

Planet	Max	Elon D	Max E	RA	Dec	Br Mag	D	Br Mag	Min Dist	D	Min Dist
1550	2014/10/09	164.3°	1h16m	- 8°	2014/10/09	13.0	2014/10/08	0.768			
2642	2014/10/10	177.5°	0h55m	+ 8°	2014/10/10	14.3	2014/10/07	0.986			
1738	2014/10/11	175.3°	1h13m	+ 2°	2014/10/11	13.6	2014/10/02	0.844			
1662	2014/10/15	174.1°	1h11m	+13°	2014/10/15	13.9	2014/10/15	1.289			
55	2014/10/18	176.9°	1h26m	+12°	2014/10/18	10.5	2014/10/16	1.376			
1463	2014/10/21	170.0°	1h27m	+19°	2014/10/21	14.0	2014/10/22	1.598			
475	2014/10/23	175.2°	1h49m	+ 6°	2014/10/22	12.8	2014/10/08	0.746			
3220	2014/10/29	177.7°	2h11m	+15°	2014/10/29	14.1	2014/10/30	0.858			
4820	2014/10/29	157.2°	1h44m	+35°	2014/11/02	13.6	2014/11/06	0.972			
2340	2014/10/30	172.1°	2h33m	+ 6°	2014/10/27	14.2	2014/10/21	0.048			
1407	2014/10/31	171.0°	2h 7m	+22°	2014/10/30	12.6	2014/10/26	1.022			
245	2014/11/03	177.0°	2h37m	+12°	2014/11/03	10.9	2014/11/01	1.514			
713	2014/11/03	179.1°	2h35m	+14°	2014/11/03	12.9	2014/10/29	1.965			
1057	2014/11/05	176.3°	2h36m	+19°	2014/11/05	13.4	2014/10/30	1.251			
10565	2014/11/05	173.7°	2h45m	+ 9°	2014/11/05	14.4	2014/11/01	1.084			
333	2014/11/06	175.4°	2h38m	+20°	2014/11/05	12.9	2014/11/02	1.685			
5176	2014/11/07	168.2°	3h 1m	+ 6°	2014/11/05	14.1	2014/10/27	0.977			
931	2014/11/08	162.7°	3h11m	- 0°	2014/11/09	12.7	2014/11/10	1.522			
1756	2014/11/12	171.1°	2h56m	+26°	2014/11/12	14.1	2014/11/08	0.998			
515	2014/11/20	177.0°	3h43m	+16°	2014/11/20	14.5	2014/11/19	1.607			
7369	2014/11/20	140.4°	1h36m	+50°	2014/11/15	14.4	2014/11/11	0.743			
503	2014/11/21	178.5°	3h49m	+18°	2014/11/21	11.9	2014/11/26	1.390			
2693	2014/11/22	179.9°	3h51m	+20°	2014/11/22	14.3	2014/11/19	0.855			
3722	2014/11/22	178.3°	3h52m	+18°	2014/11/22	14.3	2014/11/14	0.914			
2078	2014/11/26	136.3°	1h29m	+52°	2014/11/12	13.3	2014/11/07	0.639			

A PHOTOMETRIC STUDY OF 582 OLYMPIA

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The lightcurve period for asteroid 582 Olympia has been ambiguous due to its having a rotation period commensurate with the Earth's. A consortium of observers from Australia, Europe, and North America have obtained full phase coverage and find a rotation period of 36.312 ± 0.002 hours, amplitude 0.14 ± 0.02 mag. H and G parameters were computed from sparse data only and yield $H = 9.19 \pm 0.06$, $G = 0.23 \pm 0.06$.

Previous studies of the rotation period of 582 Olympia obtained the following results: Behrend (2005), 10.68 hours; Higgins *et al.* (2004), 72.0 hours; Menke (2011), 72 hours, whose observations are also included in Higgins *et al.* (2004); Schober *et al.* (1993), 36.0 hours. With a strong suggestion of an Earth-day commensurate period observers Pilcher, Ferrero, and Oey agreed to collaborate so that their wide distribution of longitudes would most likely enable full lightcurve coverage. Warner independently obtained several sessions. When they learned of each other's observations, they agreed to collaborate and combine their data. Table I lists the equipment used by each observer.

Planet	Max	Elon D	Max E	RA	Dec	Br Mag	D	Br Mag	Min Dist	D	Min Dist
104	2014/11/28	178.1°	4h12m	+22°	2014/11/28	11.6	2014/11/28	1.675			
66	2014/11/29	175.2°	4h14m	+26°	2014/11/28	11.8	2014/11/26	1.221			
481	2014/12/01	179.1°	4h31m	+22°	2014/12/01	11.1	2014/11/29	1.338			
1041	2014/12/02	176.0°	4h33m	+25°	2014/12/02	13.4	2014/11/30	1.696			
23	2014/12/03	178.7°	4h34m	+23°	2014/12/03	9.2	2014/12/10	1.205			
3960	2014/12/07	174.4°	4h52m	+17°	2014/12/07	13.6	2014/12/11	0.956			
1067	2014/12/08	169.7°	4h49m	+32°	2014/12/07	13.7	2014/12/03	1.404			
7870	2014/12/09	177.5°	5h 7m	+20°	2014/12/09	14.0	2014/11/29	0.725			
569	2014/12/10	178.4°	5h 7m	+24°	2014/12/10	12.3	2014/11/12	1.196			
598	2014/12/14	176.3°	5h26m	+19°	2014/12/14	12.1	2014/12/06	1.307			
549	2014/12/15	176.3°	5h28m	+26°	2014/12/15	12.8	2014/12/16	1.011			
81	2014/12/18	166.6°	5h44m	+36°	2014/12/17	11.4	2014/12/14	1.361			
2648	2014/12/18	177.6°	5h43m	+25°	2014/12/18	14.3	2014/12/13	0.923			
485	2014/12/24	156.0°	6h11m	- 0°	2014/12/25	11.3	2014/12/26	1.294			
1080	2014/12/27	170.4°	6h27m	+32°	2014/12/26	13.7	2014/12/20	0.887			
2290	2014/12/28	160.8°	6h19m	+ 4°	2014/12/26	14.5	2014/12/23	1.076			

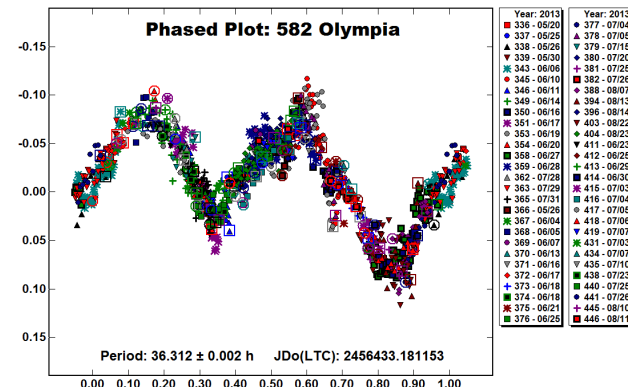
Table III. Numerical Sequence of Close Approaches

Planet	Max	Elon D	Max E	RA	Dec	Br Mag	D	Br Mag	Min Dist	D	Min Dist
2062	2014/01/03	155.9°	5h54m	+ 3°	2014/01/05	14.3	2014/01/08	0.146			
2340	2014/10/30	172.1°	2h33m	+ 6°	2014/10/27	14.2	2014/10/21	0.048			
21374	2014/05/20	151.5°	17h39m	-34°	2014/05/20	14.1	2014/05/21	0.121			
163132	2014/09/04	106.8°	3h15m	-64°	2014/08/30	13.9	2014/08/30	0.035			

Obs	Telescope	CCD
AF	0.3-m f/8 R-C	ST-9
JO	0.35-m f/5.9 SCT	ST-8XME
	0.25-m f/11 SCT	
FP	0.35-m SCT	STL-1001E
BW	0.35-m f/9.1 SCT	FLI-1001E

Table I. List of equipment used by each observer.

A total of 56 sessions obtained between 2013 May 26 and Aug 23 are included in this analysis. Sixteen other sessions were not used; generally these were of lower signal-to-noise, short duration, or not diagnostic for discriminating between alternate period solutions. Pilcher, Ferrero, and Oey measured calibration magnitudes in the R band while Warner used the V band. This caused the V band magnitudes to be about 0.5 fainter than the R band magnitudes. Furthermore, within the R band measurements, misfits of up to 0.2 magnitudes were encountered, due primarily to errors in the calibration star magnitudes. Therefore, the instrumental magnitude of each session was adjusted separately to best fit. This best fit corresponded to a bimodal lightcurve with period of 36.312 ± 0.002 hours, amplitude 0.14 ± 0.02 magnitudes. The half-period can be immediately ruled out by the asymmetry of the bimodal lightcurve. A trial plot to the double-period showed the two halves indistinguishable within the errors of measurement. Therefore, we also reject the double-period as extremely unlikely and consider the 36.312 hour period as the only one that can be supported by our observations. Trial lightcurves were also drawn for several subsets of data covering intervals of 30 to 45 days throughout the full



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 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.