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27.

THE 1992 CLOSE APPROACH BY 4179 TOUTATIS: A CALL FOR OBSERVATIONS

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On 1992 December 8, the near-Earth asteroid 4179 Toutatis will pass within 0.024 AU of the Earth, a distance of less than 10 times that of the Moon. As reported by Sicoli and Cavagna (*MPB* 19, No. 2, page 17), Toutatis will not make an encounter closer than this one until 2004. Thus this apparition marks a good chance for observers to see this small minor planet, estimated to be only about 3 km in diameter. During its close approach, observers who locate Toutatis or capture it on film should be able to detect its motion or record a trail within a few minutes.

Unfortunately, Toutatis will most likely be substantially fainter than was originally predicted. A recent analysis of Toutatis observations obtained after its discovery in 1989 (its preliminary designation was 1989 AC) suggests that it will be about 1.4 magnitudes fainter than originally estimated. Its absolute magnitude (H) is probably closer to a value of 15.4, rather than the value of 14.0 tabulated in the *Ephemerides of Minor Planets*. As such, Toutatis will probably not reach an apparent V magnitude brighter than 11.0 during the apparition. The full moon on December 9 will also interfere with observations near the time of closest approach.

While it may be exciting just to glimpse this small body as it whizzes past the Earth, an international observing campaign is being organized to obtain lightcurve measurements of Toutatis. Amateurs with suitable aperture telescopes and equipment are welcome to collaborate with this professional effort. Apart from just learning about the rotational properties of Toutatis, this information is also needed as part of an effort by Steven Ostro of JPL to obtain radar images of Toutatis. An image deconvolution of the radar returns requires knowledge of the spin rate and pole position of the

asteroid. Observers with the capability to participate in the Toutatis lightcurve campaign should contact one of us (AWH) for further information.

To aid in all visual, photographic, and photometric observations, an ephemeris for Toutatis at 12 hour intervals is given below. Finder charts appear in the *Near-Earth Asteroids Bulletin* and are available for two stamped, self-addressed, legal-size envelopes. Contact Lawrence Garrett, 162 North Champlain Street, Burlington, VT 05401.

UT Date	Hour	R.A. (J2000)			Dec.		Phase Angle	V Mag
		h	m	s	d	m		
92/12/ 8	0	13	32	20.1	-25	3 55.	131.6	13.13
92/12/ 8	12	13	01	46.4	-22	0 16.	123.6	12.38
92/12/ 9	0	12	33	7.7	-18	40 24.	115.6	11.83
92/12/ 9	12	12	7	1.2	-15	16 14.	108.0	11.43
92/12/10	0	11	43	42.2	-11	58 7.	101.0	11.16
92/12/10	12	11	23	9.4	- 8	53 10.	94.5	10.98
92/12/11	0	11	5	11.0	- 6	5 11.	88.7	10.88
92/12/11	12	10	49	30.4	- 3	35 19.	83.6	10.82
92/12/12	0	10	35	49.7	- 1	23 2.	78.9	10.81
92/12/12	12	10	23	51.8	0	33 8.	74.8	10.81
92/12/13	0	10	13	21.5	2	14 60.	71.1	10.84
92/12/13	12	10	4	5.5	3	44 24.	67.8	10.88
92/12/14	0	9	55	52.5	5	3 3.	64.8	10.93
92/12/14	12	9	48	33.2	6	12 31.	62.1	10.98
92/12/15	0	9	41	59.6	7	14 6.	59.6	11.04
92/12/15	12	9	36	5.2	8	8 58.	57.4	11.10
92/12/16	0	9	30	44.6	8	58 3.	55.2	11.16
92/12/16	12	9	25	53.1	9	42 10.	53.3	11.22
92/12/17	0	9	21	26.9	10	21 59.	51.4	11.28
92/12/17	12	9	17	22.8	10	58 6.	49.7	11.34
92/12/18	0	9	13	38.0	11	30 58.	48.1	11.40
92/12/18	12	9	10	10.1	12	1 0.	46.6	11.46
92/12/19	0	9	6	57.2	12	28 34.	45.1	11.52
92/12/19	12	9	3	57.7	12	53 56.	43.7	11.57
92/12/20	0	9	1	10.0	13	17 21.	42.4	11.63
92/12/20	12	8	58	32.9	13	39 3.	41.1	11.69
92/12/21	0	8	56	5.3	13	59 13.	39.9	11.74
92/12/21	12	8	53	46.2	14	18 1.	38.7	11.79
92/12/22	0	8	51	34.8	14	35 34.	37.6	11.84
92/12/22	12	8	49	30.3	14	52 1.	36.5	11.89
92/12/23	0	8	47	32.2	15	7 27.	35.4	11.94
92/12/23	12	8	45	39.9	15	21 58.	34.4	11.99
92/12/24	0	8	43	52.9	15	35 40.	33.4	12.03
92/12/24	12	8	42	10.7	15	48 36.	32.4	12.08
92/12/25	0	8	40	32.9	16	0 50.	31.5	12.12
92/12/25	12	8	38	59.2	16	12 26.	30.5	12.17
92/12/26	0	8	37	29.3	16	23 27.	29.6	12.21
92/12/26	12	8	36	2.8	16	33 56.	28.7	12.25
92/12/27	0	8	34	39.6	16	43 55.	27.9	12.29
92/12/27	12	8	33	19.4	16	53 26.	27.0	12.33
92/12/28	0	8	32	2.1	17	2 31.	26.2	12.37
92/12/28	12	8	30	47.4	17	11 13.	25.4	12.41
92/12/29	0	8	29	35.1	17	19 32.	24.5	12.44
92/12/29	12	8	28	25.2	17	27 30.	23.8	12.48

CCD PHOTOMETRY OF ASTEROID 16 PSYCHE

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Photometric observations of the asteroid 16 Psyche were made during its 1992 apparition using a CCD detector at the NF/ Observatory. The synodic rotational period was 4.196 ± 0.005 hrs. The lightcurve amplitude was 0.19 ± 0.02 magnitudes. These results agree well with previous studies.

Introduction

Asteroid 16 Psyche is listed as an M-type asteroid (Tholen 1989). It has a diameter of about 264 km and an albedo of about 0.10 with an absolute H magnitude of 5.99 (Tedesco 1989). It has been studied previously (Lagerkvist et al. 1989). Switches between the primary and secondary extrema occurring in some solutions have been a matter of debate (Magnusson et al. 1989). Therefore, continued monitoring has been important. During February and March of 1992, Psyche was in a favorable position and phase angle for observation. The asteroid was listed as a desirable target by Harris and Zappalà (1992).

Observations

Exposures were obtained through a Johnson V-filter with a CRAF-Cassini charge-coupled-device (CCD) detector having 1024x1024 pixels, where the opposite quadrants are silvered to allow the frame transfer of a 512x512 pixel image. The image scale was 1.2 arcseconds per pixel. The chip and amplifier read-out noise is 25 electrons. Full well is 100,000 electrons. The telescope used was a 0.45-m Newtonian. Control of the observatory was by digital radio link and is described elsewhere (Neely 1989). The images were stored on tape and analyzed with PCVISTA, written by M. Richmond.

The comparison and check stars were within the same frame of the CCD image. This reduced the differential atmospheric extinction to negligible levels and allowed data collection on nights with marginal photometric conditions. The comparison star calibration was unsuccessful due to bad weather during the nights when this was attempted.

Integrations of 90 seconds were obtained for all data points. Dark fields were taken before each exposure and approximately 60 exposures were taken per night. The dark and bias frames were subtracted at the time of readout and the images were flat-field corrected before being stored on tape for later analysis. All of the flat fields were obtained on the twilight sky.

Results

CCD observations of 16 Psyche were made on UT dates (1992): February 17 and 22, March 6, 12, and 13. Observational circumstances for these dates are shown in Table I.

The synodic rotation period was calculated using a minimum phase error method similar to Stellingworf (1978). A constant was added to each night's data to obtain the best vertical fit. A period solution of 4.196 ± 0.005 hours was obtained, in excellent agreement with previous results (Lagerkvist et al. 1989). The lightcurve, shown plotted for the rotational phase occurring on UT 1992 February 22, appears to display two unequal minima and maxima per rotation. Within the noise of the observations, we estimate the peak-to-peak amplitude to be 0.19 ± 0.02 magnitudes.

Acknowledgments

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