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878 MILDRED REVEALED

Robert D. Stephens
Goat Mountain Astronomical Research Station (GMARS)
11355 Mount Johnson Court, Rancho Cucamonga, CA 91737
RStephens@foxandstephens.com

Linda M. French
Illinois Wesleyan University
Bloomington, IL 61702 USA

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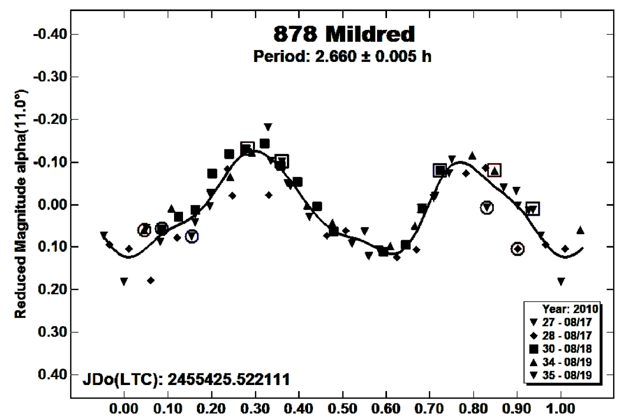
Observations of the main-belt asteroid 878 Mildred made at Cerro Tololo Interamerican Observatory in August 2010 found a synodic period of 2.660 ± 0.005 h and an amplitude of 0.23 ± 0.03 mag.

Asteroid 878 Mildred has a famous history as a small solar system body. It was originally discovered on September 6, 1916, by Seth Nicholson (1916) and Harlow Shapley using the 1.5 m Hale Telescope at Mount Wilson Observatory, the world's largest telescope at the time. Thinking the orbit was unusual; Nicholson and Shapley continued to observe the asteroid until October 18. It was then lost for 75 years.

The asteroid was named for Shapley's infant daughter "Mildred". Like her famous father, Mildred Shapley Matthews went on to work in the field of astronomy, becoming a research assistant and editor of many astronomy books.

Several attempts to recover 878 Mildred were unsuccessful. Then on April 10, 1991, the ESO 1-meter telescope at La Silla recorded several asteroids on a plate. Gareth Williams working at the Minor Planet Center realized that one of the asteroids fit the orbit predicted by the 1916 measurements of Mildred (Messenger 1991). Working backwards, Williams found another single observation of the asteroid from 1985. More single-night observations in 1984 and 1977 were then found making its orbit well established. At the time of Mildred's recovery, there was only one asteroid still "lost" – 719 Albert. Albert was subsequently found in 2000.

Although 878 Mildred is no longer lost, very little is known about its physical properties. It is in the Main Belt and is the namesake of the Mildred family (Mothé-Diniz 2005), a subgroup of the Nysa family. The Mildred subgroup is thought to have been recently formed and consists of over 1,200 members.



In August, French and Stephens were using the 0.9-m telescope at Cerro Tololo Inter-American Observatory in Chile to study Trojan asteroids. While observing a Trojan, we blinked several images and noticed a moving object tracking the target. A check of the field showed the second asteroid was 878 Mildred.

Realizing the opportunity, we reduced the images the following day and derived a preliminary lightcurve suggesting a short rotational period. Mildred was still in the field of the targeted Trojan the next night so more data was obtained. Since it appeared that a third night would add a sufficient level of confidence to the derived period, Mildred was made a primary target.

A search of the Asteroid Lightcurve Data file (Warner 2010) did not reveal any previously reported periods. The final data set has 64 data points over three consecutive nights. Analysis of the lightcurve determined a synodic period of 2.660 ± 0.005 h with an amplitude of 0.23 ± 0.03 mag.

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References

Messenger (1991). "Recovery of (878) Mildred" **64**, 55

Mothé-Diniz, T., Roig, F., and Carvano, J.M. (2005). "Reanalysis of asteroid families structure through visible spectroscopy" Icarus **174**, 54-80.

Nicholson, S. and Shapley, H. (1916). "The Orbit and Probable Size of a Very Faint Asteroid" Astron. Journal **710**, 127.

Warner, B.D., Harris, A.W., and Pravec, P. (2010). Asteroid Lightcurve Data File, *http://www.MinorPlanetObserver.com/astlc/LightcurveParameters.htm.*

THE LIGHTCURVE OF JOVIAN TROJAN ASTEROID 884 PRIAMUS

Linda M. French
Department of Physics
Illinois Wesleyan University
P. O. Box 2900
Bloomington, IL 61702 USA
lfrench@iwu.edu

Robert D. Stephens
Goat Mountain Astronomical Research Station (GMARS)
Rancho Cucamonga, CA USA

Susan M. Lederer
NASA JSC/Cal State Univ. San Bernardino
Houston, TX USA

Derrick A. Rohl
Illinois Wesleyan University
Bloomington, IL USA

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Observations of Jovian Trojan Asteroid 884 Priamus in July and August 2010 yield a symmetrical lightcurve with a period of 6.8605 ± 0.0005 h and an amplitude of 0.24 mag.

The Jovian Trojan asteroids are found in orbits near the stable L4 and L5 Lagrange points of Jupiter's orbit. As of 29 September 2010, 2791 had been found in the L4 (preceding) region and 1732 in the L5 region.

As yet, the rotation properties of Trojan asteroids are poorly known relative to those of main belt asteroids, due to the low albedo and greater distance of the Trojans. No rotation period has been reported for 884 Priamus; Hartmann *et al.* (1988) reported a lower limit to the lightcurve amplitude of 0.37 mag., but did not publish a rotation period or a lightcurve. One of us (LF) had attempted observations of Priamus in 1987 on two successive nights which showed identical-looking fragments of a lightcurve. This suggested aliasing might be present (see the following discussion).

Observations at CTIO (Cerro Tololo Interamerican Observatory, MPC 807) were made with the CTIO 0.9-m telescope. The NOAO CFCCD camera has a field of view of 13.5' on a side. At 0.401" per pixel, a quarter-chip configuration was used to yield 1024 x 1024-pixel images with a read noise of 3.5 and a gain of 1.5. All images taken at CTIO were unbinned; V and R filters were used. Data analysis was carried out using IRAF and MPO Canopus. Period analysis was done using Canopus, which incorporates the Fourier analysis algorithm (FALC) developed by Harris (1989).

The results are summarized in the accompanying plot of all the lightcurve data. The plot is phased so that the data range from 0.0 to 1.0 of the best-fit period. Night-to-night calibration of the data (generally less than ±0.05 mag) was done using field stars converted to approximate Cousins R magnitudes based on 2MASS J-K colors (Warner 2007, Stephens 2010).

As mentioned previously, fragmentary observations from two successive nights in 1987 looked identical, suggesting that aliasing might be present. The best-fit period, 6.8605 ± 0.0005 h, is quite close to the period one would observe for an asteroid rotating 3.5 times in 24 hours, 6.8571 h. Observations on three nights, two of them closely spaced, were necessary to determine the period adequately.

By chance, the three observing dates found the asteroid at very nearly the same phase angle, although the July date was before opposition and the August dates after. Since some Trojans do not show the opposition effect implied by the standard IAU value of G = 0.150 for dark asteroids (French 1987; Shevchenko *et al.* 2009), we have chosen not to assume a value for G and have left the lightcurve in terms of relative magnitudes. In the future we will observe Priamus at a wider range of phase angles in order to see whether it shows the same unusual phase behavior as other Trojans.

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References

French, L.M. (1987). "Rotation Properties of Four Trojan Asteroids from CCD Photometry." *Icarus* **72**, 325-341.

Harris, A.W., Young, J.W., Bowell, E., Martin, L. J., Millis, R. L., Poutanen, M., Scaltriti, F., Zappala, V., Schober, H. J., Debehogne, H, and Zeigler, K. (1989). "Photoelectric Observations of Asteroids 3, 24, 60, 261, and 863." *Icarus* 77, 171-186.

Hartmann, W., *et al.* (1988). "Trojan and Hilda asteroid lightcurves. I - Anomalously elongated shapes among Trojans (and Hildas?)." *Icarus* **73**, 487-498.

Shevchenko, V. G.; Krugly, Yu. N.; Belskaya, I. N.; Chiorny, V. G.; Gaftonyuk, N. M.; Slyusarev, I. G.; Tereschenko, I. A.; Donchev, Z.; Ivanova, V.; Borisov, G.; Ibrahimov, M. A.; Marshalkina, A. L.; and Molotov, I. E.. (2009). "Do Jupiter Trojans Have the Brightness Opposition Effect?" *Abst. LPSC* 1391.

Stephens, R. D. (2010). "Trojan Asteroids Observed from GMARS and Santana Observatories: 2009 October-December." *Minor Planet Bul.* **37**, 47-48.

Warner, B.D. (2007). "Initial Results from a Dedicated H-G Project." *Minor Planet Bul.* **34**, 113-119.