A New Double Star from an Asteroidal Occultation: TYC 1950-00148-1

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Abstract: An occultation of TYC 1950-00148-1 by the asteroid (92) Undina on February 6, 2013 showed this star to be a double star with a separation of 28 mas.

Observation

On February 6, 2013, Bradshaw, Broughton, and Hanna observed the asteroid (92) Undina occult the star TYC 1950-00148-1 from four locations in Australia. Watson observed a miss from New Zealand. The observations were made with the equipment described in Table 1.

Six other observers (Gordon Hudson, John Talbot, Terry Butt, Ross Skilton, Dennis Lowe, and Rory O'Keefe) had registered in Occult Watcher for this event, but were clouded out. Had it been clear, at least 3 of these had a good chance of a positive recording.

Videos were analyzed and light curves produced by the observers using Tangra 1.4 software by Hristo Pavlov. Results were consolidated and analyzed by Talbot using Occult4 Software by Dave Herald.

The star is of magnitude 11.2(V), 11.6(R), and has a corresponding expected apparent diameter of less than 0.1 mas. The expected magnitude drop at occultation was 1.0 magnitudes (0.8 R).

Table 1. Equipment Used in Observing the Occultation.

Observer	Telescope	Camera	Timing
Watson, NZ	20 cm	Visual	Tape Recorder and Time signal
Bradshaw,AU	36 cm	CCD	GPS time inserted
Broughton Reedy Creek,AU	25 cm	WAT120N	GPS time inserted
Broughton Mobile Pimpama, AU	32 cm	WAT120N	GPS other linking
Hanna,AU	20 cm	StellaCam 3	GPS time inserted

The star is not listed in the Fourth Interferometric Catalog nor the Washington Double Star catalog.

Three of the light curves obtained from the occultation (Figures 1 - 4) show clear AB-BA step events,

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characteristic of a double star. Hanna's (Figure 1) shows only a single event, but Bradshaw's (Figure 2) shows the steps most clearly.

The observations were analyzed in the standard manner described by Herald [Herald, 2010]. With seven effective chords, there is no ambiguity in the solution.

The asteroid has a near elliptical profile (Figure 5) with dimensions approximately 180 x 155 km. It becomes clear in this figure why Hanna did not see a step

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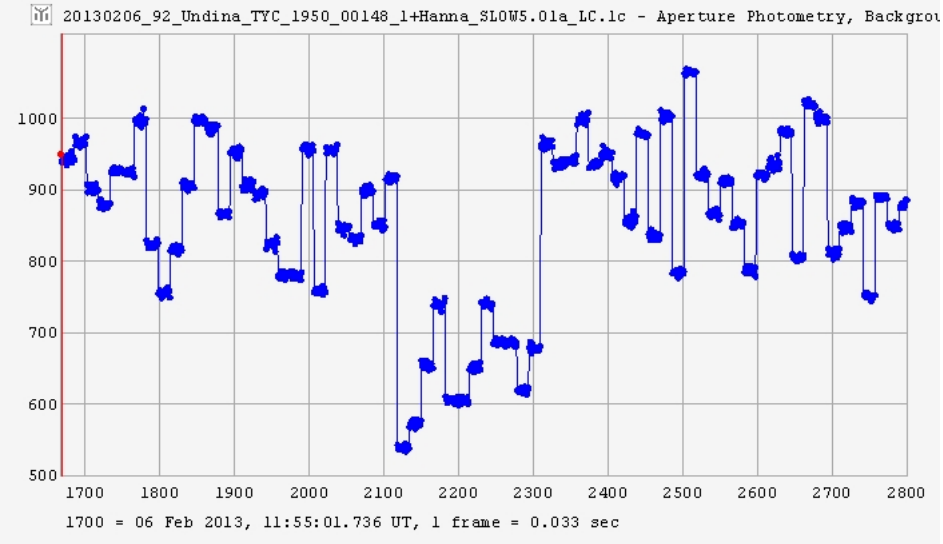

Figure 1: Occultation light curve obtained by Hanna.

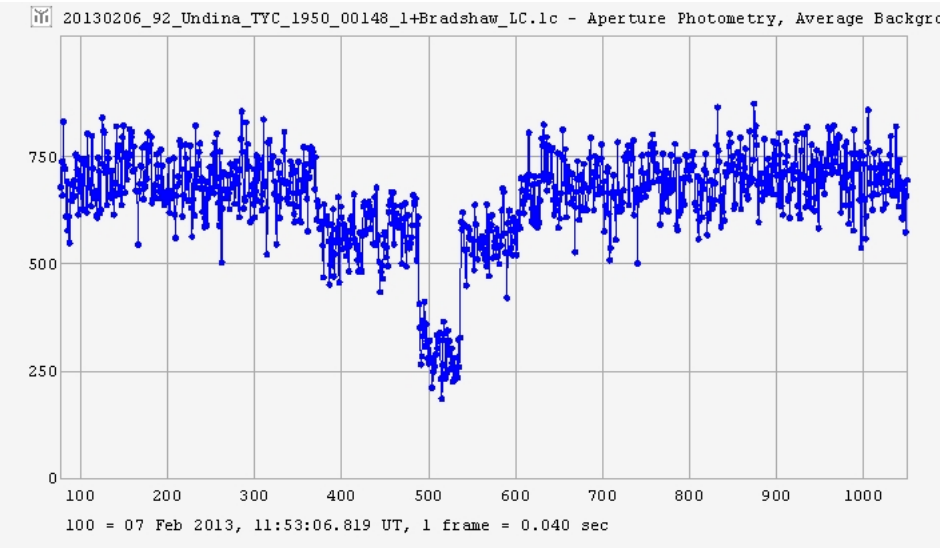

Figure 2: Occultation light curve obtained by Bradshaw.

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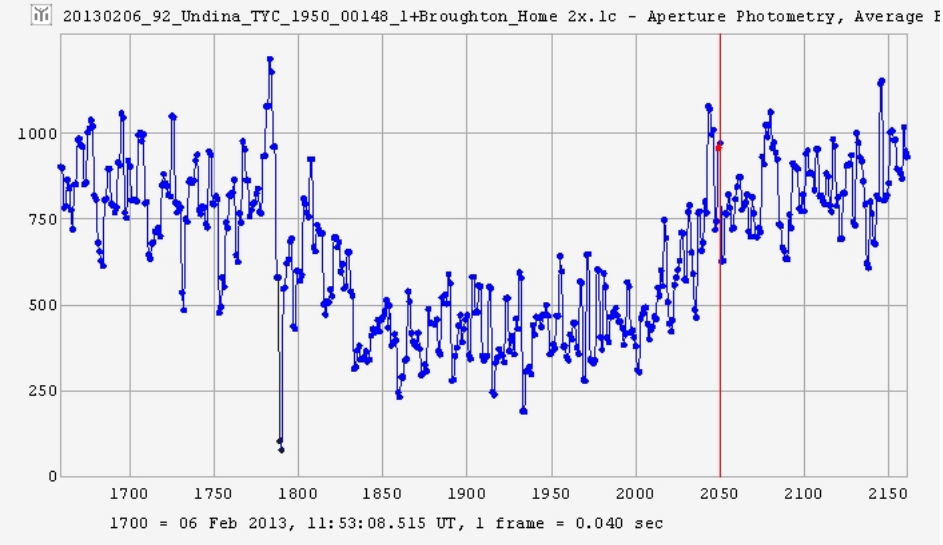

Figure 3: Occultation light curve obtained at Broughton Home, Reedy Creek.

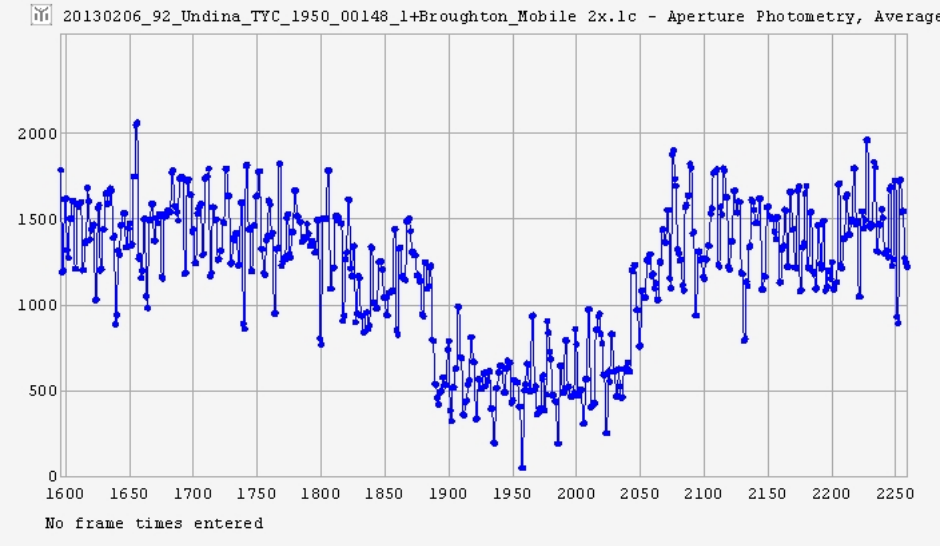

Figure 4: Occultation light curve obtained at Broughton Mobile, Pimpama.

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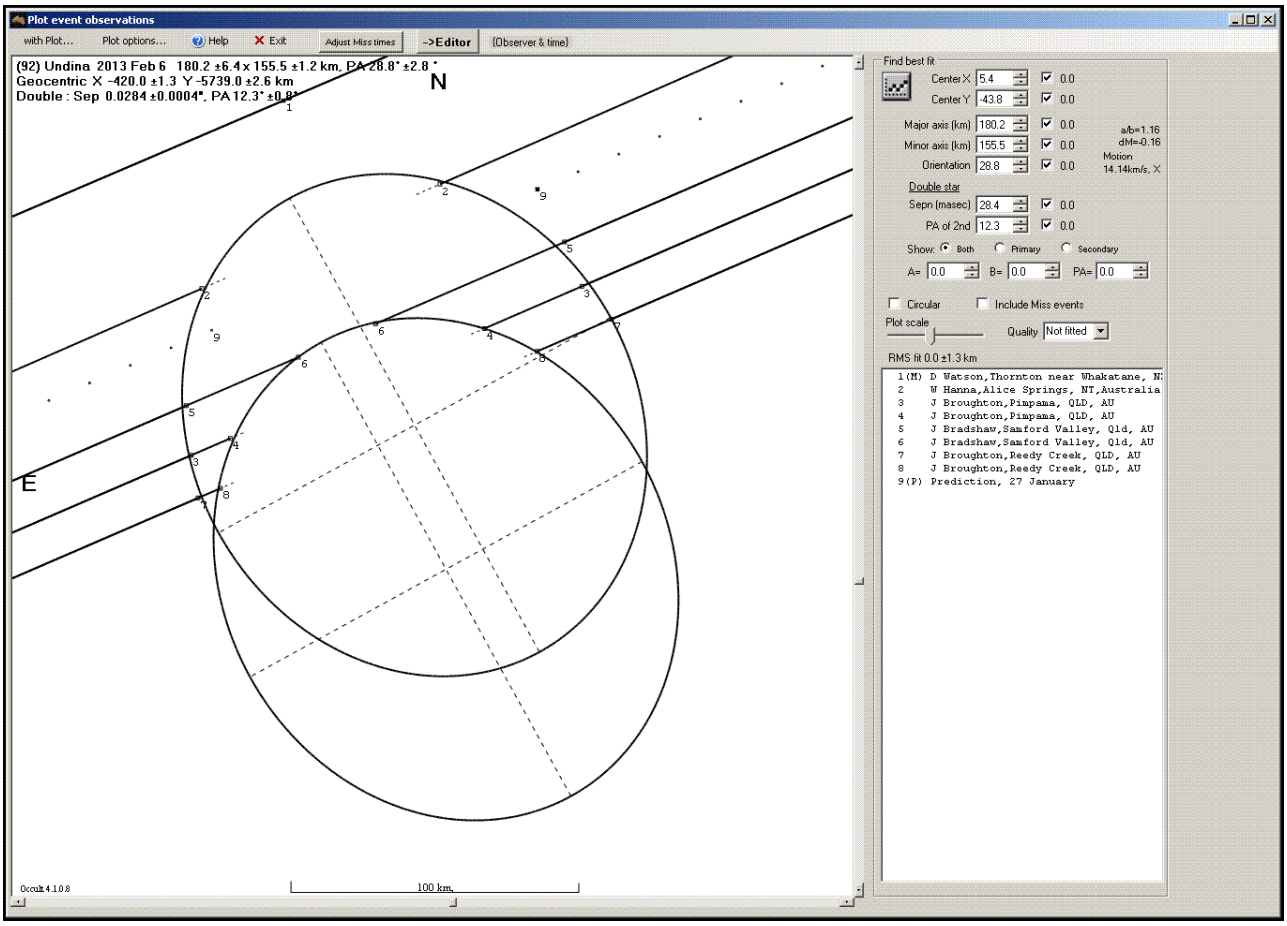

Figure 5. Outline of the asteroid from the shadows of the two stars. Hanna's observation is path 2, showing that he could observe the shadow of only one star.

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as he saw the shadow of only one star.

The double star characteristics are:

Star	TYC 1950-00148-1 = UCAC4 573-045670
Coordinates(J2000)	09h01m30.65s, +24° 27' 27.95"
Spectral type	(none found)
Mag A	12.14 ± 0.2 (V)
Mag B	12.11 ± 0.2 (V)
Separation	28.4 ± 0.5 mas
Position Angle	12.3º ± 2º
Epoch	2013.1008 (Besselian)

References

Herald, D. , 2010, "New Double Stars from Asteroidal Occultations, 1971 – 2008", JDSO, **6**, 88-96.

Herald, D., *Occult 4 Software* http://www.lunar-occultations.com/iota/occult4.htm

Pavlov, H., *Tangra Software* http://www.hristopavlov.net/Tangra/Tangra.html