

# THE MINOR PLANET BULLETIN

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OF THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

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19.

## MINOR PLANETS AT UNUSUALLY FAVORABLE OPPOSITION IN 1983

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**Abstract:** A list is presented of minor planets which are much brighter than usual at their 1983 oppositions. This list includes three Earth-grazing planets at close approach, 1620 Geographos, 2340 Hathor = 1976 UA, and 2368 Beltrovata = 1977 RA. 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 1983 oppositions than at their average opposition distances. Many years may pass before these planets will be again as bright as in 1983. Observers are encouraged to give special attention to those which lie near the limit of their equipment.

This list has been compiled on the basis of a comparison of the magnitudes given in the 1983 Ephemerides of Minor Planets<sup>1</sup> with the range of opposition magnitudes in Tables of Minor Planets<sup>2</sup> and as extended and refined privately by the writer. Any planets whose perihelion and aphelion opposition magnitudes differ by 2<sup>m</sup>0 or more and in 1983 will be within 0<sup>m</sup>3 of the brightest possible, or which differ by 3<sup>m</sup>0 or more and in 1983 will be within 0<sup>m</sup>5 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.

Some planets which come to opposition at large phase angles will be fainter than listed in the 1983 ephemeris volume, because phase coefficients are not included in the calculation of magnitudes in this source. No systematic effort has been made by the writer to revise the published magnitudes for phase effects, but for a few planets in opposition far from the ecliptic a revision has been made.

Three earth approachers are included, and special efforts to observe these in 1983 should be made. Planet 1620 Geographos has a well-established rotation period of 5.2233 hours and a very large two-magnitude amplitude. In smaller telescopes it will alternately appear and disappear below the limit, and observers should watch for at least one-fourth of the period before concluding they cannot find it. Additional lightcurves with large telescopes, both at closest approach in March and at a second, more distant opposition in October, are encouraged. Combining these observations with those made in 1969 should improve the location of the rotational pole and if rotational cycles between 1969 and 1983 can be counted correctly, a twenty-fold improvement in the rotation period can be achieved.

It frequently happens that many observations are made soon after discovery of a remarkable object, and that later this object is ignored. For example, Uranus' satellite Miranda has as many observations during the

first year following its discovery as in the 34 years since. Miranda is in no danger of being lost, but the opposite is true of close-approaching asteroids for which an accurate ephemeris is necessary for observation. Two such objects will approach the Earth in 1983: 2340 Hathor and 2368 Beltrovata. That interest in them was greater at discovery than later is shown by the remark that they may be better known by their provisional designations, 1976 UA and 1977 RA, respectively. Both are on the critical list of objects observed at only two apparitions. Planet 2340 Hathor is remarkable in having semimajor axis 0.844 AU, second smallest known, and approached Earth closer than 0.01 AU shortly before discovery. Planet 2368 Beltrovata was discovered at perihelion opposition. With a period of 3.05 years, subsequent perihelia come progressively farther past opposition, and each succeeding approach for the next three decades will be more distant. The Minor Planet Bulletin strongly urges additional observations of both of these planets with larger telescopes this year to guard against a considerable danger of their becoming lost.

Separate lists arranged in numerical order and in order of opposition date are provided. All magnitudes given in this paper are in the photoelectric B system. Visually most planets are 0<sup>m</sup>.7 to 0<sup>m</sup>.9 brighter.

### References

1. Ephemerides of Minor Planets for the Year 1983, Institute for Theoretical Astronomy, Leningrad (1982).
2. Pilcher, F., and Meeus, J., Tables of Minor Planets (1973), published privately by the authors.

Planet	Opposition	
	Date	B Mag
3 Juno	Oct 29	8.3
5 Astraea	Mar 1	10.0
31 Euphrosyne	Oct 24	10.6
38 Leda	Jan 16	12.2
54 Alexandra	Aug 21	11.0
68 Leto	Oct 22	10.7
69 Hesperia	Dec 30	11.1
76 Freia	Jan 12	12.7
80 Sappho	Oct 28	10.4
90 Antiope	Sep 5	12.7
121 Hermione	Nov 8	12.5
139 Juewa	Feb 17	11.7
145 Adeona	Jan 7	11.1
148 Gallia	Jan 11	11.5
177 Irma	Oct 22	12.6
181 Eucharis	Feb 8	12.1
204 Kallisto	Jul 21	12.4
247 Eukrate	Nov 8	11.9
290 Bruna	Apr 7	15.1
356 Liguria	Oct 19	11.5

Opposition			Opposition			Opposition		
Planet	Date	B Mag	Planet	Date	B Mag	Date (1983)	Planet	B Mag
382 Dodona	Apr 9	12.9				May 2	2167 Erin	15.1
384 Burdigala	Oct 29	13.4	1590 Tsiolkovskaja	Jul 21	14.4	May 10	1575 Winifred	15.5
410 Chloris	Jun 23	11.2	1620 Geographos	Mar 1	13.0	May 12	1680 Per Brahe	14.7
415 Palatia	Nov 8	12.0	1663 Van Den Bos	Aug 21	16.0	May 17	2035 Stearns	15.0
437 Rhodia	Oct 3	12.9	1680 Per Brahe	May 12	14.7	May 26	2368 Beltrovata	17.1
455 Bruchsalia	Oct 16	11.6	1808 Bellerophon	Nov 6	15.6	Jun 4	2474 Ruby	14.8
458 Hercynia	Oct 23	13.2				Jun 5	1322 Copernicus	15.3
474 Prudentia	Aug 27	13.0	1821 Aconcagua	Jul 8	16.0	Jun 15	1396 Outeniqua	14.1
504 Cora	Aug 18	13.4	1851 Lacroute	Oct 28	16.2	Jun 23	410 Chloris	11.2
531 Zerlina	Apr 9	15.0	1925 1934 RY	Oct 19	15.5	Jul 8	1821 Aconcagua	16.0
545 Messalina	Sep 21	13.3	1934 Jeffers	Nov 19	15.4	Jul 10	594 Mireille	15.5
549 Jessonda	Oct 30	13.8	1945 1930 OL	Jul 11	15.8	Jul 11	1945 1930 OL	15.8
563 Suleika	Nov 9	11.9	2035 Stearns	May 17	15.0	Jul 12	1514 Ricouxa	14.6
572 Rebekka	Sep 5	13.7	2041 Lancelot	Dec 6	16.7	Jul 21	204 Kallisto	12.4
574 Reginhild	Dec 8	14.4	2044 Wirt	Dec 8	15.0	Jul 21	1590 Tsiolkovskaja	14.4
594 Mireille	Jul 10	15.5	2057 Rosemary	Nov 11	16.6	Jul 22	2370 1965 LA	13.8
603 Timandra	Jan 30	15.5	2133 Franceswright	Aug 9	16.2	Jul 23	834 Burnhamia	13.4
629 Bernardina	Dec 17	14.1	2167 Erin	May 2	15.1	Jul 23	1246 Chaka	14.4
634 Ute	Nov 16	14.3	2171 Kiev	Jul 26	16.1	Jul 26	2171 Kiev	16.1
645 Agrippina	Jan 4	14.4	2174 Asmodeus	Sep 30	15.5	Jul 28	1473 Ounas	15.4
668 Dora	Sep 4	15.4	2237 1938 TB	Oct 1	15.5	Jul 28	1535 Päijänne	15.8
670 Ottegebe	Aug 12	13.6	2301 1965 WJ	Jan 12	15.3	Aug 9	2133 Franceswright	16.2
689 Zita	Sep 22	14.1	2340 Hathor	Nov 10	17.7	Aug 10	1525 Savonlinna	14.8
692 Hippodamia	Jan 21	13.8	2368 Beltrovata	May 26	17.1	Aug 12	670 Ottegebe	13.6
694 Ekard	Sep 26	11.2	2370 1965 LA	Jul 22	13.8	Aug 13	1427 Ruvuma	14.0
696 Leonora	Dec 18	13.2	2372 1977 RA8	Dec 14	16.0	Aug 18	504 Cora	13.4
758 Mancunia	Nov 14	13.0	2393 1955 WB	Aug 21	14.9	Aug 21	54 Alexandra	11.0
834 Burnhamia	Jul 23	13.4	2441 Hibbs	Sep 20	15.8	Aug 21	1663 Van Den Bos	16.0
899 Jokaste	Nov 1	13.7	2474 Ruby	Jun 4	14.8	Aug 21	2393 1955 WB	14.9
902 Probitas	Sep 12	15.3				Aug 23	1456 Saldanha	15.1
935 Clivia	Oct 22	15.5				Aug 26	1168 Brandia	15.0
947 Monterosa	Oct 12	13.1				Aug 27	474 Prudentia	13.0
950 Ahrensa	Mar 14	14.0				Aug 28	984 Gretia	13.1
952 Caia	Sep 22	12.7				Sep 2	1064 Aethusa	14.5
984 Gretia	Aug 28	13.1				Sep 4	668 Dora	15.4
986 Amelia	Sep 30	13.7				Sep 5	90 Antiope	12.7
987 Wallia	Sep 23	13.6				Sep 5	572 Rebekka	13.7
1034 Mozartia	Sep 25	14.3				Sep 12	902 Probitas	15.3
1064 Aethusa	Sep 2	14.5				Sep 15	1240 Centenaria	13.6
1072 Malva	Nov 4	14.8				Sep 20	2441 Hibbs	15.8
1096 Reunerta	Oct 24	13.8				Sep 21	545 Messalina	13.3
1116 Catriona	Jan 2	13.7				Sep 22	689 Zita	14.1
1168 Brandia	Aug 26	15.0				Sep 22	952 Caia	12.7
1224 Fantasia	Sep 27	13.9				Sep 23	987 Wallia	13.6
1240 Centenaria	Sep 15	13.6				Sep 25	1034 Mozartia	14.3
1246 Chaka	Jul 23	14.4				Sep 26	694 Ekard	11.2
1270 Datura	Oct 8	14.6				Sep 27	1224 Fantasia	13.9
1283 Komsomolia	Nov 5	15.0				Sep 30	986 Amelia	13.7
1312 Vassar	Dec 11	15.2				Sep 30	2174 Asmodeus	15.5
1318 Nerina	Mar 22	14.2				Oct 1	2237 1938 TB	15.5
1322 Copernicus	Jun 5	15.3				Oct 3	437 Rhodia	12.9
1383 Limburgia	Oct 24	16.0				Oct 8	1270 Datura	14.6
1396 Outeniqua	Jun 15	14.1				Oct 12	947 Monterosa	13.1
1427 Ruvuma	Aug 13	14.0				Oct 16	455 Bruchsalia	11.6
1450 Raimonda	Dec 16	14.7				Oct 19	356 Liguria	11.5
1456 Saldanha	Aug 23	15.1				Oct 19	1925 1934 RY	15.5
1473 Ounas	Jul 28	15.4				Oct 22	68 Leto	10.7
1483 Hakoila	Apr 14	15.1				Oct 22	177 Irma	12.6
1484 Postrema	Mar 8	14.8				Oct 22	935 Clivia	15.5
1514 Ricouxa	Jul 12	14.6				Oct 23	458 Hercynia	13.2
1525 Savonlinna	Aug 10	14.8				Oct 24	31 Euphrosyne	10.6
1535 Päijänne	Jul 28	15.8				Oct 24	1096 Reunerta	13.8
1537 Transylvania	Nov 5	14.9				Oct 24	1383 Limburgia	16.0
1575 Winifred	May 10	15.5				Oct 24	80 Sappho	10.4
1578 Kirkwood	Feb 2	16.0				Oct 28	1851 Lacroute	16.2
						Oct 29	3 Juno	8.2
						Oct 29	384 Burdigala	13.4
						Oct 30	549 Jessonda	13.8

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Nov 1	899 Jokaste	13.7
Nov 4	1072 Malva	14.8
Nov 5	1283 Komsomolia	15.0
Nov 5	1537 Transylvania	14.9
Nov 6	1808 Bellerophon	15.6
Nov 8	121 Hermione	12.5
Nov 8	247 Eukrate	11.9
Nov 8	415 Palatia	12.0
Nov 9	563 Suleika	11.9
Nov 10	2340 Hathor	17.7
Nov 11	2057 Rosemary	16.6
Nov 14	758 Mancunia	13.0
Nov 16	634 Ute	14.3
Nov 19	1934 Jeffers	15.4
Dec 6	2041 Lancelot	16.7
Dec 8	574 Reginhild	14.4
Dec 8	2044 Wirt	15.0
Dec 11	1312 Vassar	15.2
Dec 14	2372 1977 RA8	16.0
Dec 16	1450 Raimonda	14.7
Dec 17	629 Bernardina	14.1
Dec 18	696 Leonora	13.2
Dec 30	69 Hesperia	11.1

B(1,0). The errors in these adopted values are of order  $\pm 0^m.3$ , sufficiently improved over previous determinations to recommend their inclusion in future tabulations.

Table 1

Planet	observation	No. of obs	$B_{obs}$	$r$	$\Delta$	$\alpha$	$B(1,0)$
457	1982 Nov 22	2	15.0	2.62	1.61	1°	11.9
457	1982 Dec 7-8	3	15.4	2.63	1.68	7	11.9
577	1982 Sep 19-29	8	14.0	2.91	1.92	4	10.2
1060	1982 Sep 22-23	4	15.0	1.91	0.91	6	13.6
1066	1982 Oct 10-15	8	14.9	1.93	0.94	5	13.5

## References

1. Pilcher, F., Minor Planet Bulletin 8, 10-11 (1981 Apr-June).
2. Pilcher, F., Minor Planet Bulletin 9, 3 (1982 Jan-Mar).
3. Bowell, E., Gehrels, T., and Zellner, B., in Asteroids (T. Gehrels, Ed.), University of Arizona Press (1979), pp. 1108-1129.
4. Gehrels, T., in Surfaces and Interiors of Planets and Satellites (A. Dollfus, Ed.), Pergamon Press, London and New York (1970), chapt. 6.

IMPROVED ABSOLUTE MAGNITUDES OF MINOR  
PLANETS BY VISUAL PHOTOMETRY III.

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Abstract. The absolute magnitudes of minor planets 457, 577, 1060, and 1066 have been improved to, respectively,  $B(1,0) = 11.9, 10.2, 13.6, 13.5$ , by visual photometry.

This paper represents a continuation of the program previously described in References 1 and 2. In calendar 1982 the writer observed approximately 100 planets with  $B \geq 14.0$  by visual means with the Celestron 14 (35.6 cm aperture, effective focal ratio 11) of the Walter H. Balcke Observatory at Illinois College. Relative magnitudes of different asteroids were compared via the B scale published in the annual ephemeris volume, and could be obtained to an accuracy  $\pm 0^m.2$ . Varying color indices B-V provide an additional source of error of standard deviation  $\pm 0^m.1$  if the planets included in this report have a spread of B-V values comparable to those catalogued.<sup>3</sup> Most of the planets surveyed had magnitudes agreeing with the predicted values within this limit of accuracy. The planets 457, 577, 1060, 1066 had observed magnitudes differing from those predicted by substantially greater amounts. For these it appears that the discrepancy is real and that absolute magnitudes computed from the observed apparent magnitudes will improve the published tables of  $B(1,0)$ .<sup>3,4</sup>

All planets were observed several times. No variation above the limit of observational accuracy attributable to rotation or otherwise could be detected in any single night or in a time of a few days. The several observations over this time period have been averaged and this average value has been used to calculate the absolute magnitude  $B(1,0)$ .

The method of reduction from  $B_{observed}$  to  $B(1,0)$  has been explained previously.<sup>1</sup> Numerical values of these calculated quantities appear in Table 1, whose right column contains the adopted improved values of

## SECTION NEWS

PROF. FREDERICK PILCHER, NEW RECORDER. Effective on 1983 January 15, Professor Frederick Pilcher, of the Physics Department, Illinois College, Jacksonville Illinois will become Recorder of the Minor Planets Section of the Association of Lunar and Planetary Observers. He has served as Assistant Recorder in the Section for several years, overseeing positional observations, and has contributed a number of articles to MPB on visual photometry as well. His annual list of planets at unusually favorable opposition, also published in MPB, has attracted widespread attention, even among professional astronomers. (Cf. p. 19ff of this issue). Professor Pilcher also has the distinction of having observed more minor planets with his own eyes than any other person in history.

Under Prof. Pilcher's leadership we look forward to many more scientifically-valuable contributions by Section members in the future. Let's give him our enthusiastic support!

MINOR PLANET BULLETIN TO CEASE WITH THIS ISSUE. As indicated in the previous issue (p. 18) this is the last issue of The Minor Planet Bulletin. Henceforth minor planet observations, reports, and other related information will be published in The Journal of the Association of Lunar and Planetary Observers. All items for future publication should be submitted first to the new Recorder, Prof. Frederick Pilcher, Physics Department, Jacksonville, Illinois 62650, U.S.A.

A WORD OF THANKS. Recorder Richard G. Hodgson would like to thank the many Section members who have contributed so much to the work of the Section over the past decade. Space does not permit naming them here, but their efforts are deeply appreciated. Keep up the good work and improve upon it if possible!

A FINAL PLUG. Over the years the outstanding publication called Tonight's Asteroids has been recommended to Section members. That recommendation is worth repeating now. Dr. J.U. Gunter gets this publication out about six times a year. It provides finder charts and historical information about the asteroids which amateurs might observe, and often includes comet news as well. U.S. observers can subscribe merely by sending several large-size self-addressed stamped envelopes to Dr. J.U. Gunter at 1411 N. Mangum Street, Durham, North Carolina 27701. There is no other cost for the publication thanks to the kindness of Dr. Gunter.

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##### POSTSCRIPT

AND SO, after nine and one-half years, and nine volumes totaling 360 pages, The Minor Planet Bulletin is ended. As Editor, I express my thanks to all who have contributed observations and articles over the years, and to the many, both professional and non-professional astronomers, who have given helpful advice and support. For me it has been a rich and precious experience, and I know that I am going to miss it.

I also wish to express my thanks to the Sioux Center Shopper and its staff for the excellent work they have done over the years (since volume 3) in publishing the MPB.

Finally, to all our readers, I take this opportunity to wish you all a blessed and prosperous New Year. Keep on observing!

Richard G. Hodgson

Editor, MPB