

Epsilon Aurigae is not the brightest eclipsing binary, nor is it the one with the deepest eclipses. What makes it distinctive is its long period of over 27 years, coupled with the mystery surrounding the nature of the secondary object in the system. The last primary eclipse took place during 1982-84. The years 2009-2011 thus provide a rare opportunity to see Epsilon Aurigae in eclipse.

The primary star in the system is a yellow-white supergiant, whose diameter is comparable in size with that of the Earth's orbit around the Sun. The secondary object is a mystery. It orbits the primary star every 27 years, at a distance similar to that of Neptune from our Sun. These eclipses last for nearly two years – so the object involved must be huge ! Despite this, the spectrum of the primary star remains visible throughout the eclipse. Normally near magnitude 3.0, during these eclipses, the brightness of Epsilon Aurigae dips by nearly 50% (approx 0.7 magnitudes) but, strangely, it sometimes brightens slightly for a few months around the time of mid eclipse.

Little is known about this secondary object. The most commonly accepted theory is that it is a (nearly) opaque dust cloud that is around a billion miles across. The mid eclipse brightening could indicate that this cloud is thinner at its centre. What lies at its centre is a mystery. The more bizarre theories include a black hole, but more likely is the presence of a close binary star system. With technology having advanced considerably since the eclipse of 1982-84, it is hoped that observations over the next few years will resolve these mysteries.

The eclipse was due to start in early August 2009 and will continue until May/June 2011, with "totality" lasting for over a year. Some predictions, based on results from the 1982-84 eclipse, give a start date for totality of 2009 Dec 21 and an end date of 2011 Mar 12. However, because the eclipsing object is not necessarily symmetrical or of fixed size, there is no guarantee that the duration of totality will be the same as occurred last time. The mid eclipse brightening, if it occurs again, would be during the summer of 2010.

Although Epsilon Aurigae is a naked eye star, you may find it easier to observe it using binoculars, especially when it is low in the sky. At maximum, Epsilon Aurigae is close in brightness to nearby Eta Aurigae, but does sometimes show small semi-regular fluctuations of 0.1-0.2 magnitudes - it is not clear as to whether it is the supergiant star or the secondary object that is responsible for these variations. During totality it is much fainter and more comparable in brightness with Nu Persei. Brightness estimates once a month will usually be sufficient, although more frequent observations may be worthwhile when most of the brightness changes are occurring during the first few and the last few months of the eclipse. Epsilon Aurigae is circumpolar from the UK, but it is rather low in the northern sky from May to July so during these months you will need to make special efforts to obtain brightness estimates and will need to attempt, where feasible, to choose comparison stars that are at a similar altitude.

Eclipses of Epsilon Aurigae don't happen very often. Don't miss this one or you'll have to wait nearly three decades for another chance !

