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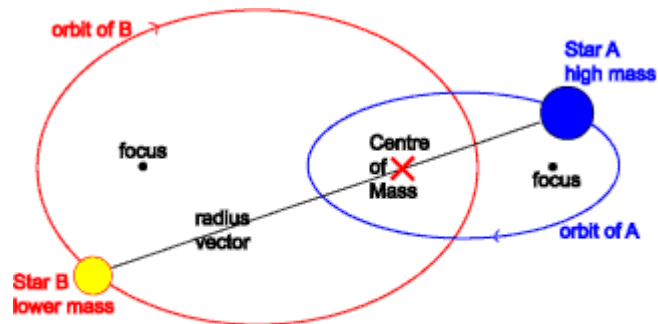| ATNF Home | About ATNF | Facilities | Science & Technology | Online Resources | Outreach |

Binary Stars

Binary stars are of immense importance to astronomers as they allow the masses of stars to be determined. A binary system is simply one in which two stars orbit around a common centre of mass, that is they are gravitationally bound to each other. Actually most stars are in binary systems. Perhaps up to 85% of stars are in binary systems with some in triple or even higher-multiple systems.

The orbital periods and distances of binaries vary enormously. Some systems are so close that the surfaces of the stars are practically touching each other and can exchange material. Others may be separated by a few thousand Astronomical Units and have orbital periods of hundreds of years.

Sir William Herschel (1738-1822) noted the apparent closeness of many stars and systematically observed them. He compiled a catalog of about 703 pairs of stars within a couple of arcseconds to each other

Orbits of Stars in a Binary System

This diagram shows how the two stars in a binary system each have an elliptical orbit (can be almost circular in some cases). They share a common focus which is the centre of mass or barycenter of the system and orbit around this point. The radius vector joining the two stars always cuts through the barycenter.
Binary systems may have highly elliptical orbits as shown above. In these cases the eccentricity, *e*, is closer to 1. If *e* is close to 0 the orbits will be more circular.

Binary systems are classified according to their means of detection. The next section discusses the types of binaries and their properties.

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