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LIGHTCURVE ANALYSIS OF 5899 JEDICKE: A NEW HUNGARIA BINARY

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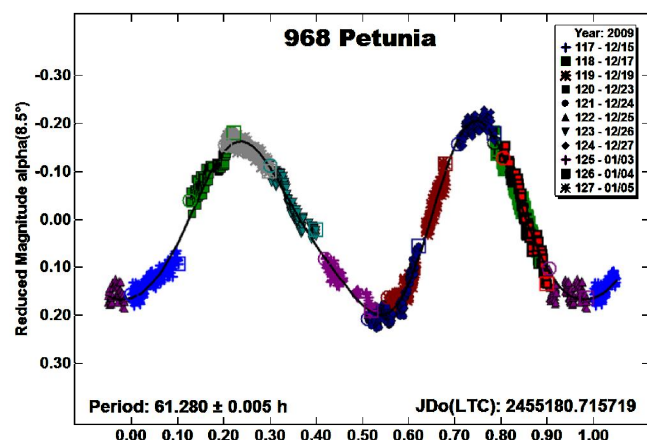
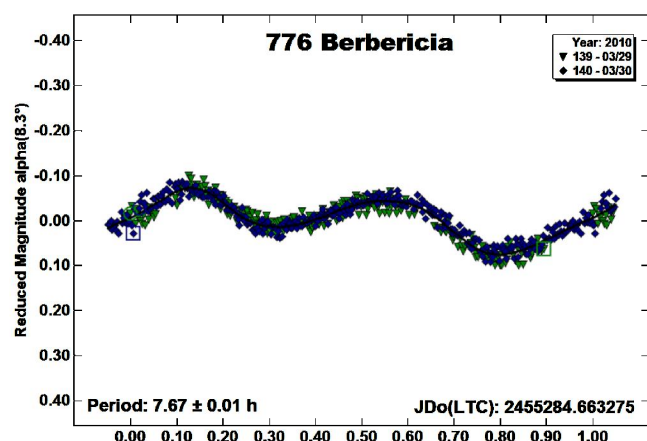
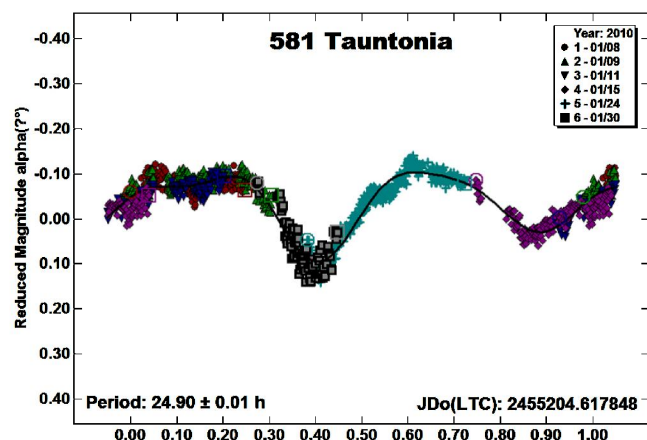
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CCD photometric observations of the Hungaria asteroid 5899 Jedicke obtained in 2010 February and March show that the asteroid is a binary system. The orbital period is 16.7 ± 0.1 h. The rotation period of the primary could not be determined with certainty due to the low amplitude of the lightcurve, $A = 0.04$ mag, but lies in the range of 3-4 h. The estimated size ratio of the pair is $D_s/D_p \sim 0.32$.

CCD observations of the Hungaria asteroid 5899 Jedicke were obtained at the Palmer Divide Observatory (PDO) from 2010 February 3-16 (see Warner 2010, for details about equipment and reduction and analysis methods). Analysis of the data in-hand showed what appeared to be mutual events (occultations and/or eclipses) due to a satellite and that $Porb \sim 16.7$ h. Due to the low amplitude of the primary lightcurve ($A = 0.04$ mag), it was not possible to find a unique period for the primary, though it was confined to the range of 3-4 hours.

Additional observations were obtained from 2010 February 17 through March 4 at PDO as well as by Pray at Carbuncle Hill using an f/7.8, 0.35-m Schmidt-Cassegrain (SCT) with an SBIG ST-10XE CCD operating at a scale of 1.2 arc sec/pixel and by Pollock et al. using the 0.45-m PROMPT telescope in Chile, which captured some additional events. A refined analysis of the larger data set by Pravec and Kušnirák confirmed the 16.7 h orbital period. A unique period for the primary still could not be found, though one at ~ 3.5 h was slightly better than most others in the 3-4 h range. (See Figure 2.) Based on the depths of the events, we estimate the size ratio (D_s/D_p) to be ≥ 0.32 .

As of 2010 March 20, this brings to 12 the total number of known Hungaria binaries ("B") with an additional 2 that are likely candidates ("?) and 2 others that have shown weak evidence where observational issues were eliminated ("??"). The last two are included to encourage careful observations at future apparitions.



Acknowledgements

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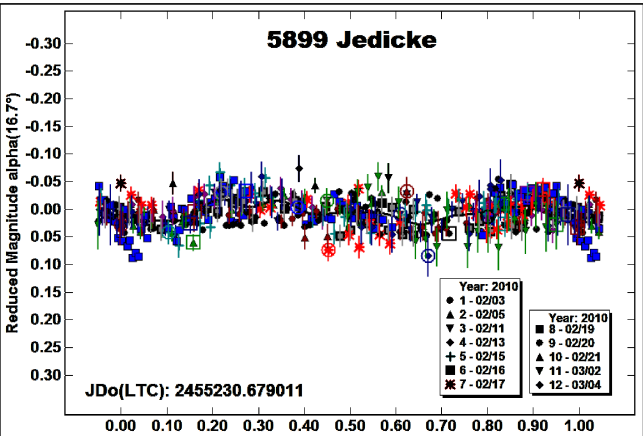


Figure 1. The short-period lightcurve for 5899. This curve is fit to ~3.5 h but several periods between 3 and 4 hours are possible.

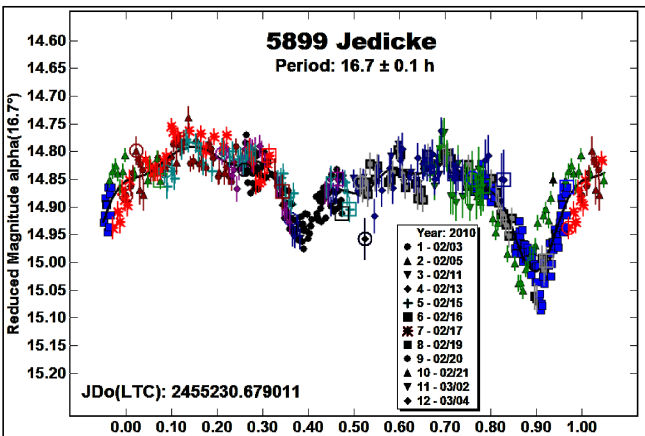


Figure 2. The long-period lightcurve for 5899 shows the mutual events, which allowed finding the orbital period.

Known, Possible, and Suspicious Hungaria Binaries				
Number	Name	P1	Porb	Status
1453	Fennia	4.412	22.99	B
1509	Esclangona	3.25	~900	B
2074	Shoemaker	2.533	55.5	?
2083	Smither	2.672	30.09	??
2131	Mayall	2.568	23.48	B
2577	Litva	2.813	35.8	B
3309	Brorefeld	2.504	18.46	B
3873	Roddy	2.479	47.3	??
4674	Pauling	2.531	~3500	B
5477	1989 UH2	2.994	24.42	B
5899	Jedicke	3-4	16.7	B
5905	Johnson	3.782	21.78	B
6901	Roybishop	4.682	17.16	?
9069	Hovland	4.218	30.33	B
26471	2000 AS152	2.687	39.25	B
76818	2000 RG79	3.166	14.12	B

Table I. A list of known and likely Hungaria binary asteroids. P1 is the approximate rotation period of the primary (in hours) and Porb is the orbital period of the satellite.

THE LIGHTCURVE FOR THE LONG-PERIOD ASTEROID 4024 RONAN

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The main-belt asteroid 4024 Ronan was observed 2010 January to March. The derived lightcurve has a synodic period of 365 ± 5 h and an amplitude of 1.0 ± 0.05 mag.

Observations of the main-belt asteroid 4024 Ronan were made by the authors from 2010 January 9 through March 13. The combined data set consists of 2868 data points. Most images were unbinned with no filter. Stephens' observations used a 0.30-m or a 0.35-m SCT with a SBIG STL-1001E CCD camera. Observations at

Palmer Divide were made with a 0.35-m SCT using a SBIG STL-1001E CCD Camera. Measurements were made using *MPO Canopus*, which employs differential aperture photometry to produce the raw data. Period analysis was done using *Canopus*, which incorporates the Fourier analysis algorithm (FALC) developed by Harris et al. (1989).

Night-to-night calibration of the zero points was done using 2MASS magnitudes of up to five comparison stars of similar color to an asteroid. See Warner (2007) and Stephens (2008) for further discussion of this process that provides calibration of the nightly zero points typically good to within 0.05 magnitudes. When working long-period asteroids where a single observing session typically produces a flat curve, it is necessary to calibrate the night-to-night zero points.

4024 Ronan was previously observed by Stephens (2003), who initially found a period of 18.9 h. This analysis was done before the new calibration techniques were developed and resulted in an asymmetric and noisy lightcurve with a 0.4 mag amplitude. Since 2010 provided a favorable opposition, Stephens decided to re-observe Ronan to check the previous results. The observations produced flat lightcurve segments, often characteristic of a long-