

# Variable Star of the Year 2014

## X Ophiuchi

X Oph is a rare example of a binary system containing a Mira Type variable (also often referred to as a Long Period Variable) and a non-variable companion. As a consequence of the non-variable companion being brighter for the majority of the time, the visible variation of the system is approximately one third of the real variation of the variable component. This means that X Oph is the Mira Type with the smallest apparent range and brightest apparent minimum magnitude.

X Oph was discovered to be variable by T.H.E.C Espin who noted its red colour with his 17.25 inch reflector at the Liverpool Astronomical Society Observatory at Darlington on 26 April 1886. Espin estimated its magnitude as 7.7 that was discrepant with Argelanders catalogue value of 8.8. Espin then recorded a rise to 6.8 by June followed by a fade back to 8.2 by August.

L. Campbell at Harvard College Observatory analysed data for the period 1904 to 1921 and calculated a mean period of 337 days with a rise to maximum being 148 days and fade to minimum being 189 days. The mean period measured between 1886 and 1989 (113 cycles) was 334 days.

X Oph was found to be a double star by W.J Hussey using the 36" refractor at Lick Observatory in 1900. Hussey visually measured a separation of 0.22" in virtually a north south direction. The north component is understood to be the variable and the orbital period of the binary system is in the order of 485 years.

On the assumption that the variable contributes negligible light at minimum the constant star is magnitude 8.4 which is the mean minimum measured by G.B Lacchini in the period 1914-1931 and K. Burns in 1941-1945. This is also confirmed by recent BAA VSS data and is illustrated on the accompanying light curve. This means that an integrated magnitude of 7.7 is the point when the variable component is equal to the constant companion and X Oph spends only one third of the time above this brightness level. If the constant star was removed from the system, the range of X Oph would increase to 5 magnitudes and the minimum would radically change from 8.4 to below 12.

It is quite normal for Mira Type variables to go deeper red when at minimum light but in the case of X Oph the opposite is true and that's because the variable component is spectral class M6e whilst the constant star is spectral class K1 (the red variable contributes most of the light at maximum whilst the orange constant star completely dominates at minimum).

The system is approximately 300pc distant with a total mass of 4.5 solar masses. The variable component consists of one third of the total mass and the components are physically separated by 64AU.

X Oph lies roughly between Altair (alpha Aql) and Rasalhague (alpha Oph) at the end of the

Cygnus Rift part of the Milky Way. In binoculars it forms a triangle with the prominent open clusters IC4756 and NGC6633 lying 3 degrees to the south. Binoculars are sufficient to follow X Oph throughout its range but it is advisable to use fairly large magnifying (x12 or x15) versions when using comparison stars G and K to ensure they are clearly separated from other nearby stars. Being 31 degrees north of the ecliptic X Oph can be followed all year round from the British Isles although it becomes low in the sky and is engulfed in twilight for a short spell around New Year.

Observers who manage to undertake observations every 10 days throughout a full calendar year are guaranteed to produce an interesting light curve including a long curved minimum and a short maximum similar to that shown on the accompanying light curve.

