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35.

MINOR PLANETS AT UNUSUALLY FAVORABLE OPPOSITION IN 1982

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Abstract: A list is presented of minor planets which are much brighter than usual at their 1982 oppositions. This list includes two Earth-crossing planets at exceptionally close approach, 1862 Apollo and 1863 Antinous. Observers are urged to give planets on this list special attention.

The minor planets in the lists which follow will be much brighter at their 1982 oppositions than at their average opposition distances. Observers are encouraged to give special attention to those which lie near the limit of their equipment, for many years may pass before these planets will be again as bright as in 1982 and within reach.

This list has been compiled on the basis of a comparison of the magnitudes given in the 1982 Ephemerides of Minor Planets¹ with the range of opposition magnitudes in Tables of Minor Planets² and as extended and refined privately by the writer. Any planets whose perihelion and aphelion opposition magnitudes differ by 2^m0 or more and in 1982 will be within 0^m3 of the brightest possible, or which differ by 3^m0 or more and in 1982 will be within 0^m5 of the brightest possible, have been included. For planets brighter than magnitude 13.5 which are within the range of a large number of observers these standards have been relaxed somewhat to include a larger number of planets.

The magnitudes given here have been improved from those in the 1982 ephemeris volume by the use of an improved list of absolute magnitudes³ and by a phase angle correction of 0^m037/degree not included in magnitude calculations in the 1982 ephemeris volume.

Two Earth-crossing asteroids will make very close approaches in 1982, and daily ephemerides of each at closest approach are included. Planet 1862 Apollo will be making its second close approach in 1½ years, but last in the 20th century. Well observed in the 1980 close approach at large phase angles, the opportunity to extend physical observations to very near zero phase occurs on April 26, 1982. Observers planning physical observations are especially encouraged to reserve telescope time on and near this date. Later in the apparition, when Apollo is actually brightest, proximity to the Moon will hamper observation roughly May 3 through 9, but Apollo may be observable for a few days afterward until it disappears into evening twilight as it approaches inferior conjunction.

Planet 1863 Antinous has a perihelion point lying far south of the ecliptic and conditions for observation in 1982 will be much better in the southern

hemisphere than in the northern. Observers able to secure observing time at southern hemisphere observatories are encouraged to do so. But Antinous should be visible at mid-northern latitudes for several days after it moves out of the glare of the full Moon, about March 12, 1982.

Another planet with a remarkable orbit, 699 Hela, with $a = 2.62$, $e = 0.41$, $q = 1.54$, $i = 15^\circ$, is unusually well-placed, near perihelion and about 30° north of the ecliptic, for northern hemisphere observers in July, 1982. Physical studies will be especially useful as orbits of this type can evolve into Earth-crossing orbits and represent a potential mechanism for delivery to Earth of material from deep within the asteroid belt.

Separate lists arranged in numerical order and in order of opposition date are provided. All magnitudes are given in the photoelectric B system. Visually most planets are 0^m7 to 0^m9 brighter.

References

1. Ephemerides of Minor Planets for the Year 1982, Institute for Theoretical Astronomy, Leningrad (1981).
2. Pilcher, F., and Meeus, J., Tables of Minor Planets (1973), published privately by the authors.
3. Bowell, E., Gehrels, T., and Zellner, B., "Magnitudes, Colors, Types, and Adopted Diameters of the Asteroids," in Asteroids, U. of Ariz. Press, (1979), pp 1108-1129.

Planet	Opposition	
	Date	B Mag
2 Pallas	Apr 9	8.0
12 Victoria	Sep 27	9.9
19 Fortuna	Oct 13	10.0
28 Bellona	Dec 17	10.9
30 Urania	Dec 3	10.7
42 Isis	Jun 20	10.2
49 Pales	Sep 10	11.6
50 Virginia	Aug 29	11.9
55 Pandora	Oct 30	11.3
62 Erato	Dec 11	13.0
67 Asia	Aug 21	10.8
100 Hekate	Jun 29	12.0
118 Peitho	Jan 16	11.9
136 Austria	Aug 1	12.7
140 Siwa	Aug 25	11.3
141 Lumen	Nov 14	12.0
166 Rhodope	Oct 20	13.2
173 Ino	Nov 27	11.3
187 Lambertia	May 13	11.1
212 Medea	Oct 9	12.8
217 Eudora	Aug 2	12.6
225 Nenrietta	Jun 21	12.8
239 Adrastea	Dec 9	14.5
266 Aline	Sep 11	12.2
281 Lucretia	Dec 3	14.4

283 Emma	Sep 2	12.9	1192 Prisma	Mar 26	14.9	1448 Lindbladia	Mar 8	16.0
288 Glauke	Apr 20	13.2	1195 Orangia	Jun 25	15.5	1863 Antinous	Mar 16	14.7
337 Devosa	Feb 13	11.9	1204 Renzia	Sep 5	13.3	1192 Prisma	Mar 26	14.9
353 Ruperto-Carola	Oct 12	13.8	1227 Geranium	Aug 9	15.0	2235 Vittore	Mar 28	15.2
354 Eleonora	Feb 3	10.4	1250 Galanthus	Jan 25	15.7	2 Pallas	Apr 9	8.0
392 Wilhelmina	Oct 15	13.8	1253 Frisia	Oct 29	16.1	288 Glauke	Apr 20	13.2
404 Arsinoë	Feb 15	12.8	1264 Letaba	Jul 12	14.4	1862 Apollo	Apr 26	13.6
434 Hungaria	Sep 6	13.4	1277 Dolores	May 30	14.4	786 Bredichina	May 3	13.3
457 Alleghenia	Nov 22	16.2	1281 Jeanne	Aug 19	14.7	187 Lamberta	May 13	11.1
468 Lina	Aug 31	13.7	1314 Paula	Dec 2	15.2	545 Messalina	May 21	13.3
479 Caprera	Dec 18	13.1	1331 Solvejg	Aug 3	14.2	966 Muschi	May 22	13.8
481 Emita	Oct 29	12.1	1358 Gaika	Sep 22	15.0	1277 Dolores	May 30	14.4
485 Genua	Dec 15	12.1	1360 Tarka	Aug 2	14.9	1779 1950 LZ	May 31	16.3
505 Cava	Oct 30	12.0	1370 Hella	Jul 5	16.1	737 Arequipa	Jun 8	12.4
519 Sylvania	Sep 28	12.8	1407 Lindelöf	Dec 4	14.4	596 Scheila	Jun 12	12.7
532 Herculina	Jan 30	9.6	1429 Pemba	Sep 12	13.6	1693 Hertzsprung	Jun 15	14.1
545 Messalina	May 21	13.3	1430 Somalia	Jul 5	15.2	1905 Ambartsumian	Jun 15	15.1
576 Emanuela	Jul 7	14.0	1440 Rostia	Nov 11	15.7	1108 Demeter	Jun 17	14.2
582 Olympia	Feb 18	12.2	1448 Lindbladia	Mar 8	16.0	755 Quintilla	Jun 19	14.3
596 Scheila	Jun 12	12.7	1459 Magnya	Nov 18	14.9	42 Isis	Jun 20	10.2
610 Valeska	Oct 28	15.6	1467 Mashona	Sep 7	13.4	225 Henrietta	Jun 21	12.8
625 Xenia	Oct 9	14.0	1475 Yalta	Nov 21	15.6	680 Genoveva	Jun 24	13.3
644 Cosima	Aug 21	14.1	1498 Lahti	Oct 27	16.0	1195 Orangia	Jun 25	15.5
662 Newtonia	Aug 7	13.3	1519 Kajaani	Aug 5	15.5	2214 1953 GF	Jun 27	16.2
675 Ludmilla	Oct 16	11.8	1527 Malmquista	Sep 7	14.5	854 Frostia	Jun 28	14.9
678 Fredegundis	Dec 4	12.4	1530 Rantaseppä	Nov 1	15.5	100 Hekate	Jun 29	12.0
679 Pax	Sep 8	12.2	1568 Aisleen	Aug 3	15.0	1370 Hella	Jul 5	16.1
680 Genoveva	Jun 24	13.3	1572 Posnanian	Sep 19	14.1	1430 Somalia	Jul 5	15.2
690 Wratislavia	Nov 18	11.9	1584 Fuji	Feb 2	13.6	1634 Ndola	Jul 6	15.7
699 Hela	Jul 16	13.2	1585 Union	Aug 25	14.8	576 Emanuela	Jul 7	14.0
706 Hirundo	Sep 2	14.2	1613 Smiley	Nov 12	14.8	953 Painleva	Jul 11	13.9
711 Marmulla	Aug 5	14.0	1623 Vivian	Oct 26	15.2	1264 Letaba	Jul 12	14.4
713 Luscinia	Aug 14	13.6	1634 Ndola	Jul 6	15.7	699 Hela	Jul 16	13.2
737 Arequipa	Jun 8	12.4	1650 Heckmann	Jul 20	14.5	1954 Kukarkin	Jul 18	15.5
755 Quintilla	Jun 19	14.3	1666 Van Gent	Oct 21	14.5	999 Zachia	Jul 19	14.4
771 Libera	Nov 13	13.6	1687 Glarona	Oct 9	14.7	1650 Heckmann	Jul 20	14.5
778 Theobalda	Feb 5	13.6	1693 Hertzsprung	Jun 15	14.1	1775 Zimmerwald	Jul 30	15.8
786 Bredichina	May 3	13.3	1718 Namibia	Sep 9	15.5	136 Austria	Aug 1	12.7
819 Barnardiana	Aug 12	14.5	1763 Williams	Sep 6	14.9	217 Eudora	Aug 2	12.6
831 Stateira	Nov 9	14.7	1769 1966 QP	Sep 3	15.1	1360 Tarka	Aug 2	14.9
846 Lipperta	Sep 19	14.6	1775 Zimmerwald	Jul 30	15.8	1331 Solvejg	Aug 3	14.2
852 Wladilena	Oct 8	12.6	1779 1950 LZ	May 31	16.3	1568 Aisleen	Aug 3	15.0
854 Frostia	Jun 28	14.9	1862 Apollo	Apr 26	13.6	711 Marmulla	Aug 5	14.0
877 Walküre	Nov 19	13.7	1863 Antinous	Mar 16	14.7	1519 Kajaani	Aug 5	15.5
885 Ulrike	Aug 12	15.0	1905 Ambartsumian	Jun 15	15.1	954 Li	Aug 6	14.2
918 Itha	Aug 26	14.5	1944 Gunter	Sep 20	15.4	662 Newtonia	Aug 7	13.3
938 Chloisinde	Sep 13	15.5	1954 Kukarkin	Jul 18	15.5	1227 Geranium	Aug 9	15.0
940 Kordula	Sep 28	13.9	2128 Wetherill	Sep 14	15.7	819 Barnardiana	Aug 12	14.5
942 Romilda	Oct 27	14.7	2139 1970 MC	Oct 16	15.5	885 Ulrike	Aug 12	15.0
951 Gaspra	Nov 10	14.0	2163 Korczak	Sep 20	15.9	713 Luscinia	Aug 14	13.6
953 Painleva	Jul 11	13.9	2214 1953 GF	Jun 27	16.2	1281 Jeanne	Aug 19	14.7
954 Li	Aug 6	14.2	2227 1955 RX	Dec 6	16.0	67 Asia	Aug 21	10.8
966 Muschi	May 22	13.8	2235 Vittore	Mar 28	15.2	644 Cosima	Aug 21	14.1
999 Zachia	Jul 19	14.4	1076 Viola	Jan 6	15.0	140 Siwa	Aug 23	11.3
1045 Michela	Nov 22	15.5	118 Peitho	Jan 16	11.9	1585 Union	Aug 25	14.8
1060 Magnolia	Sep 14	15.5	1250 Galanthus	Jan 25	15.7	918 Itha	Aug 26	14.5
1066 Lobelia	Oct 17	15.5	532 Herculina	Jan 30	9.6	50 Virginia	Aug 29	11.9
1076 Viola	Jan 6	15.0	1078 Mentha	Feb 1	14.1	468 Lina	Aug 31	13.7
1078 Mentha	Feb 1	14.1	1584 Fuji	Feb 2	13.6	283 Emma	Sep 2	12.9
1108 Demeter	Jun 17	14.2	354 Eleonora	Feb 3	10.4	706 Hirundo	Sep 2	14.2
1127 Mimi	Dec 3	13.9	778 Theobalda	Feb 5	13.6	1769 1966 QP	Sep 3	15.1
1130 Skuld	Jul 7	14.4	337 Devosa	Feb 13	11.9	1204 Renzia	Sep 5	13.3
1136 Mercedes	Aug 14	13.9	404 Arsinoë	Feb 15	12.8	434 Hungaria	Sep 6	13.4
1181 Lilith	Nov 1	14.8	582 Olympia	Feb 18	12.2	1763 Williams	Sep 6	14.9
1188 Gothlandia	Nov 19	14.3				1467 Mashona	Sep 7	13.4
						1527 Malmquista	Sep 7	14.5
						679 Pax	Sep 8	12.2
						1718 Namibia	Sep 9	15.5

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49 Pales	Sep 10	11.6	610 Valeska	Oct 28	15.6	1314 Paula	Dec 2	15.2
266 Aline	Sep 11	12.2	481 Emita	Oct 29	12.1	30 Urania	Dec 3	10.7
1429 Pemba	Sep 12	13.6	1253 Frisia	Oct 29	16.1	281 Lucretia	Dec 3	14.4
938 Chlosinde	Sep 13	15.5	55 Pandora	Oct 30	11.3	1127 Mimi	Dec 3	13.9
1060 Magnolia	Sep 14	15.5	505 Cava	Oct 30	12.0	678 Fredegundis	Dec 4	12.4
2128 Wetherill	Sep 14	15.7				1407 Lindelöf	Dec 4	14.4
846 Lipperta	Sep 19	14.6	1181 Lilith	Nov 1	14.8	2227 1955 RX	Dec 6	16.0
1572 Posnania	Sep 19	14.1	1530 Rantaseppä	Nov 1	15.5	239 Adrastea	Dec 9	14.5
1944 Gunter	Sep 20	15.4	831 Stateira	Nov 9	14.7	62 Erato	Dec 11	13.0
2163 Korczak	Sep 20	15.9	951 Gaspra	Nov 10	14.0	485 Genua	Dec 15	12.1
1358 Gaika	Sep 22	15.0	1440 Rostia	Nov 11	15.7	28 Bellona	Dec 17	10.9
12 Victoria	Sep 27	9.9	1613 Smiley	Nov 12	14.8	479 Caprera	Dec 18	13.1
519 Sylvania	Sep 28	12.8	771 Libera	Nov 13	13.6			
940 Kordula	Sep 28	13.9	141 Lumen	Nov 14	12.0			
			690 Wratislavia	Nov 18	11.9			
852 Wladilena	Oct 8	12.6	1459 Magnya	Nov 18	14.9			
212 Medea	Oct 9	12.8	877 Walküre	Nov 19	13.7			
625 Xenia	Oct 9	14.0	1188 Gothlandia	Nov 19	14.3			
1687 Glarona	Oct 9	14.7	1475 Yalta	Nov 21	15.6			
353 Ruperto-Carola	Oct 12	13.8	457 Alleghenia	Nov 22	16.2			
19 Fortuna	Oct 13	10.0	1045 Michela	Nov 22	15.5			
392 Wilhelmina	Oct 15	13.8	173 Ino	Nov 27	11.3			
2139 1970 MC	Oct 16	15.5						
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166 Rhodope	Oct 20	13.2						
1666 Van Gent	Oct 21	14.5						
1623 Vivian	Oct 26	15.2						
942 Romilda	Oct 27	14.7						
1498 Lahti	Oct 27	16.0						

EPHEMERIDES							1982	RA (1950.0)	Dec	r	Δ	B Mag	Phase	
							0 ^h ET	699 Hela						
							Jun 10	19 ^h 51 ^m .3	- 2°57'	1.770	0.893	14.1	23°5	
							Jun 20	19 51.8	+ 0 44	1.731	0.814	13.8	21.2	
							Jun 30	19 49.1	+ 4 23	1.696	0.752	13.5	19.2	
							Jul 10	19 43.9	+ 7 45	1.663	0.707	13.3	18.3	
							Jul 20	19 37.0	+10 33	1.633	0.679	13.2	19.1	
							Jul 30	19 30.1	+12 32	1.608	0.667	13.2	21.2	
							Aug 9	19 25.0	+13 36	1.586	0.668	13.3	24.2	
							Aug 19	19 23.1	+13 48	1.568	0.681	13.4	27.3	
							1862 Apollo							
							Apr 16	14 ^h 36 ^m .4	-11°45'	1.282	0.287	15.5	12°1	
							Apr 17	14 34.9	-11 50	1.273	0.276	15.3	11.2	
							Apr 18	14 33.3	-11 56	1.265	0.266	15.2	10.2	
							Apr 19	14 31.4	-12 02	1.256	0.255	15.0	9.2	
							Apr 20	14 29.4	-12 09	1.247	0.245	14.9	8.1	
							Apr 21	14 27.2	-12 16	1.238	0.235	14.7	7.0	
							Apr 22	14 24.7	-12 24	1.228	0.225	14.5	5.8	
							Apr 23	14 22.1	-12 32	1.219	0.215	14.3	4.5	
							Apr 24	14 19.2	-12 41	1.210	0.205	14.1	3.2	
							Apr 25	14 15.9	-12 51	1.201	0.195	13.9	1.8	
							Apr 26	14 12.2	-13 02	1.192	0.186	13.6	0.3	
							Apr 27	14 08.2	-13 13	1.183	0.176	13.6	1.4	
							Apr 28	14 03.7	-13 26	1.173	0.167	13.6	3.1	
							Apr 29	13 58.7	-13 39	1.164	0.158	13.6	4.9	
							Apr 30	13 53.1	-13 54	1.155	0.149	13.6	7.0	
							May 1	13 46.8	-14 10	1.145	0.140	13.5	9.2	
							May 2	13 39.6	-14 27	1.136	0.131	13.5	11.6	
							May 3	13 31.5	-14 47	1.127	0.123	13.4	14.2	
							May 4	13 22.3	-15 07	1.117	0.115	13.4	17.1	
							May 5	13 11.6	-15 30	1.108	0.107	13.4	20.4	
							May 6	12 59.3	-15 54	1.098	0.099	13.3	24.1	
							May 7	12 45.0	-16 18	1.089	0.092	13.3	28.2	
							May 8	12 28.2	-16 42	1.079	0.085	13.3	32.9	
							May 9	12 08.8	-17 03	1.070	0.079	13.3	38.2	
							May 10	11 46.0	-17 19	1.060	0.073	13.3	44.3	
							May 11	11 19.6	-17 26	1.051	0.068	13.3	51.3	
							May 12	10 49.6	-17 19	1.041	0.064	13.4	59.1	
							May 13	10 16.2	-16 52	1.032	0.061	13.6	67.8	
							May 14	9 40.5	-15 59	1.022	0.059	13.7	77.1	
							May 15	9 04.1	-14 43	1.013	0.059	14.0	86.6	
							May 16	8 27.6	-13 06	1.003	0.060	14.2	96.0	
							May 17	7 55.5	-11 18	0.993	0.062	14.5	104.9	
							May 18	7 25.8	- 9 28	0.984	0.066	14.9	113.1	
1982	RA (1950.0)	Dec	r	Δ	B Mag	Phase								
0 ^h ET	1863 Antinous													
Mar 10	11 ^h 55 ^m .8	- 6°36'	1.313	0.328	15.3	10°9								
Mar 11	11 53.7	- 7 30	1.305	0.319	15.2	10.7								
Mar 12	11 51.4	- 8 28	1.296	0.309	15.1	10.5								
Mar 13	11 48.9	- 9 28	1.288	0.300	15.0	10.5								
Mar 14	11 46.2	-10 32	1.279	0.291	14.9	10.7								
Mar 15	11 43.4	-11 38	1.270	0.283	14.9	11.1								
Mar 16	11 40.3	-12 49	1.262	0.275	14.8	11.7								
Mar 17	11 37.1	-14 03	1.253	0.266	14.8	12.6								
Mar 18	11 33.6	-15 21	1.245	0.259	14.7	13.6								
Mar 19	11 29.8	-16 43	1.236	0.251	14.7	14.8								
Mar 20	11 25.8	-18 09	1.228	0.244	14.7	16.1								
Mar 21	11 21.5	-19 38	1.220	0.237	14.7	17.7								
Mar 22	11 16.9	-21 12	1.211	0.231	14.7	19.3								
Mar 23	11 11.9	-22 50	1.203	0.225	14.7	21.1								
Mar 24	11 06.6	-24 32	1.195	0.219	14.7	23.1								
Mar 25	11 00.8	-26 18	1.186	0.214	14.7	25.1								
Mar 26	10 54.7	-28 07	1.178	0.209	14.7	27.3								
Mar 27	10 48.1	-30 00	1.170	0.204	14.7	29.6								
Mar 28	10 40.9	-31 55	1.162	0.200	14.8	32.0								
Mar 29	10 33.3	-33 52	1.154	0.196	14.8	34.4								
Mar 30	10 25.1	-35 51	1.146	0.193	14.8	37.0								
Mar 31	10 16.2	-37 51	1.138	0.190	14.9	39.6								
Apr 1	10 06.6	-39 50	1.130	0.187	14.9	42.2								
Apr 2	9 56.4	-41 49	1.122	0.185	15.0	44.9								
Apr 3	9 45.4	-43 45	1.114	0.184	15.0	47.6								
Apr 4	9 33.6	-45 38	1.107	0.183	15.1	50.4								
Apr 5	9 21.0	-47 27	1.099	0.182	15.1	53.1								
Apr 6	9 07.6	-49 10	1.092	0.182	15.2	55.8								
Apr 7	8 53.3	-50 46	1.084	0.182	15.3	58.5								
Apr 8	8 38.3	-52 15	1.077	0.183	15.3	61.1								
Apr 9	8 22.5	-53 35	1.069	0.184	15.4	63.7								
Apr 10	8 06.1	-54 46	1.062	0.185	15.5	66.2								
Apr 11	7 49.2	-55 47	1.055	0.187	15.6	68.6								
Apr 12	7 31.9	-56 38	1.048	0.189	15.6	71.0								
Apr 13	7 14.4	-57 18	1.041	0.192	15.7	73.2								
Apr 14	6 56.9	-57 49	1.034	0.194	15.8	75.4								
Apr 15	6 39.5	-58 10	1.027	0.198	15.9	77.5								
Apr 16	6 22.5	-58 22	1.021	0.201	15.9	79.4								

REFERENCES ON MINOR PLANET NAMES AND HISTORY

compiled by June LoGuirato, January, 1979

It is difficult to prepare a good list of references on minor planet names and history because this minor field has received little attention from astronomers. But something is better than nothing, so ...

A. General (listed in historical sequence)

1. Daniel Kirkwood, The Asteroids. Philadelphia: J. B. Lippincott Co., 1888, pages 12-16 give information on the discovery of the first five minor planets.

2. "Planetary Discoveries" (Chapter IV, pp. 71-8 only) in Agnes Clerke's A Popular History of Astronomy during the Nineteenth Century. London: Adams & Charles Black, 1902.

3. "The Asteroids" (Chapter IX, pp. 98-105) in Hector MacPherson's The Romance of Modern Astronomy. London: Seeby and Co. Limited, 1911.

4. "Miniature Worlds" by Hugh S. Rice. The Sky, Vol. I, August, 1937, pp. 3-5 and 21 plus October, 1937, pp. 5-7 and 19.

5. "The Asteroids" (Sections 410 thru 422, pp. 347-57) in H. N. Russell, R. S. Dugan and J. Q. Stewart's Astronomy - Vol. I The Solar System. New York: Ginn and Company, 1945.

6. "The Little Planets" (Chapter 2, pp. 11-28) and "Whirling Fragments" (Chapter 3, pp. 29-39) in Fletcher Watson's Between the Planets. Cambridge, Mass.: Harvard University Press, 1956 edition.

7. "The Minor Planets" (Chapter 10, pp. 115-129) in Patrick Moore's The New Guide to the Planets. New York: W. W. Norton & Co., Inc., 1971.

8. Tom Gehrels, ed., Physical Studies of Minor Planets. Washington, D.C.: U.S. Government Printing Office, 1971. Contains numerous references to articles on particular branches of minor planet studies.

9. "The 'Big Four' Asteroids" by Frederick Pilcher and Jay Gunter, Astronomy, May, 1978, Vol. 6, pp. 50-54.

10. Mike Collins, Astronomical Catalogues 1951-75. Inspec Bibliography Series No. 2. Page 18 lists ten different catalogues or tables of minor planet data.

11. Tom Gehrels, ed., Asteroids. Tucson, Arizona, University of Arizona Press, 1979. Contains updated lists of references to articles on particular branches of minor planet studies. Includes Frederick Pilcher's extensive table "Circumstances of Minor Planet Discovery", pp. 1130-54.

B. Historical

1. "The 'Gap' Between Mars and Jupiter" (Chapter 13, pp. 317-38) in Willy Ley's Watchers of the Skies. New York: The Viking Press, 1963.

2. M. A. Combes, "Historique des petites planetes", Ciel et Terre, Vol. 91, Nov/Dec, 1975, pp. 393-418.

3. Günter Roth, The System of Minor Planets. London: Faber & Faber Ltd., 1962 English edition, pp. 18-38.

4. Giorgio Abetti, The History of Astronomy. New York: Henry Schuman, 1952 English edition, pp. 168-173 and 286-8.

5. Jean Meeus, ed., Tables des petites planetes. Kessel-Lo, Belgium: private publication, 1963. Contains an extensive table about minor planet discoverers.

6. Frederick Pilcher and Jean Meeus, eds., Tables of Minor Planets. Jacksonville, Illinois: private publication, 1973. Pages 29-71 contain: a detailed "List of the Discoveries of the Minor Planets".

7. "Call It Icarus" (Chapter 24, pp. 250-66) in Robert Richardson's Getting Acquainted with Comets. New York: McGraw-Hill, 1967. Lively behind the scenes account of the discovery of 1566 Icarus.

8. S. B. Nicholson, "The Trojan Asteroids", Leaflet of the Astronomical Society of the Pacific #381, 1961.

9. Stanley Jaki, "The Titus-Bode Law: A Strange Bicentenary", Sky and Telescope, May, 1972, Vol. 43, pp. 280-81.

10. M. A. Combes, "Historical Note #1: The Rediscovery of Ceres", Minor Planet Bulletin, Vol. 3, July/Sept, 1975, pg. 4.

11. M. A. Combes, "Historical Note #2: 330 Adalberta, A Minor Planet of the Hungaria Group?", Minor Planet Bulletin, Vol. 3, July/Sept, 1975, pp. 4-5.

12. M. A. Combes, "Historical Note #3: Distribution of the Discoveries of Minor Planets Within the Year", Minor Planet Bulletin, Vol. 3, Jan/March, 1976, pp. 35-6.

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14. M. A. Combes, "Historical Note #5: Evolution of the Magnitudes of the First 19 Hundreds of Minor Planets", Minor Planet Bulletin, Vol. 3, Jan/March, 1976, pp. 37.

15. M. A. Combes, "Historical Note #6: Where Have the Minor Planets Been Discovered?", Minor Planet Bulletin, Vol. 3, April/June, 1976, pp. 53-4.

16. M. A. Combes, "Historical Note #7: Evolution of the Magnitudes of the Most Favorable and at the Least Favorable Oppositions for the Least Favorable Oppositions for the 1966 Minor Planets Numbered on 1975 Dec. 31", Minor Planet Bulletin, Vol. 4, Jan/March, 1977, pg. 26.

17. M. A. Combes, "Historical Note #8: Evolution of the Number of Numbered Minor Planets from 1801 to 1975", Minor Planet Bulletin, Vol. 4, Jan/March, 1977, pp. 26-7.

18. M. A. Combes, "Historical Note #9: The Numbered Asteroids Which are Presently Lost", Minor Planet Bulletin, Vol. 4, April/June, 1977, pp. 34-5.

19. Brian Marsden, "Carl Friedrich Gauss, Astronomer", Journal Royal Astronomical Society of Canada, Vol. 71, 1977, pp. 309-23. Good account of discovery and recovery of 1 Ceres.

20. "Strange Interlude" (Chapter 7, pp. 147-162) in Richard Baum's The Planets - Some Myths and Realities. New York: Halsted Press - a division of John Wiley & Sons Inc., 1973. Describes the object k controversy that involved some of the leading minor planet workers in the 1850's.

C. Names of Minor Planets

1. The Names of the Minor Planets. Cincinnati, Ohio: Minor Planet Center at the University of Cincinnati Observatory. Part 1 issued in 1955; part 2 in 1968.

2. A. Paluzie-Borrell, The Names of the Minor Planets and Their Meanings. Kessel-Lo, Belgium: private publication, 1963.

3. M. A. Combes, "Les Noms des Asteroids", l'Astronomie, 87th year, April, 1973, pp. 164-78.

4. E. S. Holden, "Nomenclature of the Asteroids, Etc.", Publications of the Astronomical Society of the Pacific, Vol. VIII, 1896, pp. 28-30.

5. Joseph Ashbrook, "Naming the Minor Planets", Sky and Telescope, Vol. 17, December, 1957, pp. 74-5.

6. "The Names of Minor Planets" (Chapter V, pp. 39-41) in Gunter Roth's The System of Minor Planets. London: Faber & Faber Ltd., 1962 English edition.

7. June LoGuirato, "The Names of the Asteroids. Part 1 - An IAU in the Sky", Minor Planet Bulletin, Vol. 3, Jan/March, 1976, pp. 37-39.

D. Information on Individual Minor Planet Discoverers

Knowing the year in which a minor planet discoverer died, one can often locate references to several obituary notices about him/her in the appropriate issue of Astronomische Jahresbericht (1899-1968) or its successor Astronomy and Astrophysics Abstracts (1969 to date).

Other standard biographic references include: Dictionary of Scientific Biography, Poggendorff's Biographisch-Literarisches Handwörterbuch (in German)

Asimov's Biographical Encyclopedia of Science and Technology

MacPherson's Biographical Dictionary of Astronomers

National Cyclopaedia of American Biography, American Men and Women of Science

Current Biography Yearbook

International Who's Who

Who's Who in Science in Europe

Enciclopedia Italiana (in Italian)

Grand Larousse Encyclopedique (in French)

E. Magazine Columns on the Minor Planets

The following writers have prepared popular columns on minor planets on a regular basis:

Hugh Rice for the old Popular Astronomy (1934-51, Vol. 42-59)

Frederick Pilcher for the Review of Popular Astronomy (1969, Vol. 63)

J. U. Gunter for Modern Astronomy, Celestial Observer, Observer's Sky and Star & Sky.

F. Publications Devoted to the Minor Planets

1. Tonight's Asteroids, popular publication. Dr. J. U. Gunter, editor-publisher

2. Minor Planet Bulletin, semi-technical publication produced by ALPO Minor Planets Section. Prof. Richard Hodgson, editor.

3. The Minor Planet Circulars/Minor Planets and Comets, technical publication published on behalf of Commission 20 of the International Astronomical Union by the Minor Planet Center, Smithsonian Astrophysical Observatory. Dr. Brian Marsden, Minor Planet Center Director.

Technical articles on minor planets regularly appear in Icarus.

The compiler would be happy to learn about additions or corrections to this list. Contact: June LoGuirato, 12200 Chapel Road, Clifton, VA 22024, U.S.A.

108 HECUBA OBSERVED

by Paul G. Comba

I recently observed 108 Hecuba on 1981 Sept. 21.2, Sept. 25.2 and Sept. 29.2. The 1981 opposition date was October 1, and the opposition magnitude, listed in Ephemerides of Minor Planets was 14.3. On previous occasions I have found that with my Celestron 8-inch (20 cm) and under comparable observing conditions, the faintest objects I could see were of 8-magnitude approximately 14.0. When I made each of the three observations mentioned above, Hecuba appeared somewhat brighter than a barely visible object. It would appear likely, therefore, that 108 Hecuba is somewhat brighter than heretofore believed.

[The Editor wishes to thank Mr. Comba for this observing note, and requests that suitably equipped Section members make it a point to check the brightness of 108 Hecuba in future years.]

THE NEED FOR POLITICAL ACTION

by the Editor

Abstract. Today's astronomers, both professional and amateur, cannot afford to remain politically silent -- increasing problems with light pollution in many areas, and the real possibility that the U.S. planetary space program may be terminated call for action.

The Minor Planet Bulletin is about as far removed from politics as one can get. But "there is a time for all things under the Sun," and there is now growing need for political action by both professional and amateur astronomers (and their friends) on two major issues: the growing problem of light pollution which is robbing us of dark skies in many areas, wasting our valuable electrical energy, and, among other things, hindering observation of many minor planets, and the distinct danger that the U.S. planetary space program may be terminated for budgetary reasons.

Contending against the problems of light pollution is probably a long-term battle, but with increasing energy costs, it is easier to make a case. June LoGuirato, a charter member of the Minor Planets Section, has long fought for this cause with considerable success in Fairfax County, Virginia. She points out that few politicians are familiar with the idea of saving energy and astronomical viewing by installing proper outdoor lighting fixtures. If we do nothing to enlighten them we shall only have ourselves to blame if conditions become even worse.

In presenting the main arguments in the case of light pollution, June LoGuirato suggests reviewing recent articles on the subject including "Licking Light Pollution" in Sky and Telescope, July, 1980, vol. 60, pp. 17-20, and "Lick Licks Light Pollution" in Astronomy, February, 1981, vol. 9, pp. 61-62.

The other issue is of a more national character (rather than global). It concerns possible termination of the planetary research portion of the U.S. space program by the present Reagan administration in its all-out efforts to reduce the government budget. While many of us may be sympathetic to government cost cutting, and might be willing to consider some stretching out of programs in the interests of economy, the distinct possibility of total termina-

tion of all planetary probes is false economy in our opinion. Not only have the planetary probes of recent years greatly increased our knowledge of the Solar System, and thereby greatly stimulated scientific thought and improved our technology, they have also helped us to understand our own planet and appreciate its uniqueness in a new and deeper way. In a world which is running out of many valuable resources to fuel its modern civilization and technology, termination of NASA's planetary research could prevent us from finding and mining additional mineral supplies in the future. This is especially true for objects which are fairly close to us in space -- the Moon, Mars, and the Apollo and Amor asteroids. Indeed it is believed that economically profitable voyages to these objects will be likely in two or three decades, provided we do not give up the effort and throw away the opportunity now. To stop now would mean that the Galileo orbiter and probe of Jupiter, scheduled for launch in the mid-1980's (on which \$ 300 million has already been spent), would be left to rust; even the enormously successful Voyager 2, which taught us so much about Jupiter and Saturn, would simply be shut off, and report nothing of its rendezvous with Uranus in 1986 and with Neptune in 1989. What a waste that would be! What a missed opportunity!

One searches for a possible parallel in history. What if Spain, unimpressed by the modest trinkets Columbus brought back from his initial voyages, had decided for budgetary reasons to send no more vessels? Could there have been a greater opportunity missed?

Minor Planets Section members in the United States should contact their senators and representatives in Congress, and should express their concerns to President Reagan as well. We must persuade them that terminating the planetary research program would be false economy indeed! Members in other countries might also wish to write -- sometimes foreign mail, since it is less frequent, may attract attention. Members outside the U.S. might also prod their own governments to consider internationalizing the NASA planetary program by underwriting part of it.

For more information, see Science News (October 24, 1981). The writer thanks David Oesper for calling this matter to his attention.

RECENTLY DISCOVERED APOLLO/AMOR PLANETS

In recent weeks three Earth-approaching minor planets have been discovered. The first two found, 1981 QA and 1981 QB, are of the Amor type with perihelia just outside the Earth's orbit; the third planet, 1981 VA, just recently discovered, is an Apollo type with an Earth-crossing orbit of high eccentricity.

Planet 1981 QA was discovered by Ladislav Brožek on August 21, at which time it was reported to be magnitude 13.0. Orbiting the Sun in about 3.18 years, 1981 QA is about 1.19 AU from the Sun at perihelion. It has been reported that this asteroid has an unusually long rotation period of approximately 6 days. Additional photometric observations are obviously needed at future apparitions.

Planet 1981 QB was discovered by Charles Kowal at Mt. Palomar with the 1.2 meter Schmidt on August 28. It orbits the Sun in about 3.30 years, and is about 1.08 AU from the Sun at perihelion.

Planet 1981 VA was discovered by E. Helin and S. Dunbar at Mt. Palomar with the 1.2 meter Schmidt on

November 4. The following orbital elements by C.M. Bardwell in IAU Circular 3645 are based on observations made November 4 - 7:

T = 1981 Sept. 2.329 ET	
$\omega = 58.734$	e = 0.73112
$\Omega = 246.649$	1950.0 a = 2.34968 AU
i = 20.966	$n^\circ = 0.273648$
q = 0.63178 AU	P = 3.60 years

At discovery the magnitude of 1981 VA was reported as 16.5; it will be growing fainter as November progresses. While diameter and surface chemistry have yet to be determined, the observed brightness suggests a diameter of about 1.0 km if 1981 VA is of S-type up to about 1.6 km if the planet is C-type. More observations of course are needed to verify its magnitude, and the ephemeris is preliminary, being based on only a small portion of its orbit. -- R.G. Hodgson

SECTION NEWS

COORDINATOR FOR PHOTOELECTRIC PHOTOMETRY. The Recorder is happy to announce the appointment of Richard P. ("Rick") Binzel to serve as Photoelectric Photometry Coordinator. Section members who are equipped to make photoelectric observations should contact him in order to coordinate the work. This is important because it is important to have a few planets each year well observed rather than obtain scattered coverage of a larger number. All photoelectric photometry observations should be sent to him at the Department of Astronomy, University of Texas at Austin, Austin, Texas 78712 U.S.A. (Henceforth all photoelectric photometry observations will be reviewed by Mr. Binzel prior to publication in MPB, so please send them to him directly to speed consideration and save postage).

VISUAL PHOTOMETRY. Visual photometry observations should continue to be sent to Alain C. Porter, c/o Graduate Housing, California Institute of Technology, Pasadena, California 99925, U.S.A. (Henceforth all visual photometry observations will be reviewed by Mr. Porter prior to publication in MPB, so please send them to him rather than the Editor and save time and postage).

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Book Reviews

Gehrels, Tom, ed., Asteroids. Tucson, Arizona: University of Arizona Press, 1979. Reviewed by R.G. Hodgson. 5-6.

Ottewell, Guy, Astronomical Calendar 1981. Reviewed by R.G. Hodgson. 6.

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THE A.L.P.O. MINOR PLANETS SECTION is directed by its Recorder, Prof. Richard G. Hodgson, who is also Editor of MPB. Items for publication, subscriptions, and reports of unusual observations should be sent to him at Dordt College, Sioux Center, Iowa 51250, U.S.A. (Please note, however, that visual photometry observations should be sent to Alain C. Porter, and photoelectric photometry observations should be sent to Richard P. Binzel for analysis (see page 40 of this issue); positional observations should be sent to Prof. Frederick Pilcher, Assistant Minor Planets Section Recorder, Illinois College, Jacksonville, Illinois 62650, U.S.A.)

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BACK ISSUES. Volumes 1 through 3 are out of print. Volumes 4 through 7 are available for \$ 5.00 a volume; overseas orders should add \$ 1.00 for additional postage. All are sent surface mail. Order from the Editor.

This concludes volume 8.