THE MINOR PLANET BULLETIN

BULLETIN OF THE MINOR PLANETS SECTION OF THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

VOLUME 21, NUMBER 4, A.D. 1994 OCTOBER-DECEMBER

CCD PHOTOMETRY OF ASTEROID 480 HANSA

Ernest H. Richmond
and A. William Neely
NF/ Observatory
Rt. 15, Box 760
San Lorenzo, NM 88041
EMAIL NFO@silver.wnmu.edu

(Received: 17 May Revised: 26 July)

CCD observations in V, R, and I of the asteroid 480 Hansa were made at the NF/ Observatory during its 1993 apparition. The synodic rotational period was found to be 16.22 ± 0.08 hours, assuming a lightcurve with 2 maxima per rotation. The lightcurve amplitude was 0.39 ± 0.02 mag.

Introduction

Asteroid 480 Hansa is listed as a type S asteroid (Tholen, 1989). It has an estimated diameter of 58km ± 3.5km and albedo of 0.17 with an absolute magnitude of 8.71 (Tedesco, 1989). During early December of 1993 the asteroid was in favorable position and phase for observation. The photometric studies were conducted at the NF/ Observatory located at Silver City, NM.

Observations

The CCD exposures were made through a Johnson V filter on a CRAF-Cassini 1024x1024 CCD. The frame size is decreased in software, normally allowing transfer of a 512x512 pixel image. The pixel size is 1.2 arc seconds. The chip and amplifier noise is 27 electrons. Full well is 100,000 electrons. The telescope is a 0.45m Newtonian. Control of the observatory was by digital radio link, and has been described elsewhere (Neely, 1989). The images were stored on tape and analyzed with PCVISTA (written by Michael Richmond at Berkley). After the centroids of the asteroid and comparison stars were found, an aperture of 8 arcseconds was integrated, then an annulus was subtracted for the sky.

The comparison and check stars were within the frame of the CCD image. This reduced the differential atmospheric extinction to negligible levels and allowed data collection on nights with marginal seeing. The uncertainties were primarily related to the brightness of the comparison stars. Since the field is only 10 arc-minutes, well-matched comparisons are a matter of luck. The uncertainties on a given night were between 0.02 and 0.04 magnitudes. The comparison stars were calibrated with a star in Landolt group 95, star 101 (Landolt, 1983), for UT December1, 2, 4, 5 and 6th. All-sky photometry was done to determine a first order extinction term to correct for airmass differences. The Landolt field was imaged at zero hour angle to minimize airmass and extinction corrections. The asteroid magnitudes were averaged and referenced to the calibrated comparison stars to calculate a V magnitude for the asteroid. The uncertainties were 0.02 mag.

240 second integrations were obtained for all data points. Dark, bias, and flat fields were taken at the beginning of the night. Approximately 60 exposures were taken each night. The dark and bias fields were subtracted at the time of readout and the frame was flatfielded before being stored on tape for later analysis. All of the flatfields were "twilight flats."

Results

CCD observations of the asteroid were made on 1993 UT dates: December 1, 2, 4, 5 and 6th. Observational circumstances for 480 Hansa are shown in Table 1.

The synodic rotational period was calculated using three different methods of analysis. The first method used was a modeling method where we assumed the asteroid to be a perfect elliptoid shape. This method would approximate a lightcurve with two minima and two maxima.

The second method involved binning the data (Stellingwerf, 1978). We started with an approximation to the period and split the data up into a number of evenly spaced bins. We then calculated the variance of each bin and compared this to the overall variance of the data. The period with the least amount of scatter is said to be the true period.

The third method involved shifting the data with respect to itself using a variation of the auto-correlation method done in time series analysis. Let k be a range of guesses for the period, and m be the magnitudes. Then for each k, the correlation coefficient between a rearrangement of the data and the set {m1,m2,...,mn} is computed. The value of k which produces the highest correlation coefficient is used to compute the period.

These methods determined a period of 16.22 hours ± 0.08 hours with two unequal maxima per rotation.

This value is consistent with other observations of 480 Hansa reported by DeYoung (1994).

Acknowledgments

This work was supported by a grant from the Theodore Dunham Jr, Fund for Astronomical Research. Special thanks to Al Arasteh, WNMU Univ., Silver City, N. M. for his derivation of the auto-correlation method.

References

DeYoung, J. A. (1994). "The Light Curve and Period of the S-type Minor Planet 480 Hansa". Minor Plan. Bull. 21, 33.

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

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

Tedesco, E. P. (1989), "Asteroid Magnitudes, UBV Colors, and IRAS Albedos and Diameters". In *Asteroids II* (R. Binzel, T. Gehrels, and M. Shapley Matthew's, Ed.), pp. 1090-1138. University of Arizona Press, Tucson.

Tholen, D. J. (1989). "Asteroid Taxonomic Classifications". In *Asteroids II* (R. Binzel, T. Gehrels, and M. Shapley Matthew's, Ed.), pp. 1139-1150. University of Arizona Press, Tucson.

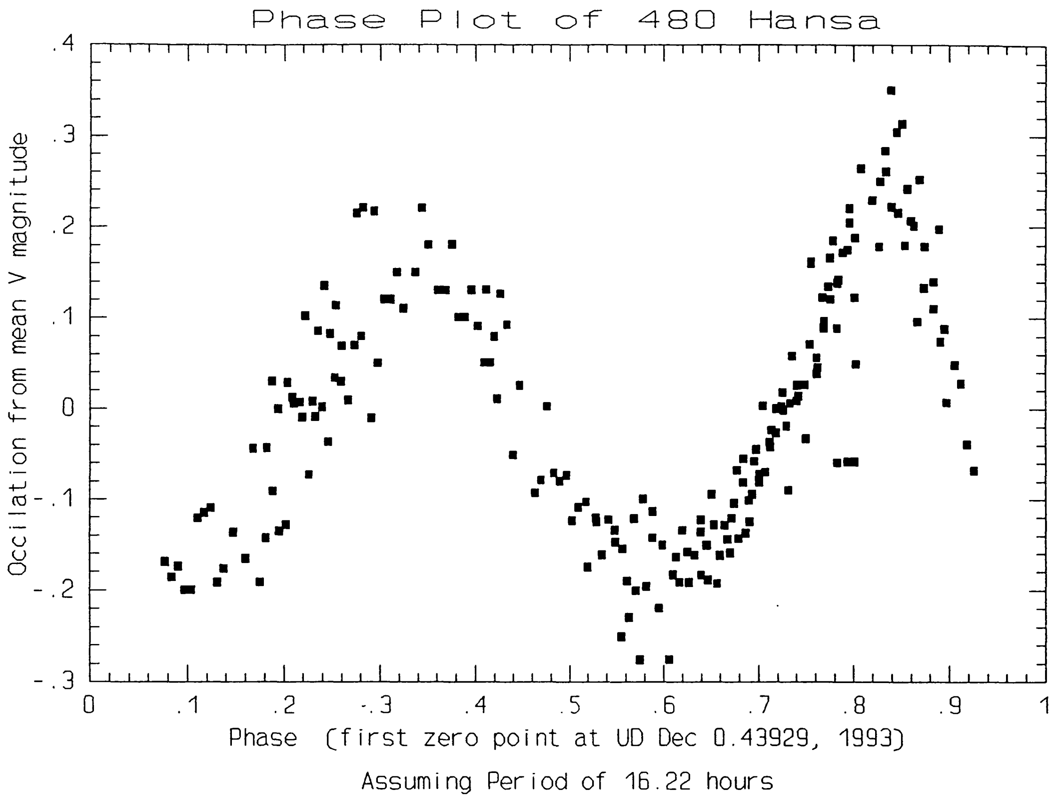

Table I. Observational circumstances for 480 Hansa

Date	Long	RA (2000)	Dec	AU to Earth	Ph	Vmag*
12/01/93	77 36	05 32.3	10 57	1.569	7.3	8.97
12/02/93	77 47	05 31.1	10 45	1.565	7.0	8.75
12/04/93	78 15	05 29.2	10 24	1.561	6.3	8.80
12/05/93	78 30	05 28.2	10 14	1.559	6.2	8.75
12/06/93	78 44	05 27.3	10 04	1.558	6.1	8.74

* maximum magnitude for night calibrated to group 95, star 101 ± 0.02. Vmag = absolute Vmag @max(reduced)

PHOTOGRAPHIC POSITIONS OF MINOR PLANETS

Saverio Arlia
Gustavo D. Rodriguez
gustavor@aaaa.org.ar (Internet)
Seccion Sistema Solar
Asociacion Argentina Amigos de la Astronomia
Av. Patricias Argentinas 550
1405 - Buenos Aires Argentina

(Received: 18 July Revised: 11 August)

Photographic positions of six asteroids were obtained from 17 exposures taken at Asociacion Argentina Amigos de la Astronomia (AAAA). Mean standard deviations of ±1.012 arcsec in R.A. and of ± 0.927 arcsec in Declination were derived for the positions calculated. These results were incorporated into a larger astrometric program which is being developed at Observatorio Astronomico de Mercedes.

Observations

During the period May 1993 - May 1994 the asteroids 40 Harmonia, 43 Ariadne, 47 Aglaja, 516 Amherstia, 532 Herculina and 804 Hispania were favorably placed for being photographed. The program of Astrometric Studies of Comets and Asteroids was begun in 1990 at Observatorio Astronomico de Mercedes. The first results of this program were obtained for comet Levy 1990c by Rodriguez et. al. (1991). We present results from recent photographic observations which were conducted by the Asociacion Argentina Amigos de la Astronomia.

For these six asteroids we obtained 17 positions for the period 22 May 1993 to 19 May 1994. All photographs were taken by S. Arlia using Kodak Tri-X pan film with a 0.10-m Newtonian reflector of 0.86-m focal length (f8.6). The telescope coordinates are: Latitude -34° 37' 48" and Longitude 58° 32' 12" W, elevation 24 meters.

Results

In measuring each photograph, we selected from 4 to 8 SAO stars. In the selection process we have taken into account their proper motions, the proximity with respect to the asteroid and their symmetric distribution around it in all directions to reduce the errors caused by differential refraction and by the objective aberrations. The measurements were made using the Zeiss electronic plate measuring machine of the Facultad de Ciencias Astronomicas y Geofisicas (Universidad Nacional de La Plata) which can reach a precision of ± 0.0005 mm. For the 17 photographs, all measurements were processed using the plate constants method using the Observatorio Astronomico de Mercedes software. It employs the calculation algorithms proposed by P. Van de Kamp (1967) and W. Smart (1966). The final results were analyzed at the Departamento de Astrometria of the Facultad de Ciencias Astronomicas y Geofisicas (Universidad Nacional de La Plata) by G. Rodriguez. The positions obtained for these asteroids are shown in Table I. The photographs taken have a typical uncertainty of ± 1.012" for R.A. and of ± 0.927" for Declination. Included in the Table are the estimated uncertainties for each measurement in arcseconds and the number of SAO stars used in the solution.

Acknowledgment

The authors wishes to thank Lic. Raul Perdomo and the staff of the Departamento de Astrometria of Facultad de Ciencias Astronomicas y Geofisicas (Universidad Nacional de La Plata) for the time and kindness during the course of this research program, and to Ricardo Gil-Hutton of Observatorio Astronomico Felix Aguilar for his useful suggestions.

References

Konig, A. (1962). "Astrometry With Astrograph". In *Astronomical Techniques: Stars and Stellar Systems II* (W.A. Hiltner, Ed.), pp. 461-486. Univ. of Chicago Press, Chicago.

Rodriguez, G.D., Mackintosh, R., and Lopez, J. (1991). "Astrometria Fotografica del Cometa Levy 1990c". Universo 38 (4th Convencion Regional de Observadores de la LIADA), 62-71

Smart, W.M. (1966). *Text Book on Spherical Astronomy.* Cambridge University Press, Cambridge.

Van de Kamp, P. (1967). *Principles of Astrometry.* W.H. Freeman and Co., San Francisco.

TABLE I. Astrometric Measurements

MINOR PLANET	DATE	R.A. (1950.0) h m sec	DECL. ° ' "	UNCERTAINTIES (")	(")	#*
00040	1993 08 14.96117	16 36 44.93	-22 18 37.2	.19	1.30	4
00040	1993 08 24.01134	16 43 47.00	-22 44 02.2	.84	.70	5
00040	1993 09 03.96181	16 54 58.91	-23 17 42.5	.13	1.55	5
00043	1994 02 18.15710	10 06 08.70	+05 56 26.7	.43	.64	6
00047	1993 05 22.14421	16 26 18.95	-28 51 11.2	.85	.52	5
00047	1993 05 25.11076	16 23 31.56	-28 49 24.6	1.30	1.17	6
00516	1994 04 13.14130	15 00 50.46	-40 58 28.0	1.87	.39	7
00516	1994 04 18.09777	14 57 51.64	-41 40 49.9	1.34	1.33	6
00516	1994 04 23.11848	14 54 01.50	-42 14 58.0	.47	.91	6
00516	1994 05 06.11993	14 41 38.95	-42 55 29.2	1.18	.73	6
00516	1994 05 19.11292	14 29 17.47	-42 25 49.7	.82	.90	8
00532	1993 09 08.09363	22 49 52.60	-27 06 06.4	2.08	.85	5
00804	1993 08 18.08547	21 30 21.62	-27 45 00.5	1.09	1.08	6
00804	1993 08 20.11441	21 28 09.53	-27 38 43.4	1.20	.78	5
00804	1993 09 06.02881	21 12 19.59	-26 18 06.8	1.28	2.00	5
00804	1993 09 12.98807	21 07 47.95	-25 32 14.2	1.49	.65	6

VISUAL PHOTOMETRY OF 23 THALIA

Sergio Foglia
Osservatorio Astronomico "Serafino Zani"
Via F. Bisleri 11
20148 Milan
Italy

(Received: 17 May Revised: 8 August)

Visual photometry observations of asteroid 23 Thalia were made during January and February 1994. The lightcurve obtained is similar to previous photoelectric results.

In February 1994, the asteroid 23 Thalia reached a favorable opposition. At this time, the asteroid passed near the variable star R Leo Minoris. Using the established comparison stars for that variable star, it was possible to visually monitor the lightcurve variation of 23 Thalia. This proved to be a challenge because of the characteristics of this asteroid's rotation: period = 12.308 hours, lightcurve amplitude = 0.10 to 0.18 magnitudes. Because the period is nearly commensurate with 24 hours, observations made at a particular time on a given night fall at a rotational phase only 0.05 different from the previous night. Thus observations were necessary over many nights to monitor the entire rotational lightcurve of the asteroid.

Visual estimates of the magnitude of 23 Thalia were made over the period of January 29 to February 21, 1994 UT by the author and Mr. Sandro Baroni. Each magnitude estimate was reduced to a V(1,0) magnitude using the relation found in the 1994 *Ephemerides for Minor Planets*, where we assumed a G value of 0.15. Values for the heliocentric and geocentric distances and the solar phase angle were computed using a program written by Roberto Serpilli.

Figure 1 shows the variation in the V(1,0) magnitude of asteroid 23 Thalia reduced to rotational phase using the known period. The obtained lightcurve is similar to those obtained photoelectrically in 1987 and 1991 and presented in the Asteroid Photometric Catalog.

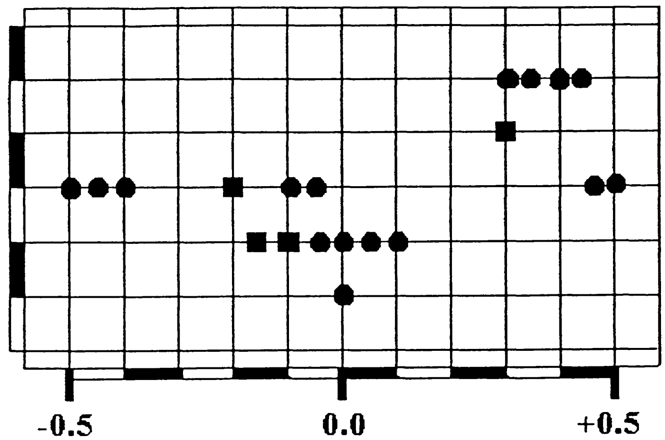

Figure 1. The rotation lightcurve of asteroid 23 Thalia as determined through visual magnitude estimates by the author (circles) and Mr. Sandro Baroni (squares). The abscissa gives the rotational phase of the asteroid while the ordinate gives the brightness estimates at intervals of 0.1 magnitude.

PRECISE ASTROMETRIC POSITIONS OF MINOR PLANETS

Stephen Mc Andrew
2/32 Twin Rd.
North Ryde N.S.W. 2113
Australia

(Received: 18 July)

Precise photographic astrometric positions of minor planets 30 Urania and 945 Barcelona are presented.

Films were exposed with a 20 cm f/4 astrograph and the negatives measured with a Hilger long screw measuring engine. On each film positions of the minor planet and 7 reference stars were repeated three times. The plate hold was turned through 90 degrees and three more readings of each were taken. This procedure was repeated for two more successive rotations of 90 degrees so that six values for the positions along each of the X and Y axes were obtained. The average of these individual measurements was taken. In all measurements the screw advanced consistently in the same direction so that no backlash occurred.

The reduction was carried out using a Fortran computer program which I wrote earlier this year. The program is based on the method described by Jeremy B. Tatum (1982). The output is modeled on that of the reduction program by J. D. Marche (1990). The program calculates the focal length of the f/4 astrograph from the measured X and Y positions and the RA and DEC of pairs of reference stars. This focal length is the average of all of the focal lengths calculated using the pairs of reference stars. Residuals are then listed which are the differences between the measured X and Y values and the X and Y values calculated using plate constants.

References

Marche, J. D. (1990). *Sky and Telescope* 80, 71.

Tatum, J. B. (1982). *JRASC* 76, 97.

Observatory coordinates: Longitude 151° 7' 24.9" E, Latitude -33° 48' 23.4", Altitude 63m above sea level. Observations and their standard deviations are:

Planet	UT	R (J2000.0)	Dec
30	1993 12 23.48596	$5^h40^m20.57^s$ ± 0.05s	+25°48'44.3" ± 0.9"
945	1994 3 02.51192	10 04 33.95 ± 0.29	-12 21 26.2 ± 3.1

NOTICE TO ASTROMETRY CONTRIBUTORS

Frederick Pilcher
Illinois College
Jacksonville, IL 62650

Richard P. Binzel
MIT 54-410
Cambridge, MA 02139

It is with great satisfaction that we note the continuing increase in contributions of amateur astrometric measurements of minor planets. For the purpose of routinely handling these observations and to help maximize their scientific value, we communicate the following recommendations made in the 1994 July 22 *Minor Planet Circulars:* "Greatest efficiency is achieved when observations of specific objects are made on each of two [or, if feasible, several] nights. This recommendation applies to comets, as well as numbered and unnumbered minor planets. There is no need to make more than two (or three) observations of a specific object on the same night, unless the object has just been discovered, is close to the earth, and the observations cover several hours. Observers are also advised that submissions made on paper are also subject to delays, and those who continue to use this means to report observations to the Minor Planet Center are urged to investigate the possibility of using e-mail."

Because all astrometric observations submitted to the *Minor Planet Bulletin* are now routinely forwarded to the Minor Planet Center for an evaluation of their residuals, we now request (but do not require) that all future astrometric measurements submitted for publication in the *Minor Planet Bulletin* be sent in an electronic format either by electronic mail (rpb@astron.mit.edu) or in an ASCII file on a diskette readable by an IBM-PC compatible or Apple Macintosh computer. Table I gives an example of the requested format for observations submitted to the *Minor Planet Bulletin*, where this format is consistent with the format required by the Minor Planet Center. A description of the format for numbered minor planets follows below. Observers are reminded to clearly communicate the geographic coordinates and elevation of their observatory and clearly state the equator and equinox for their coordinates.

Columns 1-5. The minor planet number. Note the use of leading zeros.

Columns 16-31. The Universal Time corresponding to the minor planet's position. The time consists of the year [space] month [space] and decimal date. If time precision does not merit five decimal places, leave trailing decimals blank (rather than adding zeros).

Columns 33-44. Right ascension. J2000.0 is preferred by the Minor Planet Center, but coordinates with other epochs may be submitted if the alternate epoch is clearly stated in the accompanying description. The format is hours [space] minutes [space] and decimal seconds. If measurement precision does not merit three decimal places, leave trailing decimals blank (rather than adding zeros).

Columns 45-56. Declination. J2000.0 is preferred by the Minor Planet Center, but coordinates with other epochs may be submitted if the alternate epoch is clearly stated in the accompanying description. The format is degrees (always give preceding + or -) [space] arcminutes [space] and decimal arcseconds. If measurement precision does not merit two decimal places, leave trailing decimals blank (rather than adding zeros).

Columns 59-63. Uncertainty in right ascension measurement. This value should be given in arcseconds.

Columns 65-69. Uncertainty in declination measurement. This value should be given in arcseconds.

Table I. Requested electronic format for submission of astrometry measurements to the *Minor Planet Bulletin.*

```
Minor                                                      Uncertainties
Planet             U.T.         R.A. (2000.0) Decl.          (")     (")
00047          1993 05 22.14421 16 29 26.69 -28 57 43.3     0.85   0.52
00047          1993 05 25.11076 16 26 39.08 -28 56 07.9     1.30   1.17
00516          1994 04 13.14130 15 04 05.85 -41 10 09.1     1.87   0.39
00516          1994 04 18.09777 15 01 07.54 -41 52 40.2     1.34   1.33
00804          1993 08 18.08547 21 33 16.48 -27 31 40.6     1.09   1.08
00804          1993 08 20.11441 21 31 04.57 -27 25 29.3     1.20   0.80
123456789012345678901234567890123456789012345678901234567890123456789
----------------------------Column Guide-----------------------------
```

PHOTOELECTRIC 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 which 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 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	
263 Dresda	Nov 10	14.0	14.32	0.3	MOD
76 Freia	Nov 15	11.8	9.972	0.2	PHA
40 Harmonia	Nov 24	9.4	9.136	0.2	MOD
4 Vesta	Dec 25	6.3	5.342	0.1	PHA+HST
17 Thetis	Jan 7	11.4	12.275	0.2	MOD

Photoelectric Photometry Opportunities

For this issue, special attention is called to 4 Vesta. Although its lightcurve has been very well observed in the past, the December opposition offers two new scientific opportunities. The first is that Vesta will reach a low phase angle of 0.8 degrees on December 25, making it a valuable target for phase curve studies for observers with the capability to achieve 0.005 magnitude photometric precision. Secondly, Vesta is scheduled for observations with the Hubble Space Telescope in an effort to map its surface. A lightcurve in December will be very useful for correlating specific regions mapped on Vesta with its lightcurve extrema. Observers interested in coordinating Vesta lightcurve observations with the Hubble Space Telescope should contact Richard P. Binzel, MIT 54-410, Cambridge, MA 02139.

DATE	R.A. (2000) HR	MIN	DEC. DEG	MIN	MAG V	PHASE ANGLE
Minor Planet 4 Vesta						
1994 Nov 19	6	43.95	+19	37.8	7.14	15.5
29	6	38.57	+19	58.0	6.93	12.0
Dec 9	6	30.37	+20	24.0	6.72	7.8
19	6	20.09	+20	53.7	6.48	3.1
29	6	8.87	+21	24.5	6.42	2.1
1995 Jan 8	5	58.08	+21	54.5	6.65	6.8
18	5	49.02	+22	22.5	6.86	11.1
28	5	42.63	+22	48.6	7.06	14.9
Feb 7	5	39.40	+23	13.2	7.25	17.9
Minor Planet 17 Thetis						
1994 Nov 29	7	33.00	+17	59.9	12.32	14.6
Dec 9	7	28.12	+18	15.4	12.10	11.5
19	7	20.69	+18	38.7	11.86	7.8
29	7	11.32	+19	8.1	11.60	3.6
1995 Jan 8	7	0.94	+19	40.6	11.43	1.5
18	6	50.72	+20	13.6	11.70	5.6
28	6	41.81	+20	44.7	11.93	9.6
Feb 7	6	35.13	+21	12.8	12.14	13.2
17	6	31.21	+21	37.4	12.34	16.2
Minor Planet 40 Harmonia						
1994 Oct 10	4	28.73	+16	55.1	10.50	21.0
20	4	26.92	+16	48.8	10.26	17.5
30	4	21.58	+16	38.6	10.01	13.2
Nov 9	4	13.15	+16	25.8	9.75	8.2
19	4	2.62	+16	12.3	9.46	3.1
29	3	51.46	+16	0.9	9.52	3.8
Dec 9	3	41.29	+15	55.3	9.83	8.9
19	3	33.44	+15	58.4	10.12	13.6
29	3	28.75	+16	12.2	10.39	17.7
Minor Planet 76 Freia						
1994 Oct 10	3	47.89	+18	53.7	12.80	12.8
20	3	44.18	+18	33.4	12.59	9.9
30	3	38.47	+18	6.3	12.36	6.6
Nov 9	3	31.29	+17	34.0	12.10	2.8
19	3	23.44	+16	59.1	11.96	1.3
29	3	15.82	+16	25.2	12.22	5.2
Dec 9	3	9.30	+15	56.1	12.42	8.8
19	3	4.59	+15	35.0	12.61	12.1
29	3	2.09	+15	24.1	12.79	14.7
Minor Planet 263 Dresda						
1994 Sep 30	3	25.22	+18	39.8	14.77	15.9
Oct 10	3	22.11	+18	23.3	14.57	12.8
20	3	16.51	+17	56.8	14.35	9.1
30	3	8.99	+17	21.8	14.11	4.9
Nov 9	3	0.43	+16	41.3	13.77	0.4
19	2	51.89	+15	59.7	14.08	4.1
29	2	44.43	+15	22.2	14.35	8.3
Dec 9	2	38.88	+14	53.2	14.59	12.0
19	2	35.76	+14	35.8	14.81	15.1

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. 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.

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

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 54-410 Cambridge, MA 02139, USA.