Occultation Newsletter

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FROM THE PUBLISHER

For subscription purposes, this is the fourth issue of 1991. It is the sixth issue of Volume 5.

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Local circumstance (asteroidal appulse) predictions (for your location) - 1.00
Graze limit and profile predictions (per graze) 1.50
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Asteroidal occultation supplements will be available at extra cost: for South America through Ignacio Ferrin (Apartado 700; Merida 5101-A; Venezuela), for Europe through Roland Boninsegna (Rue de Mariembourg, 33; B-6381 DOURBES; Belgium) or IOTA/ES (see below), for southern Africa through M. D. Overbeek (Box 212; Edenvale 1610; Republic of South Africa), for Australia and New Zealand through Graham Blow (P.O. Box 2241; Wellington, New Zealand), and for Japan through Toshio Hirose (1-13 Shimomaruko 1-chome; Ota-ku, Tokyo 146, Japan). Supplements for all other areas will be available from Jim Stamm (117891 N. Joi Drive; Tucson, AZ 85737; U.S.A.) for $2.50.

Observers from Europe and the British isles should join IOTA/ES, sending DM 40.-- to the account IOTA/ES; Bartold-Knaust Strasse 8; 3000 Hannover 91; Postgiro Hannover 555 829 - 303; bank-code-number (Bankleitzahl) 250 100 30.

IOTA NEWS

David W. Dunham

This Issue and 1992 Planetary Occultations: The main purpose for this issue is to distribute my predictions for planetary, asteroidal, and cometary occultations that will occur during 1992. Unfortunately, my many prediction obligations and the holidays will make distribution of this issue late, so that most subscribers will receive this after the first few events occurred. Most, but not all, of these early events were covered in E. Goffin's predictions distributed earlier, or in my article starting on p. 72 of the 1992 January issue of Sky and Telescope (S&T). It was not possible to assemble this issue before departure for our 2-week holiday vacation, which will include trying to observe the annular eclipse in California. So the issue will either be assembled and printed while we are away, in which case it may look a little unusual since it will not be possible to reprint pages to make figures and text fit well. Or it will be assembled, printed, and finally mailed many days after we return on Jan. 6, in which case you will get it well after the middle of January, after many good events have passed.

Don Stockbauer and Tony Murray have not submitted articles on grazing occultations and new double stars for this issue, since too few reports have been received since the last issue. Robert Sandy notes an error in the graze list on p. 108 of the last issue; his expedition for the June 17th graze was at Peculiar, MO (not KS).

IOTA Meeting: The next (10th) annual meeting of the International Occultation Timing Association will probably be held Saturday, 1992 October 3, in the

Houston, Texas, area. This will give those who arrive early a chance to observe two good grazing occultations that will occur in the area Thursday evening, October 1st (U.T. October 2). The Moon will be 35% sunlit waxing, and the grazes are dark-limb southern-limit events. The stars are 6.3-mag. ZC 2510 and 4.3-mag. 44 Ophiuchi. The paths are shown as numbers 284 and 285 on p. 124 of the RASC Observer's Handbook, and the 44 Ophiuchi event is also shown on p. 68 of the January issue of S&T. The location of the meeting has not yet been determined, since our usual meeting place, the Lunar and Planetary Institute, will probably not be available during weekends in their new location. More specific information will be given in either the next issue, or the one following it.

Graze Supplements and Next Issue: I had planned on distributing the hemispheric grazing occultation supplements for 1992 with this issue, but this will not be possible; it was more important that I spend my limited time on distribution of the detailed IOTA graze predictions for early 1992, and related data for others helping with this effort. We plan to distribute the graze supplements in a separate mailing in January. We hope to produce the next issue of ON in March. If you have a contribution for that issue, we should receive it by March 7.

SOLAR SYSTEM OCCULTATIONS DURING 1992

David W. Dunham

General: My predictions of occultations of stars by major and minor planets, and by one comet, are given in two tables whose contents are described in ON 5, No. 2, and in subsequent sections of this article. Most of the asteroidal occultation prediction material distributed by IOTA was prepared by Edwin Goffin in Belgium and is discussed in the third section. Sources of the predictions, other information, including stellar diameters (when significant) and a priority list, and notes about individual events, are given in the last sections.

Reporting Observations: Reports of observations of any of these events should be sent to Jim Stamm; 11781 N. Joi Drive; Tucson, AZ 85737; U.S.A. Report positive or negative observations made under good conditions, but clouded-out attempts need not be reported. If a definite occultation is seen that could use some analysis for comparison with others, also send copies of the report to me at 7006 Megan Lane; Greenbelt, MD 20770; U.S.A., and to the chairman of the International Astronomical Union's (I.A.U.) Commission 20 Working Group on Predictions of Occultations by Satellites and Minor Planets, who is Lawrence Wasserman; Lowell Observatory; Mars Hill Road, 1400 West; Flagstaff, AZ 86001; U.S.A. Alternatively, observers may send their reports to their local or regional coordinators, who can then send the results to Stamm, and, when appropriate, to Lowell Observatory. The addresses of the regional coordinators are given in "From the Publisher" on p. 129 of this issue. Forms for reporting the observations can be obtained from Stamm or from the regional coordinators. Please indicate on the forms to whom copies are being sent. These forms are preferred, but the forms of the International Lunar Occultation Centre (ILOC), or the equivalent IOTA/ILOC graze report forms, can be used for reporting timed occultations or appulses. The main difference from reporting lunar events is that the name of the occulting body should be written prominently at the top of the form, and the report should be sent to neither ILOC in Japan nor to Don Stockbauer. Also, if the asteroid is visible, the time that it merged with the star to form one apparent object, and the time the two were again noticeably separated, should be reported, with an estimate of whether the asteroid passed north or south of the star, if possible. Copies of the ILOC forms can be obtained from ILOC, the IOTA secretary-treasurer (the McManuses in Topeka, KS), or from Don Stockbauer; 2846 Mayflower Landing; Webster, TX 77598; U.S.A.

Event Selection: I made computer comparisons of my combined catalog with ephemerides of all of the major planets, the giant comet P/Schwassmann-Wachmann 1 (P/Sm-Wm-1), and all minor planets for which Edwin Goffin predicted (see section below) at least one event under the selection conditions that we used for the main part of the North American Asteroidal Occultation Supplement for 1992: The star must be brighter than mag. 12.6; the magnitude drop must be at least 0.5; and for angular diameters smaller than 0.″021, the star must be brighter than mag. 5.1; 0.″021 to 0.″050, brighter than mag. 6.1; 0.″051 to 0.″060, brighter than mag. 7.1; 0.″061 to 0.″070, brighter than mag. 8.1; and 0.″071 to 0.″079, brighter than mag. 9.1. In a few cases, these conditions were violated, such as for interesting objects like 44 Nysa, 624 Hektor, and 2060 Chiron. The numbers of the minor planets included in my combined catalog searches included 1-4, 6, 10, 13, 15, 17, 18, 20, 21, 24, 27, 29, 30, 34, 36, 38, 40, 41, 44, 47-49, 51, 52, 54, 58, 68, 70, 80, 84, 86-8, 92, 94, 103, 105, 115, 117, 121, 137, 139, 144, 145, 154, 164, 165, 175, 184, 192, 194, 212, 216 (unfortunately, no events were found), 230, 248, 276, 308, 324, 334, 344, 349, 409, 410, 429, 451, 455, 469, 490, 511, 524, 532, 584, 596, 624, 626, 654, 704, 804, 805, 914, 2060, 3123, and 3148. In addition, FAC comparisons were made for 1-4, 10, 18, 48, 52, 87, 121, 451, 704, 2060, and P/Sm-Wm-1.

Asteroidal Occultation Predictions by E. Goffin: The 1992 Asteroidal Occultation Supplement for North American Observers, prepared by Edwin Goffin with finder charts annotated by David Werner, were distributed with the last issue of ON for IOTA members and ON subscribers in North America. Copies of Goffin's predictions and charts applicable to other parts of the world were sent by Jim Stamm a few months ago to regional coordinators for distribution to members and subscribers in their regions. Goffin has continued to improve the orbits for many asteroids, and we have both used these for our predictions. Goffin used my Combined Catalog (CC), and my version of Fresneau's Astrographic Catalog (FAC), for most of his calculations, so many of our predicted events are in common, and our predicted paths for the common events are generally in good agreement. Consequently, we need to publish only a few finder charts in the regular issues of ON, since they have already been distributed with Goffin's predictions. In a few cases, we will publish 1° charts for some of the more crowded star fields on Goffin's charts, to facilitate locating the star to be occulted (the "target star"). These will be published alone, to be used in conjunction with Goffin's broader-field charts. Remember that the 1° charts are generated mostly from FAC. Unfortunately, for my finder charts published in this issue, there was not time to include Atlas Coeli-type charts or to annotate the other charts with star designations or comparisons with the T.V.M.A. Two of Goffin's charts were not included in the main part of the North American Asteroidal Occultation Supplement for 1992, even though the events are listed in my January S&T article. Goffin's information about these events, involving 44 Nysa on April 18 and 105 Artemis on November 26, are reproduced in this issue.

Comparison with the True Visual Magnitude Atlas (TVMA) often shows that some FAC stars are brighter, fainter, or very faint relative to their plotted magnitudes, indicated with B, F, or VF, respectively. "N" indicates that the star is not shown in TVMA.

For many asteroids, Goffin used orbital elements published in the Minor Planet Circulars (MPC's) rather than computing new elements himself. In three cases (21 Lutetia, 36 Atalante, and 805 Hormuthia), there were large discrepancies between my calculations and Goffin's, exceeding 1'; Larry Wasserman at Lowell confirmed my calculations. Investigation showed that Goffin made typographical errors in these cases, so his early predictions were wrong. For Atalante and Hormuthia, I discovered the differences in July, so Goffin was able to generate new predictions for these objects which have been generated. The Lutetia error was discovered only recently, but new predictions by Goffin can probably be distributed for that asteroid before the first events in March.

There are a few minor problems with Goffin's use of the CC and FAC. The most significant problem was caused by an error that I made in creating the CC: The sign of the proper motion in declination of Yale catalog stars was inadvertently omitted. This is usually not a serious problem, since correct data for virtually all Yale stars are given in the SAO and other catalogs, all of which had more priority than Yale when CC was created. The main purpose for merging Yale into CC was to obtain a few hundred Yale stars with southern declinations whose proper motions were not determined (zero used) and which are not in the SAO or most other catalogs. For stars with large negative proper motion in declination, the coordinate matching used to create CC did not work, resulting in many "false" stars whose only source was Yale. Only a few of Goffin's 1992 predictions involve these "false" stars, so the actual occultations will not be visible from the Earth's surface, including DM -14° 4437 (= SAO 159960) by 92 Undina on June 14 (South America to Australia) and DM +26° 778 (= SAO 76936) by 349 Dembowska on October 1 (Peru to U.K. in strong twilight). Goffin predicts an occultation of 8.9-mag. FAC 119281 by 51 Nemausa on February 23 in China and Japan, but this star is no. 94224 in the

SAO catalog, which shows the star to have significant proper motion so that the shadow will miss the Earth's surface.

Goffin made wide use of the new Positions and Proper Motions (PPM) catalog, which I have not had time to merge into my combined catalog. For many of these stars, Zodiacal Zone (ZZ) data were available, which is of comparable quality to most of the PPM data, so I have generally preferred to use ZZ (source code U). When ZZ data were not available, I often used the PPM position directly from Goffin's predictions. Most of the PPM stars have SAO numbers, which I prefer to use, considering the more widespread availability of the SAO catalog.

Also, Goffin assigned sequential numbers to some of the catalog sources, including the FAC, where the stars remain unnumbered in my version. For the five different Lick-Voyager catalogs, he used my original source catalog number, rather than the sequential numbers for the five catalogs given in the DM number column, which are used by Lowell Observatory in their publications as well as by me. For the same reason, our designations for the Astrographic Catalog (AC) stars in the CC differ. He used my positional source catalog number, rather than my preferred designations, which are in the DM number fields for non-SAO stars.

<u>Explanation of Data in Tables 1 and 2:</u> A complete explanation of the data in Table 1, and a partial explanation (actually, covering most of it) of the data in Table 2, was given in my article, "Solar System Occultations during 1991", in <u>ON</u> <u>5</u> (#2, December 1990), starting on p. 39. The only change for 1992 is that an attempt has been made to convert the photographic magnitudes of AGK3 stars with spectral types to approximate visual magnitudes by use of a table of B-V values for different spectral types given in documentation for the Skymap catalog. The combined catalog that I use for my asteroid search runs was processed with a computer program that I wrote to apply these corrections, similar to the processing of AGK3 magnitudes of XZ stars that I performed to create the 80L version of the XZ. The explanation of the rest of the Table 2 data, not covered in <u>ON</u> <u>5</u> (2) referenced above, is given below:

Following the minimum geocentric separation time and angular distance is the star's position and proper motion source catalog code specified under <u>S</u>. The catalog codes are listed below; the value at the end of each description is the current estimated positional accuracy in arc seconds:

- A AGK3 (Astronomische Gesellschaft, 3rd Katalog), quite accurate at the epoch of the last plates taken in 1960, but now having a mean accuracy of about 0.″5, with many stars now having errors of about 1″.
- B ACRS (Astrographic Catalog Reference Stars), a new catalog organized by Tom Corbin at USNO, accuracy now about 0.″3.
- C Carte du Ciel, or Astrographic Catalog (AC). The mean epoch is around 1900, and no proper motions are available. Most of the AC stars are faint and distant, with small proper motions, so that the current mean error is about 1″. However, many AC stars have significant proper motions so that current actual positions can differ by a few to several seconds. When possible, the positions of AC stars involved with important occultations should be updated with modern astrometric observations.
- D Positions from measurement of Palomar Schmidt plates, with an absolute accuracy of about 1″. Mainly includes several stars in Scorpius whose positions were measured from 1954-5 Palomar Sky Survey plates to provide predictions of stars in the 1975 May lunar eclipse star field.
- E Eichhorn's Pleiades (USNO P) catalog, accuracy now about 0.″5.
- F FK4 (4th Fundamental Katalog). FK5 positions are better and will be added later. Less than 0.″2.
- G Albany General Catalog (G.C., via SAO; mean epoch is in late 1800's, so current positions are usually in error by more than 1″ or 2″).
- H Positions of generally fainter stars measured by Arnold Klemola with the 20-in. twin astrograph at Lick Observatory on Mt. Hamilton, Calif., current accuracy about 0.″3.
- I IRS (International Reference System), a new reference star catalog that gives improved positional data for about 1 star per square degree, to supersede the AGK3R and Perth 70 catalogs. NIRS is the northern half of IRS. Generally less than 0.″2.
- J Guide Star Catalog, absolute accuracy about 1″, but may be 0.″5, in rare cases, 2″.
- K USNO K-catalog of zodiacal stars, including some AGK3 stars and southern Yale stars with no proper motions determined. The accuracy is the

same as the AGK3, except for the Yale stars, whose current accuracy is about 1" (worse for some stars with large proper motions).

L High-precision subset of PPM (see M below), mainly from observations by the Carlsburg photoelectric meridian circle, La Palma, Canary Is. 0ʺ15.

M PPM (Positions and Proper Motions, a new catalog from the German Astronomisches Rechen Institut that is effectively an update of AGK3 and SAO). 0ʺ3.

N N30 is a compilation catalog formed in the late 1930's for astrometric observations of Pluto. Only stars common to the ZC are included, and more recent observations included in the formation of the XZ catalog have been used. The current accuracy is only slightly better than the XZ (see X below).

O PPM stars with problems; the current positions are generally significantly worse than the PPM average errors. ("O" for "Oops"). Also includes PPM double stars.

P Perth70 photoelectric meridian circle catalog covering the southern sky at a density of about 1 star per square degree. Mean epoch is about 1970; proper motions were taken from earlier catalogs. Current accuracy is about 0ʺ3.

Q PPM or combined catalog star position has been changed to get better agreement of my predicted path with that predicted by E. Goffin.

R AGK3R, reference star catalog for the photographic AGK3. 0ʺ4.

S SAO catalog with SAO source Yale, last plate epochs usually in the early 1930's. 1".

U USNO preliminary Zodiacal Zone catalog (ZZ87), 0ʺ3.

W AC position altered to obtain better agreement of my path with that computed by E. Goffin.

X USNO XZ where the data were not simply taken from the SAO or ZZ87. 0ʺ6.

Y Yale, see K (most of these have unknown proper motion) and S above. In the combined catalog, all of the Yale declination proper motions were erroneously taken as positive, so events with a code of Y need to be checked and manually corrected, when appropriate.

Z Robertson's Zodiacal Catalog (ZC), with some later catalog data added when the XZ was created. 0ʺ6 to 1ʺ0.

2 FK5 extension catalog. 0ʺ2.

3 FK3, the predecessor of the FK4. 0ʺ4.

5 FK5, current accuracy 0ʺ1 or less.

7 Combination of Perth70 and XZ data. 0ʺ3.

If there are two letters under S, the second letter is the position and proper motion source for the comparison shift data following the AGK3 number. The path shift, in the (occultation path) sense, second catalog minus first catalog, is given under Shift, which is expressed in seconds of arc, to the north if positive and to the south if negative. The value in minutes to be added to the U.T. is given under Time. A "B" precedes the shift value if the comparison data (shift and time) are for the path of the star's B-component relative to the A-component, rather than the second star source catalog relative to the main source catalog. In these cases, the latter is the same for both components, so it is sufficient to list the second source catalog comparison only for the primary (A-component).

The last columns give the star's apparent R.A. and Dec. computed for the time of geocentric conjunction, for direct use with setting circles.

Explanation of Data in Table 3: Information about the estimated angular diameter of the occulted stars is given in Table 3 only for events for which the stellar angular diameter is large enough for the edge of the asteroid or planet to require more than 0.05 second to geometrically pass across the star during a central occultation. For these events, the effect of the stellar diameter might be noticed by visual observers, especially for nearly grazing events when the observer is near one of the edges of the occultation path. The double star code is given in the D column just after the SAO/DM No. Parameters relating to the stellar angular diameter are given in the last four columns. The first of these, mʺ, is the angular diameter in milli-arc seconds (units of 0ʺ001). Under m is given the distance in meters that the star subtends at the asteroid's distance from the Earth. The time in milliseconds that it takes the edge of the asteroid to geometrically pass across the star during a central occultation is given under time. Lastly, under df, the subtended diameter of the star is expressed in units of Fresnel diffraction fringe separation. If it is 3 or larger, diffraction will be negligible and the occultation light curve will be essentially geometric. If it is 0.3 or less, the star's angular diameter will manifest itself only as a very slight modification to a point-source Fresnel diffraction pattern, which could only be measured from a high

Table 1 Part A

1992 Date	Universal Time	PLANET Name	PLANET m_v	PLANET Δ,AU	STAR SAO NO	STAR m_v	STAR Sp	STAR R.A.(1950)	STAR Dec.	Occultation Δm	Occultation dur	Occultation df	Occultation P	Possible Path LoiLai	Possible Path LomLam	Possible Path LoeLae	El Sun	MOON El	MOON %Snl	MOON Up	Ephem. Source
Jan 1	7h42–59m	P/Sm-Wm-1	13.1	5.183		13.2		3h 7m.2	28° 8'	0.7	11s	49	75	-84° 21°	141° 16°	174° 21°	132°	170°	12–	none	MPC18255
Jan 1	8 1	Euterpe	12.5	3.279	159572A	6.1	B5	15 52.1	-19 14	6.4	3	9	40	-69–16	-59–20	-47–25	40	4	12–	all	EMP 1987
Jan 1	8 1	Euterpe	12.5	3.279	159572B	8.1	B5	15 52.1	-19 14	4.4	3	9	40	-67–14	-58–18	-47–22	40	4	12–	all	EMP 1987
Jan 1	11 32	Argentina	14.2	3.260	183334	9.1	A3	15 13.9	-26 58	5.1	3	9	37	-104 28	-96 22	-84 14	47	10	11–	all	EMP 1986
Jan 4	8 26	Venus	-4.1	1.140	159767	8.0	B9	16 9.2	-18 56		293	5	1	Chile, Argentina			39	32	0–	none	NA0001
Jan 7	21 0–60	Aurora	12.3	2.277		10.5	K2	2 50.0	25 50	2.0	83	117	16	-54 49	-5 18	30–20	121	89	7+	w 26W	EMP 1988
Jan 7	22 54–67	Juewa	11.2	1.536	41603	9.0	K5	7 7.3	40 8	2.3	15	23	14	65–25	15 –2	-39–22	162	139	8+	none	MPC12303
Jan 8	3 33–45	Davida	10.2	1.824		12.0		9 31.5	23 13	0.2	33	26	8	31 12	18 52	128 78	148	168	9+	none	MPC15384
Jan 8	8 33–56	Egeria	10.3	1.523	39748	7.0	A0	4 43.5	41 13	3.3	30	34	10	-93–11	-151 14	145 –2	144	109	10+	w175E	Goffin87
Jan 8	13 25–34	Prokne	12.0	2.063	133151	9.2	A0	6 19.0	-0 18	2.8	12	19	17	-135 27	170 43	85 68	154	127	11+	none	MPC15527
Jan 9	1 35–39	Themis	12.4	2.438		10.7		12 40.5	-3 42	1.9	16	22	16	6 65	44 53	74 40	97	141	14+	none	MPC13294
Jan 10	18 56–58	Meliboea	13.2	2.867	109185	9.0	K2	0 22.0	1 27	4.3	6	13	28	-17 34	11 40	49 44	76	14	28+	all	MPC16843
Jan 14	7 22	Zelinda	12.2	1.869	204900	7.1	A5	13 47.8	-30 58	5.1	5	11	21	-67 34	-47 14	-27 –5	77	166	63+	none	Goffin87
Jan 14	23 18–32	Davida	10.1	1.791		11.0		9 28.1	24 20	0.4	29	23	8	38–54	9 –2	-47 16	155	90	69+	w 23E	MPC15384
Jan 17	12 24	Eunomia	11.1	3.106	182092	9.1	K0	13 53.0	-24 7	2.2	14	18	17	-107 54	-99 44	-90 32	81	131	92+	w 99W	Goffin87
Jan 19	22 12–27	Hygiea	11.2	3.101		11.6		2 47.7	19 13	0.6	74	60	10	-85 68	-9 64	40 49	107	74	100–	all	Goffin86
Jan 20	0 38	Venus	-4.0	1.238	185489	8.3	G5	17 29.7	-21 50		267	5	1	68 27	75 24	83 20	36	142	100–	all	NA0001
Jan 21	9 12–30	Patienti>	11.3	2.142		12.0		10 52.4	26 8	0.5	22	27	14	-69–29	-101 30	152 60	142	25	97–	all	MPC15529
Jan 23	21 6–16	Chiron	15.0	8.956		11.5		8 26.5	11 20	3.5	10	30	65	122 –5	48 16	-35 20	172	51	78–	e 5E	Marsdn88
Jan 24	15 23–31	Interamnia	10.8	2.107		11.2		6 6.0	22 58	0.6	32	28	9	161–25	126–30	97–55	148	97	71–	all	Schmadel
Feb 3	2 21–38	Harmonia	10.0	1.354	79961	8.5	K0	8 4.9	24 10	1.7	11	23	18	11–36	-49 –5	-117 –3	165	171	0–	none	MPC12687
Feb 5	13 27	Ceres	9.1	3.615	187365	8.1	G5	18 48.5	-24 25	1.4	23	9	6	-134 –3	-128 –5	-119 –9	34	54	3+	none	MPC12187
Feb 6	18 37–66	Massalia	9.9	1.131		9.5	K0	7 53.7	19 34	1.0	23	32	11	137–14	68 11	-8 14	160	127	8+	w 14E	MPC11982
Feb 11	14 52	Pallas	10.0	3.302		11.8		17 31.5	6 31	0.2	16	11	9	-177 2	-158 7	-137 15	64	135	49+	none	Goffin87
Feb 14	6 21–23	Pallas	10.0	3.279		10.4		17 34.7	6 51	0.6	17	11	9	-56 27	-30 35	0 50	66	149	78+	w 46W	Goffin87
Feb 16	2 3–	Athamantis	12.5	2.923		11.0		18 13.5	-21 19	1.7	4	9	33	17 –8	30–13	46–17	53	159	93+	w 24E	MPC11508
Feb 18	14 17–30	Adeona	11.2	1.357	62014	9.0	G0	10 21.1	32 17	2.3	17	25	13	160–48	128–17	83–16	159	26	100–	all	MPC15527
Feb 21	23 59–61	Hygiea	11.5	3.588		11.6		3 5.7	19 49	0.7	21	18	12	-83 64	-43 62	-6 54	78	152	82–	e 23W	Goffin86
Feb 23	8 38–47	Juewa	11.7	1.738		10.4	K0	6 34.0	37 3	1.6	28	44	15	-87 24	-104 17	-108 0	122	123	70–	all	MPC12303
Feb 28	1 22	Loreley	13.0	3.304	187194	9.1	K2	18 40.7	-29 39	4.0	5	11	30	65 42	67 41	69 40	59	7	25–	all	Goffin89
Feb 29	3 34–45	Zelinda	11.9	1.513	225232	8.3	G0	14 47.5	-41 5	3.6	13	25	17	-20 33	-3 –1	22–36	106	62	17–	e 7W	Goffin87
Feb 29	4 45–51	Hektor	15.1	5.076		9.8		16 22.0	-39 51	5.3	14	26	31	-63 –5	-47–35	-50–72	89	45	16–	e 45W	MPC16006
Mar 8	14 20–30	Leda	12.5	1.808		11.5		6 31.4	22 24	1.4	13	29	22	72 65	124 47	161 26	110	63	16+	w119E	MPC14158
Mar 10	4 0	Venus	-3.9	1.502	164699	8.7	G5	21 49.2	-14 10		218	4	1	14–26	16–26	20–27	25	90	29+	none	NA0001
Mar 10	3 53–71	Patientia	11.3	2.119		11.0		10 18.2	31 45	0.9	22	27	13	-6–15	-66 17	-140 15	149	89	29+	w 76W	MPC15529
Mar 12	14 4–13	Interamnia	11.6	2.731		10.5		6 5.3	20 6	1.5	30	29	12	69 23	104 8	141–10	100	5	55+	all	Schmadel
Mar 12	15 45–47	Lutetia	12.1	2.293	186489	8.5	B2	18 10.4	-22 44	3.6	4	12	33	134–32	161–42	-160–51	79	176	56+	none	MPC15523
Mar 12	16 56–64	Leda	12.6	1.857	78558	7.8	A0	6 34.5	22 12	4.7	11	25	22	25 –4	58–16	93–34	106	9	57+	all	MPC14158
Mar 13	12 47–58	Aglaja	12.6	2.225		8.6	F8	10 55.2	9 17	4.0	10	21	24	-133–46	153–24	86–15	169	60	66+	w176E	MPC15524
Mar 17	6 31–36	Circe	13.2	2.326	160459	8.8	K5	17 16.7	-18 3	4.5	9	22	29	-82 27	-48 21	-14 23	97	104	97+	w 28W	MPC13294
Mar 17	11 14–19	Massalia	11.0	1.452		10.1	M4	7 48.0	20 10	1.3	27	42	14	118–52	131–54	145–59	119	44	98+	all	MPC11982
Mar 18	20 55	Alexandra	12.2	2.649		10.4		20 39.6	-23 8	2.0	4	8	22	99 –8	112–12	127–14	52	126	100+	all	MPC11723
Mar 20	3 54–57	Andromache	13.8	2.876	185761	9.5	B9	17 44.6	-25 55	4.3	7	21	39	-13 42	3 33	23 26	93	68	97–	all	MPC12303
Mar 20	17 59–75	Doris	11.4	2.103		9.5	K0	11 31.0	1 37	2.1	17	22	14	162–32	85 –2	8 29	173	34	95–	e 24E	MPC12188
Mar 23	21 31–34	Vibilia	13.0	2.661		11.1		18 36.6	-23 17	2.1	7	15	26	53–11	82–22	116–30	85	30	71–	all	MPC14752
Mar 25	12 19–33	Sappho	11.8	1.791	137978	7.6	G5	11 2.1	-3 57	4.2	6	20	32	-118–42	158–14	90 23	161	100	56–	e160E	MPC15524
Mar 26	11 32–51	Aspasia	11.0	1.582	137506	8.9	K0	10 18.3	-7 44	2.2	18	27	14	-117–66	151–32	102 12	149	119	46–	e163E	MPC16844
Mar 31	15 30–33	Athamantis	12.1	2.379	162593	9.0	G5	19 22.5	-17 45	3.2	6	13	27	142–23	175–28	-149–25	81	51	7–	e173W	MPC11508
Mar 31	16 36–38	Nemausa	12.4	2.368		10.5		5 36.8	14 27	2.1	5	12	25	29–20	52–19	77–22	74	103	6–	none	Goffin87
Apr 1	14 21	Pallas	9.8	2.849	103592	9.1	F2	18 16.4	14 34	1.1	28	17	8	Japan (low)			95	77	3–	none	Goffin87
Apr 1	18 17–20	Amphitrite	10.7	2.273		9.4	K0	6 48.4	28 10	1.6	12	16	15	5 8	32 –4	62–22	89	105	2–	none	Landgraf

Table 2 Part A

1992 Date	No.	MINOR PLANET Name	km-Diam.	-//	RSOI	Type	Motion °/Day	P.A.	STAR SAO No	DM/ID No	D	Min. Geocentric U. T.	Sep.	S	Comparison Data AGK3	No	Shift	Time	APPARENT R.A.	Dec.
Jan 1		P/Sm-Wm-1	100	0.03	758		0.059	226°4				7h52m8	0"21S	C					3h 9m7	28°17'
Jan 1	27	Euterpe	118	0.05	429	S	0.399	102.0	159572	-18°4195	A	8 2.9	1.20S	7P			-0"21	0m1	15 54.5	-19 22
Jan 1	27	Euterpe	118	0.05	429	S	0.399	102.0	159572	-18 4195	B	8 3.5	1.09S	7			B 0.11	0.5	15 54.5	-19 22
Jan 1	469	Argentina	129	0.05	507	X	0.399	111.6	183334	C2610788		11 34.2	0.79N	US			0.58	-0.6	15 16.4	-27 7
Jan 4		Venus	12220	14.78			1.209	101.9	159767	-18 4243		8 28.2	11.52S	UX			0.18	-0.3	16 11.6	-19 3
Jan 7	94	Aurora	212	0.13	1157	CP	0.037	127.4		+25 455		21 20.8	0.51N	QA	N25°	245	-1.00	-0.9	2 52.5	26 0
Jan 7	139	Juewa	164	0.15	674	CP	0.232	272.8	41603	+40 1800		23 0.6	3.90S	A	N40	846	-0.65	-7.6	7 10.2	40 3
Jan 8	511	Davida	337	0.25	2158	C	0.187	328.8				3 36.9	2.86N	C					9 33.9	23 2
Jan 8	13	Egeria	215	0.19	969	G	0.154	265.2	39748	+41 956		8 46.0	2.57S	RA	N41	473	-0.10	0.0	4 46.5	41 18
Jan 8	194	Prokne	174	0.12	880	C	0.237	291.8	133151	- 0 1265		13 29.7	3.21N	MA	S 0	773	0.39	-0.2	6 21.2	-0 19
Jan 9	24	Themis	228	0.13	1212	C	0.190	112.7		L 2 9		1 40.0	2.60N	H					12 42.7	-3 55
Jan 10	137	Meliboea	150	0.07	664	C	0.292	75.5	109185	+ 0 50		18 54.4	1.51N	UM	N 1	38	0.03	-0.1	0 24.2	1 41
Jan 14	654	Zelinda	132	0.10	373	C	0.454	125.5	204900	C3010945		7 25.5	1.11N	G					13 50.2	-31 10
Jan 14	511	Davida	337	0.26	2164	C	0.212	321.7				23 24.9	3.02S	C					9 30.5	24 9
Jan 17	15	Eunomia	272	0.12	1800	S	0.210	126.9	182092	C2311373		12 27.9	1.96N	MU			0.85	0.1	13 55.4	-24 19
Jan 19	10	Hygiea	429	0.19	4021	C	0.062	93.2				22 15.8	2.16N	C					2 50.1	19 24
Jan 20		Venus	12220	13.61			1.222	94.9	185489	-21 4638		0 40.1	3.45N	UX			-0.16	-0.1	17 32.2	-21 52
Jan 21	451	Patientia	230	0.15	1339	CU	0.163	333.3				9 20.9	0.11S	C					10 54.7	25 54
Jan 23	2060	Chiron	200	0.03	3618	B	0.073	283.6				21 11.4	0.09N	C					8 28.8	11 12
Jan 24	704	Interamnia	333	0.22	2339	F	0.163	242.0				15 27.1	3.63S	C					6 8.6	22 58
Feb 3	40	Harmonia	111	0.11	349	S	0.247	287.1	79961	+24 1863		2 30.5	3.12S	UR	N24	936	-0.05	-0.3	8 7.4	24 2
Feb 5	1	Ceres	946	0.36	10708	G	0.382	89.7	187365	C2414767		13 29.8	0.05N	UH			-0.65	0.4	18 51.1	-24 22
Feb 6	20	Massalia	151	0.18	498	S	0.194	282.9		L 4 3112		18 52.5	0.79S	H					7 56.2	19 28
Feb 11	2	Pallas	533	0.22	4761	B	0.329	68.4				14 54.6	1.01N	C					17 33.6	6 29
Feb 14	2	Pallas	533	0.22	4770	B	0.324	67.1				6 22.8	2.00N	C					17 36.8	6 49
Feb 16	230	Athamantis	130	0.06	469	S	0.412	82.7		B2171027		2 6.2	0.11N	C					18 16.0	-21 18
Feb 18	145	Adeona	155	0.16	574	C	0.227	299.4	62014	+32 2023		14 23.5	5.29S	A	N32	1014			10 23.5	32 4
Feb 21	10	Hygiea	429	0.16	4018	C	0.189	79.3				23 57.0	1.65N	C					3 8.1	19 59
Feb 23	139	Juewa	164	0.13	654	CP	0.112	172.4				8 42.2	4.80E	MA	N37	748	0.19	0.1	6 36.9	37 1
Feb 28	165	Loreley	160	0.07	763	CD	0.329	85.1	187194	C2915277		1 22.9	2.42N	HX			-0.12	-0.1	18 43.3	-29 36
Feb 29	654	Zelinda	132	0.12	394	C	0.214	142.1	225232	P40 6723		3 44.9	1.14N	MS			-0.31	-1.8	14 50.2	-41 16
Feb 29	624	Hektor	234	0.06	2376	D	0.109	133.9		PPM 575350		4 49.5	1.14S	M					16 24.9	-39 56
Mar 8	38	Leda	120	0.09	396	C	0.166	107.5		A2250035		14 21.5	3.11N	C					6 34.0	22 22
Mar 10		Venus	12220	11.21			1.235	71.9	164699	-14 6145		4 1.4	0.66S	UX			0.22	0.0	21 51.5	-13 58
Mar 10	451	Patientia	230	0.15	1354	CU	0.164	284.9				4 2.0	0.85S	C					10 20.7	31 32
Mar 12	704	Interamnia	333	0.17	2393	F	0.135	109.3				14 4.3	0.18N	C					6 7.9	20 6
Mar 12	21	Lutetia	100	0.06	299	M	0.363	90.5	186489	C2212720		15 48.5	1.96S	UH			-0.21	0.2	18 13.0	-22 43
Mar 12	38	Leda	120	0.09	396	C	0.190	105.3	78558	+22 1408		16 55.7	2.21S	UR	N22	738	-0.02	0.1	6 37.0	22 9
Mar 13	47	Aglaja	135	0.08	648	C	0.209	286.6		+ 9 2431		12 52.5	2.20S	XA	N 9	1357	0.08	0.2	10 57.5	9 3
Mar 17	34	Circe	118	0.07	435	C	0.195	81.3	160459	-17 4771		6 36.4	2.48N	MU			-0.52	-1.0	17 19.2	-18 6
Mar 17	20	Massalia	151	0.14	506	S	0.128	96.6		L 4 2848		11 14.5	5.79S	H					7 50.5	20 3
Mar 18	54	Alexandra	171	0.09	628	C	0.493	70.9		L 5 4330		20 57.9	0.83N	H					20 42.0	-22 59
Mar 20	175	Andromache	107	0.05	440	C	0.188	97.3	185761	C2512299		3 58.1	2.34N	MX			-0.49	-3.3	17 47.2	-25 56
Mar 20	48	Doris	219	0.14	1292	CG	0.204	302.1		+ 2 2444		18 7.4	0.11S	MX	N 1	1390	0.10	-0.6	11 33.2	1 23
Mar 23	144	Vibilia	146	0.08	625	C	0.259	90.2		B2374637		21 35.4	0.46S	C					18 39.2	-23 14
Mar 25	80	Sappho	82	0.06	263	S	0.243	305.1	137978	- 3 3040	A	12 26.4	0.65S	MG			1.42	1.0	11 4.3	-4 11
Mar 26	409	Aspasia	168	0.15	699	CX	0.192	316.0	137506	- 7 3011		11 42.3	1.87S	MS			0.09	3.6	10 20.5	-7 57
Mar 31	230	Athamantis	130	0.08	464	S	0.323	70.8	162593	-17 5620	X	15 34.7	0.16S	U7			0.19	0.0	19 24.9	-17 40
Mar 31	51	Nemausa	137	0.08	475	CU	0.361	77.8				16 35.2	2.31S	C					5 39.2	14 29
Apr 1	2	Pallas	533	0.26	4918	B	0.224	31.4	103592	+14 3483		14 20.7	3.08N	A	N14	1857	0.02	0.0	18 18.3	14 34
Apr 1	29	Amphitrite	219	0.13	1030	S	0.268	105.3		+28 1258		18 14.8	1.09S	XA	N28	721	0.08	0.0	6 51.1	28 7

Table 1 Part B

1992 Date	Universal Time	PLANET Name	m_v	Δ,AU	STAR SAO NO	m^*_v	Sp	R.A.(1950)	Dec.	Occultation Δm	dur	df	P	Possible Path LolLal	LomLam	LoeLae	El Sun	MOON El	%Snl	Up	Ephem. Source
Apr 3	12^h55^m	Nemausa	12.4	2.399	94810	9.0	A2	$5^h41^m.0$	14°40'	3.5	5^s	11	25	s.w. Australia?n			72°	69°	0+	none	Goffin87
Apr 3	22 27–30	Lomia	13.4	3.040	58639	8.1	A0	5 56.4	36 3	5.4	6	14	29	-50°44°	-23°26°	2° 5°	76	66	1+	w 46W	MPC13294
Apr 7	2 27	Hygiea	11.7	4.158		11.5		3 51.8	21 54	0.9	12	11	14	-104 45	-95 42	-82 38	44	4	16+	all	Goffin86
Apr 9	10 16–18	Athamantis	12.0	2.263		11.4	G	19 33.1	-16 47	1.1	6	15	25	-121 33	-103 33	-84 39	87	163	39+	none	MPC11508
Apr 9	22 41–45	Vibilia	12.7	2.392	187485	9.1	A0	18 53.7	-23 19	3.7	10	21	24	48 36	72 26	97 21	97	178	45+	none	MPC14752
Apr 12	10 51–70	Bertha	11.9	2.144	184133	8.8	F0	16 4.3	-28 44	3.1	19	29	16	-86 30	-135-24	133-36	137	105	73+	w140W	Landgraf
Apr 13	8 53–68	Dejopeja	12.6	1.925	139293	7.0	G5	13 18.6	-9 44	5.6	6	24	41	-55 13	-121 22	159 52	178	49	82+	w 89W	MPC17796
Apr 14	9 45–61	Adelheid	13.1	2.145	137723	9.4	G0	10 38.5	-9 50	3.7	11	25	24	-97-84	166-20	144 50	138	12	90+	all	EMP 1989
Apr 18	3 18–22	Dejopeja	12.6	1.929	139265	9.2	G0	13 15.0	-9 24	3.5	6	24	41	(Benelux,UK,Iceland)?s			173	19	99-	all	MPC17796
Apr 18	3 50–54	Nysa	10.7	1.828	79986	9.0	F0	8 6.6	21 31	1.9	4	14	36	-127 39	-91 28	-57 14	91	101	99-	e125W	MPC11982
Apr 18	21 48–66	Pales	13.4	3.007		10.3		18 39.6	-24 32	3.2	28	63	28	40 21	73 11	106 11	110	49	96-	all	MPC15524
Apr 23	1 17–25	Pallas	9.7	2.671		10.9		18 22.0	18 40	0.3	35	21	7	47-59	46-13	47 34	109	41	67-	all	Goffin87
Apr 26	11 4– 9	Davida	11.3	2.609		11.3		9 4.5	29 30	0.8	23	21	11	124 30	154 12	-175 -9	94	159	36-	none	MPC15384
Apr 26	14 22–38	Palisana	12.7	1.400		11.2	K8	18 35.5	-25 3	1.7	8	22	26	118-31	178-12	-157 44	118	47	34-	e162E	MPC14760
Apr 26	14 43	Eva	12.7	2.176	191635	7.0	K0	23 2.6	-24 37	5.7	3	7	29	-156 26	-150 24	-143 21	60	24	34-	all	MPC14159
Apr 26	15 5–27	Thetis	10.6	1.248		12.0		13 44.9	-0 8	0.3	11	26	19	-158-11	131 4	56 24	165	119	34-	e155E	Goffin87
Apr 27	18 52–66	Bertha	11.7	2.035	207147	10.3	G0	15 53.9	-30 18	1.6	15	22	15	146 33	87 -7	15 -5	153	97	24-	e111E	Landgraf
Apr 30	17 35	Mars	1.1	1.906	146915	5.5	K0	23 45.4	-3 2		153	6	1	149-21	166-20	-174-17	45	21	5-	e164E	NAO001
May 1	17 10–28	Palisana	12.6	1.340		11.0		18 37.8	-23 54	1.8	8	23	25	55-57	143-30	164 32	122	110	1-	none	MPC14760
May 2	3 55–97	Polyxo	12.2	1.855		10.7		17 38.1	-17 30	1.7	38	69	18	32-44	-36-15	-93 21	136	129	1-	none	MPC16004
May 2	7 12–21	Hermione	13.6	3.543		11.0		9 57.2	21 15	2.7	28	47	24	-101 64	-111 40	-96 17	102	107	0-	none	MPC12191
May 4	14 19–46	Scheila	12.5	1.593		11.0		17 25.3	-21 58	1.7	19	40	20	-139 10	175-36	76-55	142	165	4+	none	MPC16996
May 5	7 4–61	Chloris	11.1	1.297	161232	9.4	B9	18 13.0	-15 55	1.9	45	78	15	-132 7	-92-31	0-75	131	162	8+	none	MPC18085
May 5	11 12–28	Hispania	12.1	2.063	181281	8.8	K5	12 56.0	-22 35	3.4	14	24	19	-107-25	174-31	104 -3	153	121	9+	w128E	EMP 1986
May 6	2 18–35	Lotis	14.0	2.010	139033	4.8	M3	12 51.7	-9 16	9.2	7	27	42	26-49	-60-26	-118 19	150	107	14+	w 89W	MPC15529
May 7	12 26–44	Loreley	12.3	2.377	188706	8.8	K0	19 52.1	-27 14	3.6	25	48	22	144-40	-158-54	-95-43	112	170	26+	none	Goffin89
May 7	19 43–58	Panopaea	11.3	1.514		11.9		13 57.7	-8 18	0.5	11	22	17	120 24	55 17	-10 20	163	98	30+	w 45E	MPC12118
May 12	13 22–47	Scheila	12.3	1.537	185362	8.6	F5	17 21.4	-22 45	3.8	15	31	19	-127 23	174-19	92-28	150	82	81+	w161W	MPC16996
May 15	11 23–40	Palisana	12.2	1.195		7.0	B9	18 39.5	-20 22	5.2	8	21	22	124-62	-160-22	174 41	135	60	98+	all	MPC14760
May 19	22 2–13	Polyxo	11.9	1.720		10.2		17 29.9	-16 48	1.9	17	30	17	92 33	55 38	12 55	155	15	89-	all	MPC16004
May 21	6 16–21	Pluto	15.5	28.733		13.5	G	15 29.1	-3 12	2.1	99	46	1	n. U.S.A., S. Canada			162	62	80-	e100W	DE130
May 24	11 52–78	Chloris	10.7	1.151		11.0		18 11.2	-17 15	0.6	28	46	13	-161 58	174 21	129 5	150	58	52-	e175W	MPC18085
May 27	13 2– 9	Artemis	12.1	1.707	107217	7.6	K5	21 30.1	11 38	4.4	9	18	20	166-19	-158 0	-128 29	96	43	23-	e167W	MPC12190
May 30	2 15–35	Andromache	12.5	1.953	185892	7.7	A2	17 50.1	-27 37	4.8	11	29	26	51 -8	-25-29	-104-10	160	134	5-	e 28E	MPC12303
May 30	9 35–50	Pallas	9.4	2.477		11.6		18 8.0	24 9	0.1	38	22	7	-59-17	-124 23	148 27	128	114	4-	e 77W	Goffin87
Jun 2	13 3	Davida	11.7	3.142		11.0		9 43.3	26 3	1.2	12	12	14	86 6	105 -5	125-18	68	50	3+	w 93E	MPC15384
Jun 4	23 46–62	Euterpe	11.0	1.728	185351	9.3	F5	17 20.2	-22 26	1.8	9	20	21	82 2	6-11	-69 8	173	135	19+	w 41W	EMP 1987
Jun 10	23 10–43	Lutetia	10.3	1.221	187936	9.3	K0	19 15.1	-23 41	1.3	20	44	18	77 28	20 0	-44 0	153	78	82+	w 45E	MPC15523
Jun 15	13 42–59	Argentina	13.1	1.961	207622	5.4	G0	16 20.6	-39 5	7.7	12	26	22	-141 -1	145-13	83 32	158	25	100-	all	EMP 1986
Jun 21	1 55	Mercury	-0.3	1.086	79471	8.5	F0	7 28.8	23 45	0.0	92	4	1	Louisiana to s.Ontario			21	136	71-	none	DE130
Jun 24	23 15–17	Eva	12.1	1.639	147935	7.6	A5	1 36.9	-18 3	4.5	4	9	22	19-56	71-66	138-64	79	32	34-	e 55E	MPC14159
Jun 26	18 17	Mercury	0.0	0.988	79959	5.3	G0	8 4.8	21 44		117	5	1	s.Volga, Cyprus, Egypt			24	74	18-	none	DE130
Jun 28	5 20–22	Eva	12.0	1.614	148011	7.4	A2	1 44.9	-17 44	4.7	4	9	21	-58-22	-24-29	16-30	80	54	7-	e 13W	MPC14159
Jul 1	9 6–22	Alexandra	11.2	1.566	146467	9.4	K2	23 0.0	-4 16	2.0	20	29	13	-147-58	-91-30	-65 13	115	127	1+	none	MPC11723
Jul 4	3 10–26	Leto	10.6	1.656	165669	9.2	F5	23 21.2	-16 9	1.7	17	35	19	-64-26	-13-38	47-39	117	160	18+	none	MPC11507
Jul 11	5 36	Meliboea	14.0	3.938	94081	8.2	A5	4 40.2	15 24	5.8	4	10	38	-10-32	-1-29	10-26	38	171	88+	none	MPC16843
Jul 14	12 23–38	Pales	12.6	2.349		10.2	B5	17 55.6	-24 12	2.5	13	25	22	-127-10	162-26	87-10	157	20	100+	all	MPC15524
Jul 18	0 50	Vesta	7.7	2.395		11.0		12 17.1	5 6	0.1	17	10	7	-98-20	-79-29	-52-37	67	147	91-	e 73W	Goffin86
Jul 18	1 33–36	Europa	11.9	3.014		10.8		2 0.7	5 5	1.4	14	18	16	0-35	33-29	65-24	85	60	90-	all	MPC12188
Jul 18	8 28–33	Grechko	16.8	4.049	118355	3.8	B0P	10 30.2	9 34	13.0	1	101	13	9 3	85 -7	168-39	40	175	89-	none	MPC14932
Jul 18	10 9–11	Themis	12.9	2.978	138959	9.5	F8	12 43.6	-4 38	3.4	9	14	19	122-15	150-23	-176-26	76	143	88-	e150E	MPC13294

Table 2 Part B

1992 Date	No.	MINOR PLANET Name	km-Diam.	-//	RSOI	Type	Motion °/Day	P.A.	STAR SAO No	DM/ID No	D	Min. U. T.	Geocentric Sep.	S	Comparison Data AGK3	No	Shift	Time	APPARENT R.A.	Dec.
Apr 3	51	Nemausa	137	0.08	475	CU	0.369	78.7	94810	+14°1003		12h53m.2	3".82S	UA	N14°	540	-0".19	-0m.2	5h43m.5	14°41'
Apr 3	117	Lomia	154	0.07	728	XC	0.268	107.2	58639	+36 1324		22 25.9	0.85N	UR	N36	608	-0.11	0.2	5 59.3	36 3
Apr 7	10	Hygiea	429	0.14	4007	C	0.285	80.2				2 24.8	0.94N	C					3 54.3	22 1
Apr 9	230	Athamantis	130	0.08	463	S	0.295	67.6		L 5 157		10 18.3	3.38N	H					19 35.6	-16 42
Apr 9	144	Vibilia	146	0.08	616	C	0.199	91.0	187485	C2314866		22 45.5	2.59N	UX			-0.16	0.2	18 56.3	-23 16
Apr 12	154	Bertha	192	0.12	1013		0.154	223.4	184133	C2811883		11 0.2	0.70N	MS			0.04	1.9	16 7.0	-28 51
Apr 13	184	Dejopeja	68	0.05	211	X	0.200	290.8	139293	- 9 3669	K	9 0.4	2.67N	MU			-0.60	0.1	13 20.8	-9 58
Apr 14	276	Adelheid	127	0.08	547	X	0.181	349.6	137723	- 9 3118		9 53.5	0.34W	MS			-0.84	-0.7	10 40.7	-10 3
Apr 18	184	Dejopeja	68	0.05	212	X	0.196	291.2	139265	- 8 3524		3 20.6	5.33N	UX			-0.22	-1.1	13 17.3	-9 38
Apr 18	44	Nysa	73	0.06	169	E	0.338	99.4	79986	+21 1769		3 49.1	1.70N	UM	N21	906	-0.28	-0.3	8 9.1	21 23
Apr 18	49	Pales	154	0.07	855	CG	0.060	84.2		B2564135		22 3.4	1.69N	C					18 42.2	-24 30
Apr 23	2	Pallas	533	0.28	4979	B	0.187	1.8				1 23.8	0.16E	C					18 23.9	18 41
Apr 26	511	Davida	337	0.18	2280	C	0.189	112.2				11 2.5	0.22N	C					9 7.0	29 20
Apr 26	914	Palisana	79	0.08	187	CU	0.249	29.7		C2513308		14 30.3	3.12N	H					18 38.1	-25 1
Apr 26	164	Eva	110	0.07	282	CX	0.615	80.1	191635	C2516269		14 44.5	2.77N	YG			0.36	-0.4	23 4.8	-24 23
Apr 26	17	Thetis	93	0.10	258	S	0.228	289.2		L 2 3346		15 16.1	0.84N	H					13 47.1	0 21
Apr 27	154	Bertha	192	0.13	1017		0.207	243.7	207147	C3012681		18 58.6	1.84N	S					15 56.5	-30 26
Apr 30		Mars	6782	4.91	99522		0.769	66.7	146915	- 3 5707		17 37.0	0.15N	FU			0.06	-0.1	23 47.5	-2 48
May 1	914	Palisana	79	0.08	187	CU	0.248	19.7		B2374971		17 20.1	1.29N	C					18 40.5	-23 52
May 2	308	Polyxo	148	0.11	621	T	0.070	305.2		B1749587		4 12.0	0.62S	C					17 40.6	-17 31
May 2	121	Hermione	217	0.08	1600	C	0.073	136.5				7 15.4	2.13N	W					9 59.6	21 3
May 4	596	Scheila	117	0.10	402	PCD	0.129	221.7		B2166446		14 30.3	0.66S	C					17 27.9	-22 0
May 5	410	Chloris	128	0.14	392	C	0.073	132.4	161232	-15 4897		7 33.9	3.47S	UH			-0.20	2.5	18 15.4	-15 54
May 5	804	Hispania	161	0.11	788	PC	0.187	288.2	181281	C22 9692		11 20.8	0.39S	S					12 58.3	-22 49
May 6	429	Lotis	70	0.05	221	C	0.173	311.1	139033	- 8 3449	V	2 27.8	0.65S	F					12 54.0	-9 30
May 7	165	Loreley	160	0.09	757	CD	0.089	71.7	188706	C2714376		12 41.6	1.41S	MX			2.36	-0.9	19 54.7	-27 8
May 7	70	Panopaea	127	0.12	460	C	0.242	268.9		L 2 4036		19 51.2	2.54N	H					14 0.0	-8 30
May 12	596	Scheila	117	0.10	402	PCD	0.171	233.8	185362	C2212025		13 33.7	0.87N	UX			-0.62	-2.0	17 24.0	-22 48
May 15	914	Palisana	79	0.09	184	CU	0.284	353.0		-20 5240		11 31.8	3.92W	PO			0.33	0.8	18 42.0	-20 19
May 19	308	Polyxo	148	0.12	620	T	0.164	283.0		B1748615		22 6.1	4.14N	C					17 32.4	-16 49
May 21		Pluto	2300	0.11			0.027	279.3		P 17		6 18.3	0.28N	H					15 31.4	-3 20
May 24	410	Chloris	128	0.15	390	C	0.131	226.4		B1752053		12 4.6	6.00N	C					18 13.7	-17 14
May 27	105	Artemis	123	0.10	365	C	0.277	49.5	107217	+11 4591		13 9.4	1.60N	A	N11	2678	0.83	1.2	21 32.2	11 49
May 30	175	Andromache	107	0.08	417	C	0.164	263.8	185892	C2712062		2 24.2	0.12S	MX			-0.14	-2.8	17 52.8	-27 38
May 30	2	Pallas	533	0.30	5078	B	0.185	296.8				9 42.6	0.13S	C					18 9.8	24 9
Jun 2	511	Davida	337	0.15	2328	C	0.298	112.2				13 0.7	0.24S	C					9 45.7	25 51
Jun 4	27	Euterpe	118	0.09	452	S	0.244	271.9	185351	C2212020		23 53.6	1.00N	UX			-0.60	1.7	17 22.9	-22 29
Jun 10	21	Lutetia	100	0.11	280	M	0.135	246.8	187936	C2315257		23 24.8	3.37N	UX			0.34	-2.5	19 17.7	-23 37
Jun 15	469	Argentina	129	0.09	552	X	0.182	293.7	207622	C3810983		13 50.5	2.05N	PF			-0.12	-1.6	16 23.6	-39 11
Jun 21		Mercury	4880	6.20	17054		1.620	101.0	79471	+23 1737		1 54.0	8.30N	UH	N23	832	0.12	-0.1	7 31.3	23 40
Jun 24	164	Eva	110	0.09	261	CX	0.590	80.5	147935	-18 279		23 17.4	3.95S	PS			-0.45	-0.2	1 39.0	-17 50
Jun 26		Mercury	4880	6.81	18377		1.391	107.0	79959	+22 1862		18 15.4	6.89N	3P	N21	900	0.51	0.1	8 7.3	21 36
Jun 28	164	Eva	110	0.09	261	CX	0.584	80.7	148011	-18 306		5 23.2	1.10S	MG			0.10	0.1	1 46.9	-17 31
Jul 1	54	Alexandra	171	0.15	632	C	0.178	30.4	146467	- 4 5809		9 18.0	0.10N	UX			0.10	0.2	23 2.3	-4 2
Jul 4	68	Leto	127	0.11	424	S	0.147	90.9	165669	-16 6276		3 21.8	2.25S	US			0.66	0.1	23 23.4	-15 54
Jul 11	137	Meliboea	150	0.05	758	C	0.320	89.6	94081	+15 670		5 38.6	1.32S	UA	N15	400	0.02	0.3	4 42.6	15 29
Jul 14	49	Pales	154	0.09	815	CG	0.172	274.7		C2413701		12 31.2	0.11S	H					17 58.2	-24 13
Jul 18	4	Vesta	520	0.30	3369	V	0.413	118.6				0 47.6	0.68S	C					12 19.3	4 52
Jul 18	52	Europa	278	0.13	1851	CF	0.211	81.3				1 37.1	1.38S	C					2 3.0	5 17
Jul 18	3148	Grechko	52	0.02	161		0.311	112.0	118355	+10 2166	C	8 30.3	0.72S	F					10 32.4	9 21
Jul 18	24	Themis	228	0.11	1291	C	0.273	113.5	138959	- 4 3353		10 6.9	0.12S	HX			-0.61	0.9	12 45.8	-4 52

Table 1 Part C

1992 Date	Universal Time	PLANET Name	m_v	Δ, AU	STAR SAO NO	m_v	Sp	R.A. (1950)	Dec.	Occultation Δm	dur	df	P	Possible Path LoiLai	LomLam	LoeLae	El Sun	MOON El	%Snl	N Up	Ephem. Source
Jul 19	5h 6- 8m	Notburga	12.6	1.706	92440	9.2	K2	1h23m.7	16°44'	3.5	5s	11	24	-13°60°	0°40°	12°19°	91°	41°	83-	all	Goffin87
Jul 19	7 46-63	Pales	12.6	2.369		10.4		17 52.1	-24 8	2.4	14	27	22	-61-15	-131-30	155-15	152	78	82-	e159W	MPC15524
Jul 20	16 8-20	Loreley	11.5	1.890	188002	9.9	A0	19 18.0	-25 41	1.8	14	23	17	170 27	117 20	63 42	169	75	72-	e 80E	Goffin89
Jul 25	8 28-40	Pallas	9.6	2.636		12.3		17 26.9	21 25	0.1	36	21	7	-76 41	-151 12	171-53	122	130	25-	e121W	Goffin87
Aug 5	9 27-29	Sylvia	12.9	3.415		12.6		3 45.8	13 56	0.9	12	16	18	-115 2	-93 9	-68 18	75	162	50+	none	MPC11507
Aug 5	19 24	P/Sm-Wm-1	13.6	6.526		11.2		5 23.9	30 25	2.5	3	17	95	(S.Is.,e.Australia)?n			51	145	54+	none	MPC18255
Aug 7	15 46-87	Urania	11.1	1.609		10.4		17 51.9	-24 35	1.2	35	84	22	176-46	99-56	24-37	133	17	72+	all	MPC12680
Aug 9	6 7-15	Veritas	12.9	2.097	143850	9.3	K0	19 48.4	-9 51	3.6	11	26	25	-90 66	-128 43	-165 27	158	29	85+	w 98W	MPC17797
Aug 14	13 19-35	Medea	13.2	2.322	188208	9.6	G0	19 27.4	-23 22	3.6	15	32	24	-140-28	152-47	67-39	149	44	99-	all	MPC16685
Aug 20	11 29-37	Semiramis	10.4	0.965	144513	9.3	G5	20 28.0	-5 54	1.5	9	30	25	-135-82	133-76	86-67	157	97	60-	none	MPC14930
Aug 21	12 26-51	Thyra	10.8	1.504	188076	9.1	F0	19 21.2	-23 32	1.9	12	35	26	-130-37	149-39	85 -5	140	131	49-	e169W	MPC15526
Aug 22	7 17-18	Melpomene	10.3	2.135		10.2		5 50.0	14 31	0.8	4	9	21	-63-23	-45-19	-24-16	62	21	41-	all	Goffin87
Aug 22	15 0	Sylvia	12.7	3.187		10.5		3 59.1	14 41	2.4	17	22	17	-168-59	-152-53	-136-47	89	15	37-	all	MPC11507
Aug 24	3 45	Melpomene	10.3	2.122		11.2		5 54.0	14 27	0.4	5	9	21	-30 55	-21 57	-9 59	62	11	22-	all	Goffin87
Aug 27	7 44	Melpomene	10.3	2.100		10.0		6 0.5	14 20	0.9	5	9	21	-94 55	-82 58	-65 61	64	52	1-	none	Goffin87
Aug 28	7 6-17	Chicago	13.0	2.887		9.2		23 43.9	-6 0	3.9	13	26	25	-21-16	-69-42	-163-70	160	161	0+	none	MPC11724
Sep 3	4 12	Melpomene	10.2	2.050		12.2		6 14.4	14 2	0.2	5	9	20	-39 54	-27 56	-9 58	67	146	42+	none	Goffin87
Sep 5	9 9	Melpomene	10.2	2.033		11.0		6 18.7	13 55	0.4	5	10	20	-109 22	-88 26	-62 28	68	169	64+	none	Goffin87
Sep 6	3 10	Melpomene	10.2	2.028		11.6		6 20.2	13 52	0.3	5	10	20	-7-23	11-20	33-18	69	171	71+	none	Goffin87
Sep 9	6 44-54	Urania	11.6	1.923		10.5	A8	18 0.4	-24 1	1.5	11	28	27	175-38	-139-30	-98-13	104	46	93+	all	MPC12680
Sep 9	9 28-32	P/Sm-Wm-1	13.5	6.047		9.9		5 44.0	31 0	3.6	6	29	88	North America?s			80	128	93+	w 90W	MPC18255
Sep 9	11 23-25	Melpomene	10.2	2.002	95738	8.3	B9	6 26.6	13 40	2.1	5	10	20	-142 1	-117 5	-89 7	70	139	94+	w113W	Goffin87
Sep 9	12 17-18	Thisbe	13.1	3.519		11.1		7 23.5	22 18	2.1	8	12	22	-145 16	-129 21	-107 25	57	151	94+	w127W	Goffin89
Sep 10	0 40-85	Thyra	11.1	1.650	187964	9.3	K2	19 16.3	-22 2	2.0	21	62	28	-89-70	-68 -9	-50 53	121	37	96+	all	MPC15526
Sep 10	2 26	Hygiea	11.6	3.847		12.0		7 21.6	22 39	0.6	14	13	13	(U.K., Scandinavia)?s			58	143	96+	w 18E	Goffin86
Sep 12	7 4-14	Desiderata	10.9	1.262	147873	8.5	K2	1 30.1	-15 42	2.5	16	26	13	-38 58	-85 46	-132 48	146	36	100-	all	MPC16384
Sep 14	11 30	Concordia	14.2	3.427	98520	6.6	F5	9 18.6	13 19	7.6	2	9	51	-116 38	-107 39	-92 41	33	120	94-	all	EMP 1989
Sep 14	11 34-41	Notburga	11.6	1.172	55027	8.9	F8	1 48.0	38 47	2.8	7	15	16	-90-21	-102 11	-102 50	127	29	94-	all	Goffin87
Sep 16	0 41	Hygiea	11.5	3.767		12.2		7 28.0	22 23	0.5	15	14	13	21 27	38 32	61 36	63	73	86-	all	Goffin86
Sep 17	0 23-27	Pallas	10.2	3.210	102953	7.6	K2	17 33.7	11 21	2.7	23	15	9	-90 9	-67-17	-30-41	89	132	78-	none	Goffin87
Sep 19	1 32-36	Pallas	10.2	3.236	102972	8.9	K0	17 35.0	10 58	1.6	23	15	9	-22 71	-59 41	-35 13	87	145	58-	e 44W	Goffin87
Sep 21	3 51	Melpomene	10.1	1.910		11.5		6 47.7	12 52	0.3	6	11	19	-42 46	-17 49	12 50	76	9	35-	all	Goffin87
Sep 21	4 27-31	Juno	9.1	1.726		8.3		5 55.1	9 33	1.2	13	12	9	-58 6	-23 7	12 0	89	20	35-	e 48W	Goffin86
Sep 23	23 58-60	Melpomene	10.1	1.887		9.1	G5	6 52.5	12 39	1.4	6	11	18	14 38	42 42	76 41	78	43	9-	e 47E	Goffin87
Sep 24	2 53	Thisbe	13.0	3.348		10.5	M8	7 40.0	21 30	2.6	9	14	21	2-22	18-18	34-17	68	35	8-	e 13E	Goffin89
Sep 25	7 49	Hebe	10.8	2.923	98280	8.5	F2	8 56.9	12 8	2.4	5	9	23	-74 45	-60 47	-39 48	49	33	2-	e 52W	Goffin86
Sep 27	9 28-35	Lutetia	11.2	1.642	187570	9.0	A5	18 57.9	-25 48	2.4	7	17	24	134-23	174-13	-148 3	99	86	1+	w136E	MPC15523
Oct 7	1 42-44	Hygiea	11.4	3.463		11.1		7 47.9	21 27	0.9	21	18	12	-23 54	5 62	50 65	78	153	81+	w 5W	Goffin86
Oct 10	7 59	Herculina	10.9	3.045		11.3		17 14.8	-20 40	0.6	7	11	20	161-23	-179-21	-156-15	63	101	98+	all	Goffin88
Oct 14	15 10-12	Pallas	10.4	3.556		9.9		17 55.8	6 51	1.0	18	12	10	42 36	69 20	97 8	71	134	92-	e 63E	Goffin87
Oct 20	3 40-44	Melpomene	9.9	1.666		11.5		7 29.3	10 25	0.2	10	18	16	-53 45	-14 45	24 38	94	18	39-	all	Goffin87
Oct 22	8 34	Venus	-4.0	1.294	184077	8.6	K0	16 1.1	-21 48		257	5	1	Japan			34	81	16-	none	NA0001
Oct 26	3 2	Herculina	11.1	3.253	185623	9.3	A0	17 38.5	-21 55	2.0	6	10	22	-134 18	-122 21	-108 25	53	49	0+	none	Goffin88
Oct 29	21 18-31	Eva	10.5	0.916	149140	8.6	G0	3 42.3	-10 56	2.1	11	18	12	121 10	73 30	19 66	147	135	18+	none	MPC14159
Oct 30	13 31-35	Ceres	9.1	2.906	189263	8.8	K5	20 22.2	-29 11	0.9	49	17	4	99-54	126-35	151-16	84	28	24+	w138E	MPC12187
Oct 30	16 26-40	Juno	8.5	1.371		9.8		6 40.2	4 2	0.3	31	26	7	94 11	135 -6	168-44	115	162	25+	none	Goffin86
Oct 31	6 57-86	Bruchsalia	12.3	1.500		9.5		5 39.6	20 14	2.9	18	49	25	-24 11	-68 47	-168 59	132	161	30+	none	EMP 1988
Nov 4	10 45-47	Thyra	11.7	2.201		9.8		20 2.4	-17 2	2.1	4	13	38	130-38	154-26	179-15	78	35	69+	all	MPC15526
Nov 8	15 23	Klio	12.6	1.541	164103	8.1	A0	21 0.9	-13 3	4.6	4	11	27	n.e. Europe?s			88	71	97+	all	MPC15525
Nov 12	8 25-47	Fidelio	12.7	1.326		9.5	F8	2 31.1	29 47	3.3	8	25	26	-41 32	-142 43	141 2	165	31	96-	e152E	MPC16387
Nov 13	9 26	Pales	13.5	3.567	187396	8.9	K5	18 49.8	-22 27	4.6	4	11	34	133 0	146 4	162 11	51	166	90-	e162E	MPC15524

Table 2 Part C

1992 Date	No.	MINOR PLANET Name	km-Diam.	//	RSOI	Type	Motion °/Day	P.A.	STAR SAO No	DM/ID No	D	Min. Geocentric U. T.	Sep.	S	Comparison Data AGK3 No		Shift	Time	APPARENT R.A.	Dec.
Jul 19	626	Notburga	104	0.08	273	CX	0.443	36°3	92440	+16° 150		5h10m3	2"20S	UA	N16°	128			1h26m0	16°58'
Jul 19	49	Pales	154	0.09	812	CG	0.156	275.5		C2413621		7 55.3	0.38S	H					17 54.8	-24 8
Jul 20	165	Loreley	160	0.12	755	CD	0.204	280.7	188002	C2513959		16 14.0	3.40N	MX			0"03	-4m2	19 20.7	-25 36
Jul 25	2	Pallas	533	0.28	5203	B	0.188	210.5				8 34.0	1.10S	C					17 28.8	21 24
Aug 5	87	Sylvia	271	0.11	1900	P	0.219	76.7				9 31.1	0.53N	C					3 48.2	14 4
Aug 5		P/Sm-Wm-1	100	0.02	766		0.154	83.6				19 26.4	1.73S	C					5 26.6	30 27
Aug 7	30	Urania	104	0.09	331	S	0.061	289.1		C2413616		16 16.4	2.44S	H					17 54.5	-24 35
Aug 9	490	Veritas	121	0.08	525	C	0.176	243.3	143850	-10 5200		6 12.3	3.34N	SU			0.85	1.7	19 50.8	-9 44
Aug 14	212	Medea	140	0.08	689	DCX:	0.135	270.3	188208	C2315482		13 28.9	1.63S	UX			-0.46	-0.9	19 30.0	-23 16
Aug 20	584	Semiramis	56	0.08	105	S	0.220	278.2	144513	- 6 5503		11 32.9	8.67S	US			-0.57	0.4	20 30.3	-5 45
Aug 21	115	Thyra	84	0.08	235	S	0.152	298.3	188076	C2315376		12 41.0	0.82S	UX			-0.14	0.0	19 23.8	-23 27
Aug 22	18	Melpomene	148	0.10	436	S	0.513	93.5				7 19.5	2.08S	C					5 52.5	14 31
Aug 22	87	Sylvia	271	0.12	1907	P	0.163	77.6				15 3.1	2.37S	C					4 1.6	14 48
Aug 24	18	Melpomene	148	0.10	437	S	0.509	94.0				3 46.8	3.14N	C					5 56.4	14 27
Aug 27	18	Melpomene	148	0.10	438	S	0.501	94.7				7 46.4	3.18N	C					6 3.0	14 20
Aug 28	334	Chicago	170	0.08	1100	C	0.149	239.9		P 513771		7 10.6	1.95S	M					23 46.1	-5 46
Sep 3	18	Melpomene	148	0.10	441	S	0.482	96.3				4 13.9	3.05N	C					6 16.8	14 1
Sep 5	18	Melpomene	148	0.10	442	S	0.476	96.8				9 12.3	1.02N	C					6 21.2	13 53
Sep 6	18	Melpomene	148	0.10	442	S	0.474	97.0				3 12.4	2.42S	C					6 22.6	13 51
Sep 9	30	Urania	104	0.07	324	S	0.169	84.5		C2413804		6 44.2	1.14S	H					18 3.1	-24 1
Sep 9		P/Sm-Wm-1	100	0.02	767		0.092	80.3				9 33.0	1.48N	C					5 46.7	31 1
Sep 9	18	Melpomene	148	0.10	443	S	0.464	97.8	95738	+13 1275		11 26.5	0.63S	UA	N13	594	0.09	-0.3	6 29.0	13 39
Sep 9	88	Thisbe	232	0.09	1407	CF	0.285	100.9		A2256167		12 20.8	0.09N	C					7 26.0	22 13
Sep 10	115	Thyra	84	0.07	231	S	0.082	13.7	187964	C2213826		0 59.3	0.36S	UX			0.64	2.7	19 18.9	-21 57
Sep 10	10	Hygiea	429	0.15	3922	C	0.260	99.8		A2355800		2 27.7	2.31N	C					7 24.1	22 34
Sep 12	344	Desiderata	138	0.15	453	C	0.228	262.4	147873	-16 259		7 8.8	6.18N	MS			0.91	-0.7	1 32.2	-15 29
Sep 14	58	Concordia	98	0.04	331	C	0.412	106.7	98520	+13 2074		11 32.5	0.91N	UR	N13	943	0.31	0.0	9 20.9	13 9
Sep 14	626	Notburga	104	0.12	266	CX	0.392	342.8	55027	+38 364		11 40.2	3.50N	A	N38	187			1 50.6	39 0
Sep 16	10	Hygiea	429	0.16	3917	C	0.249	100.5		A2257057		0 44.3	0.54N	C					7 30.6	22 18
Sep 17	2	Pallas	533	0.23	5297	B	0.236	140.1	102953	+11 3205		0 22.3	0.22N	MA	N11	1917	0.26	-0.5	17 35.7	11 19
Sep 19	2	Pallas	533	0.23	5301	B	0.239	138.3	102972	+11 3211		1 34.1	2.32N	QA	N10	2086	0.87	-0.8	17 37.0	10 57
Sep 21	18	Melpomene	148	0.11	449	S	0.425	100.5				3 54.4	2.58N	C					6 50.1	12 49
Sep 21	3	Juno	267	0.21	1115	S	0.408	106.6				4 31.6	1.00S	C					5 57.5	9 33
Sep 24	18	Melpomene	148	0.11	450	S	0.414	101.2		+12 1348		0 1.7	2.03N	A	N12	828			6 54.9	12 36
Sep 24	88	Thisbe	232	0.10	1414	CF	0.251	103.1		L 4 2318		2 55.6	1.76S	H					7 42.6	21 24
Sep 25	6	Hebe	186	0.09	780	S	0.402	101.6	98280	+12 1951		7 51.3	1.60N	UH	N12	1096	-0.31	-0.2	8 59.2	11 58
Sep 27	21	Lutetia	100	0.08	265	M	0.299	83.1	187570	C2513623		9 27.9	0.22N	XS					19 0.6	-25 44
Oct 7	10	Hygiea	429	0.17	3899	C	0.196	103.1				1 45.9	1.64N	C					7 50.5	21 20
Oct 10	532	Herculina	217	0.10	1127	S	0.347	104.7		B2165448		7 56.4	0.10N	C					17 17.4	-20 43
Oct 14	2	Pallas	533	0.21	5336	B	0.278	120.3				15 9.8	1.48N	C					17 57.9	6 51
Oct 20	18	Melpomene	148	0.12	463	S	0.288	107.8				3 45.9	2.32N	C					7 31.7	10 19
Oct 22		Venus	12220	13.02			1.216	103.4	184077	-21 4264	C	8 33.3	10.28N	G					16 3.6	-21 55
Oct 26	532	Herculina	217	0.09	1139	S	0.368	100.5	185623	-21 4701		3 0.0	1.82N	SU			0.77	-1.4	17 41.1	-21 56
Oct 29	164	Eva	110	0.17	272	CX	0.370	301.9	149140	-11 726		21 24.2	6.64N	MS			1.21	2.1	3 44.4	-10 48
Oct 30	1	Ceres	946	0.45	11153	G	0.219	68.7	189263	C2917047		13 30.6	1.71S	MS			0.26	2.2	20 24.9	-29 3
Oct 30	3	Juno	267	0.27	1125	S	0.211	135.1				16 35.2	3.55S	W					6 42.5	3 59
Oct 31	455	Bruchsalia	88	0.08	243	CP	0.109	312.1		A2043200		7 6.9	1.73N	WC			1.50	0.0	5 42.1	20 16
Nov 4	115	Thyra	84	0.05	219	S	0.351	71.4		L 5 2454		10 43.9	2.08S	H					20 4.8	-16 55
Nov 8	84	Klio	83	0.07	176	G	0.475	66.5	164103	-13 5837		15 21.7	5.80N	UX			-0.45	0.2	21 3.2	-12 53
Nov 12	524	Fidelio	74	0.08	188	XC	0.227	251.0		+29 435		8 36.2	1.46N	MA	N29	307	0.04	0.6	2 33.7	29 58
Nov 13	49	Pales	154	0.06	748	CG	0.319	83.6	187396	C2213377		9 23.5	0.46N	UX			-0.05	-0.3	18 52.3	-22 24

Table 1 Part D

1992 Date	Universal Time	PLANET Name	m_v	Δ, AU	STAR SAO NO	m_v	Sp	R.A.(1950)	Dec.	Occultation Δm	dur	df	P	Possible Path LoLa LomLam LoeLae	El Sun	MOON El	%Snl	Up	Ephem. Source
Nov 14	$1^{h}54^{m}$	Andromache	13.5	3.098	187490	8.1	K5	$18^{h}54.1^{m}$	-25°32'	5.5	3^{s}	9	42	w. U.S.A.?s	51°	173°	85-	none	MPC12303
Nov 14	23 38-51	Notburga	11.5	1.148	36383	8.6	K5	0 25.1	47 45	3.0	20	41	16	121°67° 175°82° 116°64°	134	85	77-	e121W	Goffin87
Nov 18	9 17	Hera	12.6	2.460	164286	5.4	B8	21 15.2	-18 12	7.1	4	13	41	107 51 119 57 130 66	80	157	40-	none	MPC12190
Nov 21	15 51	Athamantis	12.1	2.460	163624	8.6	G5	20 26.9	-10 10	3.5	4	10	27	8 57 24 61 45 66	68	103	9-	none	MPC11508
Nov 21	21 3-13	Semele	14.0	2.677	98684	7.8	K0	9 35.3	17 35	6.3	12	31	31	34 38 83 48 141 47	99	67	8-	e117E	EMP 1987
Nov 22	10 0-12	P/Sm-Wm-1	13.0	5.083		11.3		5 42.1	31 53	1.9	7	29	74	-68 15-138 28 152 4	152	129	5-	e 82W	MPC18255
Nov 22	20 44	Jupiter	-1.8	5.990	138840	8.7	F0	12 30.5	-2 1		2313	16	2	se Asia, nw Australia	52	34	3-	e120E	NA0001
Nov 23	8 59-71	Lameia	14.7	2.263	98709	3.5	+++	9 38.5	10 7	11.2	4	23	63	-154 68 -30 43 32 11	97	84	1-	e 36W	EMP 1986
Nov 24	17 11-14	Klio	12.8	1.701	145483	7.9	B9	21 30.9	-9 53	5.0	3	10	30	23-17 49 -5 80 5	80	76	0+	none	MPC15525
Nov 25	0 9-22	Daphne	12.4	2.462	112191	6.6	A2	4 51.3	1 29	5.8	11	19	20	84 18 4 2 -77-15	157	158	0+	none	MPC13294
Nov 26	16 25	Venus	-4.1	1.072	187759	9.3	K0	19 6.9	-24 52		317	5	1	s.cen.Europe, e.Africa	41	14	6+	w 53E	NA0001
Nov 26	22 19-22	Artemis	12.9	2.322	145750	9.4	F8	21 53.3	-6 9	3.6	5	13	27	-77 42 -42 41 -3 43	84	53	7+	w 59W	MPC12190
Nov 27	4 40	Mercury	1.8	0.729	159280	5.8	K0	15 25.4	-16 33		276	10	1	Libya,part of seEurope	12	45	8+	none	DE130
Nov 27	10 51	Klio	12.9	1.729	145558	9.3	G5	21 36.2	-9 19	3.6	3	9	30	101 30 124 41 155 51	78	42	10+	w124E	MPC15525
Nov 30	8 57	Venus	-4.1	1.047	188178	9.0	F8	19 26.0	-24 20		326	5	1	Manchuria, Korea, Japan	42	29	33+	all	NA0001
Nov 30	11 5	Nausikaa	11.8	2.460	188829	6.0	G5	19 58.4	-22 53	5.8	3	8	33	110 -9 124 -1 142 7	49	22	33+	all	MPC12432
Dec 3	17 58-60	Venus	-4.1	1.024	188545	9.2	G0	19 43.3	-23 42		335	5	1	s.w. Europe, Algeria	42	64	64+	all	NA0001
Dec 6	6 21	Davida	12.2	3.815		11.4		13 59.1	2 13	1.2	9	11	16	-21 67 -4 66 16 63	48	162	85+	none	MPC15384
Dec 6	17 49-61	Daphne	12.3	2.444	112022	8.9	A0	4 41.4	0 53	3.5	11	19	19	167 30 84 21 4 11	158	42	88+	w145E	MPC13294
Dec 7	0 9	Venus	-4.1	1.002	188847	9.1	K5	19 59.7	-22 58		343	6	1	-93 21 -87 25 -76 30	43	101	90+	all	NA0001
Dec 12	2 12-16	Prokne	13.2	3.054	118759	8.7	F8	11 13.6	1 52	4.6	13	27	25	(n.Europe,neSiberia)?s	91	62	94-	all	MPC15527
Dec 13	18 45	Loreley	13.1	3.521	163721	9.2	K0	20 33.6	-15 43	3.9	4	10	32	-16 30 -7 34 6 39	45	175	82-	none	Goffin89
Dec 15	16 59-69	P/Sm-Wm-1	12.9	5.007		11.6		5 29.8	31 43	1.6	6	24	73	169-14 107 0 44-24	172	76	62-	e 89E	MPC18255
Dec 17	2 51-84	Atalante	10.9	1.114	24597A	9.0	F0	4 21.3	56 16	2.0	17	33	15	45 23 -62 56-130 -6	144	106	46-	e 27W	MPC14752
Dec 17	2 52-85	Atalante	10.9	1.114	24597B	9.6	F0	4 21.3	56 16	1.5	17	33	15	46 24 -64 57-131 -4	144	106	46-	e 27W	MPC14752
Dec 17	4 26	Venus	-4.2	0.931	189787	9.1	G0	20 49.1	-20 2		376	6	1	-158 23-149 27-136 33	44	129	46-	none	NA0001
Dec 17	11 32	Mercury	-0.5	1.173	159858	8.0	B9	16 17.1	-19 56		102	4	1	n.e. U.S.A., se Quebec	19	62	42-	all	DE130
Dec 20	10 34	Venus	-4.2	0.908	164144	8.2	G5	21 4.3	-18 54		388	6	1	113 14 124 19 137 25	45	88	14-	none	NA0001
Dec 20	15 0- 4	Chicago	14.0	3.928	146726	8.1	G5	23 26.4	-7 41	5.8	9	20	34	54 -5 81 7 113 18	81	122	12-	none	MPC11724
Dec 21	23 43-57	Eva	11.4	1.206		10.1	G0	2 47.6	5 35	1.6	9	18	16	-36-49 -49 15-105 78	131	153	4-	none	MPC14159
Dec 23	5 18-33	Hygiea	10.4	2.433		11.6		7 57.8	20 2	0.3	37	27	8	-3 -3 -66 8-131 -2	154	144	1-	none	Goffin86
Dec 28	1 23-43	Bamberga	12.2	2.460	118469	9.4	A3	10 42.4	9 48	2.8	85	115	16	(Greenland,nwEurope)?s	118	162	15+	none	MPC11724
Dec 29	11 42	Lutetia	12.0	2.580	164737	7.0	K0	21 52.3	-15 30	5.0	2	8	37	85 37 95 42 112 49	48	15	26+	all	MPC15523
Dec 30	18 57-73	Melpomene	8.9	1.220		10.1		7 29.3	9 5	0.3	15	21	12	133-36 71-13 6 -5	161	119	37+	w 60E	Goffin87

Table 2 Part D

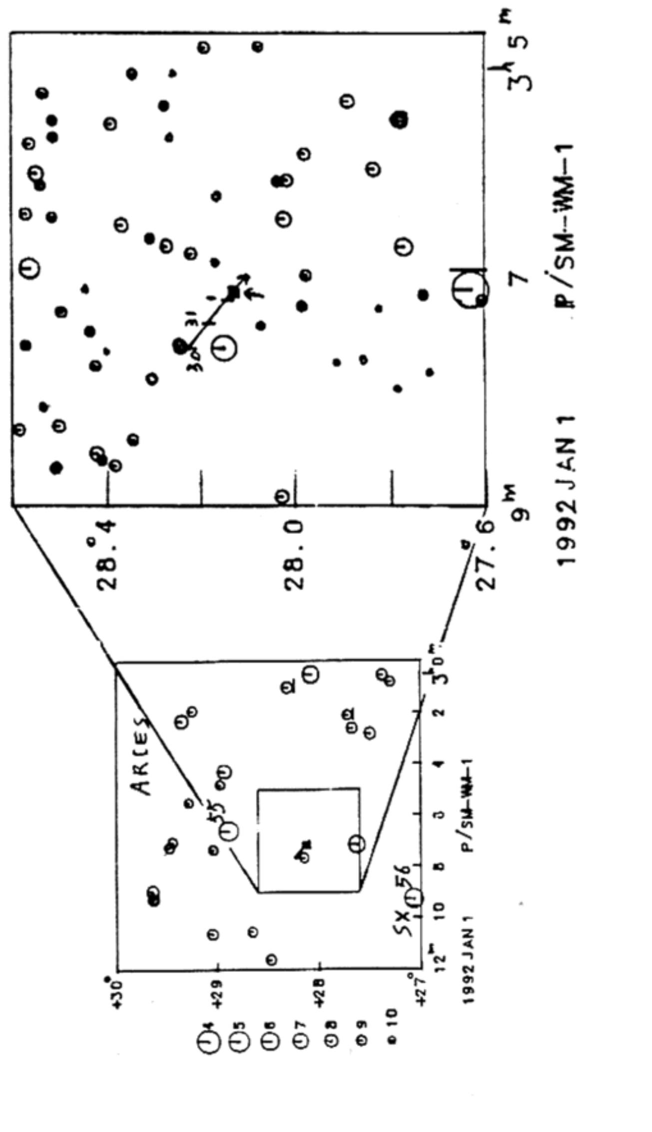
1992 Date	MINOR PLANET No.	Name	km-Diam.	-//	RSOI	Type	Motion °/Day	P.A.	STAR SAO No	DM/ID	No	D	Min. Geocentric U. T.	Sep.	S	Comparison Data AGK3	No	Shift	Time	APPARENT R.A.	Dec.
Nov 14	175	Andromache	107	0.05	369	C	0.402	82.9°	187490	C25°	13557		$1^{h}52.5^{m}$	3.06"N	7P			0.44"	-0.1^{m}	$18^{h}56.7^{m}$	-25°29'
Nov 14	626	Notburga	104	0.12	269	CX	0.147	232.9	36383	+47	104		23 50.6	4.92N	A	N47°	37			0 27.4	48 0
Nov 18	103	Hera	88	0.05	264	S	0.319	74.5	164286	-18	5903	K	9 16.1	3.36N	7P			0.24	0.0	21 17.6	-18 1
Nov 21	230	Athamantis	130	0.07	435	S	0.404	81.7	163624	-10	5405		15 50.7	3.26N	MU			0.20	-0.3	20 29.2	-10 1
Nov 21	86	Semele	127	0.07	552	C	0.128	95.2	98684	+18	2232		21 11.4	1.73N	UZ	N17	1050	0.12	-0.7	9 37.7	17 23
Nov 22		P/Sm-Wm-1	100	0.03	770		0.098	270.5					10 5.5	0.09S	C					5 44.9	31 54
Nov 22		Jupiter	140904	16.22			0.168	112.2	138840	- 1	2688	C	20 47.3	15.65S	UX	S 2	745	-0.22	0.7	12 32.7	-2 15
Nov 23	248	Lameia	52	0.03	125	U	0.193	118.9	98709	+10	2044	W	9 5.2	2.47N	F			0.04	-0.1	9 40.8	9 55
Nov 24	84	Klio	83	0.07	176	G	0.519	66.5	145483	-10	5705		17 9.7	1.45S	UX			0.11	0.0	21 33.2	-9 41
Nov 25	41	Daphne	182	0.10	1074	C	0.215	252.9	112191	+ 1	847		0 15.6	0.08N	MA	N 1	495	-0.14	0.4	4 53.6	1 34
Nov 26		Venus	12220	15.72			1.190	83.7	187759	C24	15074		16 23.2	0.03N	UX			3.96	1.7	19 9.5	-24 48
Nov 26	105	Artemis	123	0.07	426	C	0.326	93.3	145750	- 6	5865		22 19.1	2.83N	MU			0.21	0.4	21 55.5	-5 57

Table 2 Part D (continued)

1992 Date	No.	MINOR PLANET Name	km-Diam.	-//	RSOI	Type	Motion °/Day	P.A.	STAR SAO No	DM/ID No	D	Min. Geocentric U. T.	Sep.	S	Comparison Data AGK3 No	Shift	Time	APPARENT R.A.	Dec.
Nov 27		Mercury	4880	9.23	13592		0.802	298°.1	159280	-16°4089		$4^h35^m.0$	5″.02N	FU		-0″.04	$0^m.0$	$15^h27^m.9$	-16°41′
Nov 27	84	Klio	83	0.07	176	G	0.525	66.5	145558	- 9 5797		10 48.9	2.75N	UX		0.18	0.3	21 38.5	-9 7
Nov 30		Venus	12220	16.09			1.185	81.6	188178	C2415360		8 55.6	11.46N	UX		0.02	0.3	19 28.6	-24 14
Nov 30	192	Nausikaa	107	0.06	280	S	0.532	74.0	188829	C2315935		11 2.7	0.29S	7P		0.28	-0.1	20 1.0	-22 45
Dec 3		Venus	12220	16.45			1.180	79.8	188545	C2315724		17 57.6	12.43N	UX		0.28	0.0	19 45.8	-23 36
Dec 6	511	Davida	337	0.12	2586	C	0.311	103.1		L 2 4116		6 22.2	1.88N	H				14 1.3	2 0
Dec 6	41	Daphne	182	0.10	1069	C	0.218	260.6	112022	+ 0 832		17 55.3	1.26N	MA	N 0 430	-0.57	-0.1	4 43.6	0 58
Dec 7		Venus	12220	16.82			1.175	78.0	188847	C2315945		0 7.2	4.00N	UX		0.61	0.1	20 2.2	-22 51
Dec 12	194	Prokne	174	0.08	954	C	0.140	98.4	118759	+ 2 2408	A	2 15.4	3.63N	UA	N 1 1364	0.16	-2.5	11 15.8	1 37
Dec 13	165	Loreley	160	0.06	760	CD	0.364	71.8	163721	-16 5646		18 43.2	1.17N	UM		0.18	-0.3	20 36.0	-15 34
Dec 15		P/Sm-Wm-1	100	0.03	771		0.120	263.0				17 4.0	0.92S	C				5 32.6	31 45
Dec 17	36	Atalante	109	0.13	293	C	0.186	241.7	24597	+56 916	A	3 7.8	0.14S	BA	N56 466	0.17	-0.2	4 24.9	56 22
Dec 17	36	Atalante	109	0.13	293	C	0.186	241.7	24597	+56 916	B	3 9.1	0.10N	B	N56 466 B	0.24	1.3	4 24.9	56 22
Dec 17		Venus	12220	18.10			1.156	73.0	189787	-20 6053		4 23.8	3.83N	UX		-0.44	0.1	20 51.6	-19 52
Dec 17		Mercury	4880	5.74	17886		1.351	105.2	159858	-19 4358	E	11 34.1	6.26N	U7		0.01	0.0	16 19.6	-20 2
Dec 20		Venus	12220	18.56			1.149	71.5	164144	-19 6022		10 31.1	2.17N	UX		-0.62	0.0	21 6.7	-18 44
Dec 20	334	Chicago	170	0.06	1112	C	0.165	63.9	146726	- 8 6118		14 58.7	0.24S	U7		0.05	0.3	23 28.6	-7 26
Dec 21	164	Eva	110	0.13	296	CX	0.337	351.8				23 49.3	0.24W	MA	N 5 293	-0.20	0.5	2 49.9	5 46
Dec 23	10	Hygiea	429	0.24	3825	C	0.157	275.7				5 24.9	0.77S	C				8 0.4	19 55
Dec 28	324	Bamberga	228	0.13	1349	CP	0.036	232.1	118469	+10 2197		1 37.8	4.24N	UX	N 9 1337	0.19	0.8	10 44.7	9 34
Dec 29	21	Lutetia	100	0.05	264	M	0.535	69.4	164737	-15 6092		11 39.8	1.97N	UZ		-0.30	-0.2	21 54.6	-15 17
Dec 30	18	Melpomene	148	0.17	504	S	0.275	289.9				19 4.1	3.20S	C				7 31.7	9 0

Table 3. Stellar Angular Diameter Information.

1992 Date	PLANET No.	Name	STAR D SAO/DM No	Stellar Diameter m″	m	time	df
Jan 7	94	Aurora	+25° 455	0.17	279	110ms	0.9
Jan 7	139	Juewa	41603	0.61	676	63	2.8
Feb 29	654	Zelinda	225232	1.64	1794	183	7.4
Mar 17	34	Circe	160459	0.61	1024	75	3.4
Mar 18	54	Alexandra	L 5 4330	1.49	2863	73	8.9
Apr 13	184	Dejopeja	139293K	0.51	710	61	2.6
May 6	429	Lotis	139033V	4.88	7117	679	25.4
May 7	165	Loreley	188706	0.23	391	61	1.3
May 27	105	Artemis	107217	1.02	1264	88	4.9
Jun 10	21	Lutetia	187936	0.29	255	51	1.2
Jun 15	469	Argentina	207622	0.73	1032	96	3.7
Sep 10	115	Thyra	187964	0.18	210	51	0.8
Sep 17	2	Pallas	102953	0.64	1490	65	4.2
Oct 30	1	Ceres	189263	0.59	1244	65	3.7
Nov 14	626	Notburga	36383	1.02	850	167	4.0
Nov 21	86	Semele	98684	0.58	1133	109	3.5
Nov 23	248	Lameia	98709W	1.39	2274	173	7.7
Nov 27		Mercury	159280	2.37	1254	71	7.4



signal-to-noise-ratio photoelectric recording. Between these values, the occultation light curve will be a complex combination of the two effects. This information is available for all events listed in Tables 1 and 2, of possible use to those who want to analyze high signal-to-noise photoelectric records, upon request to me at: 7006 Megan Lane; Greenbelt, MD 20770-3012; USA.

Local Circumstance/Appulse Predictions: Joseph E. Carroll; 4261 Queen's Way; Minnetonka, MN 55345; USA, computes the IOTA appulse predictions for all IOTA members. Note that the star source code logic of this program has not been updated, so that the source codes in the appulse predictions will sometimes differ from that given under S in Table 2 described above. In case of disagreements, use the Table 2 code. Hans-Joachim Bode distributes similar predictions to IOTA/ES members. The format of these predictions is nearly self-explanatory and contains virtually all of the information that an observer needs. Columns headed D and S following the SAO number give the double star code and star position source code (but see the remark above), respectively. Next are the star's DM/ID No., then the star's MAG (visual mag.), OCC. DMAG (occultation magnitude drop), and DUR SEC (central occultation duration in seconds). This is followed by the U.T. and distances (in arc seconds, kilometers on the sky plane, and in terms of object diameter) of local closest approach. The distances are positive if the asteroid passes north of the star (this means that the path would be south of the observer's location). The elongation (ELG, angular distance from the star) of the Sun and Moon are given, as is also the Moon's percent sunlit (PSNL).

World Maps: World maps by Mitsuru Sôma are published here only if the event is not included in Goffin's predictions; or if the star is mag. 8.0 or brighter; or if the star is double, and I have drawn a line showing the 2nd component path; or if there is more than about 0".5 discrepancy with Goffin's prediction; or if there is a recent astrometric update. The charts show the Earth as seen from the asteroid at the time of the event; the hatched curve marks the sunrise or sunset terminator, with hatches on the night side.

Priority List: In Table 4 below, EAON is the European Asteroidal Occultation Network and I (IOTA) usually refers to attempts that will probably be made by Karen Gloria at Van Vleck Observatory in Middletown, CT (with plates usually measured by John Lee at Yale). Arnold Klemola often helps by providing measurements of secondary faint reference stars from existing Lick Observatory plates. The EAON events are from their "observational program"; astrometric updates might not be attempted for all of them. Similarly, most events in the "I" column constitute an "observing program" of events on which North Americans should concentrate. A "2" in the "I" column indicates an event of secondary importance for North Americans.

Table 4. Priority List for Astrometric Updates.

1992 Date	Asteroid	EAON	I	1992 Date	Asteroid	EAON	I
Jan 1	P/Sm-Wm-1		x	May 15	914 Palisana		2
Jan 7	94 Aurora	x		May 21	Pluto		x
Jan 17	15 Eunomia		x	Aug 9	490 Veritas		x
Jan 19	10 Hygiea	x	2	Sep 12	344 Desiderata		x
Jan 23	2060 Chiron	x		Sep 14	58 Concordia		2
Feb 14	2 Pallas	x		Sep 19	2 Pallas		x
Feb 23	139 Juewa		x	Sep 25	6 Hebe		x
Mar 10	451 Patientia		x	Oct 7	10 Hygiea	x	
Mar 17	34 Circe		2	Oct 26	532 Herculina		x
Apr 3	117 Lomia	x		Oct 30	1 Ceres		x
Apr 7	10 Hygiea		2	Oct 31	455 Bruchsalia		2
Apr 9	230 Athamantis		x	Nov 12	524 Fidelio		x
Apr 12	154 Bertha		x	Nov 26	105 Artemis		2
Apr 13	184 Dejopeja		2	Dec 17	36 Atalante	x	x
Apr 18	44 Nysa		x	Dec 21	164 Eva		2
May 2	121 Hermione		x	Dec 28	324 Bamberga	x	

Occultations by the Outer Planets: Occultations by the outer planets during the next several years, based on special astrographic surveys, are given in two 1991 Astronomical Journal (AJ) articles. Mink and Klemola list 16 occultations by Uranus and 3 by Neptune of mostly 14th-magnitude stars in AJ 102, p. 389. The best of these involves a 12.0-magnitude star that may be occulted by Uranus' rings around 5:11 U.T. July 14. Possible occultations by Pluto or by Charon are listed by D. Mink, A. Klemola, and M. Buie in AJ 101, p. 2255. Small finder charts (7' on a side) are included for each target star. The best event is an occultation of a 13th-magnitude star that may occur in the Americas on May 21. They list three other events of 15th-mag. stars during 1992 that will require photoelectric observation with very large telescopes.

Notes about Individual Events:

Jan. 1, P/S.-W. 1: This is the giant periodic comet Schwassmann-Wachmann 1, in a nearly circular orbit beyond Jupiter; its diameter is only a guess. Dimming in the coma may occur within one or two km of the path, whose location is quite uncertain due to the AC source for the star's position and the object's relatively large distance from the Earth. A path computed with a new orbit, including observations into early 1991 published in MPC18255, and an improved star position measured by Klemola from a Lick plate that he exposed this month, indicates about 0."5 arc second south shift, with closest approach times a few minutes later than my nominal times. Most of the shift is due to the star. The new path passes over the western tip of Cuba and northern Mexico, but the path is very uncertain, since the error in the orbit can be at least 0."5, so the event could still occur virtually anywhere in the U.S.A. south of Alaska.

Jan. 1, Euterpe: The star is number 9834 in Aitken's double star (ADS) catalog, with 6.1 (A) and 8.1-mag. (B) components 0."53 apart in position angle 114 deg. The occultation path for star B will be about 300 km, or two path widths, north of the path for A. Under most conditions, the stars will not be resolvable directly. Consequently, since B will remain visible, the apparent mag. drop will be 2.2 if A is covered. If B is covered, the apparent mag. change would be only 0.3, very hard to detect visually.

Jan. 4: Venus will be 76% sunlit, with a 3."5 defect of illumination.

Jan. 17: Goffin's path is about two path-widths southwest of my path.

Jan. 19: The AC position is uncertain, so this path could cross the northeastern U.S.A.

Jan. 20: Venus will be 80% sunlit, with a 2."6 defect of illumination.

March 10: Venus will be 91% sunlit, with a 1."0 defect of illumination.

March 25: The star is triple, ADS 8048. The secondary star is double, with separation 0."3 in approximate p.a. 103 deg. This pair is 11."5 from the primary in p.a. 220 deg., and will not be occulted.

March 31, Athamantis: The components are about mag. 9.2 and 10.5, with separation about 0."14 in (occultation vector p.a.) 242 deg. This probable duplicity was discovered by Richard Nolthenius during a lunar occultation on 1976 Sept. 4. Athamantis' angular size is about half that expected to separate the stellar components.

April 9, Athamantis: Goffin's path is three path-widths north of my path.

April 12: Goffin, using an orbit computed at the Institute for Theoretical Astronomy in St. Petersburg, computes a path much farther north, over s.w. Canada and Hawaii. My nominal path was computed with W. Landgraf's orbit.

April 13: The star, ZC 1917, may be a close double, based on a report of a gradual event during a lunar occultation of the star seen in South Africa in 1931.

April 18: Nysa is a rare E-class asteroid with an unusual light curve, perhaps indicating a strange shape.

April 30: Mars' disk will be 93% sunlit.

May 2, Hermione: The low-altitude geometry makes this prediction even more uncertain than for most AC stars. The north-south path could cross North America anywhere west of Indiana.

May 6: Psi Virginis is a red giant with spectral type M3; see Table 3. The star also has an 8.3-mag. companion about 0."04 away, according to a photoelectric record of a lunar occultation obtained in South Africa by A. Walker in 1975.

May 21: P17 is the special designation for a faint star that could be occulted by Pluto or by its moon, Charon. The star could also be only dimmed by Pluto's extensive atmosphere. The nominal southern limit crosses the northern U.S.A., but the prediction is very uncertain; it could be anywhere in the western hemisphere. Accurate astrometry is planned to refine the prediction.

June 21: The star will disappear on the dark side of Mercury's 68% sunlit disk.

June 26: Mercury's disk will be 57% sunlit.

July 18, Grechko: The star is Rho Leonis, a spectroscopic binary that has not been resolved by speckle interferometry (resolution about 0".03). An occultation recorded photoelectrically in Hamburg on 1969 Dec. 29 gave a "certain" separation of 0".003 in direction 277 deg., but other photoelectric occultation data have not confirmed this.

Aug. 9: Goffin and Lowell Observatory both compute a path about 4 path-widths southeast of my path.

Sept. 12: Goffin's path is about two widths south of my path, but Lowell's path crosses northern Canada.

Sept. 14, Concordia: The star is ZC 1386. Goffin's path crosses south central Canada.

Oct. 22: Venus will be 82% sunlit, with a 2".3 defect of illumination. The star has an 11.2-mag. companion 10".1 away in p.a. 156 deg.; it will not be occulted.

Oct. 26: The path computed with the Zodiacal Zone (U) catalog position nearly misses the Earth's surface to the north. The less accurate SAO position shows a more southerly path, crossing western Mexico. Herculina has the best evidence for a satellite, about 45 km across, which could cover the star along a path that could be anywhere in western North America.

Oct. 30: This will be the best occultation by Ceres in many years. A major IOTA effort is planned for it, including probable travel by some members from the USA to Australia to observe it.

Oct. 31: E. Goffin predicts a more southerly path, crossing New York City.

Nov. 18: The star is 30 Capricorni, and is a possible close double, according to a visual lunar occultation observation. However, this duplicity has not been confirmed by photoelectric occultation observations nor by speckle interferometry.

Nov. 22: Jupiter will be 99.5% sunlit, with a negligible 0".2 defect of illumination. The star has an 11.1-mag. companion 31".9 away in p.a. 309 deg., which will not be occulted.

Nov. 23: Omicron Leonis is Subra, the brightest star predicted to be covered by an asteroid this year. It is a spectroscopic binary, with 4.4 and 4.6-mag. components (spectral types A5V and F6II), separated by perhaps 0".008, which is about 1/4th of Lameia's angular diameter. The star is also a visual double, number 7480 in Aitken's catalog, with a 9.9-mag. companion 85" away in position angle 44°. This faint star will not be occulted.

Nov. 26: Venus will be 73% sunlit with a 4".3 defect of illumination.

Nov. 27: Mercury will be 12% sunlit.

Nov. 30: Venus will be 71% sunlit with a 4".6 defect of illumination.

Dec. 3: Venus will be 70% sunlit with a 4".8 defect of illumination.

Dec. 7: The star will disappear on the dark side of Venus' 69% sunlit disk.

Dec. 12: The star is ADS 8110, with 12.0-mag. companion 2".6 away in p.a. 181 deg.; it will not be occulted.

Dec. 17, Atalante: The star is number 3184 in Aitken's double star catalog, with 9.0 (A) and 9.6-mag. (B) components 0".65 apart in PA 220°. The occultation path for star B will be about 200 km north of that for A. Under most conditions, the stars will not be resolvable directly, although an elongated image might be apparent if the seeing is good. Consequently, since B will remain visible, the apparent mag. drop will be 1.1 if A is covered. If B is covered, the apparent mag. change would be only 0.5, quite hard to notice visually.

Dec. 17: Venus' disk will be 66% sunlit.

Dec. 17: Mercury's disk will be 80% sunlit, so the dark crescent, where the star will emerge, will be at most 1".2 wide. The star is the fainter component of a wide double. The primary, 7.2-mag. SAO 159860, is 47" away in PA 333°, and will not be occulted.

Dec. 20: Venus' disk will be 64% sunlit.

Dec. 21: Goffin's path crosses New Brunswick, well west of my path.

ATHAMANTIS OCCULTATION OBSERVED IN EUROPE

Roland Boninsegna

Last January was very good for asteroidal occultations, with 3 well-observed events involving Vesta, Kleopatra, and Myrrha reported in North America, Japan, and China (ON 5, #4, p. 93). A 4th event occurred on January 21, when 7 observers recorded an occultation of SAO 156876 by 230 Athamantis. Most of them were informed of the last-minute prediction based on plates from Uccle Observatory. That prediction was especially good. Adri Gerritsen is now busy with the reductions. [based on a note in EAON News, November, 1991]

PREDICTION PROGRAM NEWS

David W. Dunham

Chart Clarification: The chart of occultation programs and files on pages 125 and 126 of the last issue is a more legible version of a handwritten chart written on one large sheet of paper. The overall sections described at the top left of p. 123 referred to the old chart, and should be modified for the published chart. Specifically, solar eclipse programs are on the lower left part of p. 125, and asteroidal and planetary occultation programs are on p. 126. The programs called MAJPLCAL and MINPLCAL should be circled twice (they are incorporated in the correct OCC program). "NOVA" should be replaced with "NOVAS" in two places. On p. 125, some lines were either not drawn, or did not reproduce well enough to see. These include the following: From APPARENT Moon, Sun EPHEMs, draw lines to CONJCMAJ, CONJCMIN, MAJPLCAL/MINPLCAL, and OCCSERCH; from XZ to GRAZSRCH and NOVAS/GRAZECAL; from BEFILE to BEFLSORT/BEFLMERG and EVANS; from OCCRED to SECLDADD; from SOLECLOB to OCCRED; and from SECLDADD to BBEADR.

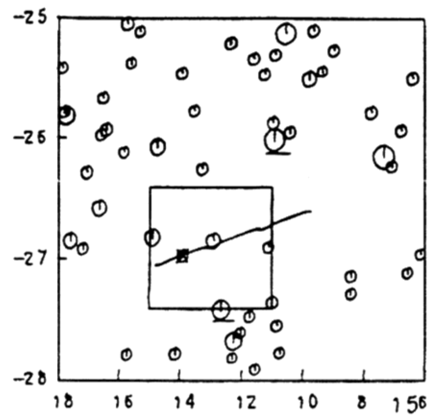
Visit to ILOC: On November 14 and 15, during a business trip to Japan, I visited the International Lunar Occultation Center in Tokyo. I gave the 3 employees of ILOC (which itself is part of the larger Geodesy and Geophysics Department of the Japanese Maritime Safety Agency), Mr. Mitsuo Kawada, Ms. Madoka Hirouchi, and Ms. Yumiko Watanabe, an intensive course in procedures that had been followed by Marie Lukac for the distribution of the USNO total occultations, and gave much advice about the computer programs involved, especially the EVANS program that generates the predictions. Also present were Dr. Yoshio Kubo of the Geodesy and Geophysics Dept., and on the 14th, Dr. Mitsuru Sôma of the National Observatory, both of whom are fluent in English and contributed much to the discussions. ILOC plans to distribute the 1993 predictions, which I will send to ILOC on a magnetic tape produced from computer runs that I will make at USNO sometime around June, 1992. ILOC is working hard to convert the Evans program to run on their mainframe computer, and with the advice I gave, they are confident that they will eventually succeed. ILOC is in favor of distributing as many of the predictions as possible through national and/or regional coordinators, and the eventual distribution of the prediction calculations as well, as described on pages 109 and 110 of the last issue. As part of the software replacement effort, Sôma is progressing with the OCCRED program, and to help, I produced some documentation for it, as well as the EVANS program, mainly to give details of the major input and output files of those programs. I wrote these, and updated some earlier files (especially occ.doc) for clarification, with our portable PC while I was in Japan.

PC Program for SAO Total Occultation Predictions: Gordon Taylor in England has written a PC program to calculate predictions of occultations of SAO stars for a given location. Alan Wells says that it agrees with the USNO predictions generally to within 4 seconds (probably due to lack of, or very crude, limb correction data), and noted an error in the cusp angle calculations, of which Taylor was aware and was working to correct. When time permits, I will send Taylor details of IOTA's replacement effort, so that we can coordinate our efforts to best mutual advantage.

PAL CCD CAMERA GROUP PURCHASE AND DCF VIDEO TIME INSERTER

Henk J. J. Bulder

As of mid-November, 12 amateurs had ordered the PAL (mainly European video format) version of the Philips CCD video camera modules, and more were expected. As an update to the video time inserter for use with the DCF long-wave time signal receivers discussed on p. 121 of the last issue, the design of Dr. H. H. Cuno for a simple video time inserter module which is triggered by DCF 77 time signals has proven to function well. So in due time Pierre Vingerhoets (Belgian total occultation prediction coordinator, see p. 109 of the last issue) will start the production of these time insertion modules for perhaps less than $25 each. According to the November issue of EAON News, Vingerhoets is also selling DCF receivers (presumably the German Conrad Electronics receiver) for 2000 Belgian Francs (about $65) post-paid.



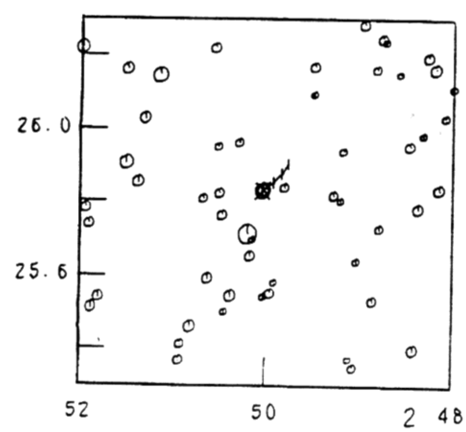
1992 JAN 1   469 ARGENTINA   SAO 183334

ECLIPSE NEWS

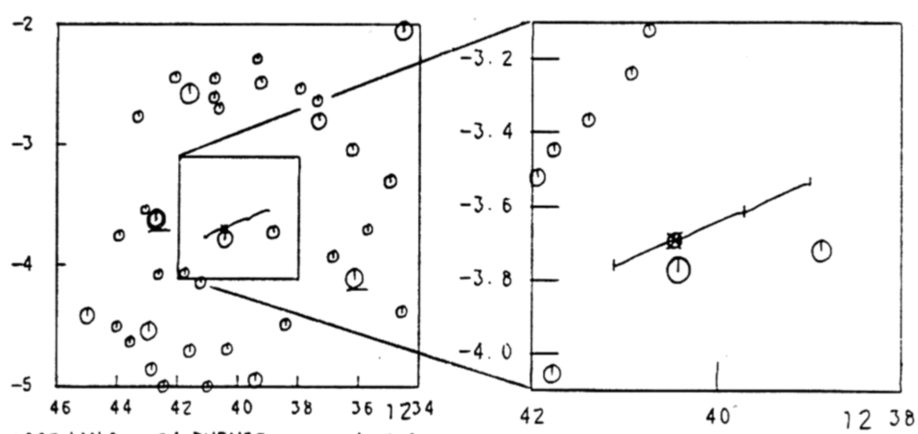
David W. Dunham

1991 July 11: Observations were made near the northern limit in Baja California, after all. Volodemer Tel'nyuk-Adamchuk and Ernest Gurtovenko, from the Astronomical Observatory of Kiev University, Ukraine, reports that their team made observations from four stations near Villa Insurgentes. In their recent fax message, they also suggested a joint analysis of their and IOTA's path-edge data, and also requested help in determining accurate geodetic coordinates of their stations. I have detailed maps of the area, which I plan to send to Kiev when I visit Moscow in mid-February.

1992 January 4: As this issue is being distributed, Paul Maley and 4 other IOTA members are headed for the northern limit on Truk, and Hans Bode is leading a similar IOTA/ES expedition to Arorae Island, close to the southern limit in the Gilbert Islands of Kiribati; see p. 110 of the last issue. Fortunately, expensive GPS receivers will not be needed, since I recently learned that both islands were linked with a geodetic Hiran survey in the early 1960's; accurate coordinates for both on the 1984 World Geodetic System are available. These and detailed descriptions of the survey markers have been provided by the Geodesy and Geophysics Department of the Defense Mapping Agency Aerospace Center. The Hiran survey was secret at the time, but was declassified in 1974.



1992 JAN 7   94 AURORA



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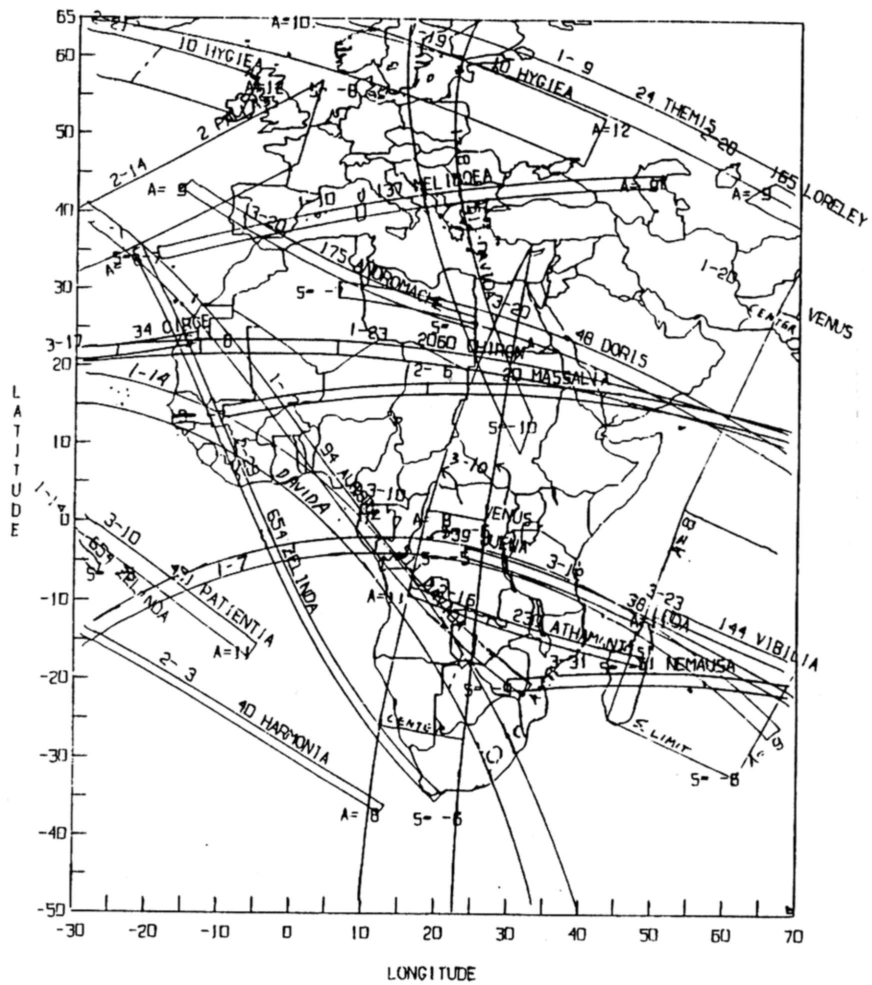
PLANETARY OCCULTATIONS. 1992 JAN. - MAR.



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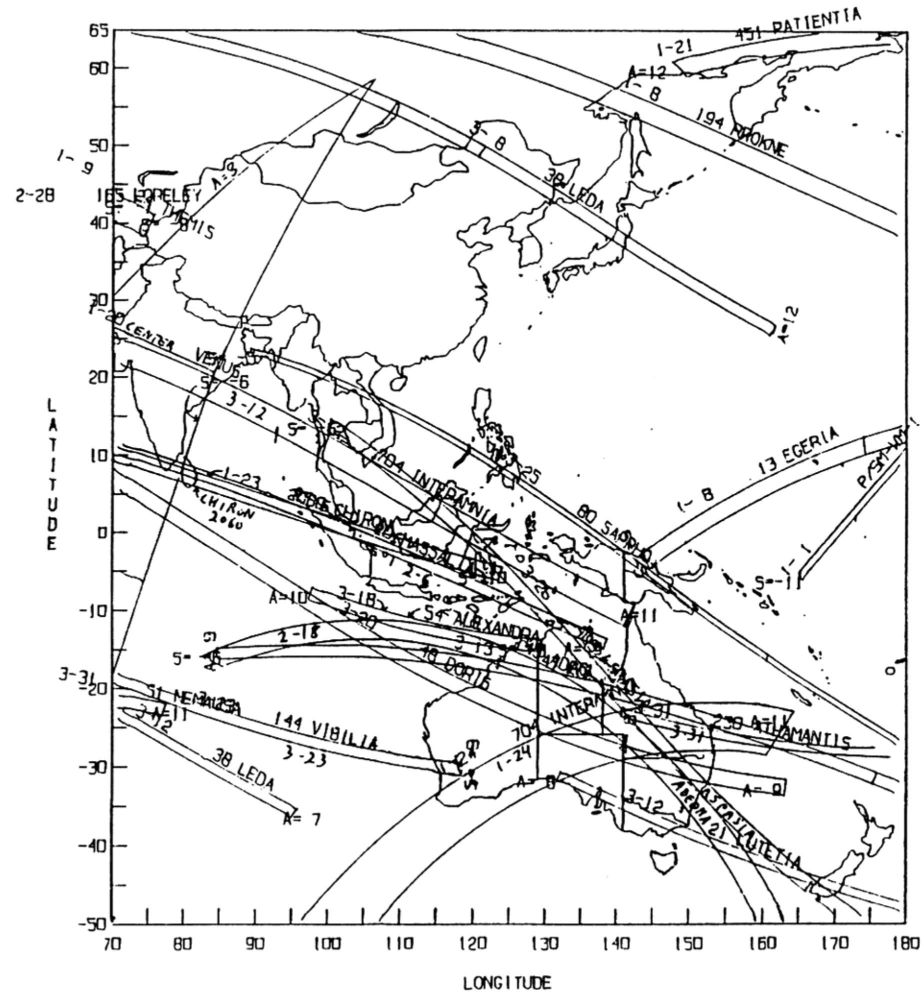
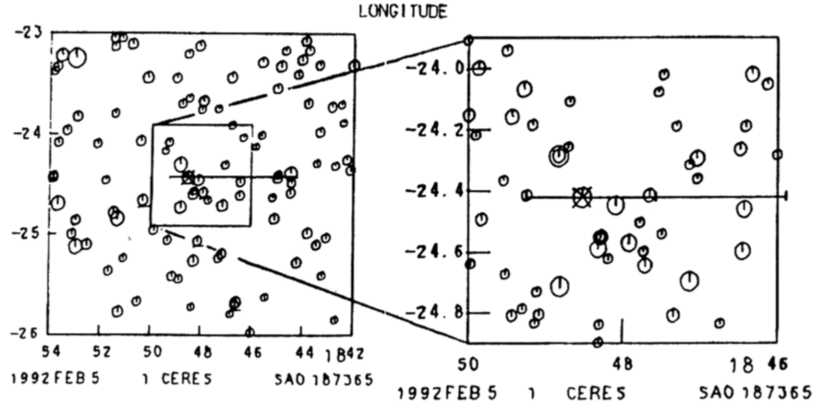
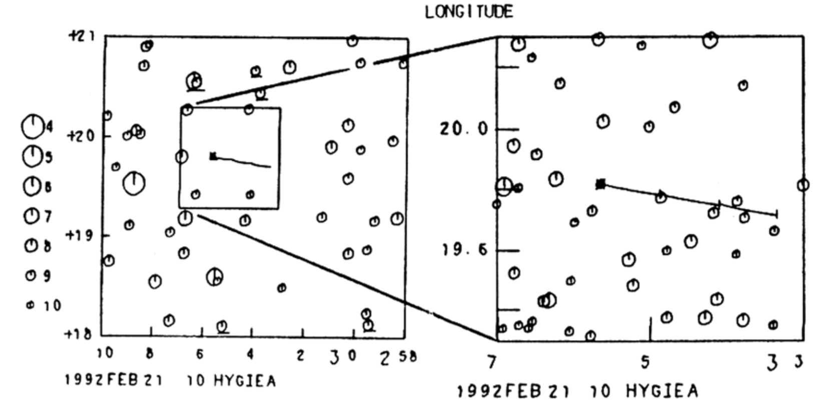
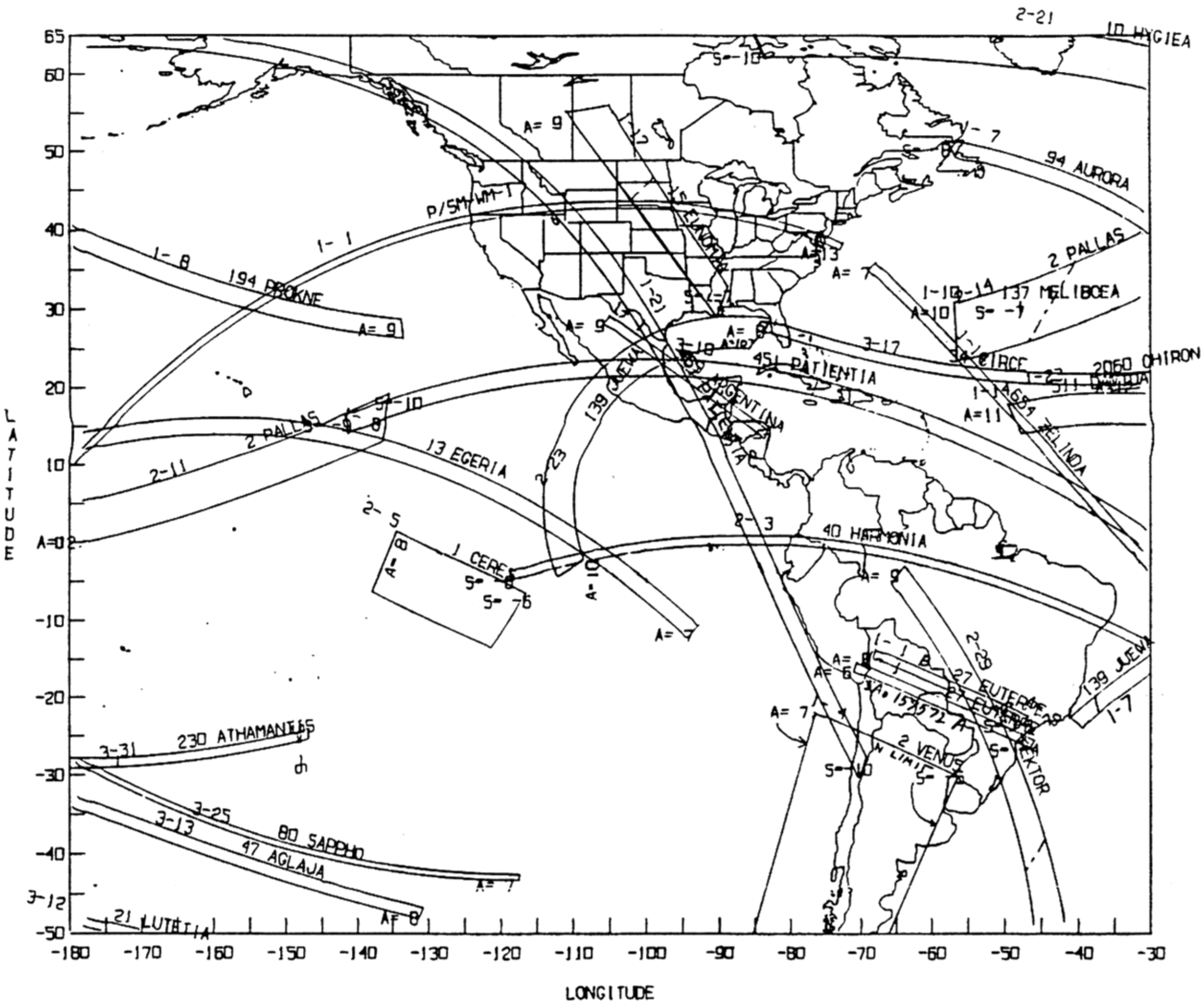
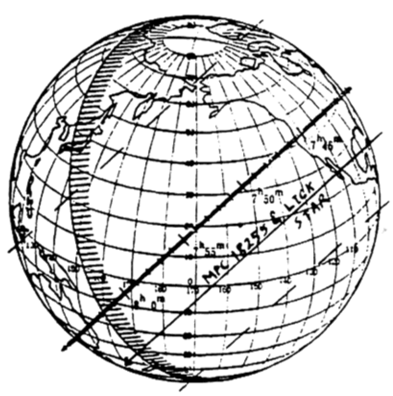


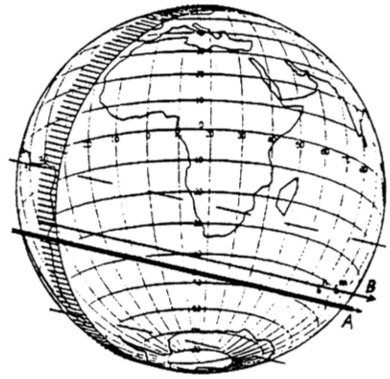


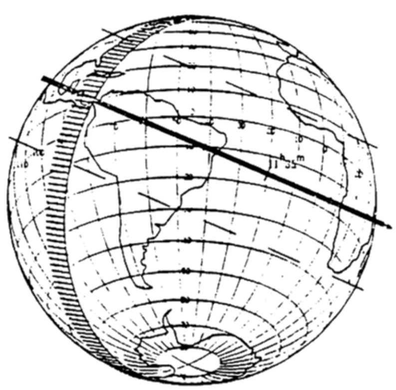


PLANETARY OCCULTATIONS. 1992 JAN. - MAR.





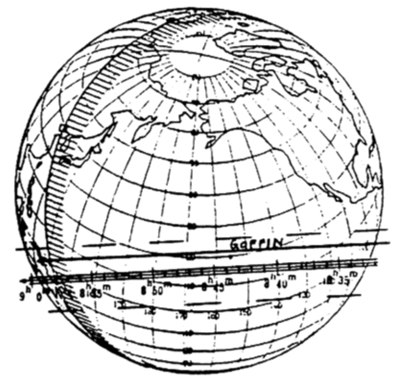




Anonymous by P/Sm-Wm-1 92 Jan 1 SAO 159572 by Euterpe Jan 1 SAO 183334 by Argentina Jan 1

SAO 159767 by Venus 92 Jan 4

SAO 41603 by Juewa 92 Jan 7



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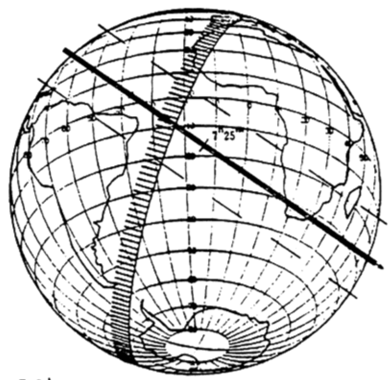
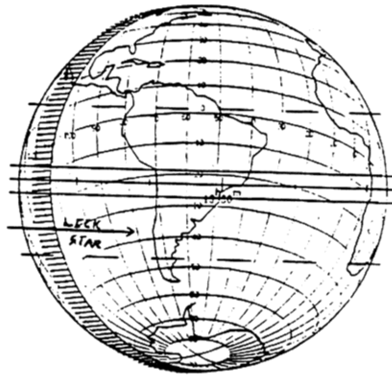
L 2 9 by Themis 92 Jan 9

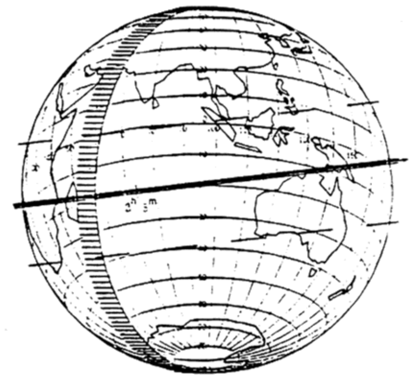

SAO 204900 by Zelinda 92 Jan 14

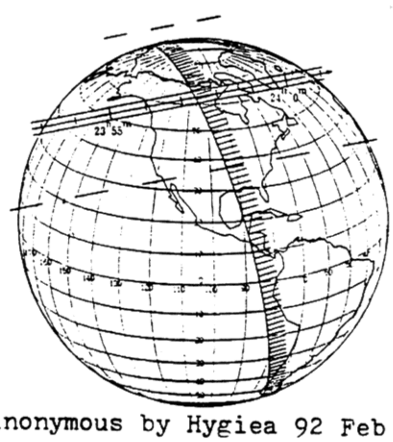

SAO 185489 by Venus Jan 20

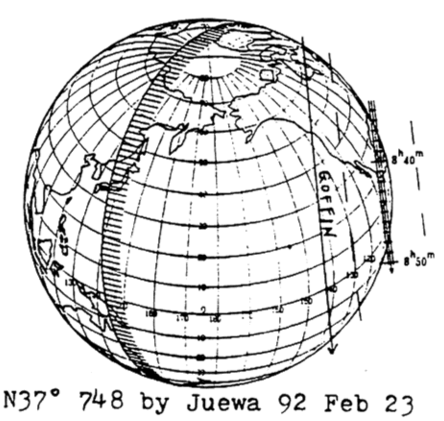
Anonymous by Interamnia Jan 24



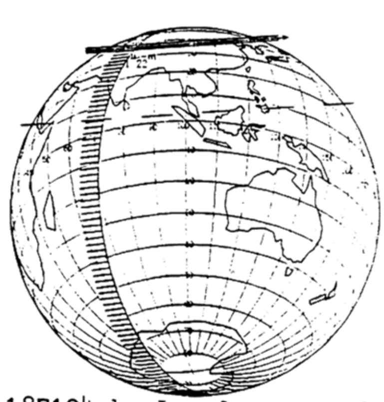
SAO 187365 by Ceres Feb 5

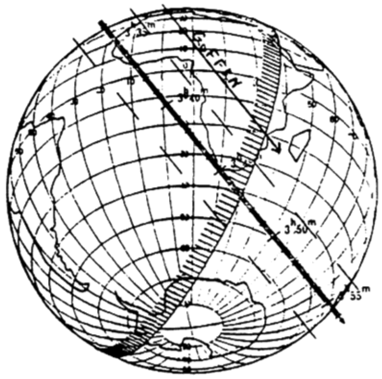

B21° 71027 by Athamantis Feb 16

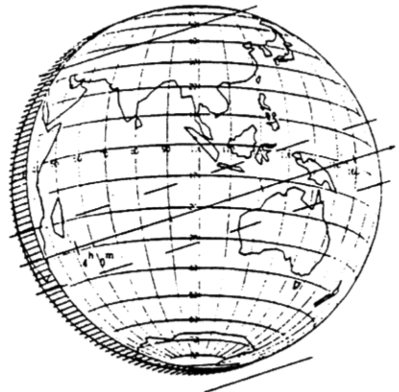

Anonymous by Hygiea 92 Feb 21

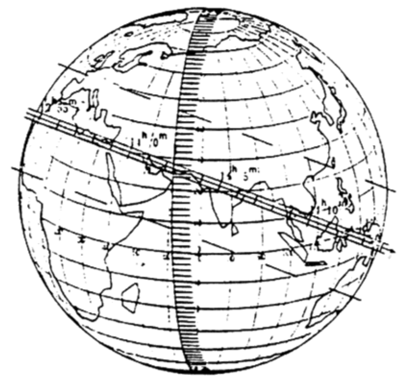


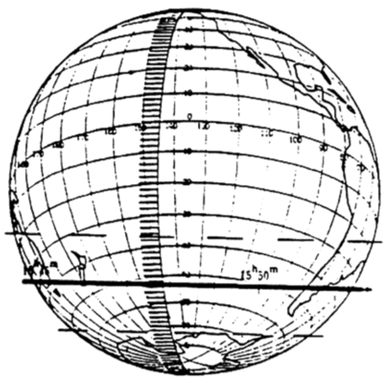
N37° 748 by Juewa 92 Feb 23


SAO 187194 by Loreley Feb 28


SAO 225232 by Zelinda Feb 29

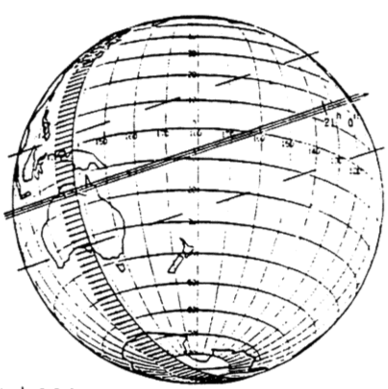

SAO 164699 by Venus 92 Mar 10

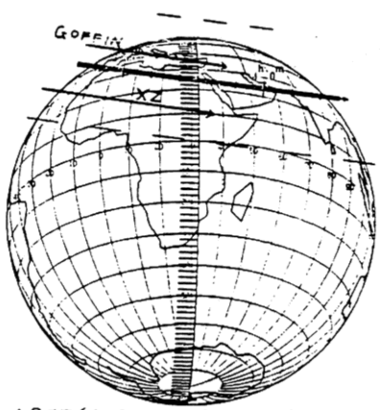

Anon. by Interamnia Mar 12


SAO 186489 by Lutetia Mar 12

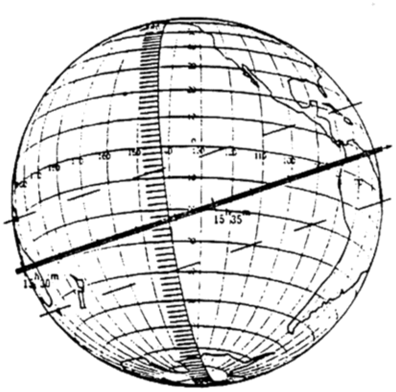

SAO 78558 by Leda 92 Mar 12

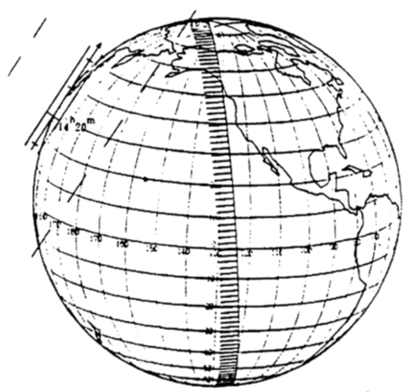

SAO 160459 by Circe 92 Mar 17


L5 4330 by Alexandra Mar 18


SAO 185761 by Andromache Mar 20


SAO 137978 by Sappho Mar 25


SAO 162593 by Athamantis Mar 31

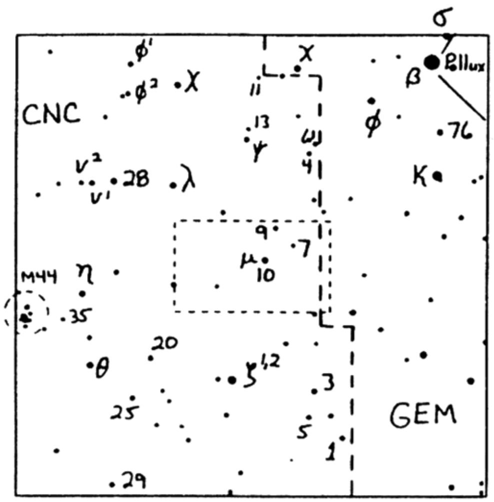

SAO 103592 by Pallas Apr 1

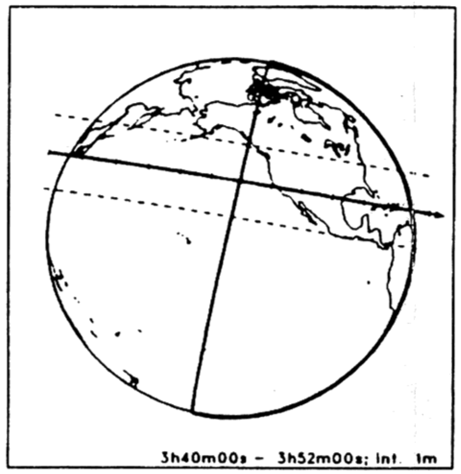

SAO 94810 by Nemausa 92 Apr 3

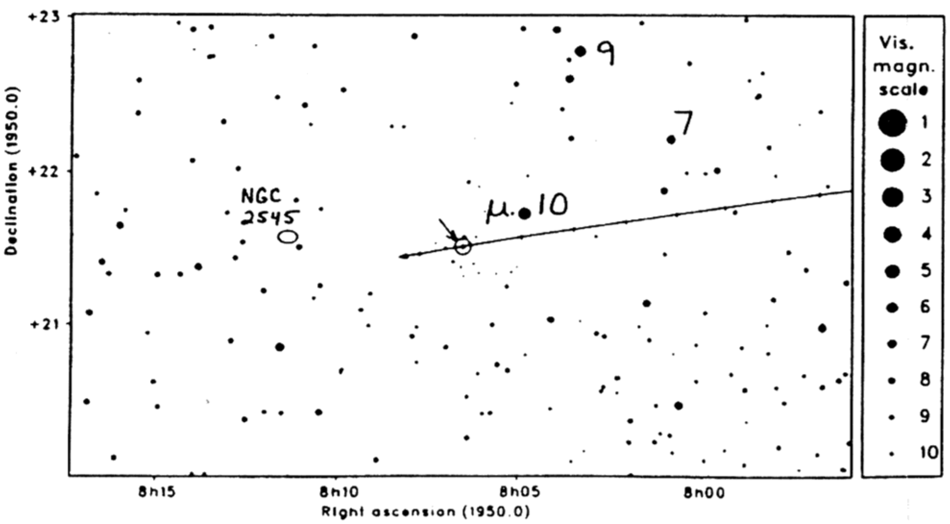
44 Nysa – PPM 98409

1992 apr 18 3h46.2m U.T.

Minor planet :			Star : SAO 79986	Source cat. PPM
V. mag. = 10.81	Diam. = 73.0 km = 0.06"		α = 8h06m33.542s	δ = +21°30'55.32"
μ = 50.64"/h	π = 4.81"	Ref. = MPC11982	V. mag. =	Ph. mag. = 9.40
Δm = 2.4	Max. dur. = 3.9 s		Sun : 91°	Moon : 101°, 99%



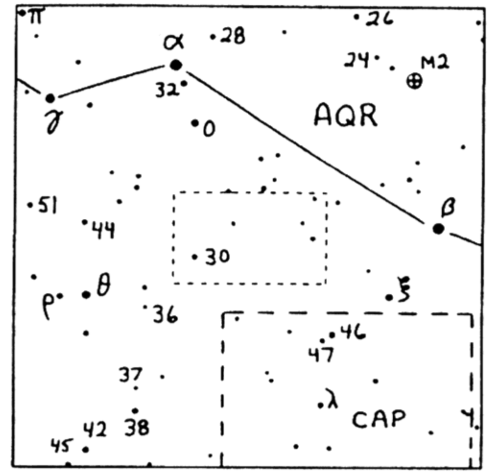


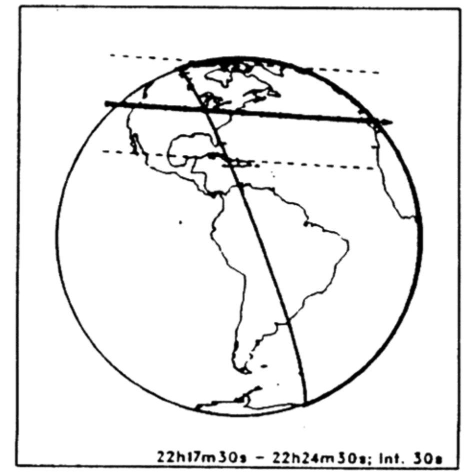


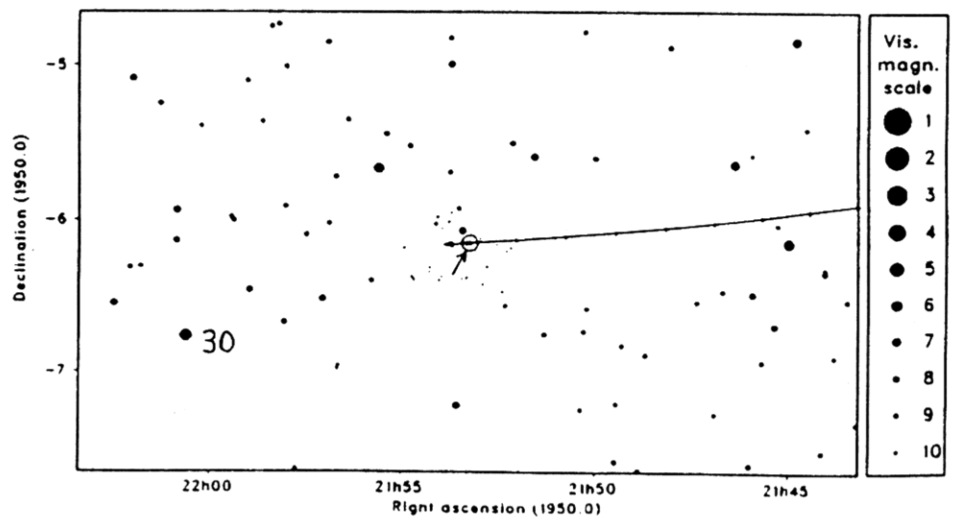
105 Artemis – PPM 512894

1992 nov 26 22h21.3m U.T.

Minor planet :			Star : SAO 145750	Source cat. PPM
V. mag. = 13.52	Diam. = 123.0 km = 0.07"		α = 21h53m16.131s	δ = – 6°09'02.40"
μ = 48.85"/h	π = 3.79"	Ref. = EG87–176	V. mag. = 9.40	Ph. mag. =
Δm = 4.1	Max. dur. = 5.4 s		Sun : 84°	Moon : 53°, 7%







IOTA

The International Occultation Timing Association was established to encourage and facilitate the observation of occultations and eclipses. It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets, information on observing equipment and techniques, and reports to the members of observations made. IOTA is a tax-exempt organization under section 509(a)(2) of the (USA) Internal Revenue Code, and is incorporated in the state of Texas.

The ON is the IOTA newsletter and is published approximately four times a year. It is also available separately to non-members.

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The Dunhams maintain the occultation information line at (301) 474-4945. Messages may also be left at that number.

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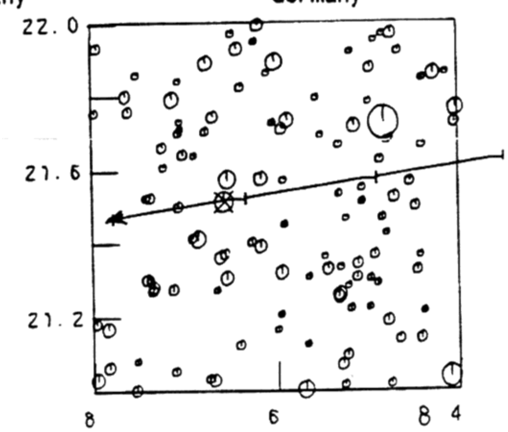
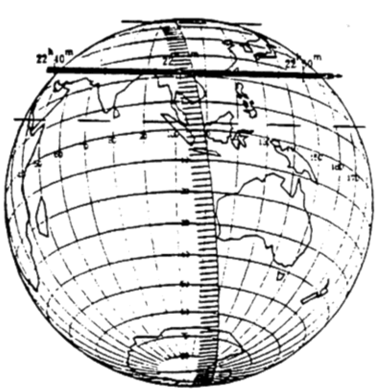
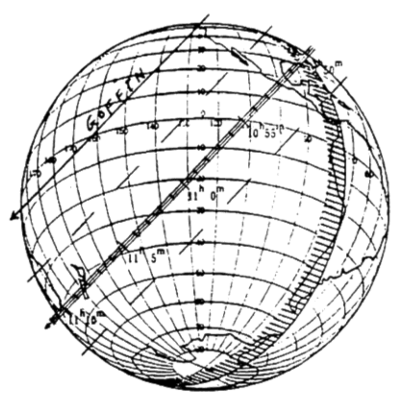


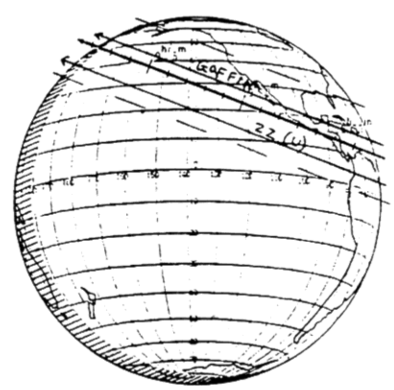
1992 APR 18 44 NYSA SAO 79986



SAO 187485 by Vibilia 92 Apr 9



SAO 184133 by Bertha Apr 12



SAO 139293 by Dejopeja Apr 13