Occultation Newsletter

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Joan Bixby Dunham, Editor

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FROM THE PUBLISHER

For subscription purposes, this is the second issue of 1995. It is the eighth issue of Volume 6. IOTA annual membership dues, including ON and supplements for U.S.A., Canada, and

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for all others	35.00

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ON subscription (1 year = 4 issues)

for U.S.A., Canada, and Mexico	20.00
for all others	25.00

Single issues are 1/4 of the price shown.

Although they are available to IOTA members without charge, nonmembers must pay for these items:

Local circumstance (asteroidal appulse) predictions	1.00
Graze limit and profile predictions (per graze)	1.50
Papers explaining the use of the predictions	2.50

Asteroidal occultation supplements will be available at extra cost: for South America via Orlando A. Naranjo (Universidad de los Andes; Dept. de Fisica; Mérida, Venezuela), for Europe via Roland Boninsegna (Rue de Mariembourg, 33; B-6381 DOURBES; Belgium) or IOTA/ES (see below), for southern Africa via M. D. Overbeek (Box 212; Edenvale 1610; Republic of South Africa), for Australia and New Zealand via Graham Blow (P.O. Box 2241; Wellington, New Zealand), and for Japan via Toshio Hirose (1-13 Shimomaruko 1-chome; Ota-ku, Tokyo 146, Japan). Supplements for all other areas will be available from Jim Stamm (11781 N. Joi Drive; Tucson, AZ 85737; U.S.A.) for $2.50.

Observers from Europe and the British isles should join IOTA/ES, sending a Eurocheck in the amount DM 40.-- to the account IOTA/ES; Bartold-Knaust Strasse 8; D-30459 Hannover, Germany; Postgiro Hannover 555 829 - 303; bank-code-number (Bankleitzahl) 250 100 30. German members should give IOTA/ES an "authorization for collection", or "Einzugs-Ermaechtigung" in German, to their bank account. Please contact the secretary for a blank form.

IOTA NEWS

David W. Dunham

IOTA Meeting: The 1995 meeting of the International Occultation Timing Association (IOTA) was held at St. Mary's University in San Antonio, Texas, on, July 22. See Rocky Harper's account later in this issue.

ESOP XIV: The 14th European Symposium on Occultation Projects was held on August 25-30 in Plzeň, Czech Republic. With over 50 registered participants, it may have been the largest ESOP meeting to date. There were many interesting presentations, and useful exchanges of software, papers, and anecdotes. Data and programs for predictions for 1996 were distributed; see the article following the next article. A good account of the meeting was published in the September issue of **OCCULTUS**, publication of the Dutch Occultation Association; the article is in Dutch. Help is sought from one of the other attendees for preparing an account for **ON**. The Czech organizers have all of the abstracts in PC files, so we hope to obtain them, so that at least the paper titles and authors could be listed here. The proceedings of the symposium should be available soon.

This Issue: The 1996 Planetary Occultation Supplement for North American Observers, with Edwin Goffin's charts annotated by David Werner, will be distributed with this issue.

E-mail: Communication by electronic mail has mushroomed during the past year. It has provided a great way to pass a lot of information to and from observers. But answering all my mail has detracted from other projects, being partly responsible for the delay of this issue. Aid in answering inquiries from new observers, especially prediction requests, is needed. If you can help, please let me know at David_Dunham@jhuapl.edu. Especially useful are those with the OCCULT program who can generate total and grazing occultation predictions, and edit them when needed for e-mail transmis-

sion. Also, I find it useful to alert potential observers to favorable grazes in their vicinities a few days or a week in advance, and provide limit predictions with expected ranges judged from the profile when some interest is shown. Initial notification can be based on the graze maps in the **RASC Observer's Handbook** and other publications. But except for local expeditions, I have not had time to do this systematically; the IOTA graze computors and regional coordinators are encouraged to use e-mail to actively notify observers of events in their regions. Early in 1996, I will distribute by e-mail an updated list of e-mail addresses arranged geographically to help this process. In the meantime, you can get the e-mail addresses of other observers in your area from messages that I distribute about asteroidal occultation updates.

E-mail is very useful, especially when last minute astrometry becomes available prior to an asteroid occultation. A more precise path that the shadow follows can be computed. Observers, depending on their geographical location, can be notified quickly if there is a shift. We are asking that people with e-mail capability join in the IOTA network. We want to encourage people with e-mail addresses to act as contacts for other observers in their area who do not receive e-mail. The overall goal is to establish a database of observers who could be alerted if there is a change.

If you do not have e-mail access, but belong to a local astronomy group, ask if a member is willing to be the mailman for those interested in last-minute astrometry.

Selenology: The (Northern Hemisphere) Summer 1995 issue of **SELENOLOGY** (Vol. 14, No. 2) is a special issue on lunar occultations, 31 pages being devoted to the subject. It is published by the American Lunar Society; P.O. Box 209; East Pittsburgh, PA 15112 and is largely prepared by IOTA member Francis Graham, e-mail graham@ksuvx1.kenteliv.kent.edu.

Next Issue: The next issue, which we expect to complete before the Christmas holidays but which you will probably not receive until the first half of January, will concentrate on documenting IOTA's predictions of 1996 planetary and asteroidal occultations, and more catching up on the backlog. In it, we plan to give some descriptions of the successful observations made near the edges of the path of totality of the October 24th solar eclipse in India, and the very successful efforts to use past observations of grazes of ρ^1 Sagittarii (Z.C. 2826) to improve the predictions for this year's grazes of the same star. However, distribution of 1996 prediction data and software will have priority. Preparation of an eclipse composite video tape suitable for distribution, and the IOTA manual, will occur early in 1996 after we get back on schedule with **ON** publication.

WEB NEWS

Rob Robinson, Jim Hart, and David W. Dunham

The creation of a World Wide Web site for IOTA was announced on p. 154 of the last issue. We soon filled up the 5 megabytes of memory allocated for this purpose on sky.net. Jim Hart of Pickering Anomalies offered space on his Web server, so now IOTA has two Web sites with URL's

http://www.sky.net/~robinson - for lunar occultations
http://www.anomalies.com - for asteroidal occultations

Much information has been added to the sites giving detailed predictions and charts, planned expedition information, observation reports (including graze reduction profiles), and general observing information. Both sites have links to the others, as well as to many other interesting astronomical sites, including Doug Mink's site at Harvard giving predictions of occultations of stars by the major planets through 1999 and Scott Degenhardt's video images of occultations that can be accessed directly at URL http://gus.phy.vanderbilt.edu/~dega. Several new observers have already found IOTA via the Web, and it is an efficient way to make a lot of information available to a very wide audience. We encourage you to send graze expedition plans and interesting observational results to Robinson at e-mail robinson@solar.sky.net, and similar information about asteroidal events to Jim Hart at e-mail jphart@anomalies.com.

PREDICTIONS FOR 1996

David W. Dunham, Eberhard Riedel,
Wolfgang Zimmermann, and Edwin Goffin

Most of the 1996 prediction data and programs mentioned below were distributed to European coordinators during the ESOP-XIV meeting. Dunham received the data then on tape cartridges, but has not had time to install a new tape drive to replace the broken one now in his PC. This will be done as soon as work on this issue of **ON** is completed, and the files will then be distributed on diskettes to the graze computors and coordinators outside Europe.

Evans Total Occultation Prediction Changes: The Besselian elements data file (befile) for 1996 has been produced by Zimmermann using his XZ94D version of the XZ catalog mentioned on p. 148 of the last issue. For those with relatively large telescopes (low O-code limits), this has meant a considerable increase in the number of

predictions, by a factor of a third or more. Inexplicably, the USNO reference numbers for many events are not included in the predictions, and sometimes there are no identifies at all for the star, making it difficult to prepare observation reports. Predictions for many more galaxies and nebulae have been added, but many of these events are not observable with telescopes owned by readers of ON. For 1996, predictions of lunar occultations of the major planets and of several asteroids have been included. Neither were included in the 1995 Evans predictions, and lunar occultations of asteroids have not been included for the predictions during the previous few years.

Grazing Occultation Predictions: Riedel has corrected an error in the computation of the distance of a station to the predicted limit line. The Amdahl mainframe computer where Dunham works will be shut down in December: December 22nd will be the last day that OCC program runs can be made for generating the LC data needed to produce ACLPPP profiles. As many of the predictions for 1996 as possible will be based on the OCC 80N version calculations, but starting in 1996, all new calculations will be based on Mitsuru Sôma's OCCRED program, now using version 85D. The mainframe computer used by Sôma was shut down late last September, but he was able to compile and test OCCRED on a workstation computer a few weeks later. There is no chance of doing that with the machine-dependant undocumented OCC code.

OCCULT VERSION 3.11a

David Herald, David W. Dunham, and Kent Okasaki

OCCULT version 3.11a has many more capabilities than version 2.0. It can compute virtually all predictions and reductions that an IOTA member would want, and it can run on most PC-compatible machines. The main menus of the program allow selection of the following major options:

Compute lunar total occultation predictions
Compute lunar grazing occultation predictions
Record occultation observations in ILOC's format
Reduce total occultation observations
Generate reduction profiles of observed grazes
Reduce asteroidal occultation observations
Predict lunar and solar eclipses
Predict occultations and appulses by asteroids

For those who have the CDROM HST Guide Star catalog, the program has the capability for creating a special star catalog in a selected part of the sky for generating predictions. This is valuable for total lunar eclipses, lunar passages across open clusters and dense parts of the Milky Way, and for identifying unpredicted stars. Herald has created GSC special catalogs for the two 1996 total lunar eclipses, and these are included on the diskettes that are distributed. In the documentation, Herald explains how to take care of the problem of missing events near 0h U.T.: Compute predictions for both the day preceding 0h as well as the date including it, and all events near 0h will appear in the list for one day or the other. He also explains that the standard DOS program graphics.com must be executed before entering OCCULT to print plots of the graphics (profiles, maps, etc.); those with HP Laserjet III and IV printers should type "graphics laserjetii" or add a line with this in the autoexec.bat file. David Herald now has an e-mail address (heraldd@canberra.DIALix.oz.au) and is willing to help users solve problems that they might encounter with OCCULT.

The asteroidal occultation prediction capability is new with version 3. It can be used to produce world-view maps, like those produced by Goffin and Sôma, and 2° PPM-based star charts. Some approximations are made for efficiency, and one test showed a difference of 0.″8 in the path from Goffin's prediction. This is larger than the typical 0.″4 error of AsteroidPRO or Goffin's predictions, but is sufficient to tell which events might be worth watching for from a given location, and which would warrant astrometric updates.

The grazing occultation prediction option is now quite powerful, allowing one to generate predictions for all XZ events within a specified travel radius virtually like the IOTA Grazereg predictions. **But observers are warned that the OCCULT graze profiles are very similar to the Grazereg profiles, and that neither include the extensive empirical corrections and previous observed-graze data that are in the ACLPPP profiles that can only be produced by the IOTA graze computors.** The same corrections described for the Grazereg profiles discussed on the last pages of the hemispheric grazing occultation supplements for late 1995 can also be applied to the OCCULT profiles to obtain a better estimate of the graze zone and decrease the chances for seeing a miss, or only a single long occultation. Both OCCULT and Grazereg need the documentation of the ACLPPP empirical data that Dunham has not had time to prepare. OCCULT can produce regional and local maps of graze limits, using IOTA's database of coastlines and political boundaries that Herald rearranged in a much more compact form. The user can add many large and medium-sized cities, and local small towns, to the cities database for plotting on the maps.

IOTA DISCOUNT FOR ASTEROID PRO

Jim Hart

Pickering Anomalies makes the following special offer to members of IOTA and IOTA/ES. For each copy ordered, a $10.00 immediate discount off regular advertised prices to the purchasing member plus Pickering Anomalies will donate an additional $15.00 to IOTA, accumulated and paid quarterly to IOTA. All the member is required to do is to make specific mention of the 'IOTA Special Offer' at time of order, paid by US funds check or VISA/MC (number plus expiration date) or wire transfer from non-US bank. (VISA/MC is preferred for non-US orders.) Shipping is $5.00 for US/Canada orders and $9.00 for other non-US. (US California orders add 8.25% state sales tax.)

The following products are available (list prices shown)

Version 2.0 Level I $169.95

- 6160 complete, numbered (ITA EMP-96) asteroid database at epoch November 5, 1996. User modifiable plus automatic import of SAO MPC/MPEC formatted orbital elements.
- 550,000+ modern catalog stellar database (full PPM, ACRS, Carlsberg Meridian, Lick Voyager series) including proper motion corrections.
- Individual asteroid and star database records can be directly accessed for additional information maintained for each body.
- World view maps for high level analysis of path
- Stunning continent view maps for detailed output analysis
- Maps show individual or batched shadow paths, centerline and edge to edge, with optional induced stellar and asteroidal position errors.
- Individual shadow steps are mouse selectable for detailed information display, including asteroid/star/magnitudes/geographical and equatorial coordinates/altitude of event/darkness/et al.
- Sky view graphical output shows orbital path against star database for segments from one hour to two month span.
- Advanced occultation search procedures quickly locates events for any asteroid for a month segment of its orbit over several year range. Searches can be filtered by magnitudes, IOTA Visual criteria, shadow duration and others. Search using 1 to all asteroids, 1 month to entire year.
- Multi function analysis and browse capability to study individual occultation events or batches of hundreds, sorted by asteroid/star/duration/shadow time on earth/date/magnitude drop.
- Extremely accurate results limited only by residual errors in original observations of asteroid and star. Orbits are automatically fully perturbed to date of occultation from reference epoch. Accounts for spheroidal shape of earth.
- Perturbed orbital elements can be output to TheSky, Dance of the Planets, Epoch 2000 in their respective input formatted text files.
- Any area of sky can be searched for presence of any asteroids and plotted.
- Requirements: DOS or Windows PC 386 DX or better, 500K+ conventional memory, 50 megabytes of hard disk space, mouse, Color SVGA display to 1024x768x16. DOS 5.0+ (DOS Version); Windows 3.1 or Windows '95 (Windows Version). CDROM drive for CDROM distribution; 3.5" disk drive for disk distribution.

Version 2.0 Level II $199.95

- Level I plus the addition of 6,600,000 stars from Hubble GSC to magnitude 13.5
- Implements an error reduction method of weighting multiple plate star images inversely by error value for each entry.
- Special on-CDROM format implemented to minimize search time.
- Requirements same as above plus CDROM drive.

Pickering Anomalies is maintaining IOTA's asteroidal occultation Web site (see p. 168) and is working with IOTA to create a comprehensive catalog of observatories and locations from which occultations are observed more than once (see pages 158-161 of the last issue).

Pickering Anomalies; e-mail jphart@anomalies.com
Asteroid PRO Asteroid Occultation Software
PO Box 1214 voice 415-593-7332 fax 415-592-1702
Belmont CA 94002 USA

LUNAR OCCULTATIONS OF PLANETS IN 1996

David W. Dunham and Joseph Senne

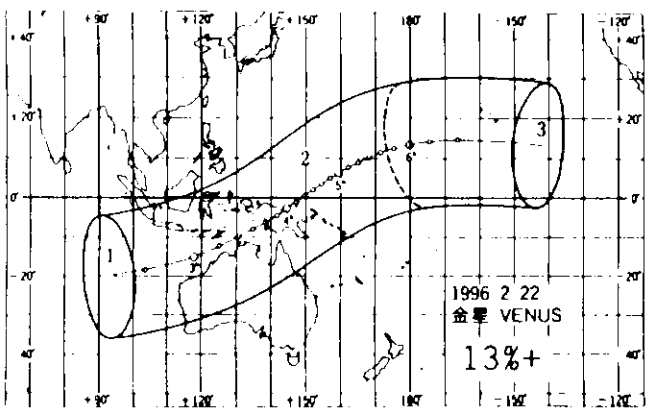
The maps showing the regions of visibility of lunar occultations of planets are reprinted by permission, from the Japanese Ephemeris for 1996, published by the Hydrographic Office of the Maritime Safety Agency of Japan. In region 1, only the reappearance is visible; in region 2, the entire occultation is visible; and in region 3, only the disappearance may be seen. Reappearance

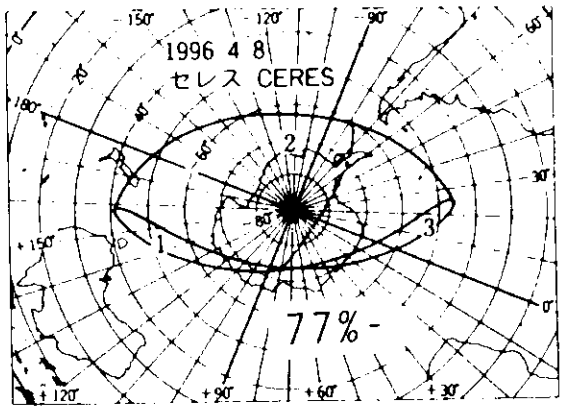
occurs at sunset along a dashed curve, while disappearance is at sunrise along a curve of alternating dots and dashes. We have added a label to each map indicating the phase of the Moon at event time.

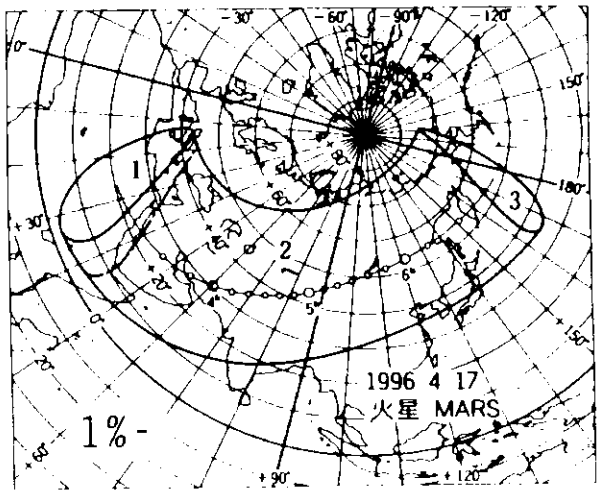
Unlike the situation for 1995, predictions of lunar occultations of planets are included in the IOTA "PC-Evans" total occultation predictions. As before, they can also be computed with OCCULT.

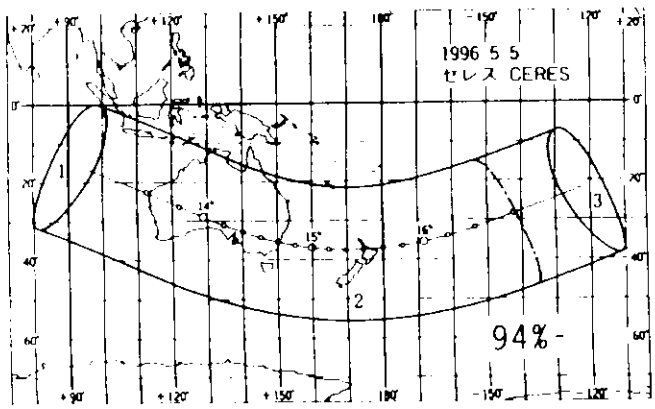
Those interested in observing partial occultations should request predictions at least three months in advance (if possible) from Joseph Senne; P. O. Box 643; Rolla, MO 65401; U.S.A.; phone 1-314-363-6233; e-mail c0458@umrvmb.umr.edu. The e-mail address may change in 1996, and Senne will not be able to compute predictions from 1995 Dec. 9 through 1996 mid January. After 1995 December 22, Dunham will no longer be able to supply the necessary information to produce data for producing ACLPPP profiles of grazes of the planets, but profiles for these events can be generated with OCCULT. Partial occultation path predictions and ACLPPP profiles will be generated in advance for the daytime partial occultations of Venus that will occur on February 22nd in Australia (the s. limit extends approximately from Perth to Cairns) and on July 12th in Scandinavia. The other partial occultations during 1996 are considerably less favorable and mainly in areas far from where IOTA members live, so they will probably not be observed, even if a detailed profile could be generated.

Ten maps showing the regions of visibility of the 1996 lunar occultations of major and bright minor planets are given below, and on later pages of this issue. The region for the occultation of Venus on July 12th is correctly shown relative to the plotted islands and continents (as confirmed with some computations with OCCULT), but the latitudes are labeled incorrectly on the map in the Japanese Ephemeris. The labels have been corrected manually on the map for this event in this issue.









IR FILTERS FOR JUPITER OCCULTATION

David W. Dunham, Wolfgang Beisker, and Hans Bode

On the morning of 1996 March 6, Jupiter will occult 4.3-mag. ν^2 Sagittarii as seen from most of the Western Hemisphere. This will be the best opportunity to record details of Jupiter's atmosphere above the levels sampled by the Galileo probe since the occultation of the components of β Scorpii by the giant planet over twenty years ago, and sensors have improved considerably since then. The event will occur in daylight for all observers except those in Mexico, the U.S.A., and Canada west of the Rocky Mountains. Bill Hubbard at the University of Arizona's Lunar and Planetary Laboratory noted that the occultation could be recorded very well, even in broad daylight, with a CCD recording system with an 8900Å near-infrared filter on a 14-inch telescope. Such filters are manufactured by Omega Optical, Inc., of Brattleboro, Vermont, but they are rather expensive, $632 for one filter. However, the price decreases with bulk purchases; there is a 22% discount per unit if three are ordered. We are also looking into a possible German source for these filters. Omega Optical says there is an 8-week delivery time from when an order is placed, so if any are wanted for the March 6th occultation, they must be ordered soon. Contact Dunham, e-mail David_Dunham@jhuapl.edu, if you might be interested in joining a possible IOTA group purchase. The filter should also be useful for recording occultations of fainter stars by the giant planets, such as the occultation of 9.6-mag. SAO 163583 by Uranus, visible from Mexico and the U.S.A. west of the Mississippi River the morning of 1996 April 10th.

NEW ZODIACAL STAR CATALOG PROPOSED AND PREVIOUS OCCULTATION CATALOGS

Wolfgang Zimmermann, David W. Dunham, and David Herald

Several thousand new stars were added to XZ80N to create XZ94D. The new stars were added after the 32,221 stars of XZ80N so that stars in the XZ94D could still be referred to with X-numbers, the first 32,221 of which are the same in the two catalogs. This is all right, since ILOC now has XZ94D. However, XZ94D is no longer arranged in order of increasing right ascension (R.A.), and this poses a serious problem for programs like OCCULT which depend on this ordering. Even if XZ94D only had the same stars as XZ80N, the order would be a little different since the J2000-equinox R.A.'s of XZ94D are different from the B1950-equinox R.A.'s of XZ80N. In addition to keeping the same stars in the same order at the beginning, XZ94D also uses the same column format as XZ80N, with new (and better-encoded) information given in columns beyond those of XZ94D. However, many of the high-numbered columns of XZ80N are now blank throughout XZ94D, wasting much space in the file. This was done so that those who have written programs to use XZ80N could use the same programs without modification to read XZ94D, and only change the programs if they wanted to access the new information.

The situation is not very satisfactory, so we propose to create a new catalog, that we plan to call the Y-catalog. It will include all of the stars of XZ94D (except some "false" stars that corrected errors in XZ80N by assigning -89° to the declination where they would never be occulted by the Moon), and possibly some more, and will be strictly ordered by J2000 R.A. Also, the blank fields in XZ94D will be eliminated. If any ON reader has any concerns about this, please communicate them to Zimmermann at Dreihornstr. 3a; D-30659 Hannover; Germany; telephone 49-511-6498029 (English spoken); e-mail via Hans Bode: bode@kphunix.han.de.

The selection of letters to use for catalogs is becoming a little bit of a problem since not very many are left. Single letters have been used to designate several different catalogs used for occultation predictions, many special-purpose ones for mainly temporary purposes, such as lunar eclipse star fields. The letters are the prefixes of the "USNO Ref. No." that have appeared in the U. S. Naval Observatory (and now IOTA) "Evans" total lunar occultation predictions during the past 20 years, but most can also be used on ILOC reports of observations, since most, if not all, of these catalogs have been provided to ILOC. The catalogs, as well as Dunham remembers them, are listed below. If you know of any errors or additions that should be made to this list, please inform Dunham.

Letter Description

A Astrographic catalog (A.C.) data in Hyades region, a 1977 predecessor of the first part of the J catalog.
B Field of lunar eclipse in late 1970's.
C Fields of lunar eclipses in 1982, Southern Astrographic Catalog fields in southern Milky Way, and fields of certain star clusters, including Praesepe and M67.
D Field of a lunar eclipse or cluster? Dunham knows such a catalog was created, but it was used only briefly. D should not be used for a new catalog,

since the letter is also used on the ILOC observation reports for Durchmusterung stars.

E Lunar eclipse fields of 1985 and 1986.

F Dunham is sure it was used, but only briefly, and the purpose is now unknown. Can probably be reused.

G Short list of Galactic-Nebular objects in Zodiac.

I Do not use because of possible confusion with "1".

J Mostly A.C. data overlain with XZ information for the Hyades, M35, M21, some other clusters, parts of the northern and southern Milky Way.

K AGK3 stars that were missed in the XZ, as well as southern Yale catalog stars with no proper motions that were not included in the SAO catalog.

L Zodiacal parts of the Lick-Voyager catalogs and lunar eclipse fields of 1989.

M Lunar eclipse field of 1979, or nearby year. It is now proposed by ILOC for PPM stars. This should cause little or no difficulty, since few if any occultations of non-XZ stars were timed during the 1979(?) lunar eclipse.

N Zodiacal catalog of infrared stars.

O Do not use because of possible confusion with "0".

P Eichhorn Pleiades catalog.

Q Total lunar eclipse fields of 1992 and 1993. It was also used for some Yale stars (a predecessor of the K catalog) in 1976, but few timings of those stars were reported.

R Zodiacal catalog of radio sources. Also used by ILOC for the Zodiacal Catalog (Z.C.), which was created and published in 1940 by Robertson. The "Evans" predictions use blank for the code to designate stars in this widely-used catalog.

S Used by ILOC for SAO numbers.

X XZ catalog (now XZ80N or XZ94D).

Z SZ catalog, a Zodiacal subset of the SAO catalog, overlain with Z.C. data, used in the early and mid-1970's before XZ was created.

NEW E-MAIL76 FORMAT FOR REPORTING OCCULTATION TIMINGS BY E-MAIL

David W. Dunham

Reporting occultation timings by electronic mail (e-mail) was described in my article on pages 148-154 of the last issue. The 78-character-per-line file format described there can be used by many e-mail file servers to send files, but several users still reported problems with line wrapping. We found out that some e-mail file servers or editors have a 76-character limit for their line length. Other problems with the 78-character e-mail format were also revealed as we used it. This article describes a new 76-character-per-line format, where it differs from the 78-character-per-line format, and also corrects the other known errors. The 76-character format is described in full, along with an example file, on IOTA's pages on the World Wide Web reachable via URL http://www.sky.net/~robinson. I can also send the complete description and the sample file to you by e-mail if you request them by sending a message to me at David_Dunham@jhuapl.edu.

A most important correction is to the e-mail address that should be used for sending grazing occultation reports to Richard Wilds, the graze coordinator for IOTA. Send report files and correspondence to him via Craig McManus, e-mail 570-0611@mcimail.com, and not via Rex Easton's personal account. The McManus' e-mail is intended for IOTA purposes and thus does not incur the personal expenses that use of Easton's account entails.

Toshio Hirose, of the Japanese Lunar Occultation Observers' Group, will continue to collect the report messages for the International Lunar Occultation Centre (ILOC). Hirose's Internet address is NBC00716@niftyserve.or.jp. In your message to him, please specify that you are using the e-mail76 format for the file. Sometimes, Hirose is away for several days on business trips and his e-mail box fills up, after which messages sent to him are bounced back to the sender. If this happens, you can send the report to his alternate e-mail address: hirose@jeton.or.jp.

Even with the e-mail76 format, there have been some problems with line wrapping when users create the files with Windows-based editors and clip the files for mailing via Windows-based Internet software. When using sophisticated editors, be sure to use a fixed-size rather than proportional font. It is recommended that you export, or "save as", the file as an ASCII text file, and if possible, go to MS-DOS and look at it with the DOS editor (edit command), or a good DOS editor such as PCWrite (this can be provided by e-mail, if your server can handle 400-kilobyte attached files, or on diskette with your prediction files, since it is freeware now that the company that produced it is no longer in business), and modify it if necessary.

Some menu-driven programs have been written to ease the reporting process and reduce errors that can occur when editing an ASCII file. Mike Kazmierczak plans to write such a program, producing the e-mail76 format, for Macintoshes. Examples for PC's include OCCULT version 3.11a (see p. 169), Eric Limburg's Lunar Occultation Workbench, Peter Manly's IOTAData, and Tom Campbell's EasyILOC. These programs all now produce the 80-column format files used by ILOC and will need to be modified to produce

the e-mail76 format. I have written a program called ILOCEM76 that will convert the ILOC-format files to e-mail76 format. The program does not require a math coprocessor and can be obtained either from IOTA's Web site mentioned above or from me upon request, preferably by e-mail. Those who don't have e-mail access (or access via a colleague) should not use the e-mail76 format and should instead continue to send the files in ILOC's 80-column format to them on diskette.

Occultations and appulses by objects other than the Moon (primarily, by asteroids, planets, and comets) can also be reported in ASCII files. But events involving these other objects should be sent to James Stamm; 11781 North Joi Drive; Tucson, Arizona 85737; U.S.A.; e-mail address jimstamm@aztec.asu.edu. Please send a copy to me (you can use the e-mail address above) for positive (actual occultation) events. Copies of these non-lunar event files should **not** be sent to ILOC or to R. Wilds (or to T. Hirose or to C. McManus). It is better to use IOTA's form for reporting asteroidal occultation observations described elsewhere in this issue rather than the e-mail76 format. The IOTA asteroidal occultation form is easier to complete than the e-mail76 form and is also limited to 76 characters per line that can also be sent by e-mail.

An example of a lunar grazing occultation report (actually, just the first 3 stations of an actual report) in e-mail76 format is shown in Figure 1 below. It is the same example that was used for the 78-character-per-line format given on p. 150 of the last issue corresponding to the manually-completed form of Figures 2a and 2b on pages 151 and 152. A comment line has been added for the first event; there was no example of a comment line in the previous examples. In general, use the codes to

```
COLUMN # 111111111122222222223333333333444444444455555555556666666666777777
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456

PLACE NAME      HOLLYWOOD, MARYLAND, U.S.A.
ADDRESS         I.O.T.A.; 7006 MEGAN LANE; GREENBELT, MARYLAND 20770; U.S.A.
E-MAIL ADDRESS DAVID_DUNHAM@JHUAPL.EDU
REPRESENTATIVE DAVID W. DUNHAM AND RICHARD TAIBI  FORMS REQUIRED       NO
REPORTED TO     ILOC, IOTA

TARAM 10.2  112      76 32 50.2  W  38 19 26.8  N  30.5NAD 1927
TBCED 20.3  203      76 32 48.1  W  38 19 24.6  N  30.5NAD 1927
TCNEM 25.4  142      76 32 44.8  W  38 19 21.5  N  30.5NAD 1927

OA  MAHIPAL VIRDY                          0.3
OB  DAVID W. DUNHAM                        0.3
OC  TERRY LOSONSKY                         0.3

0186 829080400   R    885            9T RE   5 1   112 9  6                AAA
    A MISS (NO OCCULTATION) WAS SEEN.  THIS IS A COMMENTS TEST.
0286 8290803462  R    885            1V RE   1 1   112 9  6                BBB
0386 8290803466  R    885            2V RE   1 1   112 9  6                BBB
0486 8290803521  R    885            1V RE   1 1   112 9  6                BBB
0586 8290803539  R    885            2V RE   1 1   112 9  6                BBB
0686 8290803596  R    885            1V RE   1 1   112 9  6                BBB
0786 8290804020  R    885            2V RE   1 1   112 9  6                BBB
0886 8290823492  S  77621            2S RS4  1 1   112 9                   BBB
0986 8290854170  S  77639            2S RS5  2 1   112 9                   BBB
1086 8290933319  S  77662            2S RS5  2 1   112 9                   BBB
1186 8290803465  R    885            1T RU3  3 1   112 9  6                CCC
1286 8290803500  R    885            2T RU3  3 1   112 9  6                CCC
1386 8290803515  R    885            1T RU3  3 1   112 9  6                CCC
1486 8290803550  R    885            2T RU3  3 1   112 9  6                CCC
1586 8290803575  R    885            1T RU3  3 1   112 9  6                CCC
1686 8290804025  R    885            2T RU3  3 1   112 9  6                CCC
1786 8290804055  R    885            7T RU3  3 1   112 9  6                CCC
1886 8290804355  R    885            1T RU3  3 1   112 9  6                CCC
1986 8290804360  R    885            2T RU3  3 1   112 9  6                CCC
2086 8290804420  R    885            7T RU3  3 1   112 9  6                CCC

M  HOLLYWOOD, MD                  1963 1:24,000    U.S.G.S.
G 346.0  5.6  31-  15N   9  72 1   6  0.3S 346 -57 WWV       ACLPPP
G 999.9 D. Dunham & R. Taibi

COLUMN # 111111111122222222223333333333444444444455555555556666666666777777
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456
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Figure 1. Printout of example e-mail76 file.

include all necessary information on the main timing line for each event, and avoid comments as much as possible. With the large number of observations reported to ILOC, most of the processing must be done automatically using the main line coded information. Investigators will rarely have time to read the comments or use them quantitatively. Their main value is for grazes, for which special reductions are often prepared, especially by IOTA, and for reporting suspected duplicity information. But even for possible doubles, the timing data should be coded on the main lines, using two lines with appropriate event codes to indicate the start and end of gradual events, or bright-faint (or preceding-following, or north-south) component codes for step events. This should be done whether the star is known to be double or not, but a comment should specify that the star is a newly discovered or suspected double, or newly confirmed, if either no double star code was given in the prediction, or a K, X, or Y code indicating possible or probable (but not certain) duplicity was given.

There are four new features specified with the e-mail76 format of Fig. 1 which can be used the same way with the other formats. Previously, the "recorder" column (S3 of the written form and col. 78 of the old e-mail78 format) was left blank, but judging from ILOC's information, it seems that it should always be given. If the observer and recorder are the same, as is usually the case and was the case for the three stations given in Fig. 1, the recorder code should be the same as the observer code. A new line has been added to specify the sender's e-mail address (if the file is sent by e-mail, which is the main reason for the e-mail76 format). A new optional "G" line has been added to specify exactly what is desired for the "Organizer" column of the **ON** grazing occultation expedition summary table, and positions on the main "G" line are allocated for specifying the type of graze prediction used for estimating the observed shift.

The file that you create for e-mail transmission should be a standard ASCII file; any word processor capable of creating such a file can be used. It is important to type all letters as capitals; if your computer has a Caps Lock key, keep it on as you type the report. ILOC's system correctly interprets numbers and capital letters, but it interprets small letters as Japanese Katakana characters that have no relation to what you typed. Hence, any small letter on the written form must be capitalized in the e-mail file.

In general, if a specified decimal point does not control the location of a numerical value, integer numbers should be right-justified, so that the units position is in the right-most position of the field, the tens are in the 2nd from the right, etc. So the number 123 for a 5-position field, -----, would be entered --123, NOT 123--. Alphabetic or alphameric information should usually be left-justified, starting in the left-most position of the field.

The first two lines and the last two lines of Fig. 1 specify the column numbers, to be read vertically, only to serve as a guide for specifying the columns for the data to be typed. You can include these lines in the file as you prepare it, but should delete them from the copy that you send to ILOC and/or IOTA. By "IOTA", we mean here graze reports sent to R. Wilds, or non-lunar event reports sent to Stamm and me. The rest of the data are arranged in five groups described below. The groups can be separated with blank lines, but these are not required. In the descriptions below, col. means column or columns. Only changes or additions to the information given in the article in the last issue is included below. Unless otherwise specified, the lines have the same format as the e-mail78 format described in the last issue, but now truncated at col. 76 instead of col. 78 (or col. 80 of the original ILOC format). So two fewer spaces are available for the last fields of these lines.

1. Heading Information: These lines are all the same as the e-mail78 format described in the last **ON** except that they end with col. 76. A new line is inserted after the "ADDRESS" line: "E-MAIL ADDRESS" is in col. 1-14 and the Internet e-mail address of the report preparer ("representative") is typed starting in col. 16 (hopefully, not too many e-mail addresses are over 71 characters long, or they will not fit in the col. 16 to col. 76 allocated for it. The "REPRESENTATIVE" line is then the 4th header line and the "FORMS REQUIRED" line is the 5th line. For occultations by objects other than the Moon, type a sixth header line with "OBJECT" in col. 1-6 and the object's name starting in col. 16, as described in the last issue, but the IOTA asteroidal occultation report form is preferred for reporting these events.

2. Telescopes and Positions: These are the telescope specifications and geographical coordinates given in the lower part of the heading of the front of the written form. These lines and the timing lines are the only ones where the columns have been rearranged for the e-mail76 format rather than just truncated, so they are described here. These lines do not need to be specified if ILOC has assigned you a Station/Tel/Obs code. All numbers in the format below are right-justified:

Col.	Description
1	Always the letter "T".
2	Identifying letter, start with "A", a capital letter corresponding to the small letters used in the heading and the "T" column of the written form. On the written form, spaces for only 3 telescope/positions are given, but in the

e-mail file, you can use A through Z for up to 26 telescope/positions in a file. Use two or more files if there are more than 26 telescopes used in an expedition.

3 Telescope type.
R = refractor
N = Newtonian reflector
C = Cassegrain reflector, including Schmidt-Cassegrain
O = Other, describe on a second line with the same letters in col. 1 and 2, columns 3-5 blank, and the description in col. 6-76.

4 Telescope mounting.
E = equatorial
A = alt-azimuthal

5 Telescope drive.
D = clock driven
M = manual

6-10 Telescope aperture in centimeters, to 0.1cm. Cols. 9 and 10 can be blank if the aperture is given to the nearest cm. The decimal point must be in col. 9 if tenths of a cm are given.

12-17 Telescope focal length, in centimeters, to .1 cm. Cols. 16 and 17 can be blank if the focal length is given to the nearest cm. The decimal point must be in col. 16 if tenths of a cm are given.

20-22 Degrees of longitude from Greenwich.

24-25 Minutes of arc of longitude.

27-31 Seconds of arc of longitude (hundredths of an arc second can be specified, but tenths, as given in Fig. 1 with col. 31 blank, are sufficient; the value needs to be accurate to 1″ or better). The decimal point must be in col. 29.

33 Longitude East or West of Greenwich.

36-37 Degrees of latitude.

39-40 Minutes of arc of latitude.

42-46 Seconds of arc of latitude.

48 Latitude North or South of the equator.

49-54 Height above sea level, in meters, to 0.1; should be accurate to ±30 m or better. Cols. 53 and 54 can be blank if the height is given to the nearest meter. If tenths of a meter are specified, the decimal point must be in col. 53. The thousandths of meters must be in col. 49 (0 or blank if the height is less than 1000 m), hundreds in col. 50, tens in col. 51, and units of meters in col. 52.

55-66 Name or abbreviation of geodetic datum, or other type, of coordinates.

67-71 ILOC station code, if known.

72-76 ILOC telescope code, if known.

3. Observers and Recorders. These lines are the same as described in the last issue.

4. Timings. This is normally the largest group, including all of the event timings, given in the table of the written form. Sequential numbers of the events are given in col. 1 and 2 (integers, right-justified), corresponding to the numbers printed on the left side of ILOC's form for written timings. You are not limited to 20 lines, as on the written form; you can include up to 99 timings in one e-mail file. It is important that both columns 1 and 2 be filled with numbers; there must not be any blanks. So for timing numbers 1 to 9, a "0" (zero) is needed in col. 1. Use 2 or more files to report 100 or more timings. For the data in columns 1 to 53 of the written form (column numbers given at the top of the table), add 2 to the written-form column number to obtain the corresponding column in the e-mail file. So in the e-mail file, the year is in col. 3 and 4, and the temperature is in col. 54 and 55. Col. 73 (G, grazing occultation) of the written form is typed in col. 58 of the e-mail76 file, and col. S1, S2, and S3 of the written form are typed in col. 74, 75, and 76, respectively, of the e-mail76 file. From the back of the written form, the optional col. 56 (other phenomenon) and 57 (lunar limb, D/B/U for dark/bright(sunlit)/umbra during lunar eclipse) should be typed in col. 56 and 57, respectively (same columns!), in the e-mail file. The data to be entered in these columns are explained adequately in ILOC's Guide to Lunar Occultation Observations, as well as in IOTA's file giving a complete explanation of the e-mail76 format. Remember that either Station/Tel/Obs codes (columns 26-36 of the e-mail76 file) or T/O/R letters (in columns 74, 75, and 76) must be specified, not both. If the codes are unknown (as is the case for all new stations, especially temporary sites for grazes), you need to specify the T/O/R letters, and the corresponding Telescope/Position and Observer/Recorder lines. Column 76 is usually the same as col. 75 if a tape recorder or other automatic recorder is used, but in this case, it can be used to specify an assistant.

In the written reports, repetitive data in some columns could be specified on the first line, and omitted from the following lines, as specified in ILOC's Guide. But in the e-mail76 files, repetitive data must be specified on every line. The easiest procedure is to type the data on the first line. Then, use your word processor to copy this line several times, as many as are needed for all of the timings to be included in the file. Then, you just need to correct the data that change from line to line.

For comments, which can be specified on the back of the written form, type a second line with columns 1-4 blank. Type the comment (remember to use all capital letters) in col. 5-76. Column 5 must not be blank.

5. Footing Data. These consist of two or three lines, which should be included in copies of any files sent to IOTA. ILOC does not use them, so they do not need to

be included in the copies that you send to Tokyo. They can be included in the e-mail76 format file that you send to T. Hirose; the conversion program to produce the ILOC-format files automatically removes them.

The format of the first footing (map) line in the e-mail76 format is the same as in the e-mail78 format described in the last issue, except that the last field ends in col. 76 rather than col. 78.

The format of the second footing (graze summary) line in the e-mail76 format is the same as that for the e-mail78 format, except that a field has been added in the last columns to specify the predicted profile used to determine the observed shift. The graze summary line should not be included in any report that is not a lunar grazing occultation. The graze summary line has the same format as that described in the last issue, with the following clarifications, corrections, and additions:

Column Description

32 Minimum (best) sky steadiness code (col. 51 of timing line in e-mail file, or col. 49 of written form) of all contacts (or of central graze in the case of only one station having a miss) in the expedition.

38 "C" if the graze is in the "Cassini" region, that is, if most contacts during the graze occurred in regions of the ACLPPP predicted lunar profile defined by 2's, 3's, 4's, or 7's, or if the Cassini region warning is given on the Grazereg profile.

61-76 Specify the type of profile used for determining the shift given in col. 39-42, for example, ACLPPP, preferred when available; Grazereg vers. 3.4 (specify if the unreliable Cassini region message appears); and OCCULT version 2.0. It should start in col. 61, which should not be blank.

A second graze (G) line (optional) can be used to specify the expedition organizer, if it is different from the REPRESENTATIVE in the 4th line of the header, which has more columns to specify this than are available for the ON grazing occultation summary lists. The summary list is limited to 20 characters that can be anything you want to specify, perhaps to credit the persons who set up the expedition, led the effort in the field, and prepared the report, in case they were different. Using this has an advantage over the REPRESENTATIVE line in that lower-case letters can be used. The format of the 2nd graze line is:

Column Description

1 Always the letter "G".
3- 7 Always "999.9".
9-28 Organizer for the ON grazing occultation list summary. Col. 9 must not be blank.

The e-mail76 form has been optimized for E-mail transmission and processing by ILOC's computers, so it is not user-friendly. A longer but more understandable version of the form needs to be created, such as by using some of the features of the IOTA asteroidal occultation/appulse form, yet which can be processed with a computer program to produce the e-mail76 format. Such an ASCII text form could be posted on IOTA's site on the World Wide Web, as well as distributed on diskette and by e-mail with IOTA lunar grazing and total occultation predictions. I have done much of the work to create such a form. I had to stop that work to take care of other time-critical IOTA needs, and will not be able to resume it for several weeks. Help is sought to complete this form; let me know if you are interested in this project.

STATIONS REPORTING OBSERVATIONS IN 1992

The map on the next page is copied from ILOC's Report No. 13, "Report of Lunar Occultation Observations - The Observations in 1992 and Their Reduction; The Lists of Telescopes and Observers", 1995 March. It shows with circles the locations of all sites from which occultations were timed during 1992 and for which ILOC has received reports. The paucity of stations in western North America is striking, considering the generally good weather and the number of IOTA members who live there. There seems to be much more activity in the central and eastern U.S.A., but this is misleading; the large number of circles there are mainly the result of a few who have reported grazing occultations from many locations in their region. It is clear that more efficient means of preparing and reporting observations could be useful, and the previous article addresses this. Although Europe is one of the more active areas, Eberhard Bredner is concerned enough about the number of reports received by IOTA/ES that at the ESOP-XIV meeting, he announced a prize that would be given at the next ESOP meeting to the IOTA/ES member who reported the most lunar occultation timings (that are successfully reduced) made during the previous year.

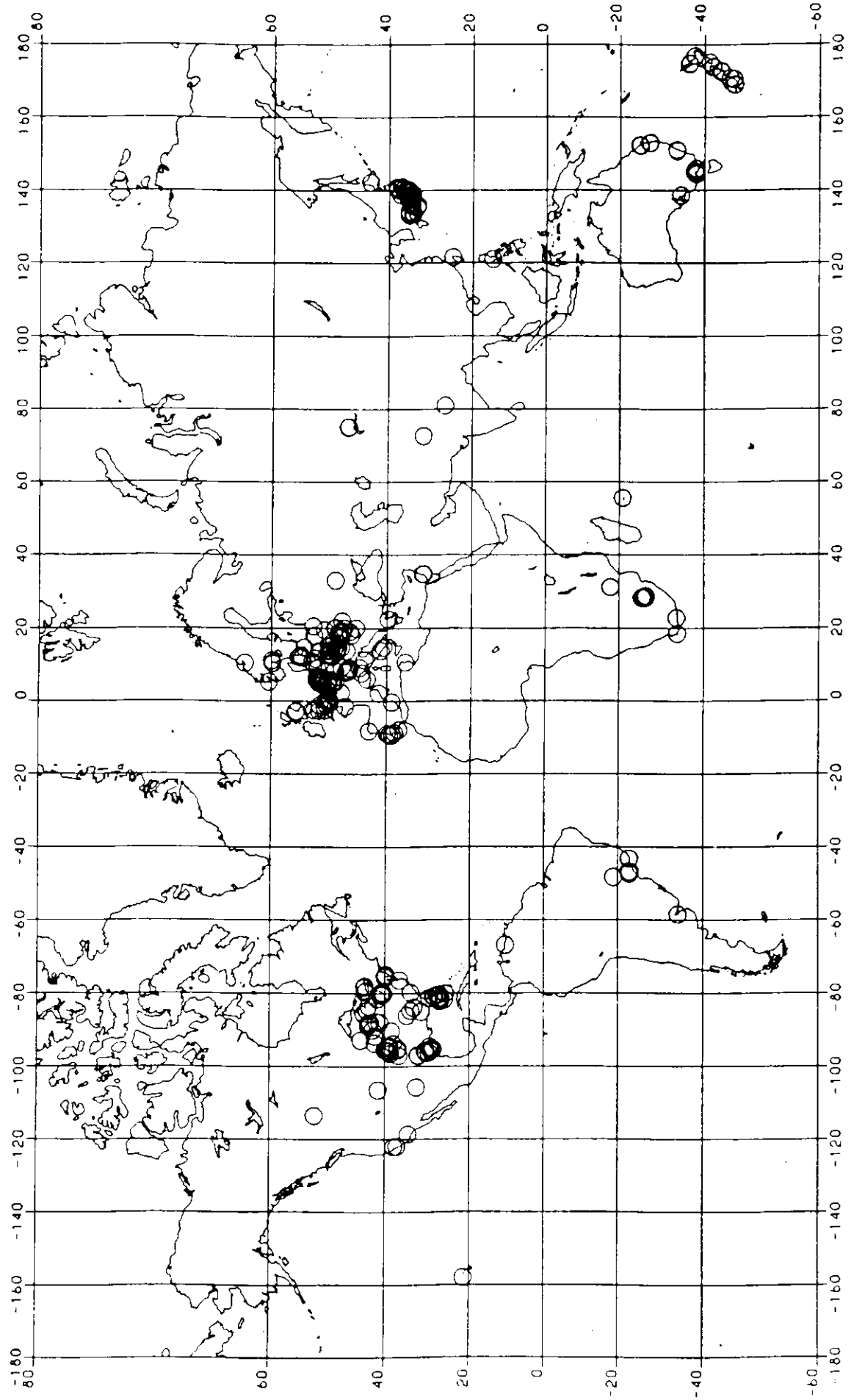


Figure 1. Distribution map of the observing site in 1992.

REPORT OF 13th ANNUAL IOTA MEETING

Rocky Harper

The 1995 annual meeting of the International Occultation Timing Association was held on July 22 at St. Mary's University in San Antonio, Texas. This meeting was held jointly with the Astronomical Leagues' 49th convention, ALCON95. David Dunham, Derald Nye, and Paul Maley addressed the ALCON95 on the morning of July 22. David gave the opening talk to the members of the Astronomical League. He was introduced by Robert Reeves of the San Antonio Astronomical Association. He described the efforts of IOTA in obtaining scientific data by means of observing objects being occulted. During his talk, he showed the results of observations of occultations of stars by asteroids, videos of grazing occultations, and of eclipse observations. The conventioneers were shown predicted Solar System events for the rest of 1995 and 1996. Details were given for many including the upcoming September 23rd occultation involving 387 Aquitania and the October 18th event by 324 Bamberga. Jupiter occults stars on September 24 this year as seen from northeast Canada and March 6, 1996 as seen from the eastern hemisphere. Other 1996 highlights will be an opportunity to see the rings of Uranus occult a star and a 243 Ida event with possible occultations by Dactyl. The upcoming September 5th graze of 3.9 magnitude ρ^1 Sagittarii was discussed in detail since many in the audience were planning expeditions, followed by a preview of grazes in 1996. David ended his talk with a video of the November 3, 1994 total eclipse that he and Joan observed from Bolivia.

IOTA member Derald Nye, presented his excellent video of 654 Zelinda occulting the star SAO 095696 last January 19th. It was taken with the 24" telescope of Grasslands Observatory at Sonoita, Arizona south of Tucson. The video showed the asteroid moving toward the star in a sort of time-lapse. The camera was turned on for 15 seconds every 10 minutes for about an hour. After Zelinda became close enough the camera was left running until the star was occulted for about 14 seconds. The brightness of the star dropped 2.4 magnitudes which brought out a lot of ooo's and ahhh's from the ALCON--95 crowd. Derald also showed a video of a graze of Spica taken by Don Wrigley on June 9th of this year. Don taped the entire graze using a hand held video camera at the eyepiece while recording WWV time signals. Derald later added the time to the tape using Pete Manly's time inserter. Although Pete Manly no longer sells the time inserter he has given Derald Nye permission to build and distribute it.

IOTA vice president Paul Maley then took the podium and talked briefly about the expedition for the October 24, 1995 total eclipse he is leading in India. He is also organizing a trip to Siberia for the March 9, 1997 eclipse. Paul, who works at the Johnson Space Center, shared an interesting experience with the audience. He and Judy Palmer, just a few hours earlier, arrived at Hobby airport at daylight to come to the IOTA meeting. Anticipating the event, they saw Discovery end it's STS-70 mission as it streaked across the Houston sky headed for the Kennedy Space Center in Florida.

The 1995 business meeting was called to order at 11:05 AM. The first order of business was the election of officers. David read off the nominees and asked if there were any write in candidates. There was none and Derald Nye moved that nominations cease. A motion was made and seconded that the nominees be elected unanimously. The officers for the next three years are:

President:	David Dunham
Executive Vice President:	Paul Maley
Executive Secretary:	Rocky Harper
Secretary/Treasurer:	Terri & Craig McManus
VP of Grazing Occ'n Services:	Richard Wilds
VP of Planetary Occ'n Services:	Jim Stamm
VP of Lunar Occ'n Services:	Kent Okasaki
Occ'n Newsletter Editor:	Joan Bixby Dunham

After elections a brief financial report was given that showed IOTA to be in good shape with approximately a $3200 balance. The cost of producing and mailing predictions was discussed. All people with computer access are encouraged to receive their predictions either by computer disk or e-mail if possible. This could save IOTA a lot of money since one of the major costs is postage. During the next hour there was a discussion concerning the Internet and how it could be utilized. IOTA currently has access to Rob Robinson's Skynet web site. Several people inquired about an updated list of IOTA members with their e-mail address if they had one. It was pointed out that some e-mail accounts charge by the message so a flag should be attached to those published address's. With that in mind, everyone took turns in explaining the costs and how their accounts worked. Paul Maley emphasized the advantage of an e-mail network in joint efforts to observe asteroid occultation's. For example, a significant shift in the path would require an observer to travel to a new location. People in the IOTA network with telescopes along the new path could be contacted. IOTA observers with special equipment that might be needed, such as low-lux video systems, photoelectric or image intensifiers, could hand carry these items on an airplane and quickly respond to the change.

Berton Stevens, executive secretary of the Astronomical League, briefly talked about his efforts in establishing an A.L. Home Page on the internet. He offered its use in coordinating time critical situations for other organizations such as IOTA, the Association of Lunar and Planetary Observers and the American Association of Variable Star Observers. Before closing the business meeting, David Dunham again stressed the need for educational outreach.

After lunch IOTA members and guests reassembled to watch a variety of solar eclipse videos. David Dunham showed his November 3, 1994 trip to Bolivia and his video and GPS setup. Richard Nugent presented his excellent video of the April 29, 1995 annular solar eclipse as seen from the Amazon rain forest in Peru. Baily's Beads were nicely shown but that was not the only thing. His scene of the Amazon, its inhabitants, and weird wildlife was amazing. Fighting the heat and creepy crawlers just goes to show how determined some people are in getting data.

I had to leave early when my daughter got sick, so I missed the last of the videos. I had a good time at the ALCON95 except that it was about 150 degrees outside. I got to see a lot of old friends.

NEW DOUBLE STARS

Tony Murray

This is the first article on new double stars discovered during lunar occultations since the article in **ON 6**, No. 3. The table on the following pages contains 36 newly discovered double stars that will now be included in IOTA's Catalog of Double Stars of the Moon's Occultation Zone.

We received reports from nine observers in five countries. Two new observers are A.H. Scholten of the Netherlands and B. Rousseau of the Observatory of the Sorbonnne, Paris, France. Some reports were received too late for this article and will appear in the next article. Especially, there is much new information in Georgia State University's Center for High Angular Resolution Astronomy's **CHARA Contribution No. 3** (1995 March), "Catalog of Photoelectric Measures of Occultation Binary Stars", by Brian D. Mason. Mason's e-mail address is mason@chara.gsu.edu and CHARA maintains a WWW site at URL http://chara.gsu.edu. In the next article, I will try to include information from Mason's report that is new or changed in IOTA's double star catalog.

Henk Bulder's and Jean Bourgeois's observations on March 29, 1993 show how seemingly ordinary observations can give interesting results. The star is SAO 77230=COU 268, Mag.1=9.1, Mag.2=9.1, Sep.=.64 sec. Its double star code is M. Bulder observed the occultation at 21h 46m 14.8s at PA 125°. Bourgeois observed the occultation 3 minutes 59.2 seconds later at 21h 50m 14.0s. Bourgeois did not report the position angle of the event, but I used David Herald's OCCULT program to calculate the circumstances of the event at Bourgeois's site. It occurred at PA 128°. Both observers reported the event as a fade.

The previous evening Bulder observed a fading occultation of SAO 76645 at 19h 42m 29.9s. Three minutes 44.3 seconds later Bourgeois observed the star disappear as a gradual event in 0.3 seconds. This star is a previously unknown double star. It is now in the IOTA's catalog with code V.

I now have a P.C. at home to use for maintaining the IOTA catalog. Anyone who wants a copy of the catalog can write and simply request a copy on a 3.5 inch 1.44Mb disk. I am afraid that I cannot answer technical questions about the various aspects of the catalog (fields, etc.) as I haven't gone into most aspects of it.

One of the principal reasons for buying the computer was to run Herald's OCCULT Version 2 program. It can predict occultations for 50 locations at any latitude and longitude. I have already included the stations of some of the regular double star observers and will include others in time. My purpose is to use OCCULT to identify future occultations of double stars I have previously discovered, that will occur during their next occultation cycle. I plan to identify events involving these stars at locations of some of the regular double star observers mentioned earlier. I am going to ask these to observe these events as they occur for evidence of duplicity.

As an example: The first star having no code that I observed as a step event was SAO 77070 on March 18, 1986. Two of 77070's several different occultations I have identified as occurring during its next cycle occur at Bulder's and Bourgeois's stations on Feb. 17, 2005 at 22h 32m for Bourgeois and 22h 38m for Bulder.

Of course, this is 10 years into the future and these events are among the earliest events to occur involving double stars I first observed. Others have been looking for occultation doubles for many more years and most likely the events of the second cycle since discovery are already occurring. I would suggest that other observers interested in inviting others to follow up on their original observations obtain a copy of OCCULT (see p. 169) and identify those occultations. I think most regular observers would enjoy helping.

Table of Double Stars 11 of 21

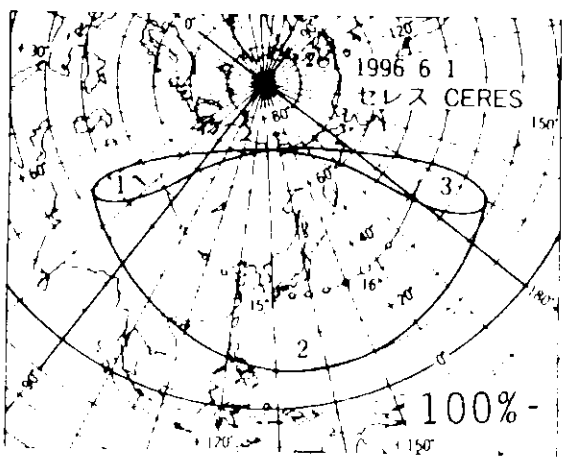
SAO	M	N	Mag1	Mag2	Sep	PA	Date	Disc	Notes
75809	T	X	9.6	9.6		23	93Jan31	H. Bril	
76038	T	X	10.0	10.0		140	93Mar27	H. Bulder	
76044	T	X	9.9	9.9			93Mar27	J. Bourgeois	
76550	G	K	9.5	9.5		351	94Nov29	R. Wilds & C. McManus	
76643	T	X	9.6	9.6		121	93Mar28	H. Bulder	
76645	T	V	8.9	8.9			93Mar28	J. Bourgeois	1
76668	T	V	8.6	8.6			93Mar28	J. Bourgeois	2
77019	G	K	8.6	8.6		351.8	92Dec09	H. Povenmire	3
77058	T	X	9.1	9.1		97	92Apr25	H. Bril	
77116	T	X	9.4	9.4		120	92Feb13	H. Bulder	
77181	T	X	9.8	9.8		94	92Feb13	H. Bulder	
77678	T	X	8.8	8.8		151	93Mar03	H. Bril	
77785	T	X	8.9	8.9		75	92Apr08	H. Bulder	
77831	T	V	7.6	7.6		111	92Apr01	H. Bulder	4
78195	T	X	8.8	8.8		30	90Apr01	A. Sholten	
78626	T	X	9.4	9.4			93Mar03	H. Bril	
78649	T	X	9.8	9.8		141	93Mar03	H. Bulder	
92216	T	X	9.8	9.8			93Jan01	J. Bourgeois	
93095	T	X	9.2	9.2		85	93Jan03	H. Bril	
93211	T	X	9.8	9.8			93Feb27	H. Bril	
93376	G	X	8.3	8.3		340.2	94Jul04	H. Povenmire	5
96575	T	X	8.8	8.8		91	93Apr27	H. Bril	6
96579	T	V	8.8	8.8			93Nov05	J. Bourgeois	
109070	T	X	9.6	9.6		112	92Dec28	A. Sholten	
117750	T	X	9.3	9.3		97	93Apr03	R. Hays Jr.	
138009	T	X	9.0	9.0		152	93Apr04	H. Bulder	
138009	T	V	8.8	8.8		93	93Apr04	H. Bulder	
145840	T	X	9.2	9.2		131	92Dec31	A. Scholten	

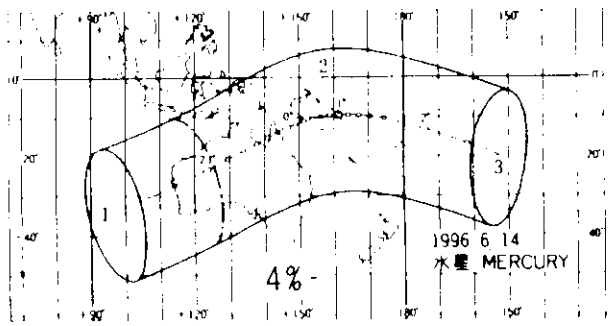
Table of Double Stars (2 of 2)

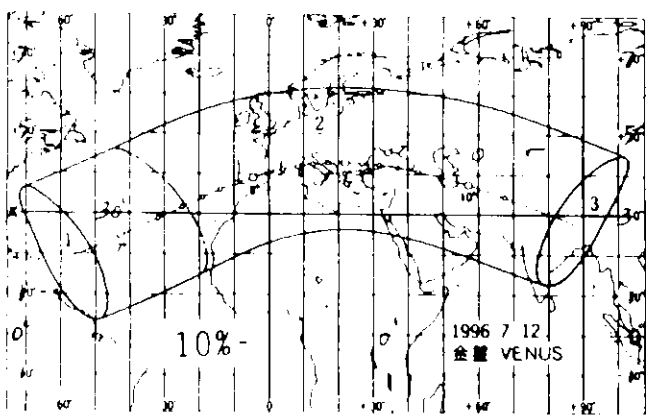
SAO	M	N	Mag1	Mag2	Sep	PA	Date	Disc	Notes
158245	T	X	10.0	10.0		42	93Jun28	H. Bril	
158880	T	K	8.7	8.7		117	93Jun29	H. Bril	7
184508	G	K	8.4	8.4		175.7	93Aug25	C. McManus	
+16 0279	T	X	10.3	10.3		85	93Jan30	H. Bril	
+18 0379	T	X	10.2	10.2		28	93Feb27	H. Bril	
+23 0902	T	Y	9.9	9.9		143	92Feb13	H. Bulder	8
+0 5001	T	X	10.8	10.8		133	92Dec30	H. Bril	9
-16 5550	G	K	8.2	8.2		154	93Nov19	C. McManus	

Table Notes

1: Events are separated by .08 second. There are visual and video records of both events.
2: Events are separated by .13 second. There are visual and video records of both events.
3. Observing during total lunar eclipse
4. This star is R 907, mag. 6.9
5. 18 events, D's slow and R's sharp
6. Disappeared in 3 steps
7. Near graze
8. This star is X6837, the companion of SAO 77122. Together, they are ADS 2922. +23° 0902 will now be in the IOTA Catalog with Code Y.
9. This star is X31602







GRAZING OCCULTATION OBSERVATIONS

Richard P. Wilds

We begin this month's report once again with some housekeeping chores. When reporting grazes keep in mind you can mail them to me in the following forms:
1. on IOTA report forms,
2. on 3.5 floppy disk,
3. on 5.25 floppy disk,
4. by e-mail to IOTA (570-0611@mcimail.com).

Please remember to include all the information found in the graze list. Many observers send me a copy of their predictions. This is excellent and it is even better if you have the observing sites plotted on the profile as they were predicted before the event. The predictions are also a help in preparing the "Stellar Cross Reference." I have access to a vast array of astronomical databases and can track down many objects, but the predictions just make this job easier. Also remember the "PP" column on my report is not a column on the IOTA report form [ed.: The predicted profile is now requested in columns 61-76 of the first G-line of e-mail76 format; see p. 175]. This is a temporary fix to the current problem of having several different prediction programs around while we are in a state of transition from the USNO. However, the "PP" information is needed just like the shifts, if your reports are to be useful to the next graze team going out to make an observation. I would like to thank all organizers for making this report a valuable tool to graze teams world wide.

Our current graze list has a healthy global representation. Pierre Vingerhoets, of Belgium, reported a 1993 graze observed around the crater de Sitter. He says that the 89% moon made the observations quite difficult. He returns to de Sitter in 1994 along with Henk Bril of the Netherlands. They reported shifts referenced to Riedel's Grazereg, but the original predictions were supplied by Jean Meeus (one of the original occultation predictors from back in the 1950s) and Adri Gerritsen. Henk Bulder followed with a report of a graze around the crater Gioja that had to be observed in bitter winter cold. Then Henk Bril returned with a double graze observed from the same location. The two grazes covered an area of the moon between the craters Brianchon and Rozhdestvenskiy.

We finally get to a graze from the USA with a large expedition led by G. Samolyk to the crater Brianchon. Then we go down under with Brian Loader of New Zealand for our first graze of Spica across the crater Drygalski and into the mountains M3 and M1. This was followed by a nice graze by Robert Sandy over the crater Drygalski. Robert Modic led a team from Ohio to observe a graze by the mountain Doerfel B. He was joined there two nights later by Robert Sandy. John Holtz led a graze over the crater Cabeus between the mountains M1 and Leibnitz A. Henk Bril returned with a graze around Leibnitz B. Hal Povenmire observed his graze through Doerfel A, the crater Boltzman and Doerfel B. Henk Bril led his next graze into Germany to observe the star graze the crater Zeeman. Guy Nason, of Canada observed his graze through the mountain Leibnitz B.

The last months of 1994 were dominated by grazes of Spica. We begin with a massive effort from Japan. They had 10 expeditions, with 50 stations, producing 270 timings. The information was sent by e-mail from Toshio Hirose. The observations were made across the crater Hermite. [See pg 147 of the last issue, **ON 6**(7), for the profile.] Mr. Predom, Mr. Rankin and Mr. Nason observed the graze of χ Virginis through Leibnitz B. They had mixed reports about its duplicity. I had particular interest in this since I was the first person to see the secondary star. Robert Sandy observed the secondary about a minute later during the same graze in 1988. Bob and I have been waiting for some time to hear of someone else seeing this star. We continue with our Spica grazes with a large effort from Spain. This included 7 teams, with 19 stations, producing 80 timings. One of the stations set up by Carles Schnabel made their observations using a computer as a timing device. Their observations were made across the crater Hermite. We finish 1994 with a report from H.A.R.T. of a graze across Leibnitz B. This is one of several faint grazes observed by our team. However, with all the prediction work and IOTA business we do, we have misplaced some or let some of the reports slide. Hopefully we can get them in at some point.

We begin our 1995 reports with two expeditions led by Hal Povenmire of Florida. He observed these grazes between the craters Gioja and Hermite. We return to Japan for our next Spica graze. Toshio Hirose reports that they had 8 expeditions, with 73 stations, producing 267 timings. The graze occurred over the crater Nobile and the mountain Leibnitz B. See pages 147 and 166 of the last issue for the observed profile. We return to the north pole of the moon for all but two of the remaining grazes. Robert Modic led one graze while John Holtz led the other to observe a star over the crater Sylvester. Robert Sandy returned with a graze between the craters Froalich and Merril. Wayne Hutchinson sent in a report of a graze in front of the crater Nansen. John Holtz observed a graze over the crater Gioja which he claimed to be "the most boring graze seen to date." He said a miss would have been more exciting! Robert Modic led the first of a number of grazes in a triangle between the

craters Brianchon, Froalich and Merril. Our Polish friends observed their graze led by Marek Zawilski. He reports leading the graze with only limited prediction information. He got the rest of the predictions a month later. The graze still went well since a cold front had just gone through Poland and the skies were beautiful. Robert Hays and Hal Povenmire followed this with two fine efforts. Then Hal Povenmire had a graze between the craters Byrd and de Sitter. The first week in May found Robert Modic, John Holtz, Wayne Hutchinson, and Guy Nason returning to our triangle of craters. Then we take a quick trip to the Lunar south pole with David Paul Werner and Warren Offutt to see the last of this series of Spica grazes. They observed this graze through the mountains M3 and M1 and the crater Cabeus. Mr. Offutt reports using the Occult program, and that they successfully recorded this graze with video equipment. They also had equipment failure with their photometry site. This report was sent in from W & B Observatory for the Alamogordo Amateur Astronomers. H.A.R.T. returns with a fine graze along with Walter Robinson and Robert Sandy. We observed the star graze along the north pole near the craters Byrd and Peary. We had two sightings of an 8th magnitude blue companion which had not been predicted.

Our last graze has quite a story. I received the report with a letter from Rui Goncalves. Joaquim Garcia planned the graze, but Rui Goncalves was the only one to observe the event. Joaquim, set to observe the graze, suffered a heart attack. Our last report is that he is resting in the hospital and planning a graze for July 24. It is hard to keep a good graze leader down!

Graze List 1993 and 1994

UTDate YYMMDD	VP PP	Star #	Mag	% Snl	CA	Location	# Sta	# Tm	S S	Ap Cm	Organizer	N Sh	S	WA	B
1993															
930806	A	128186	4.9	89-	1.0N	Geel, Belgium	9	16	2	13	Pierre Vingerhoets	0.8N		354	-5.7
1994															
940114	R	145703	7.7	8+	2.0N	Tienen, Belgium	4	13	1	15	Pierre Vingerhoets	0.1N		355	-6.1
940114	R	145703	7.7	8+	2.0N	Berg Aan de Maas,Neth.	2	11	2	13	Henk Bril	0.1N		355	-6.1
940214	R	109344	8.6	15+	4.0N	Willemstad, Neth.	1	6	1	15	Henk Bulder	0.2S		3	-4.3
940218	R	93639	9.0	50+	4.0N	Dilsen-Stokkem,Belgm	2	13	3	20	Henk Bril	0.3N		5	+7.0
940219	R	93729	8.0	51+	11.0N	Dilsen-Stokkem,Belgm	3	19	3	15	Henk Bril	0.0		13	+1.1
940417	A	95383	8.5	30+	10.4N	Jamesville, Wisconsin	12	52	1	32	G. Samolyk	0.0		14	+4.8
940812	R	157923	1.0	29+	6.0S	Amberley,New Zealand	18	78	1	20	Brian Loader	0.0		174	+2.5
940816	A	185024	6.3	70+	8.0S	Lamar, Missouri	1	17	2	15	Robert Sandy	0.0		172	-2.3
940816	A	185024	6.3	70+	10.2S	Orange, Ohio	5	11	1	15	Robert J. Modic	0.0		169	-2.3
940818	A	162229	5.3	88+	14.0S	Ozark, Missouri	1	2	2	15	Robert Sandy	0.0		169	-4.8
941002	A	118150	8.1	10-	5.9S	Oil City, PA	1	8	1	25	John Holtz	0.2N		179	+6.8
941029	R	117819	7.6	34-	7.0N	Baexem, Netherlands	1	2	2	14	Henk Bril	0.4S		184	+7.3
941107	A	162204	6.4	25+	10.0S	Riviera Beach, Florida	1	6	2	15	Hal Povenmire	0.4S		167	-5.4
941108	R	163066	7.9	34+	4.0N	Geilenkirchen,Germany	2	10	1	14	Henk Bril	0.2S		172	-5.7
941127	R	138052	8.2	39-	4.1S	Huntsville, Ontario	1	2	3	25	Guy Nason	0.3N		183	+6.9
941129	A	157923	1.0	14-	4.7N	Anamizu, Ishikawa	4	35	1	7	J. Surgie	0.0		1	+2.9
941129	A	157923	1.0	14-	4.7N	Anamizu, Ishikawa	6	30	1	8	R. Naruse	0.0		1	+2.9
941129	A	157923	1.0	14-	4.9N	Hujimi, Gunma	1	2	1	20	S. Numazawa	0.0		1	+2.9
941129	A	157923	1.0	14-	5.0N	Sano, Tochigi	3	35	1	8	K. Kurosu	0.0		1	+2.9
941129	A	157923	1.0	14-	5.0N	Sano, Tochigi	3	6	1	18	Y. Shibuya	0.0		1	+2.9
941129	A	157923	1.0	14-	5.0N	Sano, Tochigi	6	21	1	5	Y. Suzuki	0.0		1	+2.9
941129	A	157923	1.0	14-	5.0N	Sano, Tochigi	4	23	1	6	S. Matsui	0.0		1	+2.9
941129	A	157923	1.0	14-	5.1N	Hujioka, Tochigi	5	10	1	5	S. Mori	0.0		1	+2.9
941129	A	157923	1.0	14-	5.1N	Ishige, Ibaragi	14	90	1	5	K.Kitazaki	0.0		1	+2.9
941129	A	157923	1.0	14-	5.1N	Ishige, Ibaragi	4	18	1	8	H.Takahashi	0.0		1	+2.9
941226	R	138892	4.8	44-	4.0S	Wallingford, Conn.	2	8	1	20	Christopher Predom	0.0		183	+4.0
941226	A	138892	4.8	44-	4.0S	Hyde Park, New York	1	4	1	15	Thomas F. Rankin	0.0		183	+4.0
941226	R	138892	4.8	44-	4.0S	Kleinburg, Ontario	4	24	2	15	Guy Nason	0.1N		182	+4.0
941227	R	157923	1.0	39-	6.5N	Aspe (Alacant), Spain	1	2	1	11	Juan Pastor Erades	0.0		2	+2.8
941227	R	157923	1.0	39-	4.5N	Benichembla/Denia,Spain	2	4	1	11	Karlos Rubiera	0.0		2	+2.8
941227	R	157923	1.0	39	3.7N	Quintes/Asturias,Spain	1	17	2	11	Faustino Garcia	0.0		2	+2.8
941227	R	157923	1.0	39-	4.3N	Zaragoza, Spain	2	8	2	13	Oscar Canales	0.0		2	+2.8
941227	R	157923	1.0	39-	4.5N	El Perello/Catalunya,S	3	13	2	10	Carles Schnabel	0.0		2	+2.8
941227	R	157923	1.0	39	4.5N	Horta de Sant Joan,Sp	3	8	2	20	Carles Schnabel	0.0		2	+2.8
941227	R	157923	1.0	39-	4.9N	Santa Margalida, Spain	7	28	2	6	Manolo Fernandez	0.0		3	+2.8
941228	O	158692	9.4	21-	4.2S	Olpe, Kansas	1	1	2	33	H.A.R.T. R. Wilds	0.5S		182	+0.7

REMEMBER to apply the corrections that past experience has shown to be useful when using the ACLPPP (version 80N) and Riedel Grazereg profiles: See your hemispheric grazing occultation supplement for 1995: Northern limits, p. 9 & Southern limits, p. 10. **If you don't consult this information in the 1995 graze supplement, most observers in your expedition may have a miss (no occultation) rather than a graze.**

Please report all grazes to:

Richard P. Wilds
3630 S.W. Belle Ave
Topeka, KS 66614-4542; USA

e-mail: 570-0611@mcimail.com

and to the

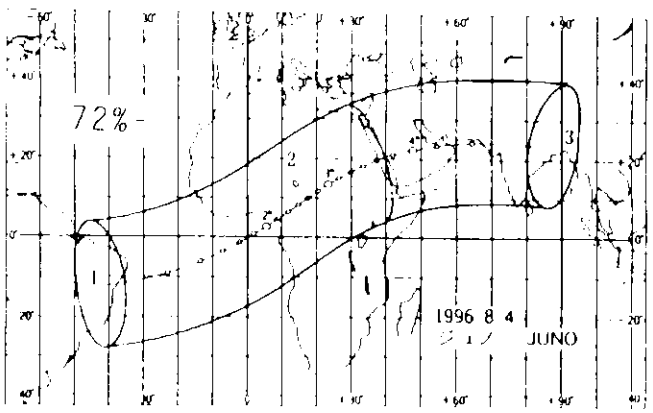
International Lunar Occultation Centre (ILOC)
Geodesy and Geophysics Division
Hydrographic Department
Tsukiji-5,Chuo-ku
Tokyo, 104 Japan

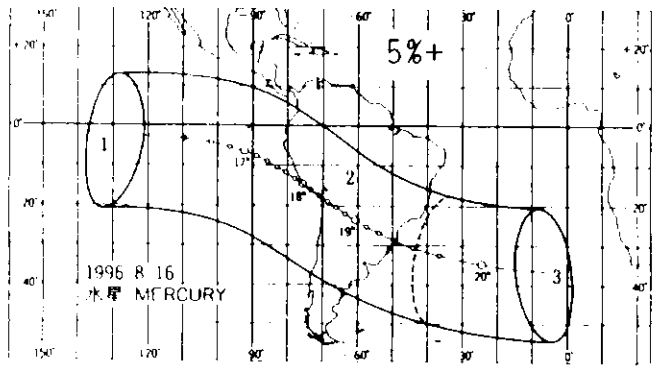
e-mail: via Toshio Hirose at
NBC00716@niftyserve.or.jp

See the article on sending reports by e-mail starting on p. 173 of this issue.

Graze List 1995

UTDate YYMMDD	VP PPStar #	Mag	% Snl	CA	Location	# Sta	# Tm	S S	Ap Cm	Organizer	N Sh	S	WA	B
950203	A 128156	6.5	10+	4.6N	Key Largo, Florida	2	14	1	15	Hal Povenmire	0.1S		1	-4.8
950205	A 109618	6.8	26+	5.0N	Vero Beach, Florida	3	9	1	15	Hal Povenmire	0.1S		6	-2.3
950219	A 157923	1.0	80-	2.9S	Hujimi, Gunma	2	12	1	13	S. Numazawa	0.3S		184	+2.2
950219	A 157923	1.0	80-	2.9S	Ota, Gunma	16	55	1	8	M. Yamamoto	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Meiwa, Toshigi	9	36	1	5	Y. Suzuki	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Meiwa, Toshigi	9	38	1	8	K. Kurosu	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Hanyu, Saitame	7	14	1	8	Y. Shibuya	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Kazo, Saitama	6	32	1	6	S. Mori	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Iwai, Ibaragi	7	18	1	8	H. Takahashi	0.3S		184	+2.2
950219	A 157923	1.0	80-	3.0S	Moriya, Ibaragi	17	62	1	5	K. Kitazaki	0.3S		184	+2.2
950304	A 109401	8.5	6+	8.6N	Claridon Twp, Ohio	2	10	1	15	Robert J. Modic	0.4S		7	-2.4
950304	A 109401	8.5	6+	8.7N	Sheakleyville, PA	1	6	2	25	John Holtz	0.3S		7	-2.4
950311	A 95913	7.7	66+	12.0N	Lamoni, Iowa	2	8	2	15	Robert Sandy	0.0		11	+6.4
950320	A 158840	2.9	85-	6.0N	Chappell Hill, Texas	2	6	2	21	Wayne Hutchinson	0.5S		351	-0.2
950326	A 163795	7.6	23-	2.2N	California, PA	1	2	2	25	John Holtz	0.3S		1	-5.9
950403	A 93173	8.4	8+	8.4N	Richmond Hts, Ohio	3	6	3	15	Robert J. Modic	0.1S		12	+1.6
950404	R 93883	6.7	19+	7.3N	Grabica, Poland	8	34	1	10	Marek Zawilski	0.3N		11	+4.1
950405	A 94025	8.7	22+	9.3N	Worth, Illinois	1	11	1	15	Robert H. Hays	0.7S		13	+4.3
950407	A 95390	7.5	38+	10.1N	Grant, Florida	1	8	1	28	Hal Povenmire	0.0		12	+6.0
950424	A 145939	7.4	27-	3.3N	Port St.Lucie, FL	1	4	1	15	Hal Povenmire	0.0		356	-4.0
950504	A 95090	8.0	16+	5.9N	Chagrin Falls, Ohio	3	10	1	15	Robert J. Modic	0.3S		12	+6.1
950504	A 95090	8.0	16+	5.9N	Portersville, PA	1	7	3	25	John Holtz	0.3S		12	+6.1
950505	A 96160	8.0	23+	9.0N	Spring Branch, Texas	2	16	1	9	Wayne Hutchinson	0.0		13	+6.6
950508	A 98495	7.4	51+	6.9N	Orangeville, Ontario	5	24	1	15	Guy Nason	0.3N		7	+7.3
950609	A 157923	1.0	79+	1.9S	Salton Sea Beach, CA	1	6	2	20	David Paul Werner	0.4N		176	+2.1
950609	VO 157923	1.0	79+	1.9S	Alamogordo,New Mexico	10	52	1	6	Warren Offutt	0.0		176	+2.1
950621	A 109627	4.4	35-	3.7N	LeRoy, Kansas	3	14	1	6	H.A.R.T. R. Wilds	0.0		358	-1.2
950621	A 109627	4.4	35-	4.0N	Louisburg, Kansas	4	18	2	10	W. Robinson/R. Sandy	0.0		358	-1.2
950622	R 92547	8.5	28-	1.8N	Santa Susana, Portugal	1	1	2	20	J.Garcia/R.Goncalves	0.2S		0	-0.1





Stellar Cross Reference
for Lists of Observed Grazes

SAO #	ZC #	Other
128186	3453	κ Piscium
145703	3201	
109344	85	
93639		PPM 119417
93729		PPM 119551
95383		PPM 122103
157923	1925	α Virginis = Spica
185024	2457	116 B. Oph
162229	2791	190 B. Sgr
118150		X 15311
117819		PPM 156041
162204	2787	187 B. Sgr
163066		
138052		X 16848
138892	1815	χ Vir
158692		PPM 525404
128156	3444	22 B. Psc
109618	143	
109401		X 901
95913		PPM 122779
158840	2118	α^2 Librae = Zubenelgenubi
163795	3021	
93173		X 3843
93883	643	
94025		X 5908
95390		X 8582
145939	3259	
95090		X 8029
96160		X 9891
98495	1384	
109627	146	ε Piscium
92547		PPM 117525

On the next page is a reduction profile for the graze of ZC 2826 (ρ^1 Sagittarii) observed on October 2nd by four expeditions including 22 stations and at least 125 consistent contact timings. Charts for each expedition were sent by Toshio Hirose and copied to transparencies, which were copied to produce this composite. Observer names for 3 expeditions on the right overlaid each other. This was used to help position observers for the November 25th graze of the same star in the U.S.A., and the Japanese observers in turn benefited from a preliminary reduction of another graze of the same star observed by eight expeditions from near Corpus Christi, Texas to the Delmarva Peninsula in the U.S.A. on September 5th. E-mail was used extensively to coordinate efforts for the November 25th graze, and detailed information about it were posted at IOTA's WWW site maintained by Rob (Walt) Robinson at URL http://www.sky.net/~robinson

We will try to post information about planned expeditions, and preliminary reports of observed events, at that site. Contributions should be sent to Robinson at 515 West Kump; Bonner Springs, KS 66012; USA; phone 1-913-422-1280, fax 913-384-2767, but preferably by e-mail at robinson@solar.sky.net.

1995 DECEMBER ASTEROIDAL OCCULTATIONS

David W. Dunham and Edwin Goffin

There are a few good events in late December that are described in the tables that start on p. 188. Data to compute planetary and asteroidal appulse local circumstance predictions were distributed to the graze computors in early September, and they should have distributed these "LOCM95" predictions to IOTA members later that month.

The predictions are in virtually the same format as those for 1994. However, now all events predicted by Goffin are included, rather than just those using the IOTA criteria described in **ON 6**, No. 4 (Sept. 1994), p. 76. This is because the basic stellar and asteroidal ephemeris data have been supplied to IOTA in ASCII files transmitted by e-mail, saving Dunham considerable work. Changes in the 1995 predictions from those published in 1994 include use of the H and G magnitude parameters; a problem with interpolation near R.A. 0^h or 24^h has been corrected; and there are other changes (in the star catalog codes and IOTA selection). Stellar SAO numbers and spectral types were not suppled by Goffin. They have been inserted manually for many events, mainly those visible from North America, and approximate spectral types could be computed from V and B magnitudes of the stars when both were given.

An asterisk (*) appears between the date and U.T. hour in Table 1, between the asteroid number and name in Table 2, and between the date and asteroid number in Table 4 if the event meets the IOTA criteria. the name of the occulting object if the event meets the IOTA criteria. Observers are encouraged to monitor the * events that occur under reasonable conditions at their location, especially those events with predicted closest approach distances less than 1.2. Although the nominal predictions for recent events have been rather better than in the past, thanks mainly to the improved PPM positions and to updated orbital elements for many asteroids, you should monitor these events even if the expected path is several hundred kilometers away, since there can still be astrometric error for the main event and secondary occultations by an asteroidal satellite is possible. To independently confirm observations of the latter, observers are encouraged to watch from two stations about a km apart.

Priority events during December 1995 for which astrometric updates have been requested are listed in Table 3 on p. 189. Events that will probably be visible from Europe are marked with "x" under the EAON column, while good events for other parts of the world are shown with an x (higher priority) or 2 (for secondary

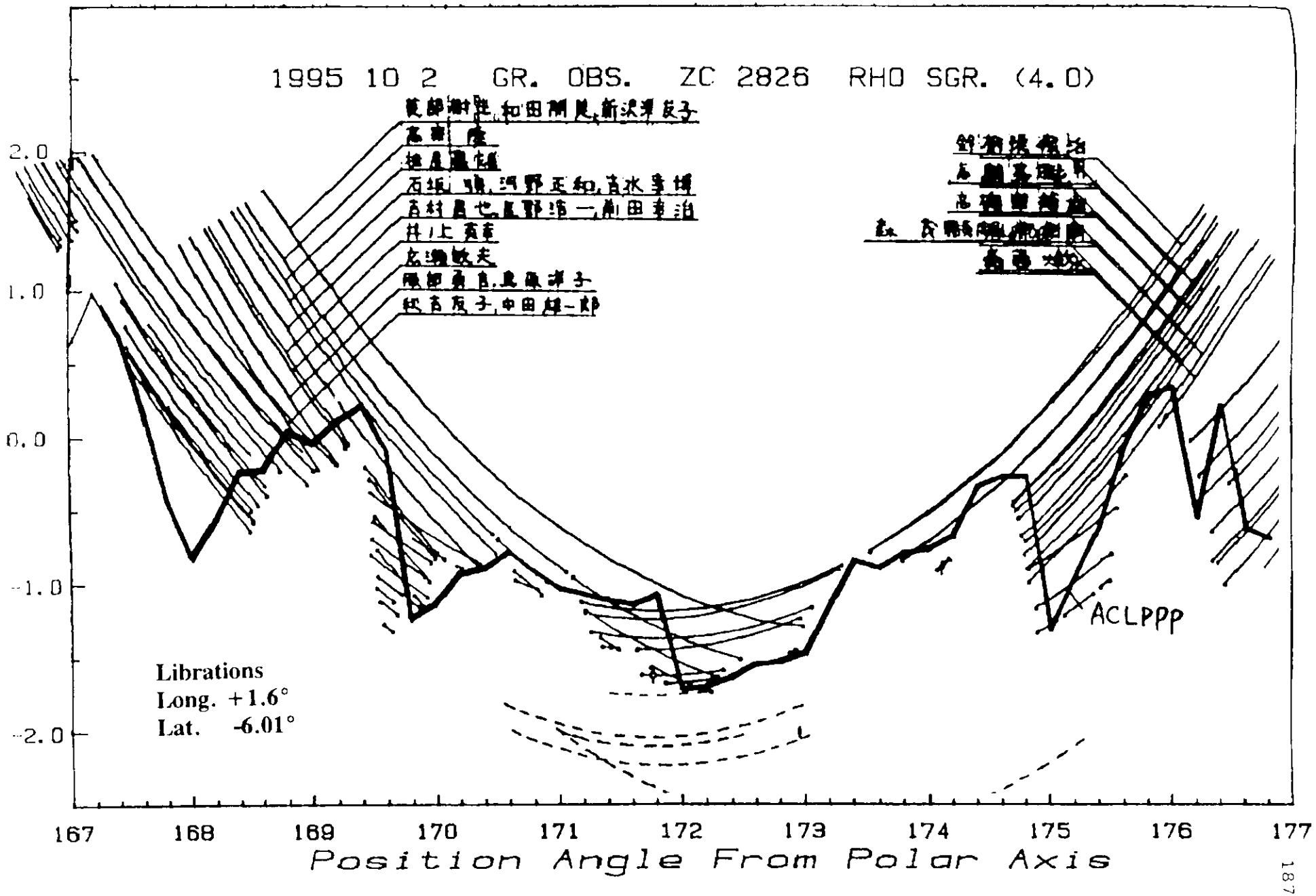

1995 10 2 GR. OBS. ZC 2826 RHO SGR. (4.0)
2.0
1.0
0.0
-1.0
-2.0
ACLPPP
Librations
Long. +1.6°
Lat. -6.01°
167
168
169
170
171
172
173
174
175
176
177
Position Angle From Polar Axis

Table 1.

1995 Date	Universal Time h m	Name	m_v	Δ AU	SAO No	m_k	sp	R.A. (1950) h m	Dec.	Δm	dur s	DF	P	Possible Path Lo1 La1	Lom Lam	Loe Lae	El Sun	M El	O %Srl	N up	Ephem. Source
Dec 1	12 5-21	Linzia	14.9	2.512		9.3		8 48.4	1°43'	5.6	10	54	61	-103 80-	107 46-	102 10	113	128	72+	none	MPC*685*
Dec 3	13 2-27	Hebe	8.6	1.230		10.9		1 48.4	-14 37	0.1	30	35	10	-163-53	157-10	175 37	125	15	86+	all	Goffin86
Dec 5*	12 43-56	Psyche	9.3	1.671	94169	8.9	F8	4 48.9	17 36	1.0	24	23	9	-96 49	162 60	73 39	175	25	94+	w121W	Goffin87
Dec 6*	5 43-57	Hilda	14.1	3.678	96355	9.2	A3	6 56.7	15 22	4.9	13	28	30	5 31	-70 31-	142 13	148	44	96+	w 7W	Goffin93
Dec 6*	9 11	Interamnia	11.7	3.031		10.5		20 50.0	-4 53	1.5	10	11	13	128 29	148 34	172 38	61	112	96+	all	Goffin92
Dec 7	22 36	Venus	-3.9	1.441		9.6		18 53.9	-24 25		226	4	1	-57 -7	-55 -6	-50 -4	28	149	95-	all	NA0001
Dec 9*	18 57-80	Nemausa	11.4	1.644		11.9		9 3.5	4 6	0.5	32	58	17	78 74	132 47	153 16	119	29	89-	all	Goffin87
Dec 10*	0 30-46	Io	11.5	1.698	111235	8.5	K0	3 28.4	7 2	3.1	17	29	16	49 64	-47 51-	108 30	152	58	88-	e 68W	Goffin94
Dec 10	8 4- 9	Mashona	14.0	2.621		8.1		1 15.5	38 31	6.0	12	35	34	120 57	131 48	137 33	129	94	86-	none	Goffin87
Dec 10*	13 32-41	Euphrosyne	11.4	2.098		10.1		11 14.2	39 50	1.6	18	21	12	171 1-	156 31-	101 52	103	62	85-	all	Goffin88
Dec 17*	12 30	Kleopatra	12.1	2.265		11.1		10 6.0	-5 6	1.4	19	42	24	(Ont., Miss.Valley)?		w	108	49	30-	all	Goffin89
Dec 18*	7 31-45	Hebe	9.0	1.367	148101	8.3	G5	1 52.4	-11 45	1.1	18	23	11	-174-36-	152 7-	112 46	114	168	23-	none	MPC24219
Dec 18*	14 16-41	Carlova	12.3	1.630		9.6		3 18.3	0 55	2.8	19	39	20	162-56	102-24	53 9	139	166	20-	none	MPC14754
Dec 18*	16 13	Daphne	13.1	3.279		10.4		22 32.5	-8 11	2.9	7	14	26	18 37	42 43	71 49	71	121	20-	none	MPC22385
Dec 19	19 49-57	Althaea	13.5	2.371		10.0		11 4.6	-0 3	3.5	6	28	57	63 -4	93-13	122-30	99	67	12-	e116E	MPC15526
Dec 20*	1 53	Ursula	13.5	3.459		9.5		12 52.3	-12 26	4.0	8	14	23	-5-16	10-25	25-40	70	45	10-	none	MPC16385
Dec 20*	2 52	Cava	13.2	1.916		4.9		23 52.9	-10 47	8.3	3	14	47	(s. South America)?		n	89	120	10-	none	MPC14755
Dec 21*	7 3-22	Amphitrite	8.9	1.415	58665	9.0	G	5 58.4	33 46	0.7	21	23	9	-15 19-	107 49	160 17	170	144	5-	e 28W	MPC23***
Dec 22	1 36-45	Anahita	11.5	1.341		9.4	K	6 28.1	21 55	2.3	5	20	37	91 59	-15 80-	125 58	173	157	4-	e 65E	Goffin90
Dec 23*	6 48-66	Campania	12.3	1.556		10.0		5 12.8	14 15	2.4	9	24	24	-28 34-	116 39	163 20	165	147	6+	w179W	MPC*4*60
Dec 24	0 35	Beatrix	13.9	2.649		**9.5**		23 23.1	-5 29	4.4	4	14	46	-105 33	-81 45	-47 56	78	52	10+	w 70W	Goffin89
Dec 24	1 17-28	Concordia	14.0	2.425	109607	**9.1**		0 59.0	1 12	4.9	10	32	36	-88-22	-57 -5	-19 3	103	75	10+	w 80W	Goffin87
Dec 26	9 7-32	Kythera	13.9	2.355	93405	9.0		3 19.7	17 33	4.9	19	56	32	-82 54-	170 58	119 35	139	77	27+	w167W	MPC*6554
Dec 30	6 33	Pallas	9.2	2.503		**9.8**	A	13 49.1	-3 43	0.5	19	11	7	-69-14	-48-15	-24-13	71	174	62+	none	Goffin92
Dec 30	15 41-58	Klytaemnestra	12.5	1.982		8.4		4 37.2	20 27	4.2	8	29	35	-163 48	100 52	30 22	153	46	65+	w143E	MPC*4753
Dec 30*	15 55	Hygiea	11.5	3.784		10.9		21 21.8	-12 59	1.1	11	10	13	13 55	17 57	22 59	41	68	65+	all	Goffin86
Dec 31	13 55	Metcalfia	14.5	1.769		7.5		11 8.6	-5 3	7.0	6	25	41	(cen.&se Australia)?		n	108	128	73+	none	MPC22666

Table 2.

1995 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 Other No	Shift	Time	Apparent R.A. h m	Dec.
Dec 1	1469	Linzia	60	0.03	182		0.076	160°2		M 155087		12h 21.m3	1.''30N	M				8 50.8	1°32'
Dec 3	6	Hebe	186	0.21	644		0.168	4.6		52800835		13 14.2	4.55E	J				1 50.7	-14 24
Dec 5	16*	Psyche	264	0.22	1467		0.222	264.7	94169	+17° 797		12 49.5	3.56N	M	M 120340			4 51.6	17 41
Dec 6	153*	Hilda	175	0.07	1356		0.122	263.4	96355	M 123361		5 49.5	0.73N	M				6 59.4	15 18
Dec 6	704*	Interamnia	333	0.15	2112		0.351	75.5		51870396		9 9.2	1.27N	J				20 52.4	-4 42
Dec 7		Venus	12220	11.69			1.240	85.6		M 269117		22 34.3	0.50S	D				18 56.7	-24 22
Dec 9	51*	Nemausa	137	0.11	473		0.087	139.1		02290399		19 18.1	2.44N	J				9 5.9	3 55
Dec 10	85*	Io	157	0.13	662		0.175	251.3	111235	+06 540		0 38.2	3.65N	L	M 146634			3 30.8	7 11
Dec 10	1467	Mashona	112	0.06	509		0.116	190.5		M 66149		8 8.7	1.81W	M				1 18.1	38 46
Dec 10	31*	Euphrosyne	248	0.16	1261		0.214	72.0		30101660		13 39.5	0.75N	J				11 16.7	39 35
Dec 17	216*	Kleopatra	137	0.08	566		0.104	158.6		49090699		12 30.3	2.87N	J				10 8.3	-5 20
Dec 18	6*	Hebe	186	0.19	649		0.247	28.9	148101	-12 352		7 34.9	0.97S	M	M 210815			1 54.7	-11 32
Dec 18	360*	Carlova	121	0.10	421		0.132	309.7		M 146477		14 30.0	1.98S	M				3 20.7	1 5
Dec 18	41*	Daphne	182	0.08	982		0.258	78.5		58111568		16 11.4	1.77N	J				22 34.9	-7 56
Dec 19	119	Althaea	60	0.03	162		0.152	119.7		M 178392		19 56.9	2.06S	M				11 7.0	-0 20
Dec 20	375*	Ursula	216	0.09	1334		0.250	127.5		M 226526		1 55.1	1.97S	M				12 54.8	-12 41
Dec 20	505*	Cava	59	0.04	125		0.337	308.7		F5S 2001		2 51.9	5.11S	2				23 55.3	-10 32
Dec 21	29*	Amphitrite	219	0.21	998		0.244	269.6	58665	+33 1214		7 12.5	1.63N	M	M 71119			6 1.4	33 46
Dec 22	270	Anahita	52	0.05	112		0.282	269.2		L1 1014		1 40.9	5.60N	H				6 30.9	21 53
Dec 23	377*	Campania	94	0.08	296		0.220	262.4		M 120763		6 57.5	2.35N	M				5 15.4	14 18
Dec 24	83	Beatrix	84	0.04	261		0.283	61.7		M 207543		0 32.3	1.73N	M				23 25.5	-5 14
Dec 24	58	Concordia	97	0.06	346		0.130	61.2	109607	M 144172		1 17.7	1.52S	M				1 1.3	1 27
Dec 26	570	Kythera	106	0.06	444		0.076	252.5	93405	+17 541		9 22.0	2.20N	U			m	3 22.3	17 43
Dec 30	2	Pallas	533	0.29	3759		0.374	80.7		M 705936		6 36.1	0.31S	MH	L2 3568	-0''25	0.0	13 51.5	-3 57
Dec 30	179	Klytaemnestra	81	0.06	272		0.160	249.8		M 93673		15 50.6	2.08N	L				4 40.0	20 32
Dec 30	10*	Hygiea	429	0.16	3559		0.348	71.8		57810755		15 53.9	1.81N	J				21 24.3	-12 47
Dec 31	792	Metcalfia	63	0.05	147		0.195	141.3		-04 3022		13 55.4	4.98S	U				11 11.0	-5 18

priority) under the "I" (for IOTA) column. Meridian circle observations are possible for events with an "x" under the "M" column, and sidereal-rate strip CCD observations might be used for those with an "x" under the "S" column, for events with small motion in declination.

Edwin Goffin's charts have been distributed to North American observers only for those events meeting the IOTA criteria, and for all events involving major planets, which are asterisked only if the occulted star is brighter than mag. 8.5. B1950 and J2000 positions of the non-asterisked stars are given in Table 4.

If you see any strange message in your local circumstance appulse (LOCM95) predictions or the data for an event seem to be grossly in error, please let me know. Some of the events use updated orbital information, so the distance given in your predictions might not agree with the charts for 1995 that were distributed last year. Usually, the differences are small and not noticeable. You can tell if an orbit has been updated by comparing the ephemeris source listed in Table 1 with that given on your chart. If there are significant differences when the ephemeris source is the same, I would be interested in investigating the cause.

CCD astrometry to update asteroidal occultation predictions was described on pages 157 and 158 of the last issue. Since then, Gordon Garradd in Loomberah, Australia, and Carl Hergenrother in Tucson, Arizona, have provided observations to update the predictions for several events, especially those with southern declinations that were difficult for the other astrometrists to cover, during the last half of this year. Unfortunately, these efforts have not yet resulted in any definite occultation observations. The astrometric updates have been distributed widely by e-mail, and starting in September, they have also been posted on IOTA's asteroidal occultation Web site at URL http://www.anomalies.com.

Regional charts showing the paths of the asterisked asteroidal occultations for late September through December, 1995 have been posted at the "anomalies" Web site, but are not given here since you will receive this after most of those events.

Jim Stamm and I have developed an IOTA asteroidal occultation report form, a copy of which is enclosed with this issue. It is also available as an ASCII file that can be sent by e-mail (request it from me or Jim Stamm) or that can be downloaded from the Web site mentioned above.

Table 3. Priority Events.

1995 Date	Asteroid	EAON	I	M	S
Dec 5	16 Psyche		2	x	x
Dec 6	153 Hilda	x	x	x	x
Dec 6	704 Interamnia		2	x	
Dec 10	85 Io	x	x	x	
Dec 10	31 Euphrosyne		2	x	
Dec 18	6 Hebe		x	x	
Dec 18	360 Carlova		2	x	
Dec 18	41 Daphne	x			
Dec 21	29 Amphitrite		x	x	x
Dec 23	377 Campania		x	x	
Dec 30	10 Hygiea	x			

Table 4. Positions of Occulted Stars.

1995 Dec.		Asteroid	R. A. (B1950) h m s	Dec.	R. A. (J2000) h m s	Dec.
1		1469 Linzia	8 48 22.77	+ 1°42'52".5	8 50 57.93	+ 1°31'36".6
3		6 Hebe	1 48 23.94	-14 37 25.0	1 50 49.76	-14 22 35.4
9	*	51 Nemausa	9 3 27.35	+ 4 6 3.2	9 6 4.35	+ 3 54 0.1
17	*	216 Kleopatra	10 5 59.22	- 5 6 21.5	10 8 30.10	- 5 21 4.7
19		119 Althaea	11 4 35.61	- 0 4 31.7	11 7 9.32	- 0 20 45.9
20	*	375 Ursula	12 52 20.86	-12 26 13.9	12 54 58.09	-12 42 28.7
20	*	505 Cava	23 52 55.80	-10 47 16.2	23 55 29.88	-10 30 34.5
22		270 Anahita	6 28 8.90	+21 55 19.9	6 31 9.31	+21 53 10.6
24		83 Beatrix	23 23 8.91	- 5 29 8.0	23 25 43.64	- 5 12 38.0
24		58 Concordia	0 58 57.29	+ 1 11 42.6	1 1 31.47	+ 1 27 50.2
26		570 Kythera	3 19 42.47	+17 32 51.2	3 22 32.57	+17 43 31.5
30		2 Pallas	13 49 5.40	- 3 43 0.1	13 51 41.25	- 3 57 48.2
30		179 Klytaemnestra	4 37 12.42	+20 27 5.5	4 40 9.61	+20 32 53.7
31		792 Metcalfia	11 8 36.29	- 5 2 59.7	11 11 8.74	- 5 19 17.9

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 sections 501(c)(3) and 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.

The officers of IOTA are:

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Addresses, membership and subscription rates, and information on where to write for predictions are found on the front page.

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

Observers from Europe and the British isles should join IOTA/ES, sending DM 40.-- to the account IOTA/ES; Bartold-Knaust Strasse 8; D-30459 Hannover; Postgiro Hannover 555 829 - 303; bank-code-number (Bankleitzahl) 250 100 30. Full membership in IOTA/ES includes the supplement for European observers (total and grazing occultations) and minor planet occultation data, including last-minute predictions, when available.

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