DATE	R.A. (1950) HR	MIN	DEC. DEG	MIN	MAG B	PHASE ANGLE
Minor Planet 198 Ampella						
Nov 1	5	44.2	28	52.	12.54	20.1
11	5	39.8	28	20.	12.31	16.0
21	5	31.8	27	38.	12.08	11.2
Dec 1	5	21.1	26	44.	11.85	5.8
11	5	9.5	25	42.	11.58	1.2
21	4	58.5	24	35.	11.98	5.5
31	4	49.7	23	31.	12.32	10.4
1985 Jan 10	4	44.0	22	35.	12.65	14.6
20	4	41.7	21	50.	12.96	17.9
30	4	42.7	21	17.	13.25	20.4
Minor Planet 337 Devosa						
1984 Oct 2	0	54.9	10	35.	12.22	4.1
12	0	44.2	10	13.	12.10	2.9
22	0	34.0	9	47.	12.38	7.6
Nov 1	0	25.7	9	22.	12.62	12.5
11	0	20.1	9	6.	12.86	16.8
21	0	17.7	9	3.	13.10	20.3
Dec 1	0	18.7	9	15.	13.32	23.0
Minor Planet 344 Desiderata						
1984 Oct 2	3	36.3	15	11.	13.26	15.8
12	3	29.4	15	34.	13.08	12.3
22	3	20.0	15	52.	12.91	8.3
Nov 1	3	8.9	16	5.	12.69	3.9
11	2	57.1	16	15.	12.48	0.6
21	2	45.8	16	22.	12.88	4.9
Dec 1	2	36.2	16	31.	13.19	8.8
11	2	28.8	16	43.	13.45	12.1
Minor Planet 488 Kreusa						
Dec 1	8	18.5	25	8.	13.12	16.7
11	8	18.0	26	5.	12.89	14.2
21	8	14.8	27	12.	12.65	11.0
31	8	8.8	28	25.	12.42	7.4
1985 Jan 10	8	0.8	29	37.	12.17	4.1
20	7	51.7	30	43.	12.14	4.0
30	7	42.6	31	36.	12.34	7.3
Feb 9	7	34.9	32	12.	12.53	11.1
19	7	29.6	32	33.	12.73	14.5
Mar 1	7	27.2	32	39.	12.93	17.3
Minor Planet 735 Marghanna						
1984 Oct 2	3	17.5	11	4.	12.94	20.0
12	3	10.8	12	29.	12.68	15.0
22	3	0.5	13	53.	12.44	9.2
Nov 1	2	48.1	15	12.	12.15	2.9
11	2	35.4	16	25.	12.26	3.3
21	2	24.2	17	31.	12.71	9.0
Dec 1	2	15.9	18	32.	13.09	13.9
Minor Planet 747 Winchester						
Nov 1	6	49.2	1	33.	12.01	26.6
11	6	52.8	1	14.	11.83	24.3
21	6	52.9	1	13.	11.63	21.3
Dec 1	6	49.7	1	36.	11.43	17.6
11	6	43.5	2	27.	11.24	13.6
21	6	35.1	3	48.	11.10	9.8
31	6	25.9	5	34.	11.08	8.0
1985 Jan 10	6	17.3	7	38.	11.24	9.4
20	6	10.6	9	50.	11.50	12.6
30	6	6.7	12	0.	11.81	16.0
Feb 9	6	5.9	14	3.	12.11	18.9
Minor Planet 751 Faina						
Nov 1	5	8.7	15	11.	12.70	16.6
11	5	2.1	16	3.	12.45	12.1
21	4	52.5	17	1.	12.21	7.1
Dec 1	4	41.1	18	4.	11.90	2.1
11	4	29.4	19	8.	12.10	4.5
21	4	19.0	20	12.	12.44	9.4
31	4	11.2	21	14.	12.74	13.9
1985 Jan 10	4	6.6	22	14.	13.04	17.5
20	4	5.7	23	14	13.31	20.4

LOW PHASE ANGLE ASTEROIDS

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As promised in the last issue, here is a continuation of the list of low phase angle asteroids. This issue's listing has been expanded to include those asteroids reaching phase angles of 0.15 degrees or less; the list, given in Table I, is complete through 1985 January 31 for asteroids up to and including number 3000.

This issue's list is somewhat more deficient in bright asteroids. Do note, however, the excellent apparition of 735 Marghanna, which is predicted to reach a blue magnitude of 11.91 on November 5. Here is an excellent opportunity to add a high-numbered asteroid to your list.

As mentioned in the last issue, the alert reader should realize that at such low phase angles, an asteroid would pass through the earth's penumbra. A quick "back of the envelope" calculation was performed to estimate the amount by which an asteroid's brightness would be diminished. The even more alert reader would have realized that my calculations were defective! To do the calculation, I pulled a couple of numbers off the top of my head: the diameter of the sun (as seen from a distance of 1 AU), which we all know is about 1/2 degree, and the diameter of the earth (also as seen from 1 AU), which I estimated as 8.8 arcsec. The 8.8 figure I recalled is known as the horizontal parallax of the earth. What I failed to recall at the time is that the horizontal parallax refers to the apparent angular radius of an object. Thus I underestimated the angular size of the earth by a factor of two. Curiously, no reader called my attention to this error; come on, MPB readers, wake up! You shouldn't let me get away with such mistakes.

For the record, let's do the calculation right. The horizontal parallaxes of the sun and earth are 959.641 and 8.794 arcsec,

respectively. At a distance of 1.919 AU, the sun subtends 1000 arcsec (diameter), and at a distance of 0.914 AU, the earth subtends 19.2 arcsec (diameter). The area ratio earth/sun is therefore 1/2700, which converts to 0.0004 mag, about four times larger than the number derived last time, but the conclusion remains unchanged: the loss of light is unmeasurable. Theoretically, one could collect enough photons to measure the brightness of an object to 0.0004 mag precision; in practice, the fluctuations produced by the atmosphere and the rotation of the object would mask such a small variation by many times over.

TABLE I

Asteroid	Phase Angle	Mag B	UT Date	Time
673 Edda	0.15	14.56	1984 Nov 4	2 hr UT
1909 Alekhin	0.09	16.97	1984 Nov 4	10
24 Themis	0.04	11.94	1984 Nov 4	14
1340 Yvette	0.13	17.22	1984 Nov 4	16
735 Marghanna	0.02	11.91	1984 Nov 5	17
1486 Marilyn	0.07	16.20	1984 Nov 8	9
1841 Masaryk	0.07	16.27	1984 Nov 11	21
2286 Fesenkov	0.09	16.19	1984 Nov 17	4
1752 van Herk	0.01	16.15	1984 Nov 19	9
90 Antiope	0.05	13.43	1984 Nov 30	3
1185 Nikko	0.03	14.49	1984 Dec 3	16
1109 Tata	0.02	15.51	1984 Dec 20	2
637 Chrysothemis	0.14	15.53	1984 Dec 21	15
514 Armida	0.13	13.59	1984 Dec 24	21
2264 Sabrina	0.03	16.46	1984 Dec 25	19
677 Aaltje	0.13	14.40	1984 Dec 26	14
2039 Payne-Gaposchkin	0.11	17.28	1985 Jan 1	0
2324 Janice	0.10	16.77	1985 Jan 1	12
2593 Buryatia	0.13	16.39	1985 Jan 2	1
2403 Sumava	0.03	16.73	1985 Jan 10	4
2800 4585 P-L	0.14	18.10	1985 Jan 10	3
1778 Alfven	0.11	17.09	1985 Jan 13	10
2066 Palala	0.04	16.66	1985 Jan 16	13
2217 Eltigen	0.14	16.89	1985 Jan 18	17
2237 1938 TB	0.06	16.29	1985 Jan 21	10
1383 Limburgia	0.02	17.01	1985 Jan 23	2
2123 Vltava	0.08	16.54	1985 Jan 23	21
1966 Tristan	0.12	17.31	1985 Jan 29	9
1748 Mauderli	0.07	17.75	1985 Jan 30	21

LETTER TO THE EDITOR

Dear Editor,

I enjoyed reading "William Herschel and the First Two Asteroids" (MPB v. 11 p. 3), but author Cunningham failed to tell you an interesting fact about the meeting of Herschel and Piazzi. According to Isaac Asimov, (Asimov's Biographical Encyclopedia of Science and Technology) when Piazzi visited England ". . . he had the doubtful privilege of falling off the ladder at the side of Herschel's great reflector and breaking his arm."

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COMPUTER TRACKING CHARTS

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To aid in photographing asteroids, a computer program is used to generate finding charts for the selection of guide stars. The data base contains all asteroids with a given minimum magnitude and the stars from the Yale catalogue down to 7th magnitude. Parameters may be set that allow the charts to be plotted in many different formats. The charts will be sent to interested readers for a small charge to cover costs for copies and postage.

It's very time consuming work to find guide stars for photographing asteroids, especially if they are invisible in the telescope itself. The normal procedure is to take the ephemerides from the EMP (Ephemerides of Minor Planets by the Institute of Theoretical Astronomy in Leningrad) or ephemerides from the Minor Planet Center and plot the positions by hand on a star chart with a good scale so that finding guide stars for long focus exposures is possible.

Because this is too much work for all asteroids, I decided to do this with a computer. At first I typed all the elements of the EMP in to my computer files, which was very hard work, but there is no computer readable version available to my knowledge. Then I took star positions from the Yale catalogue which contains about 9000 stars down to 7th magnitude. This is the limiting magnitude for guide stars for most amateurs, I think.

Now the problem was to bring both data sets together in a form which was best for quickly planning the exposures. At first I wrote a program to calculate ephemerides with errors under 20". An example of this is presented in Table I. In addition to the normal data like date (day.month.year), right ascension (hh.mmmm), declination (ddd.mmm), and magnitude, the radius (asteroid-sun distance) and earth-asteroid distance (both in AU) are given. (For example, the first entry is for 27 August 1984 and the coordinates are R.A. 4 hours 21.42 minutes and declination -8 degrees 28.2 minutes.) The table also gives the time (in minutes) for the asteroid to move 5 arc seconds (5"), the motion of the asteroid (in arc seconds) in 15 minutes (15 m), the elongation from the sun, the phase angle, and the daily motion in right ascension and declination (M-A and M-D are in minutes and arc minutes, respectively). The top of the table lists the number and name of the asteroid, the interval (in days) covered by the ephemeris, and the date of the printing.

The motion data are very useful for calculating whether or not the asteroid is bright enough to bring enough light to a point on the film. Therefore you must also know your guiding error and the resolution of the film. For example: if the greatest value