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CCD PHOTOMETRY OF 1252 CELESTIA

Walter E. Worman
Dept. of Physics
Moorhead State University
Moorhead, MN 56563

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CCD observations were made of 1252 Celestia in February and March 1995 when it was at a favorable opposition. The synodic period of rotation was found to be 10.636 ± 0.015 hours and the light curve had an amplitude of 0.258 ± 0.012 magnitudes.

Introduction

The asteroid 1252 Celestia is a type S asteroid (Tholen, 1989). It is a main belt asteroid with a highly inclined orbit (~35°) and has not been identified as being a member of a family (Williams, 1989). 1252 Celestia had a favorable opposition March 7.0, 1995 (Pilcher, 1995).

Observations

The observations of 1252 Celestia reported were made at the Paul Feder Observatory which is located on the Buffalo River Site of the Moorhead State University Regional Science Center. This facility is located 15 miles east of Moorhead, Minnesota (Fargo, North Dakota) and is adjacent to the Buffalo River State Park. Data were collected the nights of February 27, February 28, and March 2, 1995. The first two nights were cold and clear with an ambient temperature of about -13° Fahrenheit. The third night was also clear and about 10° Fahrenheit.

The observatory is about two years old and has a 16-inch computer controlled Cassegrain telescope made by DFM. The associated Photometrics Star 1 CCD camera system was used to collect data. In all, 95 images were made of the asteroid during the three nights. Of these 87 were used in the analysis. Four were rejected because they were taken too close to dawn. The other four images were rejected because the asteroid image was too close to a star image.

The exposures were 5 minutes long and typically separated by 15 minutes. No filter was used. Bias and flat field corrections were made to the data as described in French and Binzel (1989). Five (or four) stars were used as magnitude standards for each image. The magnitudes were taken from the Guide 2 program (Hubble Guide Star Catalog). A least squares fit was done for each image and the relation between the magnitude and the log of the total count determined. The magnitude of the asteroid was then determined from this relationship. An aperture of 13x13 pixels was used and a 13x13 region of background nearby used for the background correction in most cases. For the others the background was taken from an annulus.

Results

Times were corrected for travel time from the asteroid to the earth and were taken to be at the center times for the images. Lightcurves were made for the three nights. Relative magnitudes from night to night were uncertain as different comparison stars

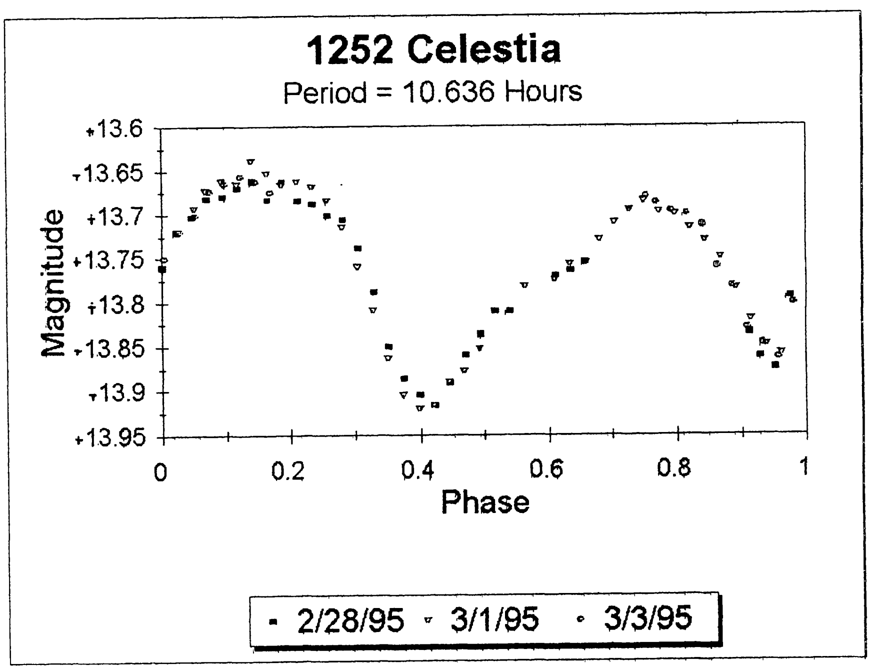

Figure 1. Phase curve for 1252 Celestia assuming a period of 10.636 hours. Zero phase at 1.7427 hours UT on March 1, 1995. The V-magnitude scale is approximate owing to the typical 0.4 magnitude uncertainty of the Hubble Guide Star Catalog.

NEW LAYOUT FOR *MPB*

We have changed the format of *Minor Planet Bulletin* from two columns per page to three. The main reason is to better accommodate tables which often require more than half but not the entire page width. An added benefit is that most figures can be larger as well. Revised "Instructions for Authors" appear later in this issue.

Your comments on the new layout are most welcome. My address appears on the last page of each issue.

–Bob Werner

were used. This was dealt with by using an additive constant for the first and another for the third night magnitudes to bring them into agreement with the second night. A single lightcurve for the three nights was then least squares fit to a Fourier series including ten harmonics. The additive constants for the first and third nights and the period were then adjusted so that the fit minimized the sum of the squares of the residuals. The resulting values were a period of 10.636 ± 0.015 hours, the additive constant for the first night was +0.048 and for the third night was +0.215. These are reasonable as the uncertainties in the Hubble Guide Star Catalog are given to be about ±0.4 magnitudes. The standard deviation of the residuals was 0.009 magnitudes which should be a good measure of the uncertainty in the relative magnitudes.

A period of 10.626 hours was assumed and the first and third night data was translated to fall on the second night data to give the composite light curve shown in Figure 1. There are clearly two maxima per period. The minima are narrow and asymmetric. The amplitude of the light curve is 0.258 ± 0.012 magnitudes. The phase angle during the observations varied between 8.80° and 9.40°.

Acknowledgments

The author would like to thank A. W. Harris and R. P. Binzel for help in getting started and R. F. Sipson for his help with some of the data analysis.

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CCD PHOTOMETRY OF 16 PSYCHE

Robert W. Brown
A. William Neely
NF/ Observatory
Rt. 15 Box 760
San Lorenzo, New Mexico, 88041

(Received: 19 June Revised: 3 August)

CCD observations of the asteroid 16 Psyche were made at the NF/Observatory at two different oppositions. Exposures were made on nine nights in May and June, 1993. Additional exposures were made on UT August 14, 1994. The spin vector was determined using the amplitude and magnitude method. The calculated pole position was found to be near ecliptic latitude 9 degrees and longitude 222 degrees. Additionally, a Vmax of 5.80 at the minimum assumed aspect angle was derived. This is 0.2 magnitude less than reported from the 1973 opposition.

Introduction

16 Psyche is a well studied main-belt asteroid listed as M-class with a rotational period of 4.196 hours. Its lightcurve amplitude varies from 0.03 to 0.42 magnitudes (Lagerkvist *et al.* 1989). Previously published pole positions for the spin vector have varied in ecliptic longitudes between 215 and 225 degrees and ecliptic latitudes from 4 to 55 degrees (Magnusson 1989). The synodic period of 16 Psyche has made observations at opposition possible only at four heliocentric longitudes; (near 70, 160, 220 and 310 degrees). This fact has increased the uncertainty on pole position calculations. Favorable data taken over ten nights at N/F Observatory possibly narrows the pole latitude solution.

Observations:

Exposures were made through a Johnson V filter on a CRAF-Cassini 1024x1024 CCD. The pixel size is 1.2 arc seconds. The chip and amplifier floor noise is 27 electrons. Full well is 100,000 electrons. The telescope is a 0.45-m Newtonian. Control of the observatory was done by radio link and has been described elsewhere (Neely 1989).

Differential photometry was used between the asteroid and comparison star within the same field. Exposures were made for 80 seconds. Data reduction and analysis was accomplished using PCVISTA (written by Michael Richmond at Berkeley). After the centroids of the asteroid and comparison stars were found, an aperture of 8 arc seconds was integrated, and an annulus was used for computing and subtracting the sky background. The V magnitudes were all transformed to the standard system.

16 Psyche was imaged with differential comparison stars on 1993 UT dates 4/27, 5/1, 5/2, 5/3, 5/11, 6/4, 6/5, 6/6 & 6/7. During this apparition, a heliocentric longitude of about 228 degrees presents the lowest lightcurve amplitude variation. Star 4383-0434 (Guide Star Catalogue) was imaged on May 3, 1993 and was used for calibration of the comparison stars. Star 4383-0434 had previously been studied for calibration of photometry for S.N. 1993j (de Vaucouleurs 1994). Accurate calibration of photometry was further insured by the negligible color difference between 16 Psyche and the calibration star. Time variable extinction was calculated by plotting a curve of the calibration star and comparison stars. Additional photometry of comparison stars in all fields were then used to calibrate instrumental V magnitude to the standard magnitude system.

On August 14, 1994 UT, 16 Psyche was imaged at heliocentric longitude 314 degrees and presented a high photometric amplitude. Calibration frames were made using Landoldt 112-275. The airmass difference between the comparison and calibration stars was negligible.

Results

The observational circumstances for the two apparitions are shown in Table I and include Vmax reduced to standard distance to determine V(1,0) using a G value of 0.21. It should be noted that on UT 5/11/93, 16 Psyche was at heliocentric longitude of 228 degrees and yielded an absolute magnitude of 5.80 which is brighter than previous measurements. It is possible that data contained within this paper represent the most favorable observational circumstances to determine Psyche's polar aspect angle.

Using data from observations cited and previously published sources, Taylor *et al.* (1976), Tedesco *et al.* (1982,1984), Lupishko *et al.* (1982), Pfleiderer *et al.* (1986), Zhou *et al.* (1982) and Weidenschilling *et al.* (1987), Psyche's pole position was calculated by the amplitude-magnitude method. A north pole longitude of about 228 degrees is in general agreement with past research. However, the north pole latitude is more difficult to determine.

Previously published pole positions vary as much as 51 degrees in latitude. Latitude designations widely vary for a number of reasons. First, the ecliptic plane and pole latitude are in apparent proximity. Due to this proximity, small errors in the variation of Vmax amplitude produces wide results using the amplitude-magnitude method. For instance, a latitude of 37 degrees could be explained by an amplitude variation of 0.07 magnitude. Additional latitudes have been derived using the epoch method. Although the epoch method has the advantage of not being phase angle dependent, two varying solutions for pole position are inherently produced.

Opportunities to gather data for the pole position of 16 Psyche have been limited due to an orbital period of 4.99 years and synodic period of about1.25 years. Using the amplitude-magnitude method demands a phase angle of <15 degrees (Magnusson *et al.* 1989). Using the epoch method, Tedesco *et al.* found a pole longitude and latitude of 223 and 37 degrees respectively, but Tedesco chose not to use data taken by Lupishko *et al.* (1982) on May 5, 1978 due to incongruities in the reported lightcurve. However, a minimum variation in amplitude of 0.03 ± 0.005 reported by this paper is in agreement with Lupishko *et al.* A solution of 8.7 ± 5 degrees in pole latitude is further strengthened by the superimposed lightcurves of three nights of data shown in Figure 1.

Finally on UT 14 August 1994, 16 Psyche offered an opposition at heliocentric longitude of 314 degrees. A V magnitude amplitude of 0.32 ± 0.05 was observed on this date. These data are published as part of a spectroscopic study of Psyche (Binzel et al. 1995). The shape of 16 Psyche was derived from this large amplitude and the minimum amplitude variation of 0.03 ± 0.005 mentioned above. The resulting axial ratios for Psyche are: a/b=1.35, b/c=1.29, a/c=1.76.

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Table I. Observational Circumstances

UT Date	Ecliptic Longitude	d	r	Phase Angle	V Max	V(1,0)
4/27/94	226° 01′	2.26	3.25	3.4°	10.56	. . .
5/01/93	226° 39′	2.25	3.25	2.8°	10.54	. . .
5/02/93	226° 49′	2.25	3.25	2.6°	10.38	. . .
5/03/93	226° 58′	2.25	3.25	2.4°	10.32	. . .
5/11/93 *	228° 14′	2.25	3.24	2.0°	10.27	5.80
6/04/93	232° 04′	2.32	3.23	9.8°	10.80	. . .
6/05/93	232° 14′	2.33	3.23	10.1°	10.78	. . .
6/06/93	232° 24′	2.34	3.23	10.5°	10.79	. . .
6/07/93	232° 33′	2.34	3.23	10.9°	10.85	. . .
8/14/94	314° 19′	1.71	2.71	2.0°	9.62	6.13

*UT 5/11/94 used for extrapolation of V(1,0)

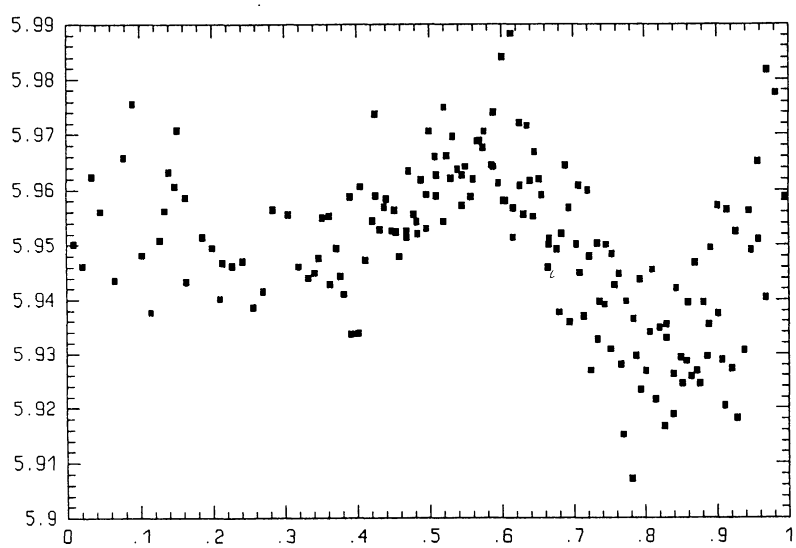

Figure 1. Low amplitude lightcurve of asteroid 16 Psyche as measured on 1993 UT Dates May 1,2, and 3. This low amplitude helps constrain the pole position of Psyche to an ecliptic latitude near 9 degrees.

PHOTOELECTRIC PHOTOMETRY OF 16 PSYCHE AND 40 HARMONIA

Frank J. Melillo
14 Glen-Hollow Drive #E16
Holtsville, NY 11742

(Received: 10 July Revised: 10 August)

Photoelectric photometry observations of asteroids 16 Psyche and 40 Harmonia were made in the second half of 1994. The observed amplitudes were about 0.35 and 0.13 magnitudes, respectively, and their measured rotation periods are consistent with their tabulated values.

Throughout mid-to-late 1994, asteroids 16 Psyche and 40 Harmonia were favorably positioned for photometry work. The photometric measurements were made at Holtsville, NY located on Long Island approximately 55 miles east of New York City. The observations were made using an Optec SSP-3 solid state photometer coupled to a 20-cm Schmidt-Cassegrain telescope. All observations reported here were made through a clear filter. The goal of these observations was to check the rotation period and lightcurve amplitudes of these asteroids.

Observations

Asteroid 16 Psyche was discovered in 1852 and has an estimated diameter of 247 km. It has an orbital period of almost exactly five years, thus presenting the same lightcurve aspect every five years. For example, Weidenschilling et al. (1987) reported observations in 1984 at nearly the same aspect. We achieved very similar results. My observations for the night of UT August 7, 1994, shown in Figure 1, reveal a surprisingly large amplitude of 0.35 magnitudes. Apparently, this date provided a very nearly equatorial aspect for observing Psyche. For the photometry, a V magnitude 7.6 comparison star was used that was located about one-half degree southwest of Psyche. Psyche's next apparition will be in November and December 1995. At that time it will have a more pole-on aspect and this author will re-observe Psyche in expectation of a minimum amplitude.

40 Harmonia was discovered in 1856 and has an estimated diameter of 112 km. The "Photometry Opportunities" column in *MPB* **21**, No. 4 listed Harmonia as a candidate for shape and pole modeling. Observations were made on UT November 26, 1994 and UT December 3, 1994 using two different comparison stars within one-half degree of Harmonia. Unfortunately the November 26 observations were cut short due to high clouds rolling in. A more reliable lightcurve was obtained on December 3. Results are shown in Figure 2. The observed amplitude is 0.15 magnitudes and the lightcurve is consistent with the published period of 9.136 hours. Observational circumstances for both asteroids are presented in Table I.

Acknowledgments

I want to thank Alan W. Harris of JPL for providing me with additional information on 16 Psyche.

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Table I

Asteroid	UT Date	R.A.(1994)	Dec.	Ecliptic Long.	Lat.	r (AU)	delta (AU)	Phase Angle
16 Psyche	Aug 7 1994	20:49	-16.04	309.6	1.58	1.71	2.72	1.61
40 Harmonia	Nov 26 1994	3:54	+16.02	59.2	-4.17	1.22	2.20	2.46
	Dec 3 1994	3:46	+15.56	57.4	-3.88	1.23	2.21	5.80

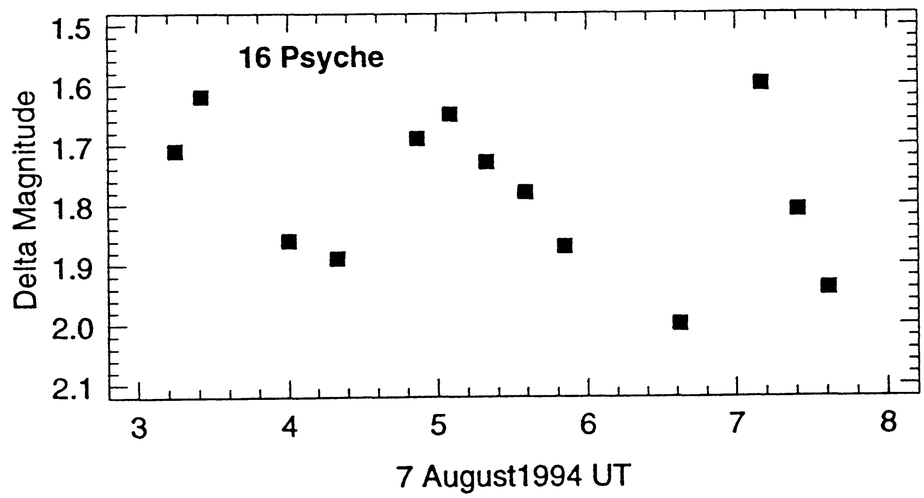

Figure 1. Photoelectric lightcurve of asteroid 16 Psyche.

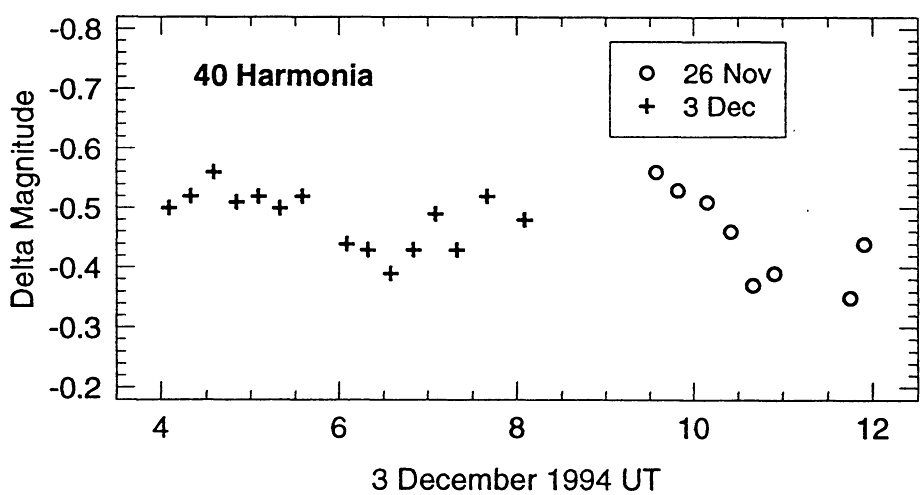

Figure 2. Photoelectric lightcurve of asteroid 40 Harmonia. The data from 26 November have been shifted in time assuming the published period of 9.136 hours. The vertical shift is arbitrary to match the levels of the maxima.

LIGHTCURVE OBSERVATIONS OF MINOR PLANETS 1508 KEMI AND 2014 VASILEVSKIS

Bill Holliday
4538 Hogan
Corpus Christi, TX 78413

(Received: 24 May Revised: 26 July)

Photometric observations of the minor planets 1508 Kemi and 2014 Vasilevskis were made in March and April 1995. For 1508, the period was found to be either 11.36 or 10.32 ± 0.2 hours. The amplitude of the lightcurve was 0.55 ± 0.07 magnitudes. For 2014, the period was found to be 36.25 hours ± 0.3 hours and the amplitude of the lightcurve was 0.30 ± 0.05 magnitudes.

Introduction

The asteroids 1508 Kemi and 2014 Vasilevskis were chosen for observation because of their favorable oppositions. For both objects, there were no published lightcurve data in the *Ephemerides of Minor Planets*. The purpose of the observations was to determine their rotation periods and lightcurve amplitudes.

Observations

Asteroids 1508 and 2014 were observed in March and April 1995 on the UT dates indicated in Table I. The table also includes their geocentric coordinates, positions of the phase angle bisector, heliocentric and geocentric distances, and phase angles. Observations were made with an SBIG ST6 CCD through a 25-cm F4.5 Newtonian telescope on a permanent mount autoguided by a separate detector. The telescope was located in Corpus Christi, Texas. For asteroid 1508, integration times were six to eight minutes, composited from three or four back to back unfiltered images. Six minute images were used on April 21 and eight minute exposures were used on other nights as the minor planet became dimmer. For 2014, the unexpected dimness of the minor planet led to integration times on all but the first night that were 12 minutes, composited from three back to back four minute unfiltered images. The first night's images had 8 minute integration times on single exposures. For all images, dark subtraction and flat fielding were done before compositing. Calibration was done using V filter images of the same fields and Astrometrica software to correlate with 6 to 10 Hubble guide stars within the image for each observing session. For 1508 on April 27, the asteroid's proximity to a close star precluded any photometric work. Unfiltered images close in time to each V filter reference image were adjusted with a calibration factor to agree with the determined magnitudes from the V filter calibrated images. Differential photometry was then performed using three arbitrary reference stars for each session.

Table I. Observational Circumstances

Date	RA (2000)	Dec	P.A.B. Long	Lat	r	d	P.A.
2014 Vasilevskis							
95/ 3/14.0	11 46.6	-15 50	181.2	-12.7	2.4395	1.4775	7.56
95/ 3/15.0	11 45.7	-15 38	181.2	-12.6	2.4364	1.4716	7.29
95/ 4/ 2.0	11 30.3	-11 22	180.8	-10.6	2.3798	1.4136	7.99
95/ 4/ 6.0	11 27.2	-10 18	180.7	-10.1	2.3671	1.4130	9.46
95/ 4/ 7.0	11 26.5	-10 2	180.7	-10.0	2.3639	1.4135	9.85
1508 Kemi							
95/ 4/21.0	12 49.0	-12 37	199.2	-5.4	2.3861	1.4035	6.59
95/ 4/26.0	12 42.7	-12 56	199.1	-6.1	2.4097	1.4465	8.93
95/ 4/28.0	12 40.4	-13 3	199.1	-6.4	2.4192	1.4655	9.82

Results

Composite lightcurves were constructed for both asteroids. For 1508, the best fit period for the data was 11.36 ± 0.2 hours and this result is shown in Figure 1. An alternative period of 10.32 ± 0.2 hours cannot be ruled out. These two solutions seemed to be the only reasonable fits to the data. The lightcurve amplitude appears to be 0.55 ±

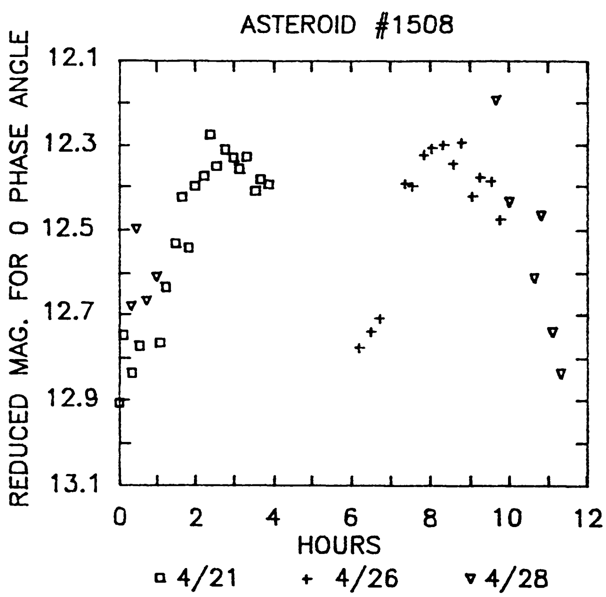

Figure 1. Composite lightcurve for asteroid 1508 Kemi based on a 11.36 hour rotation period for observations obtained April 21, 26, and 28th, 1995 UT. The ordinate is the reduced V magnitude at zero phase angle based on an assumed G value of 0.15.

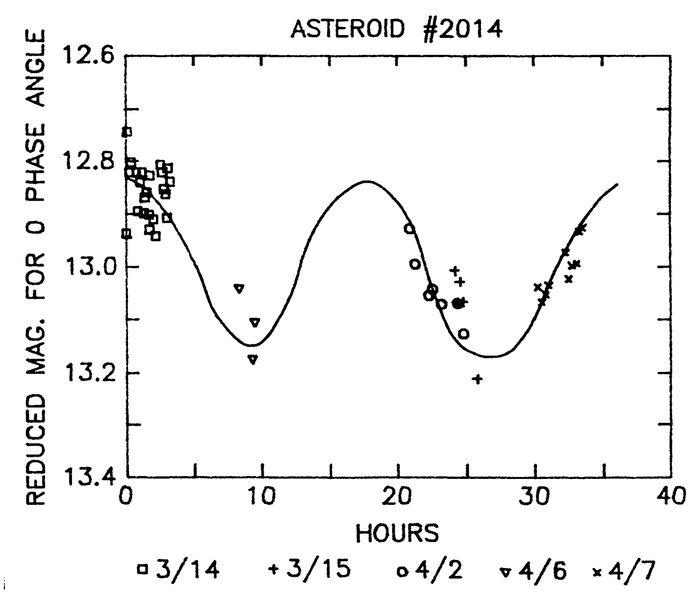

Figure 2. Composite lightcurve for asteroid 2014 Vasilevskis based on a 36.25 hour rotation period for observations obtained March 14, 15, April 2, 6, and 7th, 1995 UT. The ordinate is the reduced V magnitude at zero phase angle based on an assumed G value of 0.15.

0.07 magnitude. Although the curve for 2014 (shown in Figure 2) is fragmentary, no period other than 36.25 ± 0.3 hours fits the data very well. The composite curve indicates the lightcurve amplitude appears to be 0.30 ± 0.05 magnitudes.

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INSTRUCTIONS FOR AUTHORS

The *Minor Planet Bulletin* is open to papers on all aspects of minor planet study. Theoretical, observational, historical, review, and other topics from amateur and professional astronomers are welcome. The level of presentation should be such as to be readily understood by most amateur astronomers. The preferred language is English. All observational and theoretical papers will be reviewed by another researcher in the field prior to publication to insure that results are presented clearly and concisely. It is hoped that papers will be published within three months of receipt.

The *MPB* will not generally publish articles on instrumentation. Persons interested in details of photoelectric instrumentation should join the International Association of Amateur and Professional Photoelectric Photometers (IAPPP) and subscribe to their journal. Write to: Dr. Arnold M. Heiser, Dyer Observatory, 1000 Oman Drive, Brentwood, TN 37027. The *MPB* will carry only limited information on asteroid occultations because detailed information on observing these events is given in the *Occultation Newsletter* published by the International Occultation Timing Association (IOTA). Persons interested in subscribing to this newsletter should write to: Craig and Terri McManus, 2760 SW Jewell Ave., Topeka, KS 66611-1614.

Manuscripts

All manuscripts should be typed double-spaced and should be less than 1000 words. Longer manuscripts may be returned for revision or delayed pending available space. Manuscripts should consist of the following: a title page giving the names and addresses of all authors (editorial correspondence will be conducted with the first author unless otherwise noted), a brief abstract not exceeding four sentences, the text of the paper, acknowledgments, references, tables, figure captions, and figures. Please compile your manuscripts in this order.

In most cases, the number of tables plus figures should not exceed two. Tables should be numbered consecutively in Roman numerals, figures in Arabic numerals. We will typeset short tables. Longer tables must be neatly typed, single-spaced, on white paper with a very black ribbon to allow direct reproduction. Figures should be drawn on white paper with black ink. Labeling should be large enough to be easily readable. If possible, please supply figures at actual size. Tables and figures intended to occupy one-half page width should be 8.6 cm wide; two-thirds page width, 11.7 cm, and full-page width, 17.8 cm. Size your tables and figures to fit in two-thirds or one-half page width whenever possible. Limit the vertical extent of your figures as much as possible. In general they should be 9 cm or less.

References should be cited in the text such as Harris and Young (1980) for one or two authors or Bowell et al. (1979) for more than two authors. The reference section should list papers in alphabetical order of the first author's last name. The reference format for a journal article, book chapter, and book are as follows:

Harris, A.W., and Young, J.W. (1980). "Asteroid Rotation Rates III: 1978 Results". Icarus 43, 20-32.

Bowell, E., Gehrels, T., and Zellner, B. (1979). "Magnitudes, Colors, Types, and Adopted Diameters of the Asteroids". In *Asteroids* (T. Gehrels, Ed.), pp 1108-1129. Univ. Arizona Press, Tucson.

Wood, F.B. (1963). *Photoelectric Astronomy for Amateurs*. Macmillan, New York.

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Authors with access to Apple Macintosh or IBM compatible computers are *strongly* encouraged to submit their manuscripts on diskette or by electronic mail. Files must be saved as ASCII text files and a printed version of the file must accompany the diskette. Please label the diskette with the author's name and the type of computer (Mac, PC). When time permits, proofs of articles will be sent to authors. Submit two complete copies of the manuscript and the original tables and figures to: Dr. Richard P. Binzel, MIT 54-410, Cambridge, MA 02139, USA (Internet: rpb@astron.mit.edu).

1995MPBu...22...43H

ASTEROID PHOTOMETRY OPPORTUNITIES NOVEMBER-JANUARY

Alan W. Harris
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

Vincenzo Zappalà
Observatorio Astronomico di Torino
10025 Pino Torinese
Italy

The table below lists asteroids that come to opposition during the months of November through January that represent useful targets for photoelectric or CCD photometry observations. Observations are needed because the asteroid has either an unknown or ambiguous rotational period or because the asteroid will be observable at a very low phase angle. The table also includes asteroids which are candidates for shape and pole determinations or are targets for radar observations. The table gives (in order of opposition dates) the asteroid number and name, opposition date, opposition V magnitude, the rotational period (in hours), the estimated lightcurve amplitude (in magnitudes), and the designation PER if observations are needed to determine the rotational period. AMB implies that previous period determinations have given ambiguous results and these alternate periods are listed in the table. PHA indicates observations of the phase curve are desired because the asteroid will be at an unusually low phase angle, RAD indicates the asteroid is a planned radar target, and MOD denotes an asteroid at a critical longitude for shape and pole modeling. Question marks are used to denote uncertain or unknown values. An outline of recommended observing procedures in given in *MPB* 11, No. 1, page 7. Also recommended is the book *Solar System Photometry Handbook* published by Willmann-Bell. Ephemerides for all of the asteroids in the table are included in this issue. Finder charts for some of these asteroids may appear in the *Minor Planet Observer*. For information on this publication, contact: Brian D. Warner, Box 818, Florissant, CO 80816.

Asteroid	Opp'n Date	Opp'n V Mag	Per	Amp	
141 Lumen	Nov 7	10.9	>18?	>0.2?	PER
193 Ambrosia	Nov 30	11.5	?	?	PER
346 Hermentaria	Dec 2	10.4	28.33?	0.1?	PER
488 Kreusa	Dec 30	11.5	>28?	>0.2?	PER
487 Venetia	Jan 13	11.3	12.73	0.1	PHA
758 Mancunia	Jan 15	11.8	?	?	PER

Asteroid Photometry Opportunities

Minor Planet 141 Lumen

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Sep 25	2	52.57	+35	15.0	11.50	22.1
Oct 5	2	49.84	+36	30.7	11.31	19.0
15	2	43.50	+37	20.0	11.12	15.6
25	2	34.33	+37	36.3	10.96	12.3
Nov 4	2	23.84	+37	16.9	10.87	10.1
14	2	13.88	+36	25.3	10.91	10.3
24	2	6.15	+35	11.3	11.08	12.6
Dec 4	2	1.77	+33	47.8	11.31	15.6
14	2	1.15	+32	26.8	11.55	18.6

Minor Planet 193 Ambrosia

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Oct 25	4	33.94	+41	45.9	12.15	22.4
Nov 4	4	31.82	+43	40.6	11.91	19.2
14	4	25.12	+45	9.9	11.70	15.9
24	4	14.96	+46	1.8	11.55	13.6
Dec 4	4	3.60	+46	9.1	11.53	13.1
14	3	53.84	+45	34.2	11.63	15.0
24	3	47.94	+44	28.2	11.82	18.0
1996 Jan 3	3	47.04	+43	5.8	12.05	21.3
13	3	51.22	+41	39.9	12.30	24.3

Minor Planet 346 Hermentaria

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Oct 25	5	8.18	+16	18.0	11.30	16.4
Nov 4	5	4.35	+16	23.9	11.09	13.1
14	4	57.80	+16	31.8	10.87	9.2
24	4	49.14	+16	42.2	10.64	4.9
Dec 4	4	39.37	+16	55.8	10.46	2.0
14	4	29.69	+17	13.0	10.69	5.2
24	4	21.30	+17	34.4	10.96	9.4
1996 Jan 3	4	15.11	+18	0.7	11.21	13.1
13	4	11.67	+18	32.1	11.44	16.1

Minor Planet 487 Venetia

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Dec 4	8	7.90	+17	10.4	12.36	16.9
14	8	4.84	+17	49.4	12.16	13.7
24	7	59.00	+18	40.9	11.94	9.8
1996 Jan 3	7	50.87	+19	41.6	11.69	5.3
13	7	41.37	+20	46.6	11.36	0.6
23	7	31.69	+21	50.0	11.66	4.2
Feb 2	7	23.08	+22	47.3	11.95	8.6
12	7	16.57	+23	35.4	12.20	12.5
22	7	12.80	+24	13.6	12.44	15.7

Minor Planet 488 Kreusa

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Nov 24	7	3.36	+24	11.9	12.40	13.8
Dec 4	6	59.42	+24	59.4	12.16	10.7
14	6	52.93	+25	51.7	11.91	7.1
24	6	44.46	+26	45.1	11.64	3.2
1996 Jan 3	6	34.92	+27	35.3	11.54	2.1
13	6	25.49	+28	18.9	11.77	6.1
23	6	17.37	+28	53.9	11.98	10.0
Feb 2	6	11.50	+29	20.6	12.17	13.5
12	6	8.48	+29	40.1	12.35	16.4

Minor Planet 758 Mancunia

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
1995 Dec 4	8	17.08	+19	41.5	12.84	15.8
14	8	14.81	+20	7.6	12.65	13.0
24	8	10.01	+20	42.6	12.46	9.6
1996 Jan 3	8	3.10	+21	23.8	12.24	5.7
13	7	54.82	+22	7.3	11.98	1.5
23	7	46.15	+22	48.6	12.10	2.8
Feb 2	7	38.18	+23	24.4	12.37	6.8
12	7	31.83	+23	52.6	12.62	10.4
22	7	27.75	+24	12.5	12.84	13.4