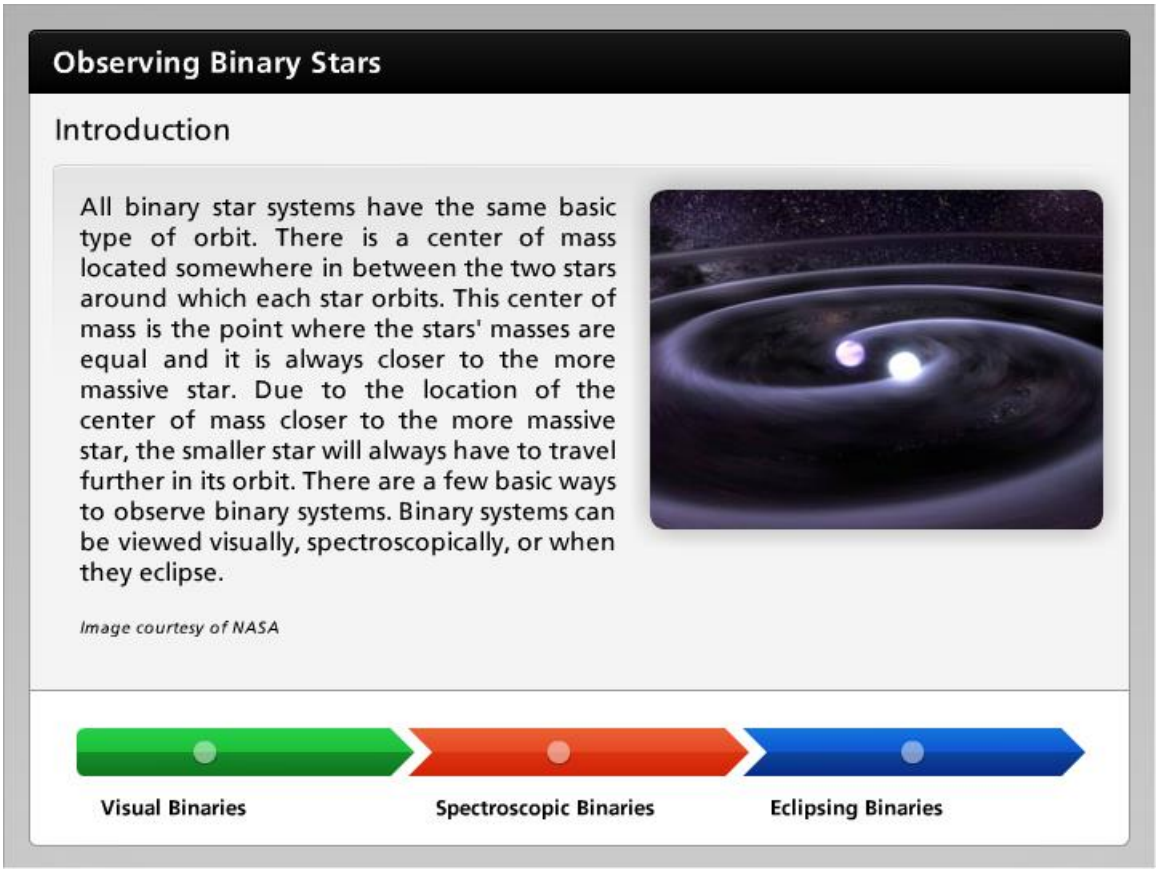
Module 8: Groups of Stars
Topic 1 Content: Observing Binary Stars Notes

Introduction



All binary star systems have the same basic type of orbit. There is a center of mass located somewhere in between the two stars around which each star orbits. This center of mass is the point where the stars' masses are equal and it is always closer to the more massive star. Due to the location of the center of mass closer to the more massive star, the smaller star will always have to travel further in its orbit. There are a few basic ways to observe binary systems. Binary systems can be viewed visually, spectroscopically, or when they eclipse.

Image courtesy of NASA

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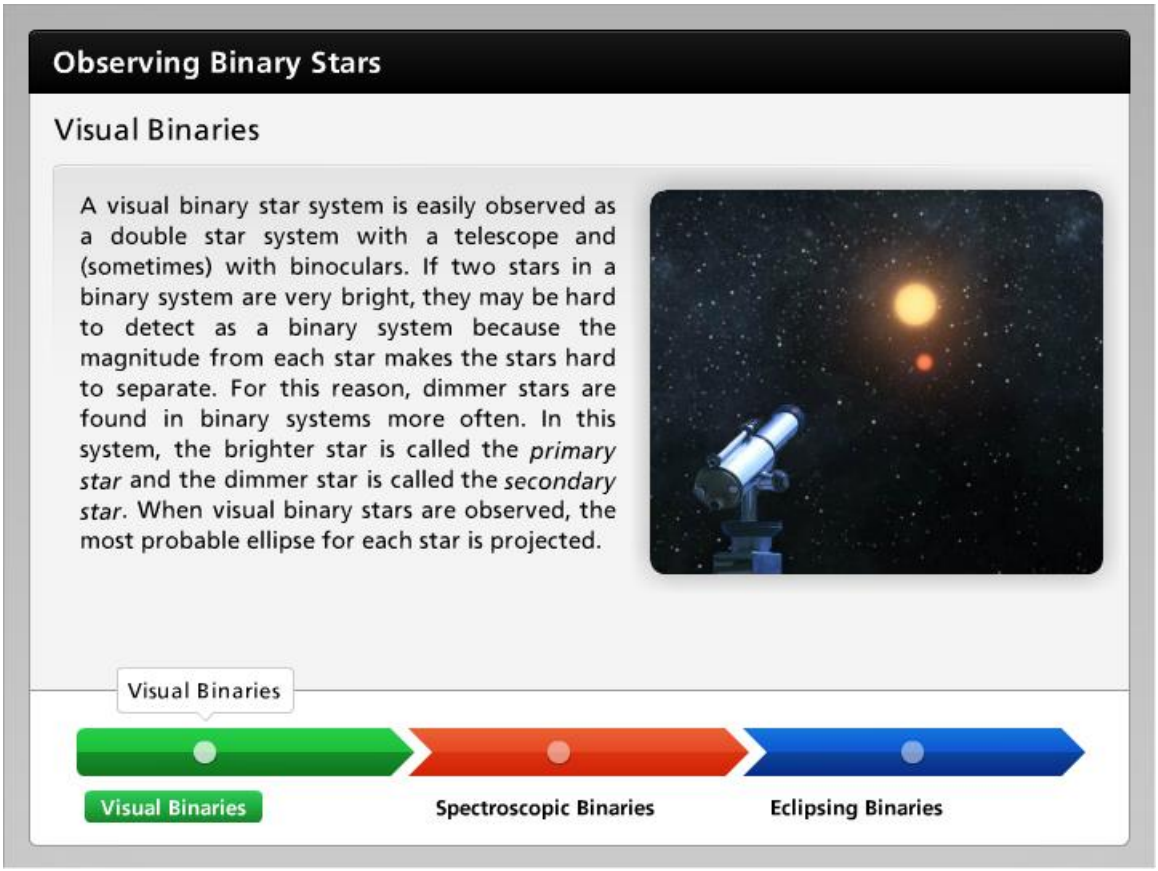
Visual Binaries



A visual binary star system is easily observed as a double star system with a telescope and (sometimes) with binoculars. If two stars in a binary system are very bright, they may be hard to detect as a binary system because the magnitude from each star makes the stars hard to separate. For this reason, dimmer stars are found in binary systems more often. In this system, the brighter star is called the *primary star* and the dimmer star is called the *secondary star*. When visual binary stars are observed, the most probable ellipse for each star is projected.

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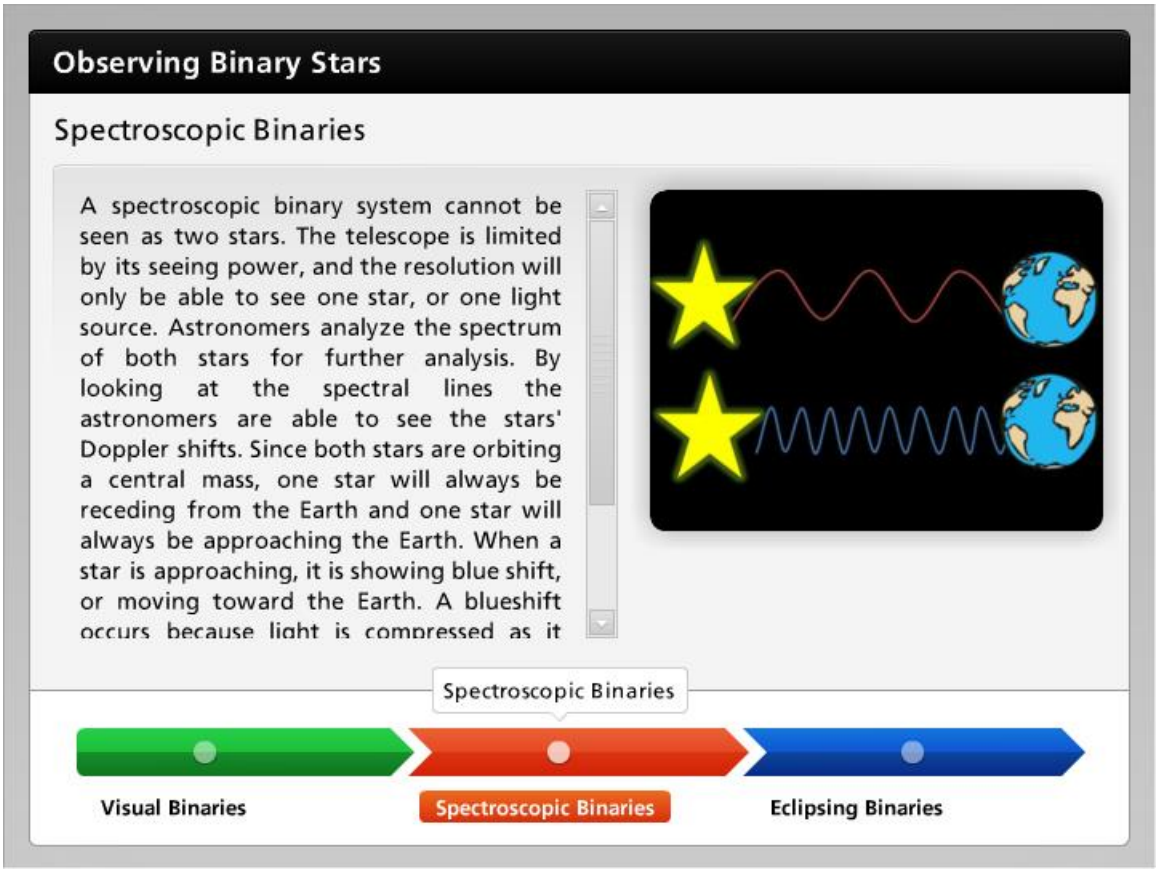
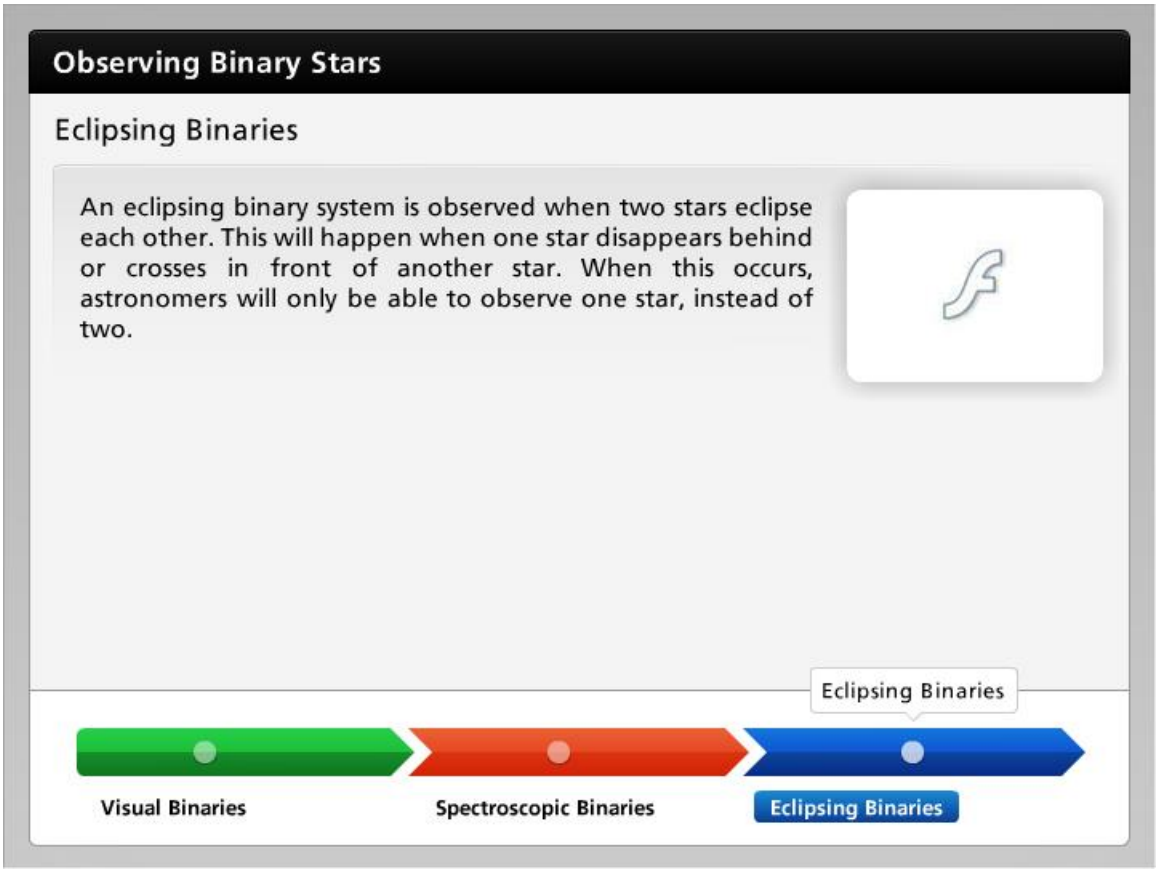
Spectroscopic Binaries



A spectroscopic binary system cannot be seen as two stars. The telescope is limited by its seeing power, and the resolution will only be able to see one star, or one light source. Astronomers analyze the spectrum of both stars for further analysis. By looking at the spectral lines the astronomers are able to see the stars' Doppler shifts. Since both stars are orbiting a central mass, one star will always be receding from the Earth and one star will always be approaching the Earth. When a star is approaching, it is showing blue shift, or moving toward the Earth. A blueshift occurs because light is compressed as it travels toward Earth. When a star is receding it is showing redshift, or moving away from Earth. The redshift occurs because light is stretched appearing red as it moves away from Earth.

Eclipsing Binaries



An eclipsing binary system is observed when two stars eclipse each other. This will happen when one star disappears behind or crosses in front of another star. When this occurs, astronomers will only be able to observe one star, instead of two.