

THE MINOR PLANET BULLETIN

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of the Association of Lunar and Planetary Observers

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Items for publication and subscriptions should be sent to the editor. Correspondents requiring a reply should enclose a self addressed stamped envelope unless residing outside the U.S.A. or writing on behalf of a government agency or planetary institute. Subscriptions are \$ 2.00 a year postpaid for 4 issues, and also include the Minor Planet Memo and Minor Planet Alert. Overseas subscribers should add \$ 1.50 if they desire air mail service.

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Editorial: Initial Reactions

In the two and a half months since the first MPB went forth into the world it has been encouraging to receive so many thoughtful criticisms, suggestions for future observations, and new subscribers. We welcome the new readers with this issue, and hope that they can contribute to our knowledge of minor planets by their observations and research. We hope too that they will communicate the fruits of their labors in the pages of MPB.

Beginning with this issue the left hand margin of MPB will be punched in a manner suitable for insertion in a common three-ring notebook. This should facilitate storage and retrieval. The same is being done for the MPM and MPA.

It should be noted that articles and papers published in MPB will be abstracted and indexed in Astronomy and Astrophysics Abstracts, which serves as the recognized international index to astronomical literature. This work is undertaken by the Astronomisches Rechen Institut of Heidelberg, and is published by Springer Verlag in semi-annual volumes. Thus articles and papers published in MPB will come to the attention of scholars around the world.

Several letters commenting on the Recorder's article in the first issue have been received, and are much appreciated. Dr. Clark R. Chapman has concurred with the Recorder regarding the extreme unlikelihood of securing valid disc drawings of Ceres or any other large minor planet with Earth-based telescopes. Perhaps, when space permits, we may look into this subject further. Others have written concerning the extreme difficulty -- if not impossibility -- of visual observation of possible binary or planet/satellite situations among the minor planets (MPB 1,4). This criticism is probably well taken. Most cases (if there are any) might be too close to resolve, even with large telescopes. It is still appropriate to ask, however, if the satellite space of the largest minor planets might not be sufficiently large to allow for separations of several seconds of arc. This theoretical possibility will be examined in a future issue. Again, many thanks to those who have written!

998 BODEA, 1272 GEFION, AND 1141 BOHMIA —

THREE PLANETS IN NEED OF OBSERVATION

In the coming weeks there is urgent need for observers with moderately large apertures to search for three planets: 998 Bodea, 1272 Gefion, and 1141 Bohmia. In each of these cases the planet's orbit is not well known according to Dr. Brian G. Marsden of the Smithsonian Astrophysical Observatory, so it is important to track them down and obtain some accurate positions. Observers who have dark skies, suitably large equipment, and some tracking experience are invited to participate. Negative as well as positive observations should be reported to the Minor Planets Section Recorder.

998 Bodea is the brightest of the trio. It is predicted to be magnitude 15.4 (photographic) at opposition. Observed visually therefore it should be about 14.7 magnitude, about the same as the limit of Vehrenberg's Atlas Stellarum. Assuming that Dr. Marsden's revised ephemeris data are essentially correct, a 30 or 32 cm aperture should show it under good conditions, although larger apertures should be used if possible in the search. Marsden believes that the 1938 observations of this planet are clearly in error, and suspects that the single 1936 observation may have been forced into agreement with those of 1938. His first ephemeris given below is based on 1923, 1934 and 1936; his second ephemeris is based merely on 1923 and 1934.

Ephemeris of 998 Bodea (by Marsden, based on 1923, 1934 and 1936 data)

1973 E.T.	R.A. 1950.0	Dec.	Delta	r	Elong.	Phase	Magnitude (pg)
Sept. 15	1 ^h 27 ^m 81	+33°34.5	1.692	2.495	133.7	16.9	15.7
25	1 ^h 21 ^m 77	+34 18.8					
Oct. 5	1 13.69	+34 33.2	1.592	2.503	149.0	11.9	15.5
15	1 04.66	+34 15.9					
25	0 55.95	+33 29.7	1.581	2.514	154.4	9.8	15.4
Nov. 4	0 48.81	+32 21.6					
14	0 44.18	+31 02.0	1.664	2.530	143.6	13.4	15.6
24	0 42.49	+29 40.9					
Dec. 4	0 43.85	+28 26.9	1.831	2.548	126.9	18.0	16.0
14	0 48.06	+27 25.6					
24	0 54.81	+26 39.5	2.057	2.570	110.3	21.0	16.3

Alternate Ephemeris of 998 Bodea (by Marsden, based on 1923, 1934 data only)

Sept. 15	1 ^h 27 ^m 21	+33°31.7	1.688	2.493	133.9	16.9	15.7
25	1 21.14	+34 15.9					
Oct. 5	1 13.05	+34 30.1	1.589	2.500	149.1	11.9	15.5
15	1 04.02	+34 12.6					
25	0 55.32	+33 26.2	1.578	2.512	154.4	9.9	15.4
Nov. 4	0 48.22	+32 18.1					
14	0 43.63	+30 58.4	1.662	2.527	143.5	13.5	15.6
24	0 41.98	+29 37.5					
Dec. 4	0 43.39	+28 23.7	1.829	2.545	126.8	18.1	16.0
14	0 47.65	+27 22.6					
24	0 54.45	+26 36.8	2.055	2.567	110.2	21.1	16.3

Planet 1272 Gefion is also in need of observation. Unfortunately it will be magnitude 16.9 (photographic) in late October when it comes to opposition, probably too faint for all but a few of our subscribers to observe. Dr. Marsden has very kindly communicated an improved ephemeris based on observations made in 1917 and 1931. A condensed version of his ephemeris is given below. Any subscribers wishing a more extended ephemeris should contact the Editor.

Ephemeris of 1272 Gefion (by Marsden based on 1917 and 1931 data)

1973 E.T.	R.A.	1950.0 Dec.	Delta	r	Elong.	Phase	Magnitude (pg)
Oct. 5	2 ^h 35 ^m .19	+28°01'.2	1.700	2.578	144.1	13.1	17.1
	15	2 27.37	+28 01.4				
	25	2 17.98	+27 41.0	1.640	2.609	163.3	6.3
Nov. 4	2 08.20	+27 02.0					
	14	1 59.31	+26 10.1	1.686	2.640	160.7	7.1
	24	1 52.31	+25 12.9				
Dec. 4	1 47.89	+24 18.0	1.835	2.672	140.7	13.5	17.4

The third planet needing observation is 1141 Bohmia, mentioned in MPB 1,6. It will be somewhat brighter than 1272 Gefion just discussed, and should be visible in instruments of 35 cm aperture and larger, given dark sky conditions. The following ephemeris is taken from Ephemerides of Minor Planets for 1973 which Dr. Marsden feels is reasonably accurate. For convenience part of the data published earlier is reprinted, but some subsequent positions have been added.

Ephemeris of 1141 Bohmia

Opposition: Sept. 18. Magnitude 15.9 pg, about 15.2 visual. Distance from Earth: 0.928 A.U. Heliocentric distance: 1.929 A.U. Last observed: 1961.

1973	R.A.	1950.0 Dec.	1973
Sept. 15	23 ^h 43 ^m .5	-10°42'	Oct. 15
	25	23 35.0	23 20.7
Oct. 5	23 27.6	-12 28	

Please report all observations, both positive and negative, to the Section Recorder. In the case of positive observations please supply positions and indicate the manner in which they have been determined. In the case of negative results please indicate carefully the boundaries of the area searched, the limiting magnitude in the area of the search, and the methods used.

RGH

BOOK REVIEW

Frederick Pilcher and Jean Meeus, Tables of Minor Planets. Privately printed, available from Prof. Frederick Pilcher, Illinois College, Jacksonville, Illinois 62650, U.S.A. Paperbound, 104 pages. Price \$ 4.00. Reviewed by RGH.

Here is an attractive, superbly compiled collection of minor planet data fully updated through March 1973. Orbital elements, estimated diameters, perihelic and aphelic opposition magnitudes are given for planets numbered 1 to 1813, plus 7 unnumbered Earth-crossing planets. Even the recovery of the famous planet Apollo on 1973 March 28 by McCrosky and Shao on the basis of an ephemeris by E.G. Marsden is noted on pages 68 and 28!

There are many other valuable lists: an alphabetical list of all planets bearing names; a list of numbered planets 1 to 1813 giving discovery date, discoverer, and place of discovery for each; lists of planet groups and families; planets larger than 80 km in order of estimated diameter; lists of planets with various orbital characteristics. It is a veritable treasure house of information.

One list of interest to those with small telescopes gives all planets brighter than blue magnitude 12.0 at perihelic opposition. These should be all visible under favorable conditions in telescopes of only 10 cm (4-inches) aperture, or with about 15 cm with mediocre conditions. There is an astonishing 173 planets that qualify for this list. For a person to observe them all would be quite an accomplishment!

There are also physical data on rotational periods and amplitudes for the cases where this has been determined. The relative brevity of this particular list indicates that much remains to be done.

Tables of Minor Planets is an excellent piece of work -- no serious minor planet observer should be without it. It is a pleasure to know that one of the authors -- Professor Pilcher -- is one of the most active members in the Minor Planets Section who will doubtless contribute much in the days ahead. The excellence of the work of the other author, Jean Meeus of Belgium, is known throughout the astronomical world.

PERIHELIC OPPOSITION OF 887 ALINDA

In the closing months of 1973 and in early 1974 minor planet observers will have an unusual opportunity to observe the unusual planet 887 Alinda. Alinda is a rather small piece of rock (estimates of its diameter based on its brightness and an assumed albedo suggest a value of 2 km) moving around the Sun in a period of 3.9905 years in a highly eccentric orbit (eccentricity = 0.54). At perihelion Alinda is just a little outside the Earth's orbit, 1.12 A.U. from the Sun. Alinda will come to perihelion and opposition with Earth in the early part of January 1974. According to the Marsden ephemeris reproduced from Ephemerides of Minor Planets Alinda will reach magnitude 12.3 photographic -- its maximum -- about January 9. In visual terms it will probably appear between 0.5 and 1.0 magnitude brighter, the exact value depending upon its color. For many observers Alinda should be bright enough to observe beginning in mid or late November, and should remain observable until late February 1974.

Apart from the educational value of finding and tracking Alinda, observers are encouraged to obtain U,B,V magnitudes and light curves if they have photoelectric photometry capability. For those not so equipped magnitude estimates utilizing variable star techniques may be of value. Observers should watch for relatively short-term light variations due to rotation. Probably a small planet like Alinda rotates on its axis in 2 to 5 hours (if it is like many other small planets), but the period is not known.

Ephemeris of 887 Alinda (from Ephemerides of Minor Planets)

1973 E.T.	R.A. 1950.0	Dec.	Magnitude(pg)	1973 E.T.	R.A. 1950.0	Dec.	Magn.(pg)
Oct. 5	3 ^h 42 ^m .4	- 3°26'	16.8	Nov. 4	4 ^h 23 ^m .8	- 9°25'	
15	3 56.7	- 5 18		14	4 37.7	- 11 03	14.9
25	4 10.4	- 7 23	15.8	24	4 53.2	- 11 45	

continued on next page

Ephemeris of 887 Alinda (continued)

1973 E.T.	R.A. 1950.0	Dec.	Magn. (pg)	1974 E.T.	R.A. 1950.0	Dec.	Magn(pg)
Dec. 4	5 ^h 12 ^m 3	-10°45'	13.9	Jan. 9	7 ^h 26 ^m 6	+19°08'	12.3
6	5 16.8	-10 15		11	7 36.7	+21 28	
8	5 21.6	- 9 39	13.7	13	7 46.6	+23 40	12.4
10	5 26.7	- 8 54		15	7 56.4	+25 44	
12	5 32.1	- 8 02	13.5	17	8 05.9	+27 38	12.6
14	5 37.9	- 7 01		19	8 15.1	+29 22	
16	5 44.1	- 5 50	13.3	21	8 23.9	+30 56	12.9
18	5 50.6	- 4 30		23	8 32.4	+32 19	
20	5 57.5	- 2 59	13.1	25	8 40.4	+33 32	13.1
22	6 04.8	- 1 18		27	8 47.9	+34 36	
24	6 12.6	+ 0 32	12.9	29	8 55.0	+35 31	13.4
26	6 20.7	+ 2 33		31	9 01.6	+36 17	
28	6 29.2	+ 4 42	12.7	Feb. 2	9 07.8	+36 56	13.6
1974 30	6 38.1	+ 6 59		12	9 32.5	+38 36	
Jan. 1	6 47.4	+ 9 22	12.5	22	9 49.3	+38 26	14.8
3	6 56.9	+11 48		Mar. 4	10 01.7	+37 07	
5	7 06.7	+14 17	12.4	14	10 12.3	+35 07	16.0
7	7 16.6	+16 44		24	10 22.4	+32 44	

Note: Observers should plan their programs with care. Remember that the full Moon may cause problems, particularly if transparency is not good, or the planet is near the limiting magnitude of the instrument. In late December and early January Alinda will be passing through the Milky Way which may cause identification problems. Please report observations without delay to the Recorder.

NEWS NOTES

OCCULTATIONS OF 10 HYGIEA BY THE MOON IN LATE 1973. Dr. David W. Dunham of The University of Texas at Austin and, independently, Dr. Clark R. Chapman of The Planetary Science Institute, Tucson, have called to the Editor's attention several occultations of planet 10 Hygiea by the Moon. These events were first noted by Dr. Chapman and Don Davis (also of the Planetary Science Institute).

The first occultation has already taken place on 1973 September 9 with a 92% sunlit waxing Moon, and should have been visible to observers in South Africa. Since as yet we have no observers belonging to the A.L.P.O. Minor Planets Section residing in South Africa no action could be taken by the Recorder in this instance. As this is written no word has been received concerning observations of the event.

The second occultation of 10 Hygiea by the Moon will take place on October 7 when the waxing Moon will be 75% sunlit, and Hygiea will be magnitude 11.5 (photographic). This event will be visible from northwestern South America, Central America, and the Caribbean Sea. Assuming Hygiea's diameter is about 150 km its disappearance should take up to 0^s.3. Photoelectric observations are needed to help determine the planet's diameter more accurately. Since at present there are no

Minor Planets Section members in this part of the world predictions for various stations will not be given here. Any readers, however, who might be in the area of visibility on October 7 and able to observe the event should contact Dr. David W. Dunham, Department of Astronomy, University of Texas at Austin, Austin, Texas 78712, U.S.A. without delay indicating the location where the observation will be made, and appropriate predictions will be supplied.

The third occultation of 10 Hygiea will occur on 1973 November 3, and will be visible from most of Europe, northeastern Africa, and the Middle East. The Moon will be 54% sunlit, waxing; Hygiea will be magnitude 11.9. Observers in Europe, northeastern Africa and the Middle East who are equipped to observe this event should contact the Recorder or Dr. Dunham at the addresses previously mentioned.

OCCULTATION OF 554 PERAGA BY THE MOON ON NOVEMBER 7. On November 7, 1973 the 90% sunlit Moon, waxing, will occult planet 554 Peraga. This event will be visible from Africa (except the southern and northwestern parts) and the Middle East excluding Turkey. The diameter of Peraga is unknown. Based on its observed brightness its diameter is roughly estimated at 50 km in Pilcher and Mees, Tables of Minor Planets. Again it is unfortunate that we have no section members resident in the region of observability.

SECTION NEWS

OBSERVATIONS OF 74 GALATEA REPORTED. As indicated in Minor Planet Memo # 1 (June 30) and # 2 (July 6) Professor Frederick Pilcher of Illinois College, Jacksonville, Illinois 62650 U.S.A. desired observations of 74 Galatea, a planet which had given him some difficulty. In immediate response to the Memo of June 30 Dr. Paul Herget of the University of Cincinnati Observatory indicated to the Recorder that the maximum deviation last year was $0^m.5$ in R.A., and that the maximum for this year is $0^m.9$. He says, "For some of the older minor planets this is not an unreasonably large amount, especially if the object lies along the Variation line." (Letter with ephemeris print-out dated 1973 July 5).

Very shortly after Prof. Pilcher sent his request for 74 Galatea observations he himself recovered the planet, and secured a number of positional observations through the course of the summer. At the time of this writing (September 18) these are the only A.L.P.O. observations received, and are as follows:

1973 June 28.32	21 ^h 22 ^m .8	-9°07'
June 29.24	21 22.7	-9 06
June 30.24	21 22.5	-9 05
July 3.35	21 22.0	-9 03
July 4.23	21 21.7	-9 02
July 29.21	21 08.6	-9 43
Aug 1.25	21 06.2	-9 52
Aug 2.22	21 05.4	-9 56

Professor Pilcher has determined these positions with the use of the Vehrenberg atlas grids, and considers accuracy to be to the order of $\pm 0^m.2$, $\pm 2'$. In a letter of August 29 to the Recorder he found residuals increasing to about $+ 0^m.9$, $+6'$ as distance decreased near opposition. Thus Pilcher's observations seem to be in agreement with the opinion of Dr. Herget.

74 Galatea is one of a number of minor planets whose positions are based on the work of computers of poor capability in the early 1950's. In such cases our actual knowledge of the planet's orbit may be better than the positional predictions might lead one to believe. While not all the orbits so generated are unreliable, a number of them have given observers trouble. Many thanks are due Professor Pilcher for his work on 74 Galatea, and to the several other astronomers whose comments on this planet were of help to the Recorder!

OBSERVATIONS OF 15 EUNOMIA REPORTED. Alain Porter of Narragansett, Rhode Island has submitted a chart showing his 20 observations of 15 Eunomia during the period 1972 September 1 to 1972 December 29 (U.T.). His chart shows fairly good correspondence between the predicted path and that observed except for a few observations in early December. He is to be commended for his patience and persistence in making these observations.

PLANET APOLLO RECOVERY. Dr. Brian G. Marsden, one of our subscribers, has written an informative article "The Recovery of Apollo" in Sky and Telescope magazine, 46, 155-158 (September 1973). Section members will want to be sure that they read this if they have not already done so.

REQUEST FOR POSITIONAL OBSERVATIONS. Professor Pilcher (address given on previous page) requests positional observations of the following minor planets which may manifest large residuals: (opposition magnitude (pg), date also given)

166 Rhodope	13.0	Sept. 12
556 Phyllis	13.4	Oct. 1
73 Klytia	13.3	Nov. 17
352 Gisela	12.9	Dec. 4
487 Venetia	12.6	Dec. 24

Rather than delay any further the speedy publication of this issue ephemerides of these planets will not be included here. All subscribers who wish to observe them and lack ephemerides should contact the Recorder (a post card is sufficient). They will be sent without charge.

IN THE NEXT ISSUE OF MPB: Professor Pilcher will supply a list of planets which are especially favorably situated for observation during 1974. Hopefully there will be some positive results from some of the predicted minor planet occultations mentioned earlier in this issue.