

**LIGHTCURVE RESULTS FOR 383 JANINA,
899 JOKASTE, 1825 KLARE, 2525 O'STEEN,
5064 TANCHOZURU, AND (17939) 1999 HH8**

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Lightcurve period and amplitude results for six minor planets are reported from Bucknell University Observatory and the Rosemary Hill Observatory. 383 Janina, $4.636 \pm 0.001h$, $0.13 \pm 0.02mag$; 899 Jokaste, $6.2475 \pm 0.0005h$, $0.1 \pm 0.03mag$; 1825 Klare, $4.7429 \pm 0.0003h$, $0.9 \pm 0.1mag$; 2525 O'Steen, $5.538 \pm 0.001h$, $0.35 \pm 0.1mag$; 5064 Tanchozuru, $8.13 \pm 0.01h$, $0.9 \pm 0.01mag$; (17939) 1999 HH8, $5.10 \pm 0.01h$, $0.35 \pm 0.03mag$. Also reported are indefinite period results for five objects in the hope that they may be useful for future observers: 978 Aidamina, 1007 Pawlowia, 1645 Waterfield, 4497 Taguchi, and (10374) 1996 GN19.

Bucknell Observatory is located on the campus of Bucknell University in Lewisburg, Pennsylvania. Two telescope/camera combinations were used for this study: 1) 20cm SCT with ST-7E CCD camera and, 2) a 35.4cm SCT with SBIG ST-9E. Rosemary Hill Observatory is situated near Bronsen, FL and is owned and operated by the University of Florida, Gainesville. Two telescope/camera setups were used. The first being a 76cm Newtonian with SBIG ST-9E. The second was a 46cm Ritchey-Chretien with SBIG ST-8E. Montgomery College Observatory is situated on the campus of Montgomery Community College in Rockville, Maryland. The main instrument is a 40cm SCT with SBIG ST-9E and f/6.3 focal reducer. ST-7 and ST-9 images were binned 1x1, while the ST-8 images were binned 2x2. All images were unfiltered and were reduced with dark frames and sky flats.

For the most part, the asteroids observed were chosen from the Collaborative Asteroid Lightcurve Link (CALL) home page that is maintained by Brian Warner. Image analysis was accomplished using differential aperture photometry with MPO Canopus. Period analysis was also done in Canopus, which implements the algorithm from Harris et al. (1989). Differential magnitudes were calculated using reference stars from the USNO-A 2.0 catalog and the UCAC2 catalog. Different comparison stars were used on different nights because of the asteroid's movement. Canopus compensates for night-to-night observation by offsetting each night's magnitude scales and then obtaining a best fit.

Results are summarized in the table below, and the lightcurve plots are presented at the end of the paper. The data and curves are presented without additional comment except where circumstances warrant. Column 3 gives the range of dates of observations and column 4 gives the number of nights on which observations were undertaken.

383 Janina. The lightcurve was clearly asymmetric with a derived period of $4.636 \pm 0.001h$. The amplitude was quite small, only about 0.13 magnitude.

978 Aidamina. Observations were possible on two nights only. This, combined with a relatively large scatter in the data, meant that no clear period with a double peak could be derived. Out of several single peak possibilities, the one presented here of around 9.5 hours appeared to fit the data the best. It is hoped that this result will be of some use to observers at the next opposition.

1007 Pawlowia. This was a frustrating asteroid to work. Data from August and September were essentially flat, with an amplitude of less than 0.1 mag, almost as much as the scatter in the data. Later observations were hampered by poor conditions, with a resulting scatter greater than any possible variation. Using the earlier data, we found a possible period of around 8.23 hours.

1645 Waterfield. Observations of this asteroid were made on three nights. However, only one night resulted in usable data. Conditions on the other two nights were poor and resulted in data with such scatter as to be unusable. That one night indicated a single minimum for a period of about 5.6 hours and a small amplitude.

2525 O'Steen. The data for O'Steen was noisy and difficult to reduce. The best period I could derive was 5.538 hours; however the second peak is difficult to discern. There was a suggestion on two nights of a second dip in this region. Whether this is real or just noise I am uncertain.

4497 Taguchi. Two nights of observations resulted in a period of 5.343 hours. However the data are quite noisy. More work is required on this asteroid to confirm this period.

5064 Tanchozuru. Four nights of observations showed that this asteroid has a very asymmetric lightcurve, with the second peak being only about half the amplitude of the first peak.

(10374) 1996 GN19. Considerable difficulty was encountered when trying to determine the period for 10374 since the data are noisy. The best solution found was using a single peak, which resulted in a period of 11.54 hours, with an amplitude of about 0.8 mag. Attempts to fit this period to a double peak of about 23 hours were unsuccessful due to a large gap in the data.

(17939) 1999 HH8. Due to the relatively short duration of observations each night, no set of observations covered the entire lightcurve. The derived result is therefore somewhat uncertain.

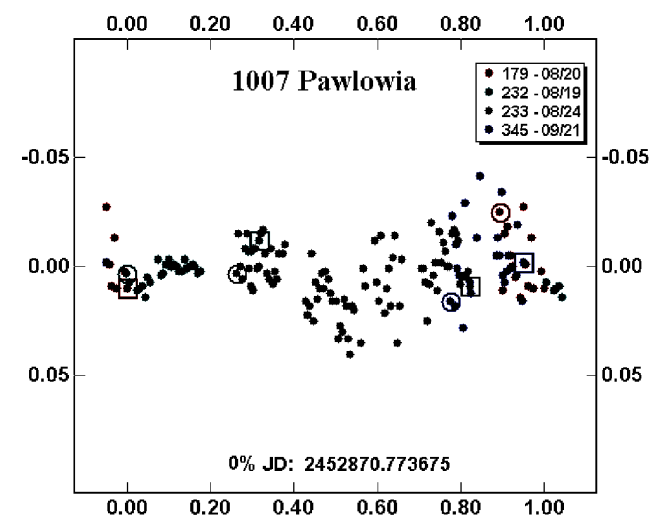
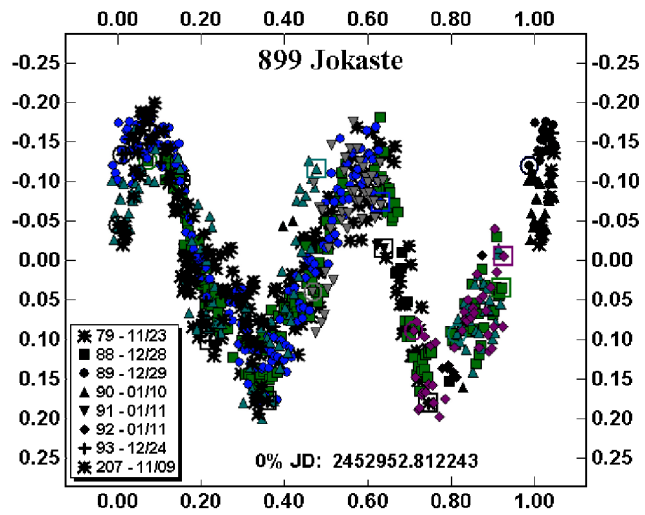
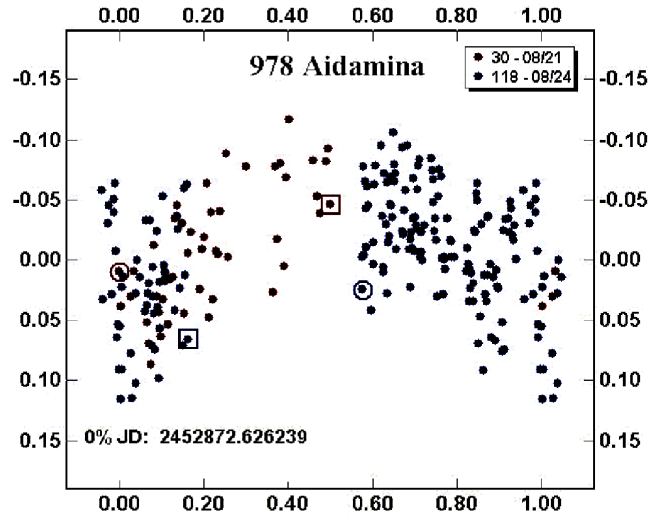
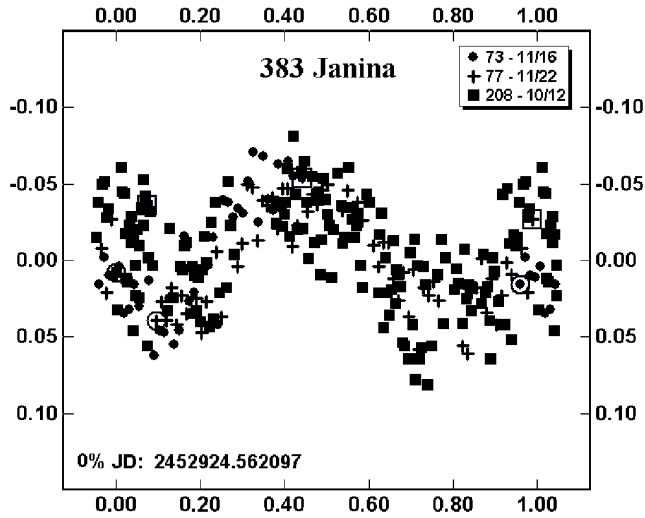
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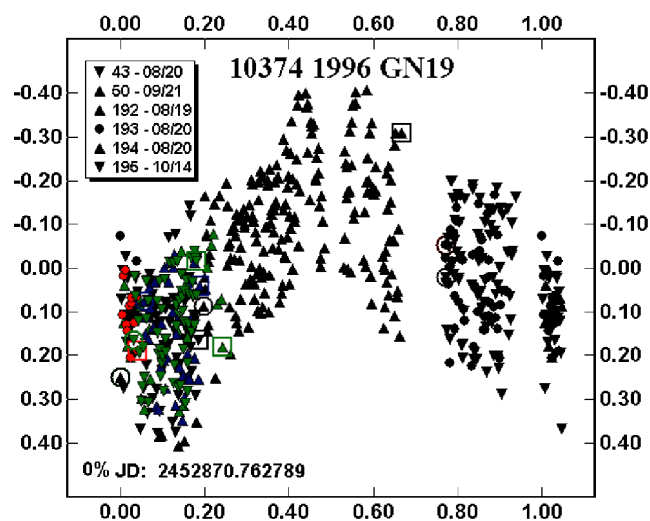
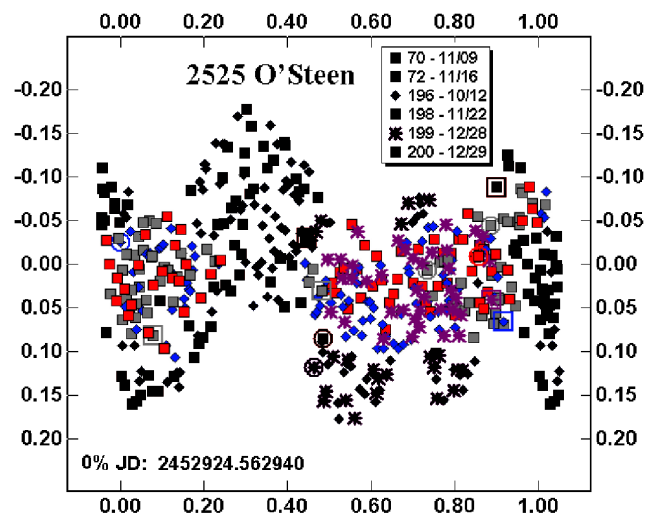
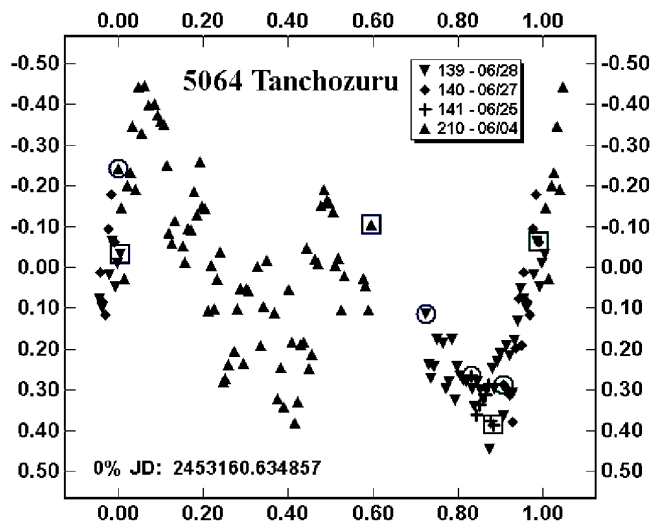
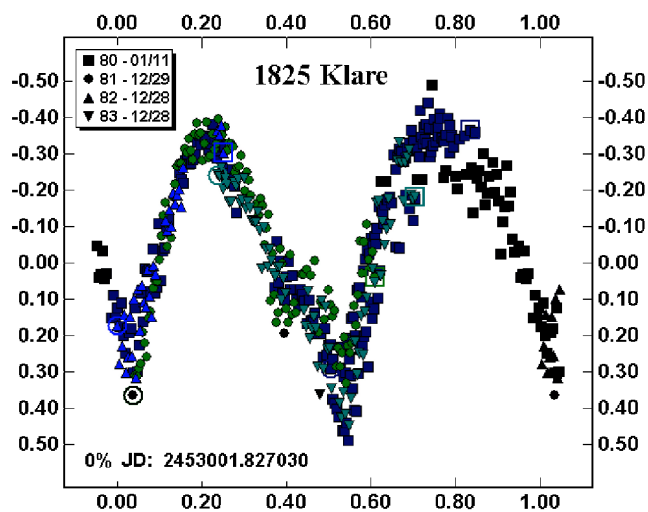
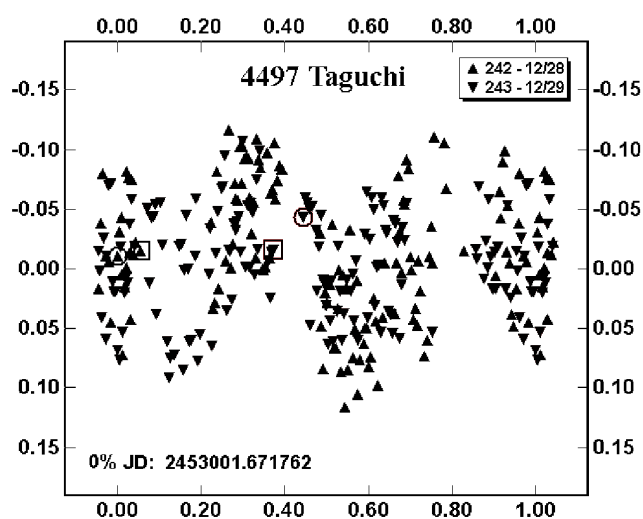
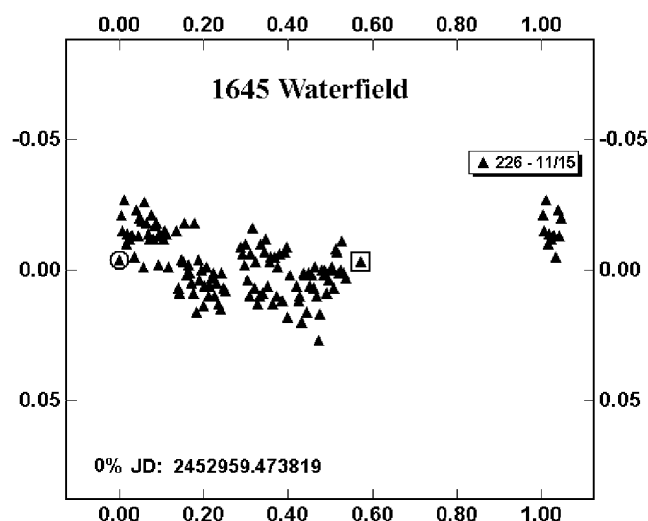
I would like to thank Dr John Oliver at the University of Florida at Gainesville for access to the Rosemary Hill Observatory, and Brian Warner for all of his work with the program "Canopus."

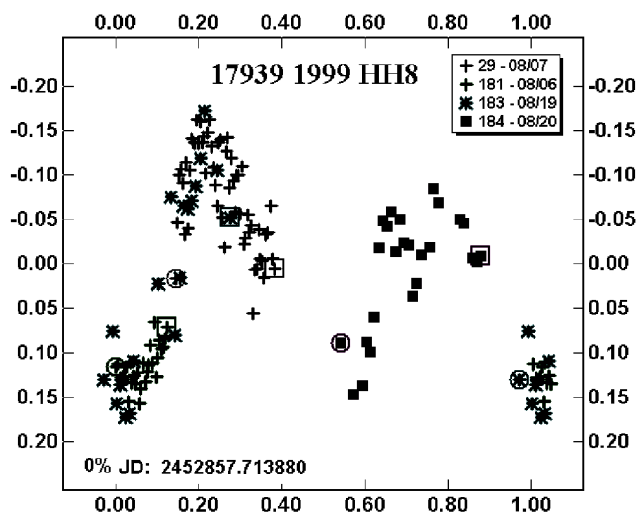
References

Harris, A. W., et al. (1989). "Photoelectric Observations of Asteroids 3, 24, 60, 261, and 863." *Icarus* **77**, 171-186.

#	Name	Date Range	Sessions	Per (h)	Error (h)	Amplitude	Error
383	Janina	Oct 12 – Nov 23, 2003	4	4.636	0.001	0.13	0.02
899	Jokaste	Nov 9, 2003 – Jan 11, 2004	6	6.2475	0.0001	0.1	0.03
978	Aidamina	Aug 21 – Aug 28, 2003	2	9.5?	-	0.22	0.1
1007	Pawlowia	Aug 19, 2003 – Nov 11, 2003	7	8.23?	-	Flat	0.03
1645	Waterfield	Oct 12 – Nov 22, 2003	3	5.6?	0.1	0.05?	0.01
1825	Klare	Dec 28, 2003 – Jan 11, 2004	3	4.7429	0.0003	0.9	0.02
2525	O'Steen	Oct 12 – Dec 29, 2003	7	5.538	0.001	0.35	0.1
4497	Taguchi	Dec 28 – Dec 29, 2003	2	5.343	0.02	0.2	0.01
5064	Tanchozuru	June 4 – June 28, 2004	4	8.13	0.01	0.9	0.1
10374	1996 GN19	Aug 19 – Oct 14, 2003	5	11.54?	-	0.8	0.3
17939	1999 HH8	Aug 5 – Aug 28, 2003	4	5.10	0.01	0.35	0.03







LIGHTCURVE ANALYSIS FOR (15362) 1996 ED

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The main-belt asteroid (15362) 1996 ED was observed in early 2006 at GMARS and Palmer Divide Observatories. The lightcurve was analyzed for its period and amplitude. The synodic period was found to be 31.4 ± 0.1 h and the amplitude to be 0.50 ± 0.02 mag.

Initial observations of (15362) 1996 ED were made by Stephens on January 28 and 29, 2006, at the Goat Mountain Astronomical Research Station (GMARS), which is owned by the Riverside Astronomical Society and located in Landers, CA. The initial data were sent to Petr Pravec, Ondrejov Observatory, Czech Republic, who confirmed that the period of the asteroid was likely >24 h. Warner took over observing from the Palmer Divide Observatory from February 2-7. All images were unfiltered. Table I gives the equipment details.

Observer	Scope / Camera	Exp (s)
Stephens	0.35m / STL-1001E	120
Warner	0.35m / FLI-1001E	210

Table I. Observer and equipment details.

Table II shows the important observation details. Column 2 gives the phase angle for the date in Column 1. Columns 3 and 4 give the Phase Angle Bisector (PAB) longitude and latitude respectively.

Date	Phase	L_{PAB}	B_{PAB}
2006 Jan 28	5.2	127.6	8.1
2006 Feb 07	7.9	128.1	7.9

Table II. The phase and Phase Angle Bisector values for the extreme dates of observations for (15362) 1996 ED.

Images were dark frame and flat field corrected. Both authors used MPO Canopus for measuring reduced images. Canopus generates differential magnitudes from aperture photometry by using up to five comparison stars in the same field as the target. The data sets from each author were merged into a common set. Warner then used Canopus, which implements the Fourier analysis algorithm developed by Harris (1989), to conduct a period search.

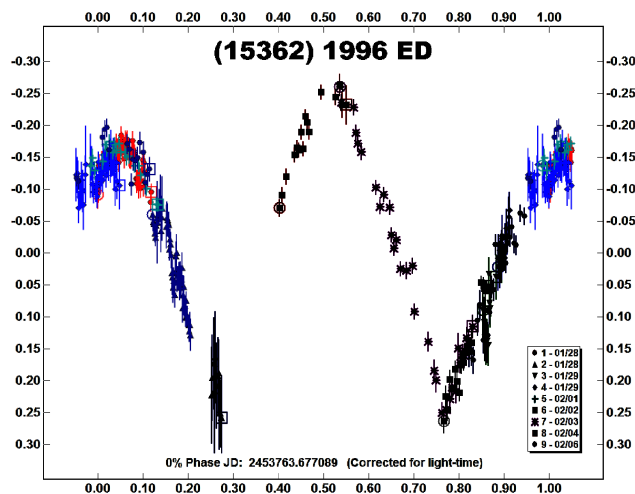
Our included figure shows the data phased to the proposed period of 34.1 ± 0.1 h. The amplitude of the curve is 0.50 ± 0.02 mag.

Acknowledgements

The authors thank Petr Pravec, Ondrejov Observatory, Czech Republic, for his assistance in the data analysis.

References

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.W. (1989). "Photoelectric Observations of Asteroids 3, 24, 60, 261, and 863." *Icarus* 77, 171-186.



LETTER TO THE EDITOR

I have designed a simple mechanical device for drawing the lightcurves from bodies of all shapes and albedos. The method is shown by simple geometry by Kristensen (1991; *Astron. Nachr.* 312, 209-220). *Minor Planet Bulletin* readers who may be interested in making a prototype of the device, from drawings I can provide, are encouraged to contact me.

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