, including eight comets.



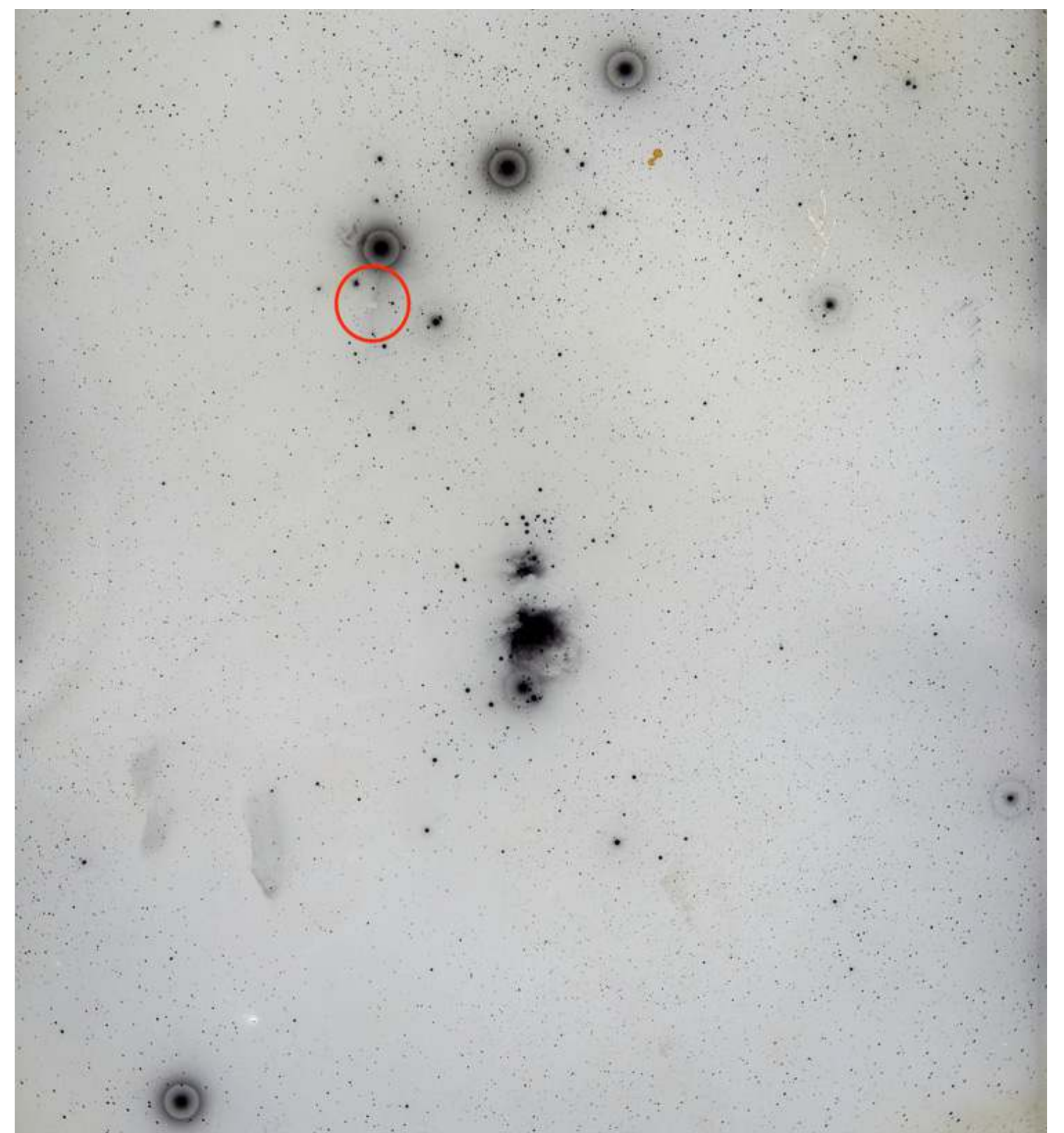
Comet



Williamina Fleming  
(1850 - 1911)

## Williamina Fleming (1850 - 1911)

The Scottish born astronomer, was a founding member of the female 'Harvard computers' employed to analyse, classify and catalogue thousands of photographic plates so as to identify chemical elements in stars, such as Hydrogen. These data were used to develop the Draper catalogue, the first stellar classification system. She also discovered the Horsehead nebula (pictured) and the first White Dwarf star.



Horsehead Nebula



Annie Jump Cannon  
(1863 - 1941)

## Annie Jump Cannon (1863 - 1941)

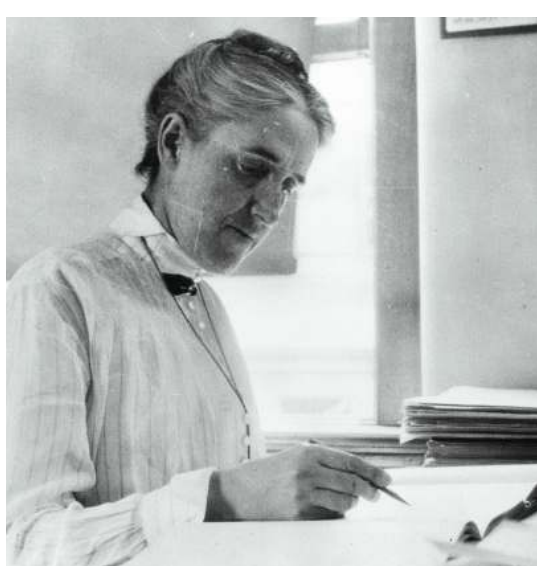
She was also a 'Harvard computer' who re-ordered the Draper system by classifying stars based on surface temperature, which resulted in the Harvard system still being used today.



Antonia Maury  
(1866 - 1952)

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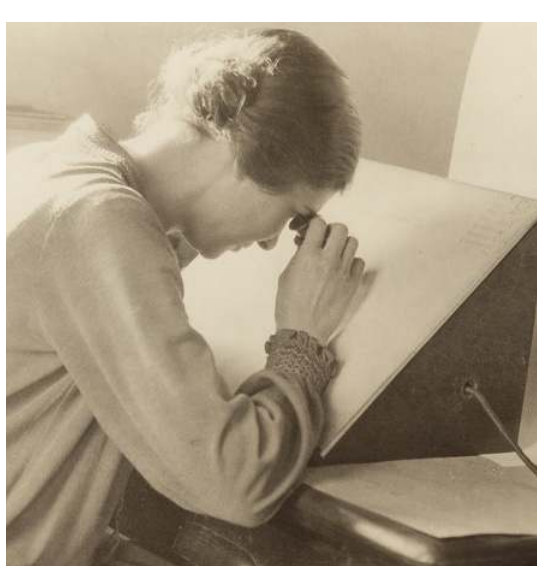
A Harvard 'computer' who further refined what became known as the Harvard stellar classification system.



Henrietta Leavitt  
(1868 - 1921)

## Henrietta Leavitt (1868 - 1921)

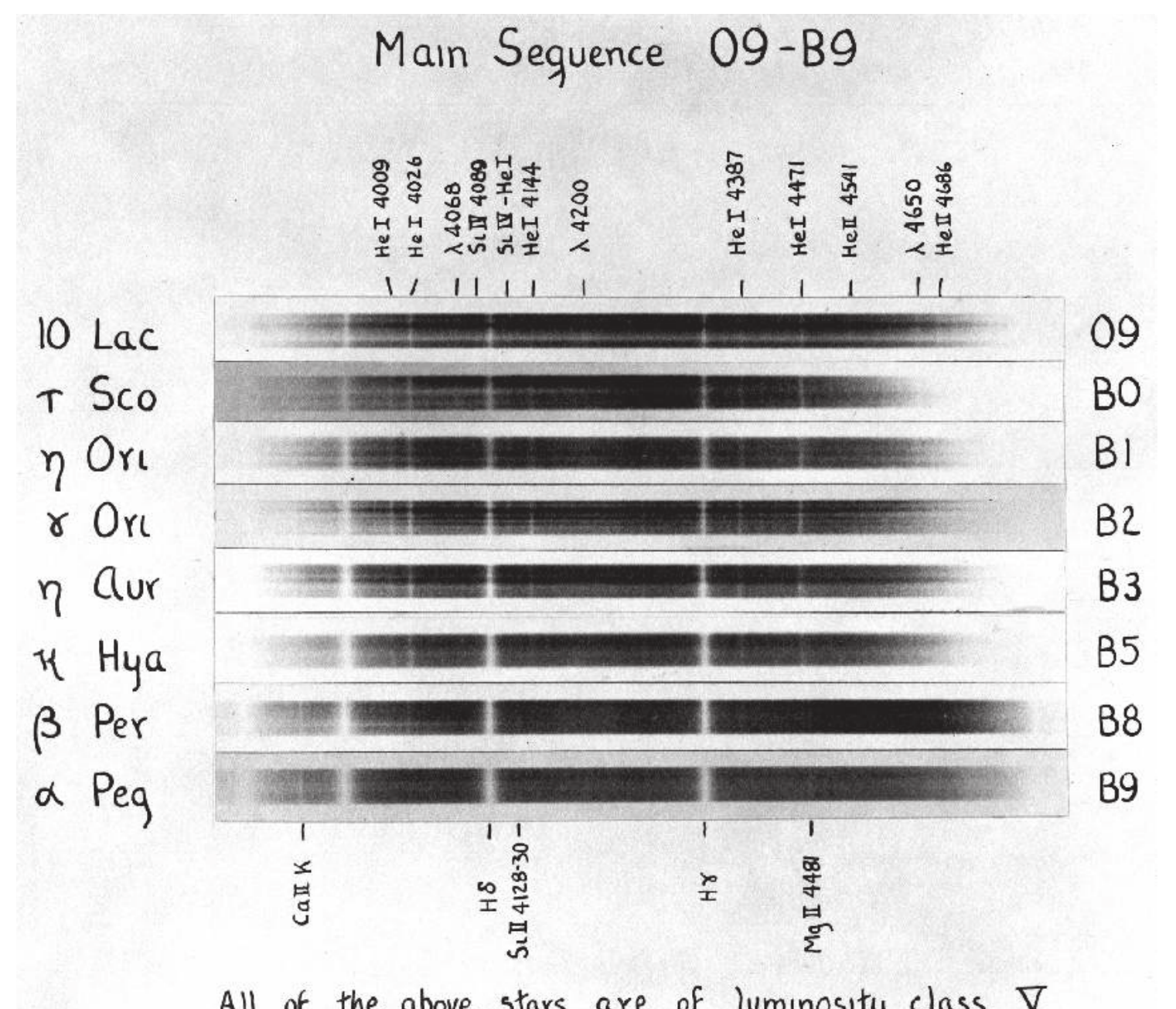
A 'Harvard computer' who discovered the linear relationship between the brightness or luminosity and period (cycle) of Cepheid variable stars, a type of star that pulsates radially with a corresponding change in surface temperature. The brightness of these stars therefore varies over time in a consistent and predictable way. This finding enabled astronomers, for the first time, to measure the distance between the Earth and distant galaxies.



Adelaide Ames  
(1900 - 1932)

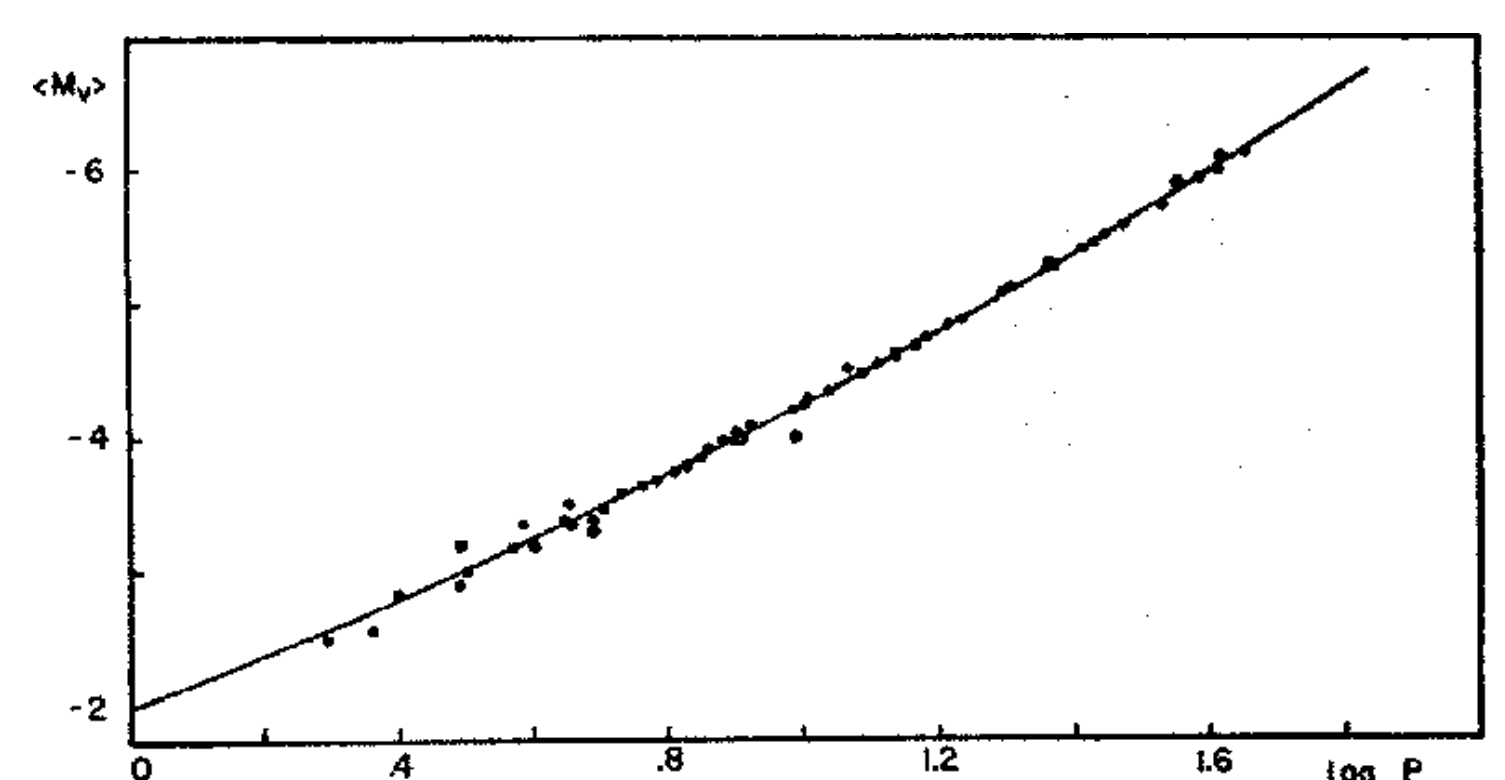
## Adelaide Ames (1900 - 1932)

Another 'Harvard computer' who worked at the College Observatory. She was the first to analyse and classify almost 2,800 galaxies in the constellations Coma and Virgo.



All of the above stars are of luminosity class V

Example of Wavelength Spectra



The Cepheid period-luminosity relation

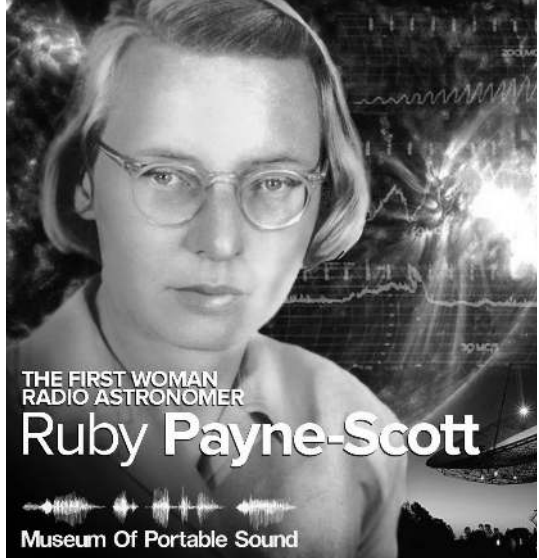




Cecilia Payne-Gaposchkin  
(1900 - 1979)

**Cecilia Payne-Gaposchkin (1900 - 1979)**

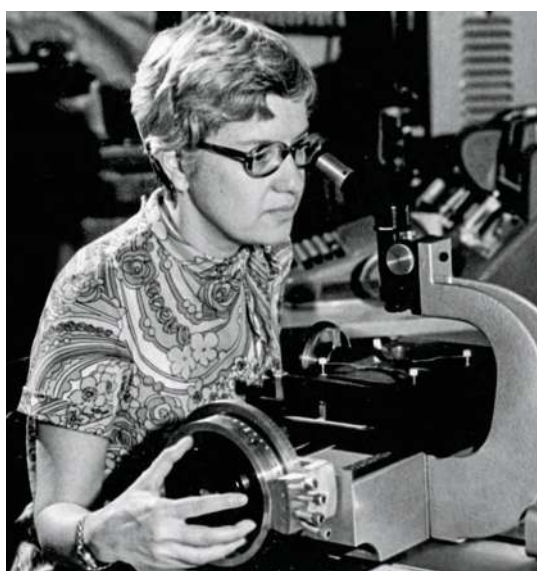
She showed that spectral characteristics could be used to determine the surface temperatures of stars and also demonstrated that Hydrogen is, by far, the main element of stars.



Ruby Payne-Scott  
(1912 - 1981)

**Ruby Payne-Scott (1912 - 1981)**

She was the first female radio astronomer. During World War II she contributed to work in Australia on radar development. Later, working in radio astronomy, she made important discoveries about the Sun.



Vera Rubin  
(1928 - 2016)

**Vera Rubin (1928 - 2016)**

She conducted pioneering work on galaxy rotation in M33 and confirmed the existence of Dark matter, the huge amounts of invisible matter in the outer region of galaxies (see the Cosmic Pie tablet).



Joan Feynman  
(1927 - 2020)

**Joan Feynman (1927 - 2020)**

A space scientist who studied the interaction between the solar wind and the Earth's magnetosphere, especially coronal mass ejections which can cause geomagnetic storms with potentially dangerous effects on electrics and electronics in modern society on Earth.



Carolyn Shoemaker  
(1929 - 2021)

**Carolyn Shoemaker (1929 - 2021)**

She holds the record for the largest number of comets discovered by one person. By 2002 she had discovered 32 comets and over 300 asteroids. With husband, Eugene Shoemaker, she discovered Comet Shoemaker-Levy 9, which broke up and crashed into Jupiter in 1994.



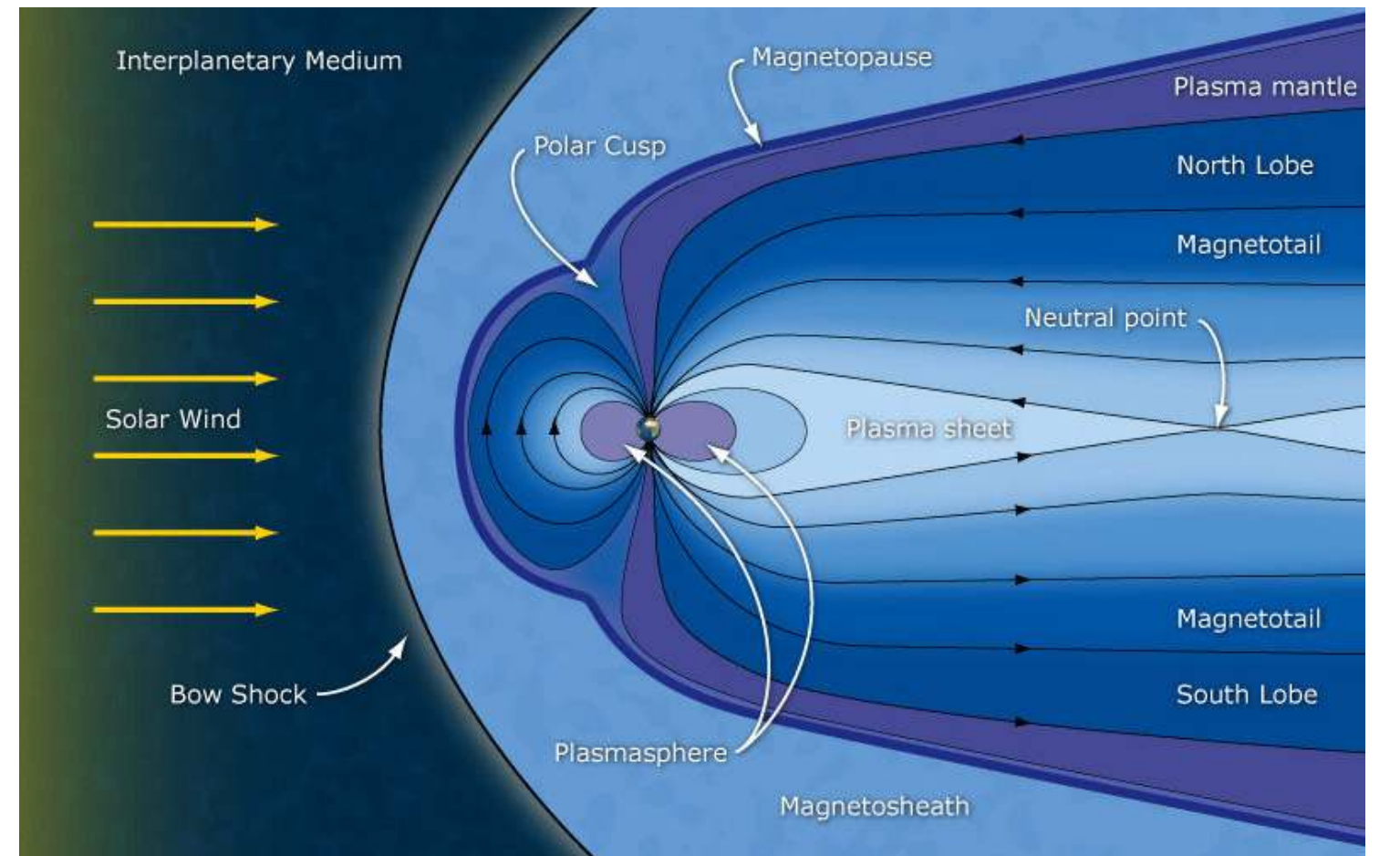
Jocelyn Bell Burnell  
(1943 - )

**Jocelyn Bell Burnell (1943 - )**

In 1974 she co-discovered pulsars, which are rapidly rotating pulsing radio emissions from neutron stars. Controversially, she was not included in the Nobel Prize for Physics for the discovery of pulsars.



M33



Effects of Solar wind on Earth's Magnetosphere



Comet Shoemaker crashed into Jupiter



Pulsar