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ROTATION PERIOD AND LIGHTCURVE OF ASTEROID 338 BUDROSA

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Photoelectric observations in V and B filters of the asteroid 338 Budrosa were made from Estación de Altura "Dr. Carlos U. Cesco" of Félix Aguilar Observatory during the 1990 apparition. The synodic rotational period, lightcurve amplitude and average B-V color found for 338 Budrosa are: P=4.6±0.1 hr, Δm=0.47±0.01, B-V=0.680±0.014. This is the first secure period reported.

Introduction

Asteroid 338 Budrosa was discovered on September 25, 1892 by A. Charlois and is listed by Tholen (1989) as an M type asteroid, and its diameter is 62.1 km (Tedesco, 1989). Lagerkvist et al. (1987) observed this minor planet in 1981 and 1984 but could not deduce a period, probably due to the small amplitude observed. During May 1990 this asteroid was favorably placed for photoelectric study. Observations of this asteroid were conducted by the authors as part of a program directed toward the study and determination of the synodic rotational periods of minor planets. The described photometric studies were conducted from Estación de Altura "Dr. Carlos U. Cesco" (ex El Leoncito Station) of Félix Aguilar Observatory (San Juan, Argentina).

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Observations

The photometric measurements were made using the V and B filters of a cooled photon-counting photometer equipped with an RCA 31034A photomultiplier tube attached to a 0.76-m Cassegrain telescope. The photometric data were recorded using a microcomputer which was interfaced with the photometer. The data were stored on a computer disk file and a hard copy was produced during each observing night.

A nearby comparison star was selected within one degree of the asteroid, thus reducing the correction of differences in atmospheric extinction to less than 0.01 magnitude. The comparison star was standardized using standard stars of the nearby Selected Area 106 Landolt (1973, 1983).

For 338 Budrosa and for both colors, 20 second photometric integrations were used on the asteroid and comparison star, and 10 seconds on the sky. The standard observing procedure followed was the same used by the authors for other asteroids (for example, Gil Hutton 1990) and the integration time and number of integrations were selected according to the method proposed by Fitzgerald and Sheldon (1982) to obtain an average uncertainty of 0.01 magnitude in both colors. Typically 4 to 6 photometric measurements of the asteroid were obtained in each color during each hour of the observing run.

Results

Photoelectric observations of this asteroid were conducted at Estación de Altura "Dr. Carlos U. Cesco" of Félix Aguilar Observatory on the night of May 31, 1990 UT, on which 22 photometric measurements were made in each color, respectively. Observational circumstances for asteroid 338 Budrosa are shown in Table I.

On the basis of the photometric data obtained during this night of observation, corrected by light-time and distance, the synodic rotational period was determined using a method proposed by Stellingwerf (1978), a generalization of the technique used by Lafler and Kinman (1965) which allows an arbitrary degree of smoothing and provides complete statistical information. This method determined that a period of 4.6±0.1 hours best conformed to the observations. This period has an excellent agreement with three of the four lightcurves provided by Lagerkvist et al. (1987). The other one has a high dispersion due probably to

bad weather during the first two hours of observation. Lightcurves for V(1,α) and B-V based upon this rotational period are shown in Figures 1 and 2, respectively. The lightcurve of 338 Budrosa shows a lightcurve amplitude of 0.47±0.01 magnitude, with two unequal maxima and two unequal minima per rotational cycle. The average B-V color of 338 Budrosa is 0.680±0.014, which is consistent with the value reported by Tedesco (1989).

Acknowledgement

The authors wish to thank Ing. José A. López and the staff of Félix Aguilar Observatory for the observing time and kindness during the course of this research program. This research program has a partial support from the Programa de Desarrollo de las Ciencias Básicas (PEDECIBA) and CONICYT (Consejo Nacional de Investigaciones Científicas y Técnicas).

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Table I. Observational circumstances for 338 Budrosa. The comparison star has coordinates RA(1950): 15h 52m, DEC(1950): -26° 36'.

Date	RA(1950) Dec	Ecliptic Lon(1950) Lat	α	Comp. Star
May 31	15h 53m -26° 38'	241.7° -06.3°	3.21°	---

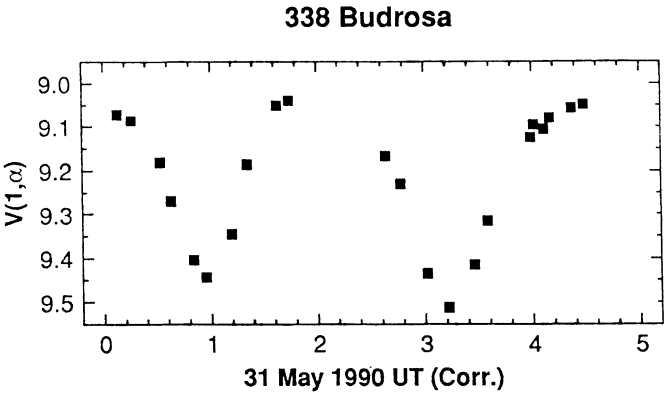

Figure 1. - V(1,α) lightcurve for 338 Budrosa.

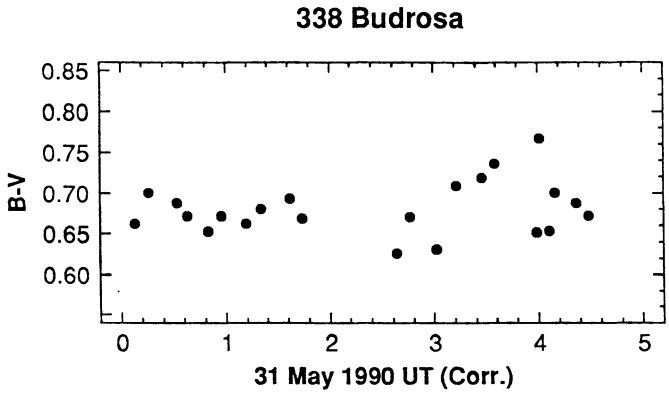

Figure 2. - (B-V) lightcurve for 338 Budrosa.

PHOTOELECTRIC PHOTOMETRY OF ASTEROID 125 LIBERATRIX

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Photoelectric observations in V and B filters of the asteroid 125 Liberatrix were made from Estación de Altura "Dr. Carlos U. Cesco" of Félix Aguilar Observatory during the 1990 apparition. The 3.97±0.1 hour synodic rotational period, and 0.695±0.014 average B-V color agree with previous determinations. The lightcurve amplitude found is Δm=0.30 ±0.01.

Introduction

Asteroid 125 Liberatrix was discovered on September 11, 1872 by P. Henry and is listed by Tholen (1989) as an M type asteroid, and its diameter is 47.5 km (Tedesco 1989). During September 1990 this asteroid was favorably placed for photoelectric study. Observations of this asteroid were conducted by the author in answer for a call made by Davis and Binzel (1987) for filling gaps in longitude coverage for large rapidly rotating asteroids. The described photometric studies were conducted from Estación de Altura "Dr. Carlos U. Cesco" (ex El Leoncito Station) of Félix Aguilar Observatory (San Juan, Argentina).

Observations

The photometric measurements were made using the V and B filters of a cooled photon-counting photometer equipped with an RCA 31034A photomultiplier tube attached to a 0.76-m Cassegrain telescope. The photometric data were recorded using a microcomputer which was interfaced with the photometer. The data were stored on a computer disk file and a hard copy was produced during each observing night.

A nearby comparison star was selected within one degree of the asteroid, thus reducing the correction of differences in atmospheric extinction to less than 0.01 magnitude. The comparison star was standardized using standard stars of the nearby Selected Area 114 Landolt (1973, 1983).

For 125 Liberatrix and for both colors, 20 second photometric integrations were used on the asteroid and comparison star, and 10 seconds on the sky. The standard observing procedure followed was the same used by the author for other asteroids (for example, Gil Hutton 1990) and the integration time and number of integrations were selected according to the method proposed by Fitzgerald and Sheldon (1982) to obtain an average uncertainty of 0.01 magnitude in both colors. Typically 4 to 6 photometric measurements of the asteroid were obtained in each color during each hour of the observing run.

Results

Photoelectric observations of this asteroid were conducted at Estación de Altura "Dr. Carlos U. Cesco" of Félix Aguilar Observatory on the night of September 18, 1990 UT, on which 28 photometric measurements were made in each color, respectively. Observational circumstances for asteroid 125 Liberatrix are shown in Table I.

On the basis of the photometric data obtained during this night of observation, corrected by light-time and distance, the synodic rotational period was determined using a method proposed by Stellingwerf (1978), a generalization of the technique used by Lafler and Kinman (1965) which allows an arbitrary degree of smoothing and provides complete statistical information. This method determined that a period of 3.97±0.1 hours best conformed to the observations. This period has an excellent agreement with previous determinations (Lagerkvist et al., 1989). Lightcurves for V(1,α) and B-V based upon this rotational period are shown in Figures 1 and 2, respectively. The lightcurve of 125 Liberatrix shows a lightcurve amplitude of 0.30±0.01 magnitude, with two unequal maxima per rotational cycle. The average B-V color of 125 Liberatrix is 0.695±0.014, which is consistent with the value reported by Tedesco (1989).

Acknowledgement

The author wishes to thank Ing. José A. López and the staff of Félix Aguilar Observatory for the observing time and kindness during the course of this research program.

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Gil Hutton, R. (1990). "V+B photoelectric Photometry of Asteroids 65 Cybele and 216 Kleopatra". MPB 17, 34.

Lafler, J., and Kinman, T. D. (1965). "An RR Lyrae Survey With the Lick 20-inch Astrograph. II. The Calculation of RR Lyrae Periods by Electronic Computer". Ap. J. Suppl. 11, 216.

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Landolt, A. U. (1983). "UBVRI Photometric Standard Stars Around the Celestial Equator". Astron. J. 88, 439-460.

Stellingwerf, R. F. (1978). "Period Determination using Phase Dispersion Minimization". Ap. J. 224, 953.

Tedesco, E. F. (1989). "Asteroid Magnitudes, UBV Colors, and IRAS Albedos and Diameters". In *Asteroids II* (R. Binzel,T. Gehrels and M. Shapley Matthews, Ed.), pp. 1090-1138. Univ. of Arizona Press, Tucson.

Tholen, D. J. (1989). "Asteroid Taxonomic Classifications". In *Asteroids II* (R. Binzel, T. Gehrels and M. Shapley Matthews, Ed.), pp. 1139-1150. Univ. of Arizona Press, Tucson.

Table I. Observational circumstances for 125 Liberatrix. The comparison star has coordinates RA(1950): 22h 42.1m, DEC(1950): -07° 35'.

		Ecliptic		
Date	RA(1950) Dec	Lon(1950) Lat	α	Comp. Star
Sept 18	22h 43m -07° 38'	339.3° 00.5°	5.64°	---

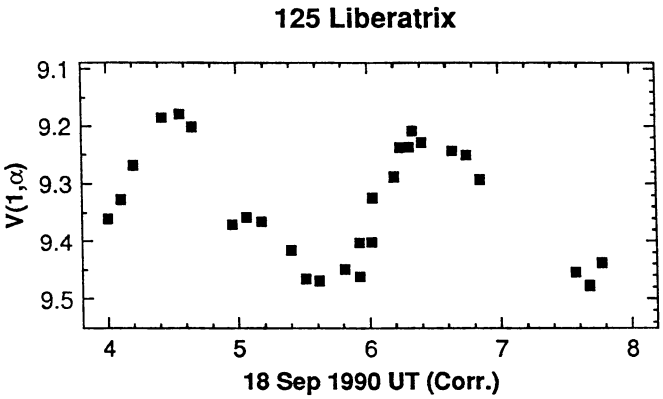

Figure 1. V(1,α) lightcurve for 125 Liberatrix.

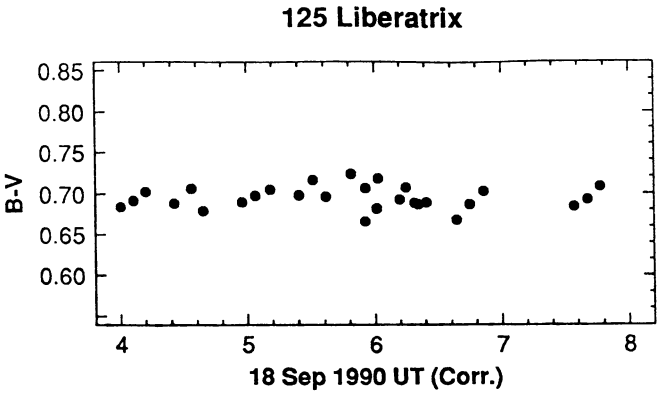

Figure 2. (B-V) lightcurve for 125 Liberatrix.

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: Mr. Robert C. Reisenweber, Rolling Ridge Observatory, P.O. Box 8125, Piscataway, New Jersey 08854. 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 McManus, 1177 Collins, Topeka, KS 66604-1524.

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. 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 after a 25 percent

reduction. Tables and figures which fit in a single column may be no wider than 11.5 cm. Double column tables and figures may be no wider than 23 cm. Constrain your tables and figures to fit in a single column whenever possible. Limit the vertical length of your figures as much as possible. In general this should be 11.5 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.

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Authors are asked to carefully comply with the above guidelines in order to minimize the time required for editorial tasks. Authors with access to Apple Macintosh or IBM compatible computers are *strongly* encouraged to submit their manuscripts on diskette. Files must be saved as ASCII text files and a printed version of the file must accompany the diskette. 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 54-426, Cambridge, MA 02139, USA.

ASTEROID NEWS NOTES

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Two-hundred-thirty-eight New Asteroids

Through the September 23 batch of Minor Planet Circulars, 238 asteroids were newly numbered since the last installment of News Notes, bringing the numbered total to 4960. Non-main-belt objects include:

(4736) Johnwood	Hungaria
(4754) Panthoos	Trojan
(4757) 1973 ST	Hilda
(4764) Joneberhart	Hungaria
(4765) Wasserburg	Hungaria
(4769) Castalia	Apollo
(4775) 1927 TC	Mars crosser
(4791) Iphidamas	Trojan
(4792) Lykaon	Trojan
(4805) Asteropaios	Trojan
(4827) Dares	Trojan
(4828) Misenus	Trojan
(4829) Sergestus	Trojan
(4832) Palinurus	Trojan
(4833) Meges	Trojan
(4834) Thoas	Trojan
(4835) 1989 BQ	Trojan
(4836) Medon	Trojan
(4867) 1989 SZ	Trojan
(4868) 1989 UN2	Hungaria
(4898) 1988 FJ	Hungaria
(4902) 1989 AN2	Trojan
(4910) 1953 PR	Mars crosser (shallow)
(4946) 1988 BW1	Trojan
(4947) 1988 TJ1	Amor
(4953) 1990 MU	Apollo
(4954) 1990 SQ	Amor
(4957) 1990 XJ	Amor

(4769) Castalia is more widely known as 1989 PB, the bifurcated object whose "picture" was taken by S. Ostro using radar.

Newly Named Unnumbered Asteroid

The number of unnumbered asteroids that have names recently increased from one to two, when IAU Commission 20 narrowly voted to give asteroid (5000) the name "IAU", temporarily waiving the requirement that names be pronounceable. The candidate names included Brancusi, Commtwenty, Demetrescu, Eminescu, Hansen, Hipparch, MPC, Pascal, and Ptolemaeus, all submitted by Commission 20 members. Interestingly, the French permutation "UAI" was not even suggested as a possible name!

The other unnumbered asteroid with a name is, of course, 1937 UB, otherwise known as Hermes, an Apollo asteroid that held the closest-approach-to-Earth record for several decades until it was broken by 1989 FC two years ago. As most MPB readers know, 1989 FC held the record only briefly; 1991 BA shattered the close-approach distance record this past January.

Unlike Hermes, IAU isn't lost. In fact, in a sense, it hasn't been found yet! But with the numbered asteroid total now at 4960, the number 5000 will be assigned to an object in either the October or November batch of MPCs, and with modern requirements for orbit accuracy in place, we can rest assured that IAU won't become lost like Hermes. So sometime before the next installment of News Notes, the number of unnumbered asteroids with names will drop back to one. We'll be sure to let you know which lucky asteroid becomes number 5000 (and the unlucky discoverer whose privilege to suggest a name has been preempted!).

Asteroid Researcher Snares Prize

The 1991 recipient of the prestigious Harold C. Urey Prize is none other than MPB editor Richard P. Binzel! This marks the second year in a row that the Urey Prize has been won by an observer of asteroids. The Prize is awarded annually by the Division for Planetary Sciences of the American Astronomical Society to recognize outstanding

achievement in planetary research by a young scientist. Rick will be giving his Prize Lecture at the 1991 DPS meeting in Palo Alto, California, the week of November 4. Congratulations!

(878) Mildred Recovered

The number of lost numbered asteroids was cut in half recently when the recovery of (878) Mildred was announced on IAU Circular 5275, dated May 25. The asteroid had been lost since its 1916 discovery opposition. G. V. Williams, a recent arrival at the Minor Planet Center in Cambridge, had identified the asteroid with objects observed on single nights in 1985 and 1991 by L. V. Zhuravleva and E. W. Elst, respectively. An important confirmation of this identification was provided by R. H. McNaught, who had already marked the faint image of an asteroid on a plate taken in 1984 as a possible candidate for Mildred. In 1987, J. Gibson remeasured the original 1916 discovery plates, so the 18 available positions are now satisfied by the new orbit with a mean residual of 0.7 arcsec.

Of course, those of us who have dealt with the University of Arizona's Space Science Series of books have known where Mildred was all along! (878) Mildred was named for the daughter of co-discoverer Harlow Shapley, and she has been an essential part of the Space Science Series for well over a decade. A special presentation was made to her during the recent "Asteroid, Comets, Meteors '91" meeting held in Flagstaff, Arizona, where she was the lowest numbered "asteroid" present.

The recovery of Mildred means that only the Mars-crossing asteroid (719) Albert remains lost among the numbered asteroids. Shortly after Williams gave his talk about the recovery of Mildred at the Flagstaff meeting, he confidently predicted that Albert would not stay lost much longer. Let's hope this prediction comes true.

Planet Crossing Asteroid Update

The frantic pace of Earth-approaching asteroid discoveries described in the last installment of News Notes did not continue, but the 14 new discoveries listed below is a respectable number indeed. May was a particularly busy month, with five discoveries over a span of seven nights. Those who subscribe to the pair discoveries theory will note that the 1991 FB and 1991 FE pair, as well as the 1991 JR and 1991 JW pair, were discovered on the same night, but at different locations; the 1991 JX and 1991 JG1 pair were discovered on the same night at the same location. To be fair, however, it should be noted that a prediscovery image of 1991 JW was found on a film taken April 19 by C. S. Shoemaker at Palomar. Continuing farther down the table, the reader will note that the 1991 RB and 1991 RC pair were discovered on consecutive nights at Siding Spring. Add 1991 FA to the 1991 FB and 1991 FE pair, and you have three objects discovered on two consecutive nights. 1991 EE was discovered only four nights before 1991 FA.

In the table below are columns containing the principal provisional designation, orbit category, estimated diameter in kilometers, discovery date, discovery instrument, and discoverer(s). Objects with diameters given as 0 are estimated to be smaller than 500 meters in diameter.

1991 EE	Apollo	1	Mar 13	Spacewatch	G-R-S
1991 FA	Amor	1	Mar 17	Spacewatch	G-R-S
1991 FB	Amor	1	Mar 18	UKST	R. H. McNaught, S. M. Hughes
1991 FE	Amor	4	Mar 18	Spacewatch	G-R-S
1991 GO	Apollo	1	Apr 11	Kitami	K. Endate, K. Watanabe
1991 JR	Amor	0	May 8	Spacewatch	J. V. Scotti
1991 JW	Apollo	0	May 8	Palomar	E. Helin, K. Lawrence, P. Rose
1991 JX	Apollo	1	May 9	Palomar	E. Helin, K. Lawrence, P. Rose
1991 JY	Aten	2	May 14	Palomar	C. & E. Shoemaker, C. Olmstead
1991 JG1	Amor	1	May 9	Palomar	E. Helin, K. Lawrence, P. Rose
1991 LH	Apollo	2	Jun 14	Spacewatch	G-R-S
1991 OA	Amor	1	Jul 16	Palomar	Holt, King, Olmstead, Petry, Skiff
1991 RB	Apollo	1	Sep 4	UKST	R. H. McNaught, S. M. Hughes
1991 RC	Apollo	2	Sep 3	UKST	McNaught, Hughes, Russell

The following abbreviations were used for the discovery instrument:

Kitami	(no details given in IAU Circular)
Palomar	Palomar 18" Schmidt telescope
Spacewatch	Spacewatch Camera 36" scanning telescope on Kitt Peak
UKST	United Kingdom Schmidt Telescope at Siding Spring

The fainter discoveries made by the Spacewatch Camera are not being routinely reported in IAU Circulars, so the discoverer of an object is a piece of information that isn't always immediately available. The Spacewatch team consists of T. Gehrels, D. Rabinowitz, and J. Scotti, which is simply abbreviated G-R-S in the table above.

1991 DA, the Jupiter and Saturn crosser mentioned in the last installment of News Notes, has had its orbit determination improved sufficiently to show that it is also a Mars and Uranus crosser! The semimajor axis is now known to be 11.87 astronomical units, and the eccentricity is 0.87. The orbital inclination is also a whopping 62 degrees. Some extremely deep CCD images of this object were obtained by R. West to extend the search for coma down to levels fainter than those reached by J. English and K. Freeman; none was found, so 1991 DA retains its asteroid designation. This 8 km-sized object is truly remarkable. One can only guess at how much similar debris is scattered throughout the Solar System.

PHOTOELECTRIC PHOTOMETRY OPPORTUNITIES NOVEMBER - JANUARY

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The table below lists asteroids which come to opposition during the months of November through January that represent useful targets for photoelectric 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 pole determinations (see the article by Di Martino and Zappalà in issue 12, No. 1), are targets for radar observations (see the article by Ostro in *MPB* 10, No. 4), or are subjects for shape modelling (see the article by Davis and Binzel in *MPB* 14, No. 3). 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, POL indicates the asteroid is a pole position candidate, RAD indicates the asteroid is a planned radar target, and MOD denotes an asteroid at a critical longitude for shape modelling. 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* (see the review by Tholen in *MPB* 11, No. 4). 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	
10 Hygiea	Nov 14	10.2	17.50	0.1	PHA
22 Kalliope	Dec 6	9.8	4.148	0.2	PHA
50 Virginia	Dec 5	11.4	>24?	0.2?	PER
704 Interamnia	Dec 29	9.9	8.727	0.1	PHA

Photoelectric Photometry Opportunities

DATE	R.A. (1950) HR MIN	DEC. DEG MIN	MAG V	PHASE ANGLE
Minor Planet 10 Hygiea				
1991 Oct 6	3 38.41	+23 42.7	11.00	11.9
16	3 34.00	+23 32.9	10.83	9.5
26	3 27.80	+23 14.1	10.65	6.7
Nov 5	3 20.29	+22 46.9	10.46	3.6
15	3 12.14	+22 12.7	10.28	1.2
25	3 4.14	+21 34.3	10.46	3.5
Dec 5	2 57.02	+20 55.2	10.66	6.6
15	2 51.41	+20 19.2	10.85	9.4
25	2 47.68	+19 49.5	11.02	11.8
Minor Planet 22 Kalliope				
1991 Oct 26	5 20.88	+22 37.0	10.76	16.7
Nov 5	5 17.64	+23 23.2	10.56	13.7
15	5 11.46	+24 10.3	10.34	10.0
25	5 2.80	+24 55.9	10.12	5.8
Dec 5	4 52.54	+25 37.2	9.87	1.6
15	4 41.93	+26 12.3	10.02	3.8
25	4 32.29	+26 41.1	10.26	8.1
1992 Jan 4	4 24.75	+27 5.1	10.49	12.0
14	4 20.03	+27 26.8	10.71	15.2
Minor Planet 50 Virginia				
1991 Oct 26	5 11.91	+18 41.7	12.17	21.2
Nov 5	5 9.31	+18 16.7	11.97	16.9
15	5 3.16	+17 50.7	11.76	11.8
25	4 54.37	+17 25.6	11.54	6.4
Dec 5	4 44.36	+17 4.1	11.38	2.4
15	4 34.80	+16 49.1	11.69	6.1
25	4 27.14	+16 43.0	12.05	10.9
1992 Jan 4	4 22.34	+16 47.1	12.38	15.2
14	4 20.79	+17 1.2	12.69	18.6
Minor Planet 704 Interamnia				
1991 Nov 15	7 2.41	+27 44.4	11.00	15.8
25	6 58.64	+27 14.2	10.81	13.1
Dec 5	6 52.17	+26 41.2	10.60	9.8
15	6 43.51	+26 4.3	10.36	6.0
25	6 33.53	+25 22.6	10.08	2.0
1992 Jan 4	6 23.32	+24 36.8	10.14	2.4
14	6 13.98	+23 48.7	10.47	6.3
24	6 6.45	+23 1.0	10.74	9.8
Feb 3	6 1.30	+22 16.2	10.99	12.8