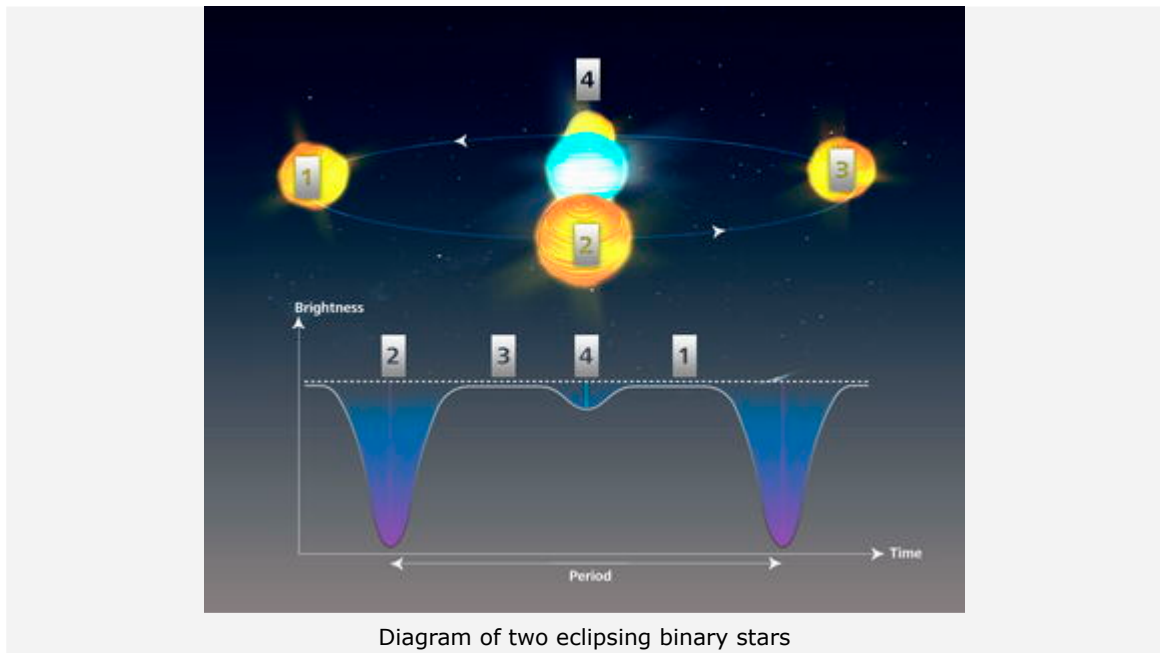


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What happens when stars play hide-and-seek?

Week 43

Astronomers know the answer and would therefore have been able to answer the One-Million-Euro question in the 250th episode of Günter Jauch's hit TV show 'Wer wird Millionär?' (Who wants to be a millionaire?): What is an eclipsing binary?



An eclipsing binary is a special binary star system. A binary star is a system comprising two stars which lie close to one another and which move around their mutual centre of gravity due to gravitational attraction between them. For an eclipsing binary, the orbits of the stars that make up the system must be oriented in space in such a way that, when viewed from the Earth, the two stars periodically either completely or partially cover one another. Usually, the two stars are different sizes and have different levels of brightness. If the smaller star covers a part of the larger one, the light that is emitted from the covered area of the surface no longer reaches observers on Earth. During this phase the brightness of the entire system is lower than in the phase in which the two stars are next to each other. The brightness curve that illustrates luminosity over time drops off significantly. A brightness minimum – known as the primary minimum – results.

The brightness curve as an indicator of the characteristics of stars

If the smaller star then passes behind the larger one, its light is completely or partially screened: the brightness of the binary star system decreases for a second time – an additional minimum, the secondary minimum, is created in the brightness curve. Whether the primary minimum or the secondary minimum is the lower depends on the difference in brightness between the two stars. If the surface brightness of the smaller star is lower, the primary minimum is lower. The secondary minimum is lower when the larger star is the 'darker' of the two; this is, for example, the case with cool red giants. (See also the astronomy question from week 27: How long will the Sun continue to shine?).

From the shape of the brightness curve, we can determine important parameters – the relationship between the radii of the two stars, the period of their orbit and, if the speed at which the stars are moving is known, even the mass of the stars. Probably the most well known eclipsing binary is the star Algol in the constellation Perseus – it regularly changes its brightness with a period of less than three days. The Englishman John Goodricke studied Algol as early as 1783 and concluded that another body was accompanying the visible star.

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