Lunar occultations of double stars – a plea for observations

Figure 1. A video frame taken before the occultation of ZC3524.

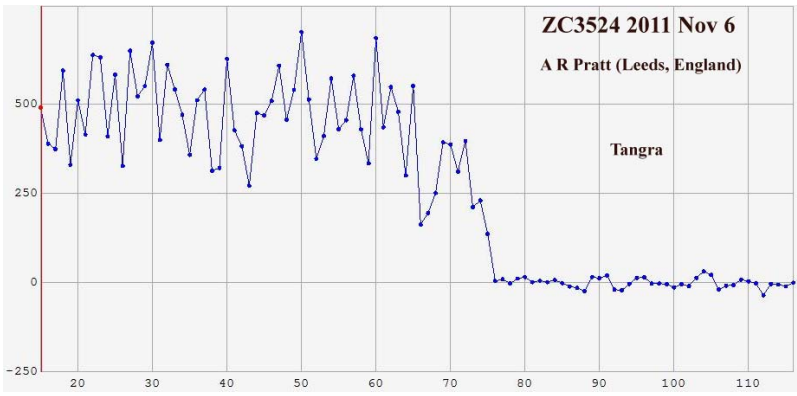


Figure 3. Lightcurve of the disappearance generated by *Tangra*.

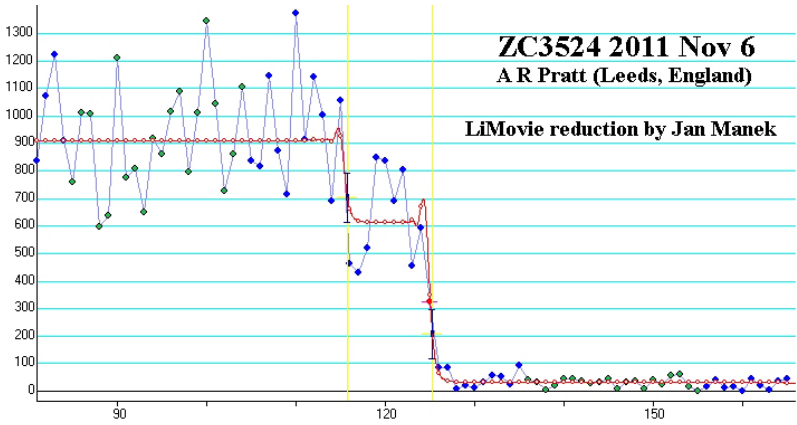


Figure 4. Jan Manek's reduction of the disappearance, processed with *LiMovie*.

The International Occultation Timing Association (IOTA) undertakes a worldwide programme of video-recording lunar occultations of known and suspected double stars, to ascertain their duplicity, position angle, separation and difference in magnitude.

During the 2011 European Symposium on Occultation Projects (ESOP) hosted by the Archenhold Observatory in Berlin and attended by members of IOTA's European Section (IOTA-ES), Tim Haymes and I discussed observing occultations of double stars in addition to our regular asteroidal occultation programmes.

Using predictions from *Occult Watcher*[1] generated by *Occult*[2] via a feed from an IOTA-ES add-in,[3] we have successfully monitored a few double star events, which did not indicate any duplicity within the temporal resolution of our recording systems.

However, on 2011 November 6 I recorded the disappearance of ZC3524, a mag 6.9 star in Pisces. The *Washington Double Star Catalogue* lists the star as having 2 components, with magnitudes of 7.4 and 7.9 at a separation of 0.36 arcseconds (epoch 2011.8). The recording was made with a Mintron video camera operating at 25 frames per second, at the prime focus of my 20cm aperture f/20 Maksutov–Cassegrain telescope. Embedded times – accurate to 1ms – were generated by a GPS video time inserter (Figure 1).

Observing conditions were not good. The gibbous Moon was 86% illuminated in a hazy sky, with the disappearance occurring at a small cusp angle of 19° (Figure 2) which gave a poor signal to noise ratio.

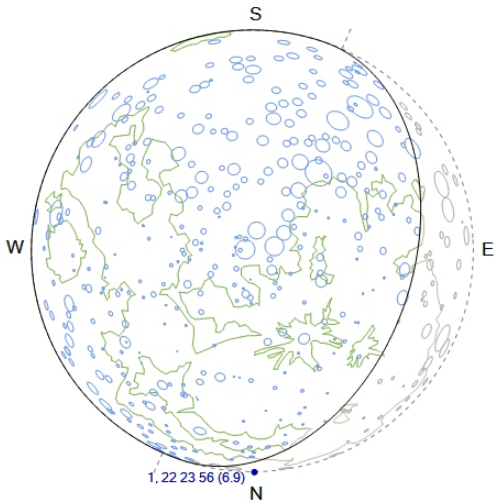


Figure 2. Moon map at the time of the occultation generated by *Occult*.

The video recording was processed in *VirtualDub*[4] and *Tangra*,[5] resulting in the lightcurve in Figure 3.

There is an indication of a probable step in the lightcurve, about 0.4s in duration, just before the total disappearance. This is also seen in a 2-values moving average.

A total occultation report was submitted to Jan Manek (IOTA occultations regional coordinator for Europe) and a double star report to Brian Loader (IOTA double star coordinator).

Jan analysed and reduced the recording using *LiMovie*[6] (Figure 4).

Jan's reduction[7] confirmed the double occultation, showing that the fainter component disappeared first, with a step height of 66% and a time interval of 0.343s. I recorded a magnitude difference (unfiltered) of about 0.75m, larger than the published value of 0.5m.

Brian commented[8] that serendipitously, Derek Breit (USA) had recorded a disappearance of ZC3524 on 2011 December 4. Our lunar limb position angles differed by almost 90°, the optimum for double star analysis. By combining both of our observations, Brian was able to estimate the position angle, separation and magnitude difference of the double star's components.The results have been included in his forthcoming paper 'Lunar occultation observations of double stars – Report #3' which will be published in the *Journal of Double Star Observations*.[9] We will also communicate his results to the Double Star Advisor of the BAA's Deep Sky Section.

Brian has asked that more UK observers undertake this work, to achieve a greater spread of observations at different position angles around the Moon's limb, preferably from observing locations at least 300km apart.

If you are interested in taking part in this programme, please contact the BAA Lunar Section Occultations Coordinator [**occultation@baalunarsection.org.uk**] who can advise you on the equipment and techniques required. You don't have to be a member of IOTA-ES.

Alex R. Pratt

References

1 **http://www.hristopavlov.net/OccultWatcher/OccultWatcher.html**
2 **http://www.lunar-occultations.com/iota/occult4.htm**
3 **http://www.iota-es.de/OWfeed_intro.html**
4 **http://virtualdub.org/**
5 **http://www.hristopavlov.net/Tangra/Tangra.html**
6 **http://www005.upp.so-net.ne.jp/k_miyash/occ02/limovie_en.html**
7 Jan Manek, *priv. comm.*, 2012 March 11
8 Brian Loader, *priv. comm.*, 2012 March 13
9 **http://www.jdso.org/**

Deep Sky Section

NGC 6826 – the Blinking Planetary

Andrea Tasselli

Light June nights are not ideal for deep sky astronomy and many observers restrict their targets to the brighter showpiece objects, leaving more challenging quarry until darker skies return. However, whatever you like to observe, challenging or not so challenging, the summer constellation of Cygnus will almost certainly feature in your plans, and even without fully dark skies there are many wonderful objects within its boundaries to enjoy. Planetary nebulae are some of the most beautiful objects in the sky and many being small and bright are ideal targets for lighter summer skies. Cygnus contains many superb examples with NGC 6826, commonly known as the Blinking Planetary, being one of the best.

When William Herschel discovered it in 1793, he catalogued it as number 73 in his class IV objects: planetary nebulae. Herschel's classification system was morphological, and planetary nebulae to him were anything that appeared small, round and sometimes greenish in colour, *i.e.* anything that looked planet-like and particularly like the planet Uranus that he discovered in 1781. The term coined by Herschel has stuck, even though planetary nebulae, confusingly, have nothing whatsoever to do with planets.

The Blinking Planetary lies at RA 19h 44.8m and Dec +50° 31' (2000.0) which puts it just over 5° ESE of kappa Cygni, the magnitude 3.8 star forming the western wing tip of the Swan, *i.e.* the opposite wing to that containing the Veil Nebula. Or, if you are observing from a dark site and can see fainter stars, it lies just over 1° east of mag 4.5 theta Cygni. At magnitude 8.8 with a diameter of around 25 arcsec it will be immediately obvious, even in quite a small telescope, as a greenish-blue slightly out of focus star, and if the atmosphere is steady allowing high power to be used, it will appear slightly elongated.

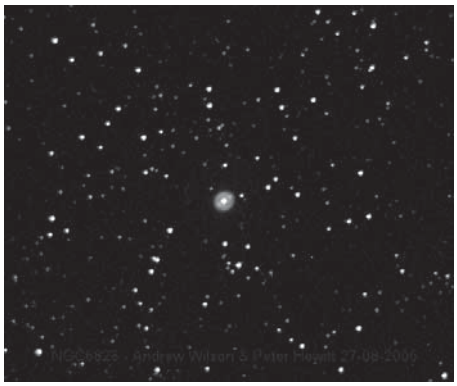
Increasing telescope aperture to something like 20cm will make the outer shell very obvious, but only if you try not to look directly at the magnitude 10.6 central star. It is this that gives the nebula its name – the Blinking Planetary. When you look straight at the planetary you will be using the central cone cells in your eye which, although sensitive to colour, are not particularly sensitive to faint light. The result is that the outer nebula shell disappears while the central star remains bright. To see the shell you need to use averted vision, that is to look to one side of the object rather than straight at it, thereby bringing your light-sensitive rod cells into play. The nebula will then reappear. Switching between direct and averted vision can make the nebula appear to blink on and off, hence its name.

Observations of NGC 6826 have been received in the Section from Andrew Wilson, Cliff Meredith, David Wagstaff, Ian Haygreen, Andrea Tasselli, Peter Grego, Dale Holt, Paul Downing and Peter Taylor. Andrew Wilson's image was taken with a Meade LX200 coupled to a MX916 CCD camera and is composed of 10×60s frames. In addition to the bright central star and the outer halo, two small spots of nebulosity can be seen on either side of the central star. These can be seen in more detail in Andrea Tasselli's fine image taken through his 20cm Intes Micro M809 f/10 Mak–Cass fitted with a SX SXV-H9 CCD camera. Exposures in this image were 205×20s L plus 24×25s each RGB.

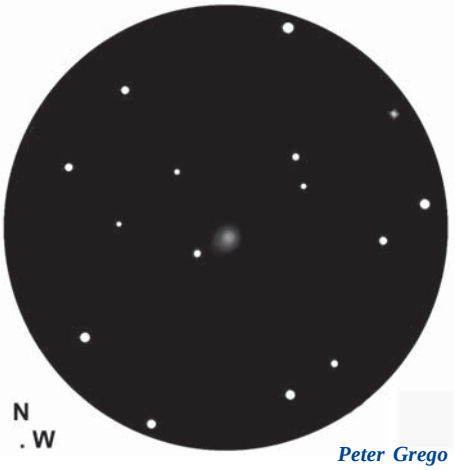
These spots are known as Fast Low Ionization Emission Regions or FLIERs for short, and they are seen in many planetary nebulae. Their exact nature and formation is still not properly understood, although it is likely that they result from material ejected from the poles of the dying star at some point in its evolution. The Hubble Space Telescope image of this planetary (**http://hubblesite. org/gallery/album/pr1997038d/**) shows them particularly well. Also shown in Andrea's image is an elongated ring of brighter (denser) material around the central star. This is caused by the so-called snow plough effect, when fast material ejected from the dying star collides with slower material ejected earlier.

The Blinking Planetary is not an easy object in which to see detail visually, and to see any of this structure, or even hints of it, will require a telescope in the half-metre class, very steady seeing, high power and almost certainly an OIII filter. Peter Grego's drawing shows how the nebula appears through a smaller instrument. Sketched through his 20cm SCT at ×75 it appears like a very small unresolved globular cluster: or perhaps, with a bit of imagination, like Herschel's planet Uranus that led him to coin the term 'planetary nebula' so many years ago.

Stewart L. Moore, *Director*



Andrew Wilson & Peter Hewitt



Peter Grego