

rates low enough to be maintained for the age of the Solar System. Once on the surface, the water would be vaporized and then undergo photodissociation into H and OH.

OH has an emission feature at 0.3085 microns that is difficult to detect from the ground, due to atmospheric extinction, so observations were made with the International Ultraviolet Explorer (IUE) satellite in both 1990 and 1991 by Mike A'Hearn and Paul Feldman. An exposure off the southern limb of Ceres before perihelion showed no OH

emission, but one off the northern limb after perihelion did show a statistically significant emission feature. Their results were published in the July issue of Icarus.

Whether this probable outgassing of Ceres qualifies it as a comet is a rather subjective matter. The important point is that the distinction between the primitive asteroids and the comets may be mainly a matter of volatile content and its internal distribution.

ASTROMETRIC POSITIONS OF MINOR PLANETS

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The following precise astrometric positions have been measured from photographs obtained by the author. The location of each observing site follows each set. The photographs were measured using the Digitized Stage Microscope, at the University of Washington. The reported UT time is that of mid-exposure. The magnitude listed is from the EMP, or obtained using G. Roger Harvey's orbit program. The number of stars used for determining the

position is indicated in the last column by #*. The calculations for the positions were made on my 286 computer using the Astrometric Reduction Program which appeared in the July 1990 issue of Sky & Telescope. The listed Standard Deviation is from that program. The Std. Dev. is corrected to seconds of arc using $\text{std. dev} \times \cos \text{dec.} \times 15$. Timing is from WWV, Ft. Collins, CO.

I wish to thank Dr. Paul W. Hodge, and Mark Wilber at the University of Washington, for allowing me time on the Digitized Stage Microscope; G. Roger Harvey for the orbit program to assist in locating those planets beyond their published ephemerides; also, Dr. Frederick Pilcher for his assistance and guidance.

Planet	Date (UT) Time 1991	RA (1950.0)	Dec	Std. Dev. RA Dec	Mv	#*
9 Metis	02 10 3:18:30	8 ^h 10 ^m 21.39 ^s	+28°44'22.5"	3.83 .35	9.1	4
	02 10 8:35:30	8 10 09.11	+28 44 54.0	4.45 2.26		6
15 Eunomia	02 10 3:25:30	8 38 06.24	+11 48 45.8	14.06 .71	9.0	4
	02 10 8:41:30	8 37 53.01	+11 48 55.1	3.83 2.16		8
27 Euterpe	02 10 3:11:30	8 46 30.04	+19 59 55.9	8.79 .57	9.2	4
	02 10 8:25:30	8 46 16.90	+20 00 56.1	0.18 .59		4

Longitude 121°43'23.9" W; Latitude 47°28'09.9" N; Altitude 195.8 Meters.

1 Ceres	04 12 5:22:00	14 03 03.61	+2 20 02.4	6.10 3.25	7.0	8
	04 12 7:57:00	14 02 57.59	+2 20 15.5	1.03 3.17		4

Longitude 121°09'23.2" W; Latitude 47°13'24.2" N; Altitude 646.2 Meters.

18 Melpomene	06 02 5:37:00	17 12 43.59	-6 31 17.3	4.98 0.74	9.8	4
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Longitude 120°44'16.4" W; Latitude 47°12'15.6" N; Altitude 734.6 Meters.

3 Juno	08 15 5:36:00	19 06 51.01	-7 40 59.7	1.18 1.28	9.6	5
6 Hebe	08 16 6:57:00	22 37 45.15	-14 34 19.2	4.43 4.08	7.9	4
25 Phocaea	08 15 5:56:30	20 59 10.58	+27 44 52.8	0.20 2.24	10.1	4
	08 16 6:31:30	20 58 34.98	+27 35 14.3	3.00 1.95		4
39 Laetitia	08 15 6:02:30	18 20 45.14	-12 42 43.3	3.36 1.14	10.3	4

Longitude 118°45'55.7" W; Latitude 46°18'56.1" N; Altitude 134.9 Meters.

324 Bamberga	09 15 5:10:00	22 57 28.17	+3 25 18.1	2.53 0.50	8.1	4
	09 15 6:58:00	22 57 22.90	+3 25 47.6	2.37 1.61		4

Longitude 121°43'23.9" W; Latitude 47°28'09.9" N; Altitude 195.8 Meters.

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 modeling (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 modeling. Question marks are used to denote uncertain or unknown values. An outline of recommended observing procedures is 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. In addition to the objects listed here, observers should especially note the opportunity to observe 4179 Toutatis, whose call for observations appears elsewhere in this issue.

Asteroid	Opp'n Date	Opp'n V Mag	Per	Amp	
441 Bathilde	Nov 29	11.7	10.35	0.1	PHA
455 Bruchsalia	Dec 9	11.6	?	?	PER
198 Ampella	Jan 14	11.7	?	?	PER
426 Hippo	Jan 29	11.7	?	?	PER

Photoelectric Photometry Opportunities

			R.A. (2000)		DEC.	MAG	PHASE		
DATE			HR	MIN	DEG	MIN	V	ANGLE	
Minor Planet			198 Ampella						
1992	Dec	9	8	16.17	+15	30.3	12.41	16.2	
		19	8	9.84	+15	5.6	12.23	12.5	
		29	8	0.93	+14	49.7	12.03	8.3	
1993	Jan	8	7	50.32	+14	41.7	11.83	4.1	
		18	7	39.20	+14	39.9	11.80	2.9	
		28	7	28.84	+14	42.4	12.08	6.6	
	Feb	7	7	20.35	+14	47.6	12.36	10.5	
		17	7	14.44	+14	53.8	12.62	13.9	
		27	7	11.43	+14	59.7	12.86	16.6	
Minor Planet			426 Hippo						
1992	Dec	19	9	26.44	+20	35.3	12.88	16.4	
		29	9	22.37	+20	1.3	12.66	13.5	
1993	Jan	8	9	15.40	+19	30.8	12.41	9.9	
		18	9	6.01	+19	1.5	12.14	5.7	
		28	8	55.05	+18	30.8	11.81	1.1	
	Feb	7	8	43.75	+17	56.7	11.98	3.6	
		17	8	33.37	+17	18.6	12.24	8.1	
		27	8	25.02	+16	36.8	12.46	12.2	
	Mar	9	8	19.39	+15	52.1	12.67	15.6	
Minor Planet			441 Bathilde						
1992	Oct	20	4	49.64	+25	42.1	12.81	16.2	
		30	4	46.40	+25	16.7	12.59	13.1	
	Nov	9	4	40.41	+24	41.7	12.35	9.3	
		19	4	32.25	+23	57.2	12.08	4.9	
		29	4	22.93	+23	4.9	11.75	0.6	
	Dec	9	4	13.67	+22	8.7	12.04	4.4	
		19	4	5.65	+21	13.7	12.30	8.8	
		29	3	59.82	+20	25.0	12.53	12.7	
	1993	Jan	8	3	56.73	+19	46.3	12.75	16.0
Minor Planet			455 Bruchsalia						
1992	Oct	30	5	42.97	+20	10.2	12.52	19.2	
		Nov	9	5	38.23	+20	55.3	12.34	15.3
	Nov	19	5	30.18	+21	42.9	12.15	10.7	
		29	5	19.62	+22	30.1	11.94	5.6	
		Dec	9	5	7.85	+23	13.7	11.63	0.3
	Dec	19	4	56.41	+23	51.9	12.05	4.8	
		29	4	46.72	+24	24.6	12.40	9.4	
		1993	Jan	8	4	39.79	+24	53.4	12.72
	18			4	36.09	+25	20.4	13.00	16.4