

## 11.19: Star Colors

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As you look up at the sky at night, you might notice stars are not all white in color. If you happen to look up at a winter sky, you will be greeted by the blue-white Dog Star Sirius in the constellation Canis Major. And nearby is the reddish star Betelgeuse in Orion the Hunter. Contrast these colors to that of our yellow Sun.

Yet star color is an important indicator for astronomers; the color is an indication of a **star's surface temperature** at its **photosphere**. A star's **photosphere temperature** dictates its **color**. It turns out that the hotter stars are **whiter** and **cooler** stars are redder. This is exactly what we observe around us. If you heat a piece of metal, you will note that the hotter metal glows what we call "a white hot." As the metal cools, it becomes orange and then red. It is still hot if it is red, it is just not as hot as the white-hot metal. Stars are the same.

We classify stars by their colors and thus their **photosphere temperatures**. This is called a star's **Spectral Type**. Stars are categorized by their spectral types. This categorization was first done by **Father Angelo Secchi** in the 1860s and 1870s. In the 1880s at Harvard University, **Edward Pickering** observed and recorded stellar spectra and **Williamina Fleming** classified Pickering's spectra with a system of letters.

In 1901, Harvard astronomer **Annie Jump Cannon** revised the various classifications to give us our more-modern Spectral Types interpretation. One of the final notes in this all-important classification system was **Cecilia Payne Gaposchkin's** 1925 doctoral dissertation, where she showed that spectral types were a sequence in stellar photosphere temperatures.

Harvard astronomer **Henry Norris Russell** was concerned about Payne Gaposchkin's dissertation conclusion that the Sun was primarily composed of hydrogen. This contradicted the theory at the time of the publication of her doctoral dissertation — that Earth could be so different than the Sun. Later, Russell came to the same conclusion, published his own paper, and barely mentioned Payne Gaposchkin's work. Russell is often given credit for this discovery, even though it was not originally his work for which to receive credit.

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