observation interval. The overall form of the lightcurve did not change perceptibly with phase angle or viewing aspect.

Further evidence against the double period near 72.6 hours is provided by Schober *et al.* (1993). They draw a composite bimodal lightcurve phased to 36.0 hours based on data from 6 consecutive nights with about 60% phase coverage. Overlapping sessions on this lightcurve centered near 1989 Nov 30.3 and Dec 3.3 each show a small rise followed by a fall greater than 0.4 magnitudes in about 6 hours. This sets a lower limit in their data for the amplitude. An amplitude as large as 0.4 magnitudes is possible only for a bimodal lightcurve.

Independently, Franco drew an *H-G* plot based only on sparse data from the U.S. Naval Observatory (USNO), i.e., not including any of the new photometry. These data contain no correction for rotational variation and in include the inherent scatter in the USNO data itself. The large quantity of data points partially compensates for the somewhat large scatter in the data set and establish moderately precise and reliable values of $H = 9.19 \pm 0.06$ mag, $G = 0.23 \pm 0.06$, which agrees with the JPL Small-Body Database Browser (JPL, 2013) value of $H = 9.11$.

The observing cadence by FP at Organ Mesa Observatory is such that a much larger number of data points were acquired than at any of the other observatories. To make the large number of data points in the segments of the lightcurve included by Organ Mesa observations more legible, those data have been binned in sets of five points with a maximum of ten minutes between points.

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PERIOD DETERMINATION FOR 330 ADALBERTA: A LOW NUMBERED ASTEROID WITH A PREVIOUSLY UNKNOWN PERIOD

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Lightcurve analysis for 330 Adalberta was performed using observations obtained from two observatories during its 2013 opposition. The synodic rotation period was found to be 3.5553 ± 0.0001 h and the lightcurve amplitude was 0.44 ± 0.04 mag.

330 Adalberta is a small main-belt asteroid with an interesting story. Originally, the name was assigned to a supposed asteroid discovered by Max Wolf on 1892 March 18 (provisional designation 1892 X) but it was lost and never recovered. Ninety years later, in 1982, it was determined that the observations leading to the designation of 1892 X were actually stars: the asteroid never existed. The number and name 330 Adalberta were then reassigned to another asteroid, also discovered by Max Wolf on 1910 February 2 (provisional designation A910 CB), which – in turn – had earlier been incorrectly identified with 783 Nora. Also worth mentioning is that, at the time of our study (2013 August), 330 Adalberta was the second lowest numbered asteroid that appeared to have no previously reported rotation period. This made it particularly appealing to us when reviewing the CALL web site list of asteroids reaching a favorable apparition in 2013.

Unfiltered CCD photometric images were taken at Observatorio Los Algarrobos, Salto, Uruguay (MPC code I38) and at the Organ Mesa Observatory, New Mexico, USA (MPC code G50). Table I gives the equipment used and Table II the imaging parameters for each observatory.

Observatory Equipment		
Obs	Telescope	CCD camera
I38	0.30-m f/6.9 Meade LX200 ACF	QSI 516wsg NABG
G50	0.35-m f/10 Meade LX200 GPS	SBIG STL-1001E

Table I. Telescope and CCD cameras.

Imaging parameters					
Obs	Exp	Temp	Guiding	Image scale	Field-of-view
I38	90 s	-10°C	yes	1.77 arcs/px	23 x 16 arcmin
G50	60 s	-12°C	no	1.40 arcs/px	24 x 24 arcmin

Table II. Imaging parameters.

Session Data				
Session	Observer	2013 Sept	UT	Data Pts
1	EMA	2-3	22:22 – 02:43	101
2	EMA	3-4	22:30 – 04:00	202
3	EMA	4-5	22:43 – 02:48	139
4	EMA	8-9	23:20 – 04:02	177
5	EMA	9-10	22:32 – 04:02	207
6	EMA	10-11	22:54 – 03:12	162
7	FP	22	02:15 – 08:19	290

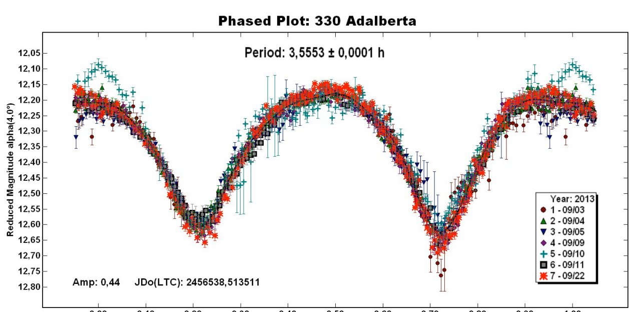
Table III. Observing Circumstances. In the Observer column, EMA is Alvarez at OLASU and FP is Pilcher at Organ Mesa.

A total of seven sessions were devoted exclusively to observing the main-belt asteroid from 2013 September 2-22. Table III summarizes the session data.

All images were dark and flat-field corrected and then measured using *MPO Canopus* (Bdw Publishing) version 10.4.0.20 with a differential photometry technique. The data were light-time corrected. Night-to-night zero point calibration was accomplished by selecting up to five comp stars with near solar colors according to recommendations by Warner (2007) and Stephens (2008). Period analysis was also done with *MPO Canopus*, which incorporates the Fourier analysis algorithm developed by Harris (Harris *et al.*, 1989).

More than 34 hours of observations and about 1,300 data points were obtained to solve the lightcurve. Over the span of observations, the phase angle varied from 3.5º to 14.3º, the phase angle bisector ecliptic longitude ranged from 335.2º to 336.8º, and the phase angle bisector ecliptic latitude from –3.3º to –4.4º. The rotation period for 330 Adalberta was determined to be 3.5553 ± 0.0001 h along with a peak-to-peak amplitude of 0.44 ± 0.04 mag. Despite its short 'potentially convenient' period, no clear evidence of a binary companion was seen in the lightcurve.

Our study now leaves only four asteroids numbered below 500 for which no rotation parameters are currently found in the literature. They are 299 Thora, 398 Admete, 457 Alleghenia, and 473 Nolli. Among the asteroids numbered from 501 to 1000, only 27 have no period that we could find. This is a dramatic reduction from two years ago (Alvarez, 2012), thus leaving only 31 asteroids among the first 1000 numbered asteroids with no previously reported rotation period. Even in cases where low numbered asteroids do have reported lightcurve parameters, not all of these period determinations are secure (Q=3) and ongoing investigations to verify, refine, or revise their values remains an important endeavor.



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PERIOD DETERMINATION OF FOUR MAIN-BELT ASTEROIDS IN MID-2013

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Observations of four main-belt asteroids (MBA) produced lightcurve parameters of: 1030 Vitja, *P* = 6.332 ± 0.001 h, *A* = 0.21 mag; 1058 Grubba, *P* = 46.30 ± 0.01 h, *A* = 0.24 mag; 1486 Marilyn, *P* = 4.568 ± 0.001 h, *A* = 0.42 mag.; and 3255 Tholen, *P* = 2.947 ± 0.001 h, *A* = 0.11 mag.

Because of prolonged periods of bad weather, only four asteroids observed during the first half of 2013 at the Bigmuskie Observatory. All of the four are main-belt members: 1030 Vitja, 1058 Grubba, 1486 Marilyn, and 3255 Tholen.

All observations were made with a Marcon 0.30-meter *f*/8 Ritchey-Chretién and SBIG ST-9 CCD camera with a pixel array of 512x512x20 microns. The combination produced a field-of-view of 15x15 arcmin and scale of 1.72 arcsec/pixel. Exposures were unguided and taken using an Astrodon R filter. *MPO Canopus* v10.4.1.9 (Warner, 2012) was used for image calibration and photometrical measurements. Night-to-night zero-point calibration was done using the Comparison Star Selector utility in *MPO Canopus* and from three to five solar-colored comparison stars from the MPOSC3 catalog supplied with *MPO Canopus*.

<u>1030 Vitja.</u> Behrend (2007) reported a period of 5.7014 h and an amplitude of 0.18 mag. After five sessions, two periods appeared reliable, but none of them is fully satisfactory. From the period spectrum, the higher probability is at *P* = 6.332 ± 0.001 h and amplitude 0.21 mag. However, scattering of the data is evident between phase 0.40-0.70. The second solution, very close to the one found by Behrend, is at *P* = 5.590 ± 0.001 h, but with a worse fit of the data and much less probability than the first one. An even worse solution is present around *P* = 7.29 h. Other solutions present in the period spectrum are only the semi-periods of the three principal periods.

<u>1058 Grubba.</u> This target shows a classical bimodal curve even if, at first, a monomodal curve seemed to be preferred. Adding further sessions showed a difference between the first and second halves of the curve. Final analysis found a lightcurve with a period *P* = 46.30 ± 0.01 h and amplitude *A* = 0.24 mag. Vesely (1985) found a period of *P* > 18 h and Behrend (2003) one of *P* > 12 h.

<u>1486 Marilyn.</u> The short period for this asteroid allowed covering more than one rotation during a single night. With two sessions spaced by two days, the resulting period is 4.568 ± 0.001 h with an amplitude of 0.42 mag. Given this amplitude and low phase angle, a bimodal solution is almost certain. The period is about double that reported by Behrend (2012).

<u>3255 Tholen.</u> This appears to be a fast rotator with small amplitude. The minimum at phase 0.90 of the curve helped to calibrate each session with the others by acting as a "stationary landmark" during the period search. The final period is 2.947 ± 0.001 h with an amplitude of 0.11 mag. This is in agreement with the results of 3 h reported by Wisniewski (1997).