Occultation Newsletter

Volume VI, Number 7 June, 1995 ISBN 0737-6766

Published quarterly by the International Occultation
Timing Association
Joan Bixby Dunham, Editor

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Occultation Newsletter is published by the International Occultation Timing Association. Editor: Joan Bixby Dunham; 7006 Megan Lane; Greenbelt, MD 20770-3012; U.S.A.; e-mail joan@ulabsgi.gsfc.nasa.gov. Please send editorial matters to the above. Send new and renewal memberships and subscriptions, back issue requests, address changes, graze prediction requests, reimbursement requests, special requests, and other IOTA business, but not observation reports, to: Craig and Terri McManus; 2760 SW Jewell Ave.; Topeka, KS 66611-1614; U.S.A.

FROM THE PUBLISHER

For subscription purposes, this is the first issue of 1995. It is the seventh issue of Volume 6. IOTA annual membership dues, including **ON** and supplements for

U.S.A., Canada, and Mexico	$30.00
for all others	35.00

Annual IOTA membership dues may be paid by check drawn on an American bank, money order, cash, or by charge to Visa or MasterCard. If you use Visa or MasterCard, include your account number, the expiration date, and your signature.

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 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.

IOTA NEWS

David W. Dunham

IOTA Meeting: The 1995 meeting of the International Occultation Timing Association (IOTA) will be held in conjunction with ALCON-95 (Astronomical League Convention) on the 2nd floor of the University Center at St. Mary's University in San Antonio, Texas, on Saturday, July 22. This 13th annual meeting of IOTA will start at 9 a.m. CDT and will last into the mid or late afternoon. In addition, I plan to give a presentation at the ALCON meeting that will probably be scheduled on Friday, July 21. New developments with asteroidal occultations, especially astrometric updates; solar eclipse expeditions and results; new video records of eclipses and occultations; and news of lunar total and grazing occultation prediction and analysis will be major topics. If you are interested in giving a presentation at the IOTA meeting, please contact me (see candidate officer addresses, including e-mail, below); a final agenda for the meeting will be prepared by July 11 and distributed to prospective attendees. 1995 is a year of our triennial elections, so a ballot is included with this issue for use by those who will not be able to attend the IOTA meeting. The results of the election will be announced at a brief business session of the IOTA meeting. Those interested in attending the IOTA meeting should contact Bob Gent in San Antonio by phone at 210-497-5180 or by e-mail at r.gent@genie.geis.com. For those who will only be attending the IOTA meeting, the $25 ALCON-95 registration fee for Saturday will be waived. The IOTA meeting is open to all who are interested in attending, and there is no registration fee. Those interested in ALCON-95 should contact Valerie Kinnamon, P.O. Box 701261; San Antonio, TX 78270; phone 210-690-9551. Anyone planning on attending who is interested in a $175 sensitive CCD video camera should contact Paul Maley.

ESOP XIV: The 14th European Symposium on Occultation Projects will be held Friday evening, August

25th, to Wednesday, August 30th, at the University Hall of the Faculty of Teaching of the West Bohemian University in Plzen, Czech Republic. The technical sessions will take place on Sat. and Sun., Aug. 26-27, with workshops and demonstrations on Mon. morning, Aug. 28. The registration fee was due May 15th, but some late registrations are probably possible. The deadline for receipt of abstracts, and the registration form (May 31st), is also past. It is recommended that any late communications be by fax to Bohumil Maleček; Hvezdarna a planetarium Plzen; 42-19-224194. More details of ESOP-XIV were distributed earlier to IOTA/ES members and to a few IOTA members, and can be obtained from the author.

Summary of This Issue: The main purpose of this issue is to distribute ballots and information for IOTA's triennial elections, and the 1995 IOTA meeting where the election will be completed. Also in this issue are important articles about reporting occultation observations by electronic mail (e-mail); IOTA on the World Wide Web; important corrections for grazing occultations (in the hemispheric graze supplement included with this issue); about identifying and organizing local and regional resources mainly for asteroidal occultations; and news on CCD astrometric updates for asteroidal occultations. The first of five lunar occultation tallies provided by Joseph Carroll is given near the end of this issue; the others will be published soon. We thank Andrew Seacord for typing in WordPerfect format some of the articles that were submitted only in hardcopy form and Wayne Warren, Jr., for his helpful review.

IOTA Elections: A ballot is enclosed in the initial mailing of this issue; it is either absent, or crossed out (invalidated) for non-IOTA **ON** subscribers. IOTA members should mark and return the ballot to Rocky Harper, executive secretary (see below and on ballot for address) soon so we can meet our quorum requirement in time for the IOTA meeting, even though, except for possible write-ins, the election is uncontested. The recommended slate of officers (all residents of the USA; the e-mail address is given after the postal address and telephone number) is:

President: David W. Dunham; 7006 Megan Lane; Greenbelt, MD 20770-3012; 301-474-4722; David_Dunham@jhuapl.edu
Executive Vice President: Paul D. Maley; 11815 Lone Hickory Court; Houston, TX 77059; 713-488-6871; pmaley@gp808.jsc.nasa.gov
Executive Secretary: Rocky Harper: 622 Utah St.; La Porte, TX 77571-5563; rockyh@tenet.edu
Secretary and Treasurer: Terri and Craig McManus; 2760 SW Jewell Ave.; Topeka, KS 66611-1614; 913-232-3693; 570-0611@mcimail.com
V.P. for Grazing Occultation Services: Richard Wilds; 3630 SW Belle Ave.; Topeka, KS 66614-4542; 913-271-7187; e-mail via Rex Easton, 73524.3235@compuserve.com
V.P. for Planetary Occultation Services: Jim Stamm; 11781 North Joi Drive; Tucson, AZ 85737; 520-575-0830; jimstamm@aztec.asu.edu
V.P. for Lunar Occultation Services: Kent Okasaki; P. O. Box 2046; Cupertino, CA 95015-2046; kento@hpcupo.cup.hp.com
Occultation Newsletter Editor: Joan Bixby Dunham (see masthead for addresses); phone 301-474-4722

The V.P.'s for Grazing and Planetary Occultation Services have changed to those who have been collecting the observations for IOTA during the past several years and writing summary reports for **ON**. Richard Wilds is also now providing update, new observer, and special request graze predictions, being able to coordinate this work more efficiently now with the secretary, also in Topeka. Joseph Senne will still be responsible for supplying predictions of partial occultations of planets to all IOTA members, and for the annual graze predictions for IOTA members in Regions C, H, and P. Joseph Carroll can still provide planetary and asteroidal appulse predictions, when the annual database is available (see above), but these predictions are now being distributed to the membership by the graze computors (who should be the main source for these predictions), and by Richard Wilds for new stations. Walter Morgan has been V.P. for Lunar Occultation Services for many years and prefers that someone else have this job for next year's predictions. Kent Okasaki volunteered to do this work.

Total Occultation Coupon: We have not included these since the last election, so coupons to report your count of lunar occultation timings made during 1992, 1993, and 1994 are enclosed along with the IOTA ballot. The counts should be sent to Joseph E. Carroll; 4261 Queen's Way; Minnetonka, MN 55345; or use his e-mail address, Carroll_Joe@htc.honeywell.com. They can also be sent to Rocky Harper along with your ballot. After the IOTA election, Rocky will forward them on to Joe. After producing the tallies into the early 1990's, Joe plans to retire from this work. A volunteer is sought to collect the coupons and prepare the tallies for 1995 and for later years. We need to announce the new person near the end of this year.

Finder Scopes: The 3-inch finder scope sold by Black Forest Observatory described on p. 126 of the last issue weighs 3 lbs., as advertised. That is heavy! It is not trivial to mount such a heavy finder, although some suggested ways of doing it are included in their package.

Although 8th-mag. stars can be seen in a dark sky, the optical quality is not good, as the advertisement warns. If these difficulties can be overcome, their finder might still be useful. In any case, observers should obtain at least 50-mm finders, and even these are marginal or inadequate in some areas of the sky. Finders of at least 60-mm aperture should give a robust capability for finding nearly all target stars and can be found for reasonable prices.

Concerning finding asteroidal occultation target stars, the charts that IOTA provides should usually be sufficient, possibly augmented with an all-sky chart showing 4th and perhaps some 5th-mag. stars (the monthly charts published in **Sky and Telescope** are usually sufficient). Those wanting more detailed general star charts have a wide selection. A new atlas called Astroatlas has been produced by IOTA member David Herald, along with Peter Bobroff. It includes 214 charts covering the whole sky at 3 different scales to 9th mag., and certain interesting areas in more detail. It includes thousands of galaxies, nebulae, and clusters graded by visibility. The Astroatlas is available for 115 Australian dollars (about $85 US), less for Australia and New Zealand, from HB2000 Publications; PO Box 254; Woden, ACT 2606; Australia; fax 61-6-295-1855. Payment can be by faxed MasterCard or Visa order, giving expiration date, signature, and name on card, and name and address for shipping. Bulk discounts are available.

USGS Maps: Detailed U. S. Geological Survey (USGS) topographic maps are available from the Map Distribution Office; USGS; Box 25286; Building 810; Denver Federal Center; Denver, CO 80225; and can be ordered by telephone at 1-800-USA-MAPS. However, service can be slow; in general, you are better off trying to find a local map dealer (the maps are often sold at sporting goods and some engineering supply stores). But if there is no nearby map store, or an expedition is planned outside the area of their coverage, Richard Wilds suggests using Powers Elevation Co. in the Denver area for a quick response (they can get any USA map over the counter). Their address is P.O. Box 440889; Aurora, CO 80044; phone 1-800-824-2550. They accept credit card orders. Richard recommends ordering several maps at once to offset their $5.00 service fee per order. Richard finds they are very friendly and will send maps by overnight delivery.

Jovian Mutual Events Published: Video and photoelectric light-curves of Galilean satellite mutual eclipses and occultations recorded in 1991 will soon be published in an article, "A catalog of the observations of the Jovian mutual phenomena made in 1991 during the PHEMU91 Campaign", J.E. Arlot *et al.*, that will appear in **Astron. and Astrophys.** Several co-authors are either members of IOTA or IOTA/ES, or have reported occultation observations to us, including J. Bourgeois, H.J.J. Bulder, M. Federspiel, D. Hube, C. Meyer, and R.P. Wilds.

Next Issue: The main purpose of the next issue will be to document IOTA's 1995 planetary and asteroidal occultation predictions, and to include any articles that were too long to include in this issue. If you have a contribution for the next issue, the editor should receive it as soon as possible. The issue will be produced quickly after the input data for the 1995 predictions of local circumstances of planetary and asteroidal occultations are distributed, and it will likely be mailed in July.

PREDICTIONS FOR 1995

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

After completing this issue, Dunham will complete some software changes needed to use event data files provided by Edwin, and will include program changes made by Wolfgang, to produce the 1995 data and updated program needed for computing asteroidal and planetary occultation/appulse local circumstance predictions. In general, these should be distributed by the graze computors, as they were done last year. We apologize for the long delay in these predictions. After the software changes are made, they will be much easier to produce on time in the future. By now, all IOTA members should have Edwin's charts for 1995 asteroidal occultations visible from their region.

Do you have your 1995 Predictions?: With the exception of the appulse local circumstance predictions mentioned above, all IOTA members who have their geographical coordinates in our databases should now have lunar total and grazing occultation predictions. If not, contact your regional coordinator or graze computor, or Dunham if you don't know who these are for your area. Regional coordinators for PC-Evans predictions were listed in **ON 6** (3), pp. 55 and 56, with 3 new ones on p. 125 of the last issue. You should also have finder charts and world maps by Edwin Goffin (in the **1995 Planetary Occultation Supplement to ON** for North American observers) for asteroidal occultations for 1995. There are a few new events that will be distributed with this issue, or separately soon.

Evans Total Occultation Prediction Changes: In previous years, observers were required to return verification forms to continue receiving these predictions. In general, verification forms were not distributed with the 1995 predictions because observers now either receive them as a privilege of IOTA membership, pay for them, or receive them from other sources (see p. 124 of

the last issue).

A new 1995 input befile has been generated by Wolfgang using his new XZ catalog described below. Software and data to compute predictions that augment those already distributed will be sent to the national and regional coordinators who distributed the 1995 PC-Evans predictions. This may have already been done by some of the European coordinators.

OCCULT Program: Version 2 of the OCCULT program can be obtained from Walter Morgan; see **ON 6** (3), pp. 56-57, which also describes its capabilities. For example, it can be used to predict occultations of major planets that are not available this year with the Evans predictions. Maps showing the regions of visibility of these events are given in **ON 6** (4), pp. 71-72. OCCULT, and predictions computed with it, are now being distributed in Latin America by the Liga Ibero-Americana de Astronomia (LIADA). For details, contact Ruben Garcia, LIADA; Casilla de Correos No 23.007; 12.800 Montevideo, Uruguay; e-mail liada@fisica.edu.uy; fax 5982-409973.

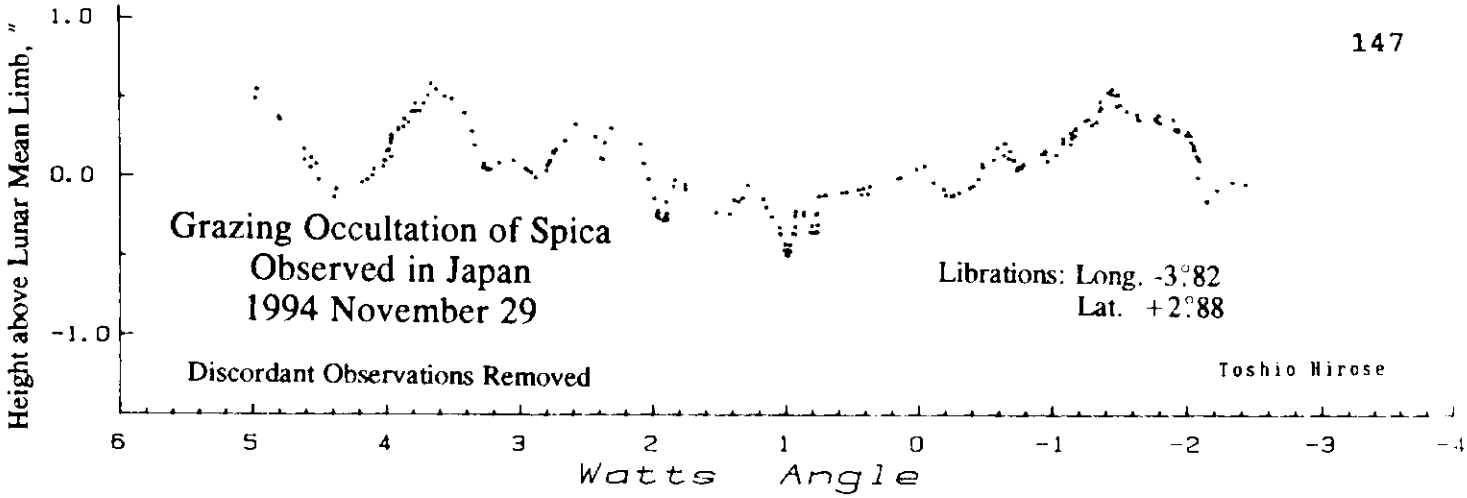
In previous issues, a problem with missing events near 0h U.T. has been mentioned. This can occur when the event occurs close to the beginning or end of the available lunar ephemeris data. The problem can be avoided by being sure that lunar ephemeris data are available for both the days preceding and following the date of the event in question.

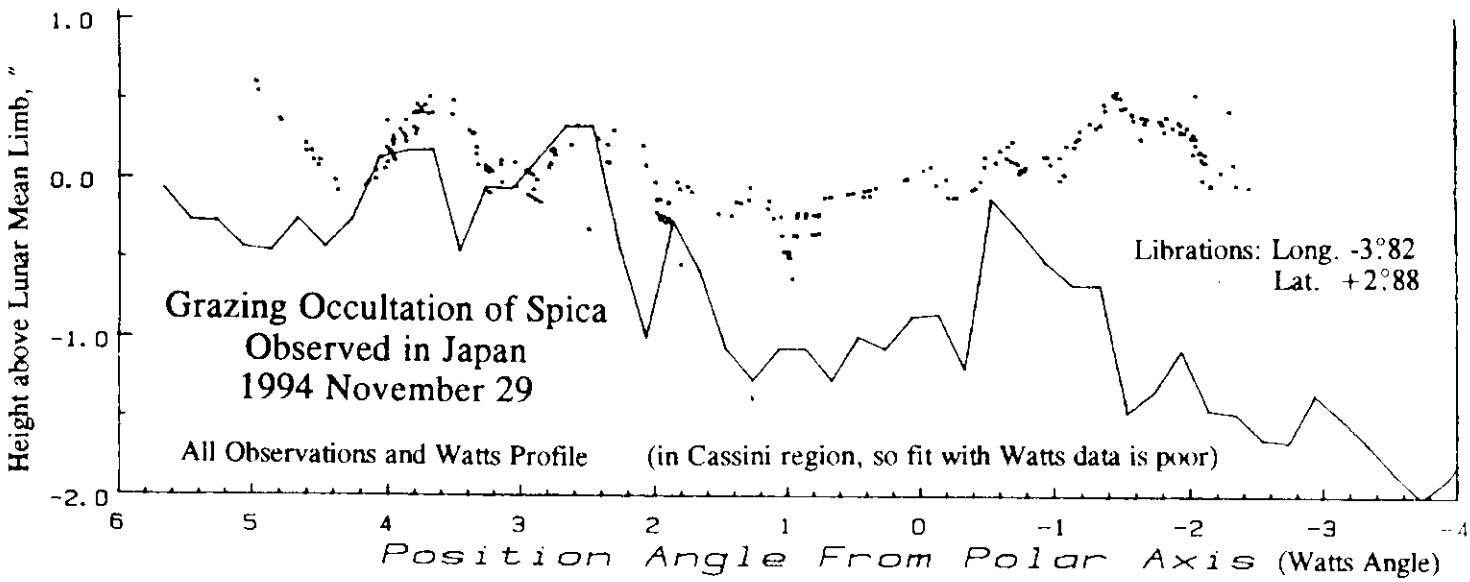
Sometimes, users of OCCULT have had problems with the program crashing on particular dates. These usually turn out to be hardware problems due to old machines with unusual processor configurations, or to insufficient high memory. If such a problem is encountered, try it on a different (preferably newer, or with more memory) PC. If problems persist, try to contact David Herald at the HB2000 address or fax given near the top of p. 145; his home phone is 61-62-319214. He doesn't have direct e-mail, but messages can be relayed to/from him via Alfred Kruijshoop in Clayton, Victoria, at a.kruijshoop@trl.oz.au.

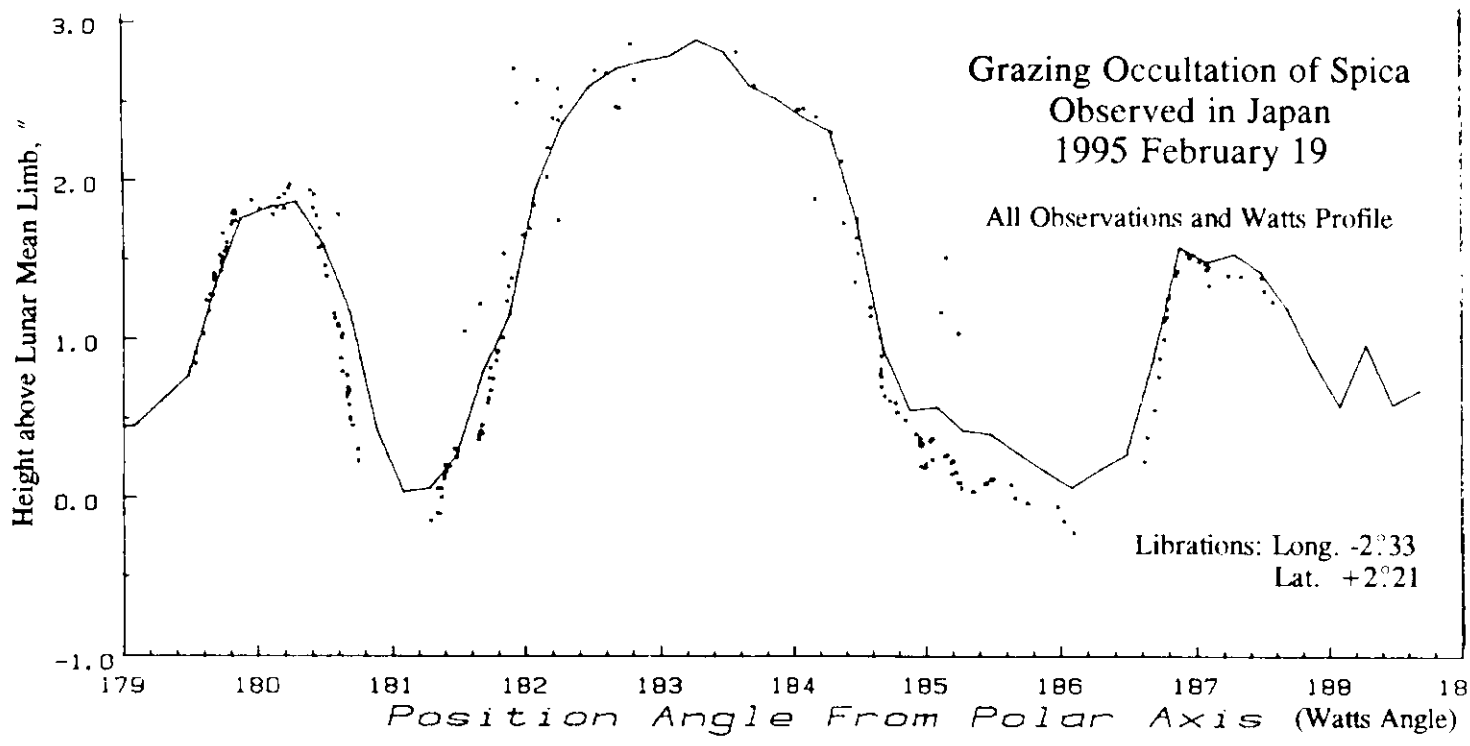
OCCULT Version 3.02 was recently received by Walter Morgan. It has some interesting new capabilities, including the ability to reduce occultation timings and to compute predictions of eclipses and of all grazes near a station between specified dates (similar to the Grazereg capability) and the ability to create special input star catalogs from the Guide Star Catalog, to allow computation of predictions of occultations of faint stars during lunar eclipses or passages through rich Milky Way star fields, or to identify unpredicted occultations that have been observed. Procedures for obtaining this new version, will be given in the next issue. A later version will have a capability for producing graze maps. Dunham recently sent our coastline/political boundary dataset to Herald for this purpose.

Hemispheric Graze Supplements: A copy of the Eastern or Western Hemisphere Grazing Occultation Supplement for Late 1995 is included with this issue of **ON**. Besides the basic maps and tables of grazes of bright stars in your hemisphere, the supplement includes information about IOTA's distribution of detailed graze predictions, including how to contact the person, or "computor", who calculates the predictions for your area; plans for preparing profiles of observed grazes more routinely; grazes by e-mail; and plans to correct errors in the current predictions. It also includes **important new corrections that need to be applied to the ACLPPP profiles to help avoid miss observations.**

Spica Grazes: The grazes of Spica on 1994 Nov. 29 and 1995 Feb. 19 were very successfully observed in Japan; see p. 72 of the June issue of **Sky and Telescope**. The reduction profiles showing the observations by Toshio Hirose are shown on the facing page. These plots use the mean limb as the horizontal axis, so the paths for each observer are essentially the bottoms of parabolic arcs, like the profiles by Robert Sandy that have been published in several **ON**'s. Due to the large number of observers, only the contacts are plotted. Since a 1° arc of the Moon's limb at average distance subtends 16″, the vertical scale on the plots is exaggerated by a factor of about 16 over the horizontal scale. A preliminary reduction of the 1994 Nov. data (supplied by Mitsuru Sôma by e-mail) was completed by Dunham using the new Grazered program mentioned in the hemispheric graze supplements. It was used to determine corrections for the January 23rd graze whose northern limit crossed New England, but a large winter storm prevented any observation of that event. The November data are valuable for filling in a previously-unobserved section of the northern Cassini region and has recently been added to the ACLPPP observed-graze database that will be used for the 1996 predicted profiles. In addition, the February 19th observations showed that a mountain predicted by Watts at W.A. 180°.6 is indeed there. Observations of a graze of 7.1-mag. Z.C. 969 on 1974 Aug. 14 had indicated that mountain was not there, but it is likely that the two observers of that event mistook a sunlit mountain for the relatively faint star. So again the observed-graze database will be altered to remove those observations so they will not override Watts' data for the 1996 predictions. The June 9th Spica graze was also successfully observed by several expeditions in California, Arizona, and New Mexico, and those observations will be valuable for correcting poor Watts' data in a region of extrapolation caused by extreme longitude libration.


Height above Lunar Mean Limb, "
1.0
0.0
-1.0
Grazing Occultation of Spica
Observed in Japan
1994 November 29
Librations: Long. -3°.82
Lat. +2°.88
Discordant Observations Removed
Toshio Hirose
6 5 4 3 2 1 0 -1 -2 -3 -4
Watts Angle


Height above Lunar Mean Limb, "
1.0
0.0
-1.0
-2.0
Grazing Occultation of Spica
Observed in Japan
1994 November 29
Librations: Long. -3°.82
Lat. +2°.88
All Observations and Watts Profile
(in Cassini region, so fit with Watts data is poor)
6 5 4 3 2 1 0 -1 -2 -3 -4
Position Angle From Polar Axis (Watts Angle)


Height above Lunar Mean Limb, "
3.0
2.0
1.0
0.0
-1.0
Grazing Occultation of Spica
Observed in Japan
1995 February 19
All Observations and Watts Profile
Librations: Long. -2°.33
Lat. +2°.21
179 180 181 182 183 184 185 186 187 188 189
Position Angle From Polar Axis (Watts Angle)

Other Lunar Occultation Software: Waldemar Villamayor, of the Sociedad Paraguaya de Astronomía Amateur (SPAA), has written PC programs to produce maps showing the locations of visibility of eclipses and occultations (small-scale maps showing South America and surrounding areas), charts showing the paths of stars behind the lunar disk, prediction tables, and a map showing grazing occultation paths (northern and southern occultation limits) that cross Paraguay. These have been published in **SPAA Informe de Eventos**, the March 1995 issue (showing events for April and May) of which he sent to Dunham. Villamayor's e-mail address is: wvilla@cap.una.py.

More information about Eric Limburg's "Lunar Occultation Workbench (LOW)", which calculates occultation predictions and reductions via user-friendly window menus, is given in the April issue of **Occultus**, the publication of the Dutch Occultation Association (Werkgroep Sterbedekkingen of Nederlandse Vereniging voor Weer- en Sterrenkunde). LOW uses a condensed version of the Watts' limb correction dataset that occupies only 850 kilobytes of memory. LOW's menus are all in English, but the **Occultus** article is in Dutch.

Asteroidal and Planetary Occultations: IOTA's predictions for 1995 will be documented in the next issue. The priority list for astrometric updates is given in a separate article below.

XZ CATALOG NEWS

David W. Dunham, Mitsuru Sôma,
Wayne H. Warren, Jr., and Wolfgang Zimmermann

The XZ catalog, consisting of 32,221 stars within 6° 40′ of the ecliptic that can be occulted by the Moon, is now available from the Astronomical Data Center (ADC) of the National Space Science Data Center at Goddard Space Flight Center. The catalog, the 80N version, has been documented by David and Wayne. The ADC number of the catalog is A1201. The ADC on-line services via the World Wide Web can be accessed at URL

http://nssdc.gsfc.nasa.gov/adc/adc_online_access.html

Mitsuru produced the J2000 version (XZ80NJ2), and supplied corrected positions and proper motions for 8 stars whose J2000 data had been computed incorrectly initially due to a software error discovered by Jean Meeus. This was corrected late last year.

In addition to the XZ, the ADC also has data for several other "U. S. Naval Observatory" (now IOTA) lunar occultation star catalogs, including the K and L (but not the Q) catalogs.

Wolfgang has replaced the positional data in XZ80N with generally better data from the PPM, and has used the PPM and its Supplement to add several thousand new stars to the catalog. The previous XZ numbers are preserved, so the new stars start with number 32222. This new version of the XZ will be deposited with the ADC soon.

LET'S REPORT OCCULTATION TIMINGS BY E-MAIL

David W. Dunham

In **ON 4** (5), p. 92 (August, 1987), I published an article, "Let's Report Occultation Timings on Diskettes", specifying an ASCII format that could be used for reporting occultation observations in files on IBM-compatible diskettes. During the last few years, many observers have gained access to electronic mail, so it would be convenient for many to send the relatively small lunar occultation observation files by e-mail. Until recently, there was no e-mail link to the International Lunar Occultation Centre (ILOC) in Tokyo. Also, for the time being, ILOC prefers that someone else collect the report messages, edit and process the files to exactly the format they need, and transmit the files to them periodically (once or twice a month). Toshio Hirose, of the Japanese Lunar Occultation Observers' Group, has agreed to collect the report messages. His Internet address is NBC00716@niftyserve.or.jp. Reporting observations by e-mail should speed the reduction process and save observers the expense of overseas postage, and thus should encourage more reporting of observations.

There is one problem with the ASCII format proposed for reporting on diskettes in 1987. That is the line length, set then at 80 characters, the same as IBM cards that had been used with mainframe computers for so many years before. Files with lines this long can be sent by e-mail only as attached (uuencoded) messages, which are difficult to create for some and not supported by many e-mail systems. Therefore, it would be better to create a 78-character-per-line format that can be sent as an ordinary e-mail message. The rest of this article is devoted to specifying such a format. For many items, the 80-character format can simply be truncated, but the crucial time lines have data in column 79, so simple truncation is not possible there. Toshio Hirose and ILOC have been provided with a PC computer program that I have written that will convert the e-mail format to the 80-character format that ILOC needs for their work. If you send diskettes to ILOC, you should continue to use the 80-character "old" format defined in 1987. Those

sending observation files by e-mail should use the new 78-character format described below.

Richard Wilds can be reached via e-mail sent to Rex Easton at 73524.3235@compuserve.com, so we also encourage reporting of graze observations to IOTA by e-mail. Do not report more than one graze in one file and use separate files for separate grazes. Those who start preparing their reports in files will find that the process is difficult at first, and one must be careful to avoid mistakes. It is important that values be placed in their exact specified columns. Observers will gain an appreciation for the transcription job now done at ILOC for the handwritten reports. After keying in a few reports, observers will learn the format and the job will become easier, as they use copies of previously-typed reports as templates for new reports. I can send you a sample report for use as a template by e-mail, if you request it in a message sent to David_Dunham@jhuapl.edu. Some menu-driven programs have been written to ease the reporting process and reduce errors that can occur when editing an ASCII file. These programs will need to be modified to produce the new e-mail format. [Ed. This job can also be done with Fox Pro or other database software.]

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.; with a copy sent to me (you can use the e-mail address above) for positive (actual occultation) events. Jim Stamm recently obtained access to Internet. His e-mail address is jimstamm@aztec.asu.edu. Copies of these non-lunar event files should **not** be sent to ILOC or to R. Wilds (or to T. Hirose or to R. Easton).

An example of a lunar grazing occultation report (actually, just the first 3 stations of an actual report) in e-mail format is shown in Figure 1 on the next page. Note that besides the graze events, three total occultations were timed at station B. The report is of the same graze as the one used as an example in the "diskette" article in 1987, but I have used my current address rather than my old Silver Spring address to try to avoid confusion about my current address.

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. A copy of part of the corresponding handwritten form is shown in Figure 2, Part A being the front of the form and Part B being part of the back of it. It is the same as Figure 2 of the 1987 article except that I have used my current address, and changed the IOTA address to Richard Wilds, who is now collecting graze reports for IOTA.

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.

1. Heading Information: The first line of the heading should contain "PLACE NAME" in col. 1-10 and the name of the place of observation in col. 16 to 78. "ADDRESS" is in col. 1-7 and the address of the report preparer ("representative"; your address, not IOTA's address or the address of the place of observation) is in col. 16 to 78 of the second line. "REPRESENTATIVE" is in col. 1-14 and the name of the representative (observer's name, or name of the graze expedition leader) is in col. 16 to 50 of the third line. "FORMS REQUIRED" is in col. 51-64 of the 3rd line, with "YES" or " NO" in col. 71-73. "REPORTED TO" is typed in col. 1-11 and the names of organizations (ILOC, IOTA, any others) to which a copy of the report is sent should be given in col. 16 to 78 of the fourth (last lunar header) line. For occultations by objects other than the Moon, type a fifth header line with "OBJECT" in col. 1-6 and the object's name starting in col. 16. For asteroids, give the asteroid's number in col. 16-19 (right-justified; leave blank for unnumbered asteroids) and its name or designation starting in col. 21.

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 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.

4 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. 6-78.

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

6 Telescope drive.
D = clock driven
M = manual

7-11 Telescope aperture in centimeters, to .1 cm. Columns 10 and 11 can be blank if the aperture is given to the nearest cm.

13-18 Telescope focal length, in centimeters, to .1 cm. Columns 17 and 18 can be blank if the focal length is given to the nearest cm.

21-23 Degrees of longitude from Greenwich.

25-26 Minutes of arc of longitude.

28-32 Seconds of arc of longitude (hundredths of an arc second can be specified, but tenths, as given in Fig. 1 with col. 32 blank, are sufficient; the value needs to be accurate to 1 arc second or better).

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COLUMN # 11111111112222222222333333333344444444445555555555566666666667777777777
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678

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

TA RAM 10.2  112      76 32 50.2  W  38 19 26.8  N   30.5NAD 1927
TB CED 20.3  203      76 32 48.1  W  38 19 24.6  N   30.5NAD 1927
TC NEM 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                  AA
0286 8290803462  R    885            1V RE   1 1   112 9  6                  BB
0386 8290803466  R    885            2V RE   1 1   112 9  6                  BB
0486 8290803521  R    885            1V RE   1 1   112 9  6                  BB
0586 8290803539  R    885            2V RE   1 1   112 9  6                  BB
0686 8290803596  R    885            1V RE   1 1   112 9  6                  BB
0786 8290804020  R    885            2V RE   1 1   112 9  6                  BB
0886 8290823492  S  77621            2S RS4  1 1   112 9                     BB
0986 8290854170  S  77639            2S RS5  2 1   112 9                     BB
1086 8290933319  S  77662            2S RS5  2 1   112 9                     BB
1186 8290803465  R    885            1T RU3  3 1   112 9  6                  CC
1286 8290803500  R    885            2T RU3  3 1   112 9  6                  CC
1386 8290803515  R    885            1T RU3  3 1   112 9  6                  CC
1486 8290803550  R    885            2T RU3  3 1   112 9  6                  CC
1586 8290803575  R    885            1T RU3  3 1   112 9  6                  CC
1686 8290804025  R    885            2T RU3  3 1   112 9  6                  CC
1786 8290804055  R    885            7T RU3  3 1   112 9  6                  CC
1886 8290804355  R    885            1T RU3  3 1   112 9  6                  CC
1986 8290804360  R    885            2T RU3  3 1   112 9  6                  CC
2086 8290804420  R    885            7T RU3  3 1   112 9  6                  CC

M  HOLLYWOOD, MD                  1963 1:24,000    U.S.G.S.
G 346.0  5.6  31-  15N   9  72 1   6  0.0  346 -57 WWV

COLUMN # 11111111112222222222333333333344444444445555555555566666666667777777777
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
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Figure 1. Printout of example e-mail file.

Fig. 2A

I O T A / I L O C (mainly G R A Z I N G)
O C C U L T A T I O N O B S E R V A T I O N S

PLACE NAME HOLLYWOOD, MARYLAND, U.S.A.

Copy has been sent to circled place(s): (IOTA) (ILOC)

ADDRESS I.O.T.A.: 7006 MEGAN LANE; GREENBELT, MD 20770, USA

TELESCOPES and POSITIONS Other _____

	Type	Aperture	Focal length	Mounting	Drive	Longitude ° ' "	Latitude ° ' "	*Acc "	Height m	Geodetic datum
a	(R)N,C,O( )	10.2 cm	112 cm	E(A)	D(M)	76 32 50.2 (E)W	38 19 26.8 (N)S	0.3	30.5	NAD 1927
b	R,N(C)O( )	20.3 cm	203 cm	(E)A	(D)M	76 32 48.1 (E)W	38 19 24.6 (N)S	0.3	30.5	NAD 1927
c	R(N)C,O( )	25.4 cm	142 cm	(E)A	D(M)	76 32 44.8 (E)W	38 19 21.5 (N)S	0.3	30.5	NAD 1927

No.	Date and Time (UTC) Yr	Mth	Day	Hr	Min	Seconds	Star Name Ct	Decl	No.	Station	Tel	Obs	Rec	Ph	MR	MT	PE A	PE B	Accur	Ce	S/N	X	Sky St	Sky Tr	C	Temp	G	T	O	R
1	86		8	29	08	04	R		885					9	T	R	E		5	1			1	1	2	9	6	a	a	
2			8	29	08	03	46	2	R			885				1	V		E		1	1			1	1	2	9	6	b	b	
3			8	29	08	03	46	6	R			885				2	V		E		1	1			1	1	2	9	6	b	b	
4			8	29	08	03	52	1	R			885				1	V		E		1	1			1	1	2	9	6	b	b	
5			8	29	08	03	53	9	R			885				2	V		E		1	1			1	1	2	9	6	b	b	
6			8	29	08	03	59	6	R			885				1	V		E		1	1			1	1	2	9	6	b	b	
7			8	29	08	04	02	0	R			885				2	V		E		1	1			1	1	2	9	6	b	b	
8			8	29	08	23	49	2	S		77	621				2	S		S	4	1	1			1	1	2	9		b	b	
9			8	29	08	54	17	0	S		77	639				2	S		S	5	2	1			1	1	2	9		b	b	
10			8	29	09	33	31	9	S		77	662				2	S		S	5	2	1			1	1	2	9		b	b	
11			8	29	08	03	46	5	R			885				1	T		U	3	3	1			1	1	2	9	6	c	c	
12			8	29	08	03	50	0	R			885				2	T		U	3	3	1			1	1	2	9	6	c	c	
13			8	29	08	03	51	5	R			885				1	T		U	3	3	1			1	1	2	9	6	c	c	
14			8	29	08	03	55	0	R			885				2	T		U	3	3	1			1	1	2	9	6	c	c	
15			8	29	08	03	57	5	R			885				1	T		U	3	3	1			1	1	2	9	6	c	c	
16			8	29	08	04	02	5	R			885				2	T		U	3	3	1			1	1	2	9	6	c	c	
17			8	29	08	04	05	5	R			885				7	T		U	3	3	1			1	1	2	9	6	c	c	
18			8	29	08	04	35	5	R			885				1	T		U	3	3	1			1	1	2	9	6	c	c	
19			8	29	08	04	36	0	R			885				2	T		U	3	3	1			1	1	2	9	6	c	c	
20			8	29	08	04	42	0	R			885				7	T		U	3	3	1			1	1	2	9	6	c	c	

* Map name or # HOLLYWOOD, MD. Year 1963 Publisher U.S.G.S. Scale 1:24000 * 85 Aug. Edition

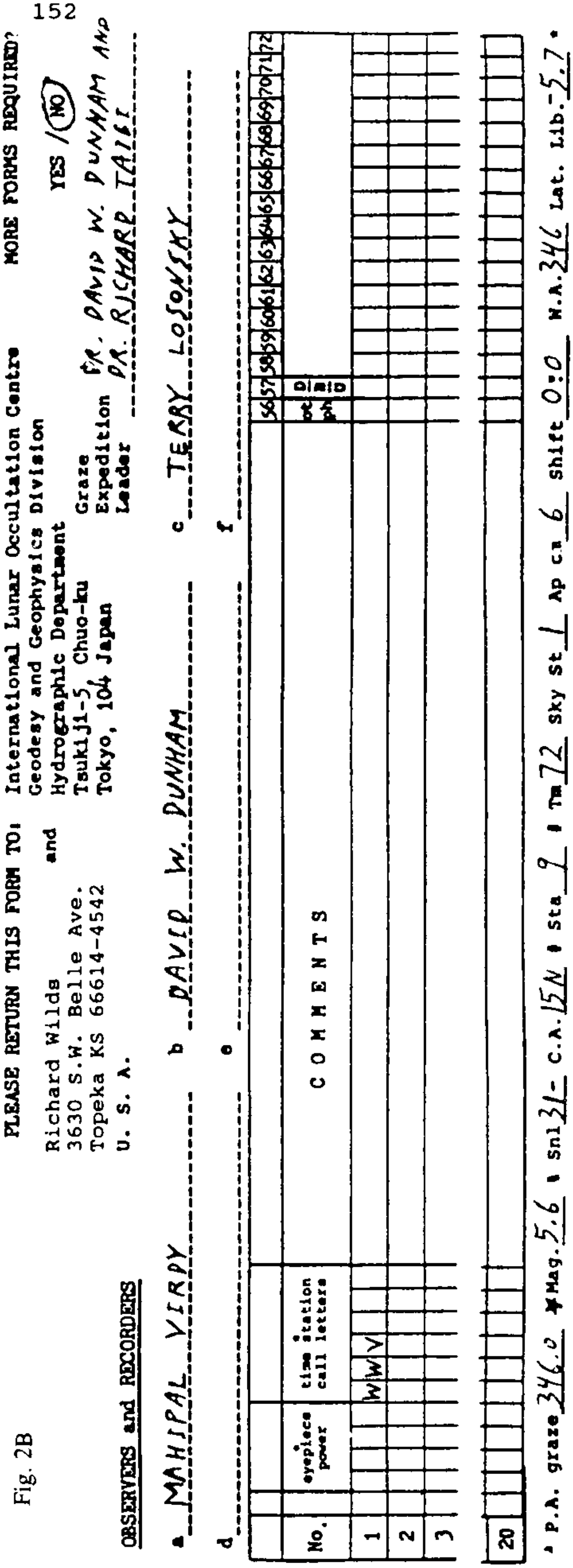


Fig. 2B

34 Longitude East or West of Greenwich.
37-38 Degrees of latitude.
40-41 Minutes of arc of latitude.
43-47 Seconds of arc of latitude.
49 Latitude North or South of the equator.
51-56 Height above sea level, in meters, to 0.1; should be accurate to +/- 30 meters or better. Cols. 55 and 56 can be blank if the height is given to the nearest meter.
57-68 Name or abbreviation of geodetic datum, or other type, of coordinates.
69-73 ILOC station code, if known.
74-78 ILOC telescope code, if known.

3. Observers and Recorders. These are the names of observers and assistants that are given at the top of the back of the written forms. These lines do not need to be specified if ILOC has assigned Station/Tel/Obs/Rec codes for the observer-recorder-station-telescope combinations in question. The format is given below:

Col. 1: Always the letter "O".
Col. 2: Identifying letter, start with "A", a capital letter corresponding to the small letters used on the written form. On the written form, spaces for only 6 names are given, but in the e-mail form, you can use A through Z for up to 26 observers and assistants in a file. Use two or more files if there are more than 26 observers and assistants in the expedition.
Col. 5-30: The observer or recorder's (assistant's) name.
Col. 33-37: ILOC station code, if known.
Col. 38-41: ILOC observer code, if known.
Col. 43-47: Estimated accuracy of latitude, in arc seconds.

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. 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-mail file, and col. S1, S2, and S3 of the written form are typed in col.

76, 77, and 78, respectively, of the e-mail 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 is explained adequately in ILOC's Guide to Lunar Occultation Observations. Remember that either Station/Tel/Obs codes (columns 26-36 of the e-mail file) or T/O letters (in columns 76 and 77) 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 letters, and the corresponding Telescope/Position and Observer/Recorder lines.

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-mail 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. 5-78. The time station call letters requested on IOTA's written form should be specified here only if they are different from those specified in the second footing line described at the end, and should be given as a comment only for the first timing. IOTA is no longer asking for the eyepiece power on the e-mail files sent to them.

5. Footing Data. These consist of two 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.

The format of the first footing (map) line corresponds to the data at the bottom of the front IOTA's form for reporting occultations, and has the following format:

Column Description

1 Always the letter "M".
2 Blank if the positions for all stations were measured from the same map, in which case, you need only one map line. Otherwise, the Telescope/Position letter (same as the letter in col. 2 of the Telescope/Position line) must be specified here, and you need to have as many map lines as there are Telescope/Position lines.
4-34 Name or number of map from which the positions were measured.
36-39 Year of publication of the map.
41-51 Scale of map, left-justified, such as "1:24,000" or "1:50,000".
53-78 Map publisher, such as "U.S.G.S."

The format of the second footing (graze summary) line corresponds to the data at the bottom of the back of IOTA's form for reporting grazing occultations. It should not be included in any report that is not a lunar grazing occultation. The graze line has the following format:

Column Description

1 Always the letter "G".
3- 7 Predicted position angle of central graze, to 0.1 degree.
9-12 Magnitude of star, to 0.1 magnitude.
14-16 Percent of Moon sunlit.
17 "+" for lunar waxing phase, "-" for waning phase, "E" for lunar eclipse.
19-21 Cusp angle of central graze; umbral distance during lunar eclipse.
22 "N" for cusp angle measured from the northern cusp, "S" if it is measured from the southern cusp, and "U" to indicate umbral distance during lunar eclipse.
24-26 Total number of stations in the graze expedition that obtained non-redundant data, not just the number of stations in the file (in case there are more than 26 stations in the expedition).
27-30 Total number of contact timings made during the expedition, counting 1 for certainty code 1 (certain) events, half for certainty code 2 (probable but not certain) events, and zero for certainty code 3 (possible, but probably spurious) events. It is not just the number of timings in the file (in case there are more than 99 timings in the expedition).
32 Maximum sky steadiness (column 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.
34-36 Minimum telescope aperture, in centimeters, reporting any contacts with the maximum sky steadiness given in column 32.
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.
39-41 Observed shift from the current ACLPPP

prediction, in arc seconds, to 0.1.

42 "N" if the observed shadow was north of the predicted shadow, and "S" if it was south of the predicted shadow (that is, the direction of the shift, which is always measured perpendicular to the predicted limit). Leave this column blank if no shift (0.0 shift) was observed.

44-46 Watts angle of center of observed events on the ACLPPP profile, to the nearest degree. It is the Watts angle of central graze if the observations are symmetric on the profile, which is usually the case with dark-limb grazes far from the cusp.

48-50 Predicted latitude libration of the graze. It is given to the nearest 0.1 degree, but the decimal is not typed, its location being understood to be between columns 49 and 50.

52-60 Time station call letters, left-justified, for the time station of ultimate reference (for example, give "WWV" and note in the comments a local AM station, if the latter was used with a master tape including WWV made elsewhere to obtain the timings).

1981 TOTAL OCCULTATION TALLY

Joseph E. Carroll

After many years, here at last is a report on the number and distribution of total occultations observed during 1981. Years 1982 through 1985 will follow shortly. After that, who knows?

During 1981 a total of 153 observers from 20 countries reported 4176 total lunar occultations. Tables 1 and 2 of this article -- one by individual and one by country -- present the ordered breakdown of these occultations.

In the individual list (Table 1, given on the following two pages) Brian Loader of New Zealand is the leader followed by B.F. Sincheskul of the USSR and Robert Hays of the USA.

In the country list (Table 2), the USA leads by virtue of its large number of observers with New Zealand and the USSR second and third. However, from an observer productivity basis (value per observer), the USSR is tops followed by South Africa and then Denmark. Abbreviations used are Reap for reappearance, Obs for observer, and Val for value.

As since 1975, the values (and therefore the ranking) are computed from the formula: Value = Disappearances + C * Reappearances, where C is the ratio of total disappearances to total reappearances for the entire year. In 1981, 4176 occultations were reported of which 1334 were reappearances and 2842 disappearances. That makes C = 2.13043478, which is the factor by which reappearances are weighted over disappearances.

For those of you who might ask, I am, to the best of my memory, retaining the county designations as they existed during the years of observation.

Table 2: 1981 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/ Obs
USA	1110	400	1562.2	28	55.8
New Zealand	828	335	1206.7	19	63.5
USSR	289	114	417.9	3	139.3
Denmark	233	142	393.5	4	98.4
Australia	334	15	351.0	4	87.7
GDR	252	39	296.1	35	8.5
Belgium	235	49	290.4	6	48.4
Poland	187	91	289.9	23	12.6
South Africa	193	37	234.8	2	117.4
Italy	127	20	149.6	3	49.9
Netherlands	76	20	98.6	2	49.3
England	52	31	87.0	2	43.5
Brazil	77	3	80.4	8	10.0
Philippines	66	11	78.4	2	39.2
Finland	41	11	53.4	3	17.8
FRG	41	5	46.7	5	9.3
Mexico	11	8	20.0	1	20.0
Portugal	11	0	11.0	1	11.0
Norway	5	3	8.4	1	8.4
Spain	8	0	8.0	1	8.0
1981 Totals	4176	1334		153	

IOTA ON WORLD WIDE WEB

Rob Robinson and David W. Dunham

IOTA now has a home page (actually, several pages) on the World Wide Web, thanks to work by Rob Robinson of Bonner Springs, KS. It can be accessed with Mosaic or Netscape. The URL for the site is:

http://www.sky.net/~robinson

The site gives basic information on observing occultations, and includes maps of North American grazing occultations and data about asteroidal occultation possibilities during the next two months. A section for last-minute asteroidal occultation updates is included, although in general we prefer to actively notify observers of these updates with messages distributed to their Internet addresses. [Continued on page 157]

Table I, Part A — 1981 Ordered Tally of Total Occultation Observations

Value	Name	Country	Province, City, State	Total	Reap
478.9	BRIAN LOADER	NEW ZEALAND	BLENHEIM	324	137
398.0	B.F. SINCHESKUL	USSR	POLTAVA	277	107
366.4	ROBERT H. HAYS JR.	USA	WORTH, IL	250	103
341.8	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	196	129
291.0	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	152	123
283.7	34 OBSERVERS	GDR	EILENBURG	243	36
239.3	PETER E. ANDERSON	AUSTRALIA	BRISBANE	237	2
228.8	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	187	37
213.4	NOEL T. MUNFORD	NEW ZEALAND	PALMERSTON NORTH	132	72
158.8	M. MATTHEWS	NEW ZEALAND	AUCKLAND	91	60
132.4	MIECZYSTAW SZULC	POLAND	TUCHOLA	77	49
121.6	ADRIANO FILIPPONI	ITALY	ROME	99	20
121.6	PAUL V. MCBRIDE	USA	GREEN FOREST, AK	99	20
114.4	JEAN BOURGEOIS	BELGIUM	FUROOZ	76	34
113.1	RICHARD W. LASHER	USA	CHINA LAKE, CA	60	47
104.0	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	95	8
86.0	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	69	15
76.0	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	41	31
71.1	JAMES H. VAN NULAND	USA	SAN JOSE, CA	70	1
69.3	NEAL D. BLACKBURN	USA	KANSAS CITY , MO	49	18
67.2	LIONEL E. HUSSEY	NEW ZEALAND	CHRISTCHURCH	48	17
62.8	ROBERT L. SANDY	USA	KANSAS CITY, MO	47	14
61.4	JEAN DOMMANGET	BELGIUM	BRUSSELS	58	3
55.2	STEVE J. ZVARA	USA	WHITTIER, CA	45	9
54.1	JUAN D. SILVESTRE	PHILIPPINES	QUEZON CITY	53	1
46.8	DAVID STEICKE	AUSTRALIA	MURRAY BRIDGE	40	6
46.4	PATRICK POTTEVIN	BELGIUM	LIMBURG, HERK-DE-STAD	43	3
46.0	ROGER LAUREYS	BELGIUM	VLIERMAALROOT	46	0
42.7	CARL SCHWEERS	USA	ARDMORE, OK	37	5
41.1	PAUL R. KILBEY	NEW ZEALAND	AUCKLAND	23	16
40.6	RICHARD NOLTHENIUS	USA	MOUNTAIN VIEW, CA	27	12
40.3	JUHANI SALMI	FINLAND	LAHTI	29	10
39.7	PAUL J. NEWMAN	USA	GARLAND, TX	25	13
39.5	HARRY O. WILLIAMS	NEW ZEALAND	AUCKLAND	35	4
39.0	ROGER H. GILLER	AUSTRALIA	ENGADINE, NSW	39	0
36.5	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	32	4
33.4	CARL GRUNNET	DENMARK	VIRUM	21	11
33.3	ROMAN FANGOR	POLAND	WARSAW	22	10
32.3	HARALD MARX	FRG	KORNTAL-MUNCHINGEN	30	2
31.2	RYSZARD DRAZKOWSKI	POLAND	WLOCLAWEK	21	9
28.8	G. HERDMAN	NEW ZEALAND	AUCKLAND	22	6
28.1	ALFRED C. WEBBER	USA	CHADDS FORD, PA	27	1
27.9	ROBERT LASCH	USA	GREEN VALLEY, AZ	20	7
27.3	G.G. COULING	NEW ZEALAND	TAWA	25	2
26.1	GERRY D. ALLCOTT	NEW ZEALAND	AUCKLAND	25	1
25.9	PAUL MAEGRAITH	AUSTRALIA	ADELAIDE, S. AUSTR.	18	7
24.3	CESARIO E. TAGANAS	PHILIPPINES	QUEZON CITY	13	10
21.3	A. WOODGER	NEW ZEALAND	SN120	19	2
21.2	JEAN SCHWRENEN	BELGIUM	MARCINELLE	11	9
21.0	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	12	8
20.1	BARRY MENZIES	NEW ZEALAND	AUCKLAND	19	1
20.0	FRANCISCO DIEGO	MEXICO	MEXICO CITY	11	8
18.0	LUIS GUSTAVO	BRAZIL	RECIFE, PERNAMBUCO	18	0
17.3	PETER MORTENSEN	DENMARK	HADSTEN	15	2
17.0	JORGE POLMAN	BRAZIL	RECIFE, PERNAMBUCO	17	0
16.9	V.N. SINCHESKUL	USSR	POLTAVA	9	7
16.0	BRAD TIMERSON	USA	NEWARK, NY	16	0
15.8	ARKADIUSZ KRAJEWSKI	POLAND	WARSAW	9	6
15.3	PAULO SERGIO BRETONES	BRAZIL	CAMPINAS, SAN PAULO	13	2
15.0	MARCO CAVAGNA	ITALY	MILAN	15	0

Table 1, Part B — 1981 Ordered Tally of Total Occultation Observations

Value	Name	Country	Province, City, State	Total	Reap
14.5	RICHARD P. BINZEL	USA	AUSTIN, TX	10	4
14.4	CRAIG R. PATTERSON	USA	LANCASTER, PA	11	3
13.5	CLIFFORD J. BADER	USA	WEST CHESTER, PA.	9	4
13.3	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	11	2
13.0	SANDRO BARONI	ITALY	MILAN	13	0
12.7	DIETER SCHMIDT	NETHERLANDS	HUIZEN	7	5
12.4	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	9	3
12.1	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	11	1
12.1	JARI HOFFREN	FINLAND	KUOPIO	11	1
12.0	ROBERT KURIANOWICZ	POLAND	WARSAW	12	0
11.4	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	8	3
11.0	DOUGLAS HALL	ENGLAND	LEICESTER	11	0
11.0	JOSE OSORIO	PORTUGAL	VILA NOVA DE GAIA	11	0
10.1	JANUSZ BANKOWSKI	POLAND	BEKCHATOW	9	1
10.0	DON M. STOCKBAUER	USA	HOUSTON, TX	10	0
9.5	RYSZARD SZUJECKI	POLAND	WARSAW	5	4
9.4	STAWOMIR CHOREK	POLAND	BELCHATOW	6	3
9.0	FELIPE SAMPAIO	BRAZIL	RECIFE, PERNAMBUCO	9	0
8.4	ROAR HANSEN	NORWAY	BERGEN	5	3
8.3	H.F. DABOLL	USA	ST. CHARLES, IL	6	2
8.3	A.W. DODSON	NEW ZEALAND	OTAKI	6	2
8.3	MICHELLE L. KLEINRICHERT	USA	AUSTIN, TX	6	2
8.0	JOSE RIPERO OSORIO	SPAIN	MADRID	8	0
7.3	EBERHARD BREDNER	FRG	MARDERWEG	5	2
7.1	WAYNE OSBORN	USA	MT PLEASANT, MI	6	1
6.3	MAREK ZAWILSKI	POLAND	LODZ	4	2
6.1	DENNIS L. HALL	USA	DEXTER, ME	5	1
6.0	JOHN A. CHURCH	USA	PRINCETON JCT., NJ	6	0
6.0	MARK GINGRICH	USA	OAKLAND , CA	6	0
6.0	JAN HERS	SOUTH AFRICA	SEDGEFIELD, CAPE PROV.	6	0
6.0	JOAO RODRIGUES	BRAZIL	RECIFE, PERNAMBUCO	6	0
5.3	DANIEL FILIPOWICZ	POLAND	OTWOCK	3	2
5.3	KRZYSZTOF ROCHOWICZ	POLAND	OLSZTYN	3	2
4.1	JERZY LUKASZEWICZ	POLAND	WARSAW	3	1
3.1	HEINZ KUCK	FRG	KENTROPERWEG	2	1
3.0	DAVID ARGANBRIGHT	USA	MT PLEASANT, MICHIGAN	3	0
3.0	MARTIN GUTEKUNST	FRG	STUTTGART	3	0
3.0	V.N. MAZHOROVSKI	USSR	POLTAVA	3	0
3.0	D. MCDONALD	NEW ZEALAND	BLACK BIRCH	3	0
2.1	KRZYSZTOF MASLOWSKI	POLAND	WARSAW	1	1
2.1	DARIUSZ MILLER	POLAND	WARSAW	1	1
2.0	STEFAN CZECH	POLAND	OPOLE	2	0
2.0	THOMAS JOHNSON	USA	MT PLEASANT, MICHIGAN	2	0
2.0	MIROSTAW KUBIAK	POLAND	GRUDZIADZ	2	0
2.0	EDUARDO C. LINS	BRAZIL	RECIFE, PERNAMBUCO	2	0
2.0	G. PATTERSON	NEW ZEALAND	CHRISTCHURCH	2	0
1.0	ZBIGNIECS BINIENDA	POLAND	BYDGOSZCZ	1	0
1.0	BLAZEJ FERET	POLAND	LODZ	1	0
1.0	MICHAEL GALLAGHER	NEW ZEALAND	TAWA	1	0
1.0	MICHAEL HANDSCHUH	FRG	STUTTGART	1	0
1.0	PER KRAMER	DENMARK	HADSTEN	1	0
1.0	DARIUSZ KROLAK	POLAND	WLOCLAWEK	1	0
1.0	TOMASZ KWIATKOWSKI	POLAND	BYDGOSZCZ	1	0
1.0	RALPH LOADER	NEW ZEALAND	BLENHEIM	1	0
1.0	JEAN MEEUS	BELGIUM	ERPS-KWERPS	1	0
1.0	ZBIGNIEW RZEPKA	POLAND	POZNAN	1	0
1.0	MATTI SUHONEN	FINLAND	HELSINKI	1	0
1.0	SEVERAL OBSERVERS UBA	BRAZIL	PORTO ALEGRE, RS	1	0
1.0	STAWOMIR WOJCZUK	POLAND	LODZ	1	0
1.0	HANNA WOJTAS	POLAND	KIELCE	1	0

Also, some grazing occultation reduction profiles are included. We are adding material as time permits.

Some of the IOTA general information on grazes and asteroidal occultations has also been included in Web pages set up by Ray Sterner in the Space Dept., Group S1R of the Johns Hopkins Univ. Applied Physics Laboratory, in a grouping called Central Maryland Amateur Astronomy. It includes information about planned local graze and asteroidal occultation expeditions planned in the Maryland-Virginia area.

ACCURATE "LAST-SECOND" CCD ASTROMETRY FOR ASTEROIDAL OCCULTATIONS

David W. Dunham

The growing number of amateur and professional observatories with CCD systems that are connected to PC's are encouraged to help update asteroidal occultation predictions during the night preceding the event when both the star and asteroid can be imaged in the same CCD field. Those who are now involved in this IOTA-organized program need to be augmented with more observers with a greater geographical distribution; for example, weather (mainly) and other problems prevented any updates from being obtained for the May 12th occultation by 74 Galatea whose nominal path crossed the USA centrally from Washington state to Florida. Those with such systems who do not already have astrometric software packages that use the GSC to quickly determine the J2000 R.A. and Dec. of the objects can get information about these from the individuals below who have already contributed observations for astrometric updates to this IOTA-organized program; the Internet address is given following the location:

Dennis DiCicco, Sudbury, Mass.;
dicicco@cfa.harvard.edu
Petr Pravec, Ondrejov, Czech Rep.;
ppravec@asu.cas.cz
John Rogers, Camarillo, Calif.;
72401.3174@compuserve.com
Fiona Vincent, St. Andrews, Scotland;
fv@st-andrews.ac.uk
George Viscome, Lake Placid, New York;
73023.561@compuserve.com

The idea of last-second astrometry using narrow-field CCD's (rather than the more warning one gets from "last-minute" astrometry that can sometimes be made using wider-field photographic plates) was first described in **ON 6** (5), pp. 112-114. The title for that article should have been "Last Second Astrometry . .", not "Last Minute Astrometry . .". Although the Eugenia occultation described below was not observed, it was the first time good last-second astrometry was obtained from two observatories. A poor distribution of GSC reference stars resulted in discordant predictions when two last-second astrometric observations were obtained to update the April 22nd occultation by 106 Dione.

George Viscome at Rand Observatory, Lake Placid, NY, obtained 5 CCD images of GSC 1385 00541 and 45 Eugenia 0.6 hour after the May 4th occultation, and my reduction of them shows that the path was only 0".04 north, or 3/8th path width north, of Edwin Goffin's nominal prediction shown on my map in the February issue of Sky and Telescope, with the time correction only +0.1 minute. This path crossed over northern Quebec, southwestern Labrador, and over western and southern Newfoundland, including Cape Race just south of St. Johns', which was probably near the northern limit. This path was only 0.4 path width, or about 110 km, south of the prediction from Petr Pravec's "last-second" astrometry obtained 6 hours before the event, and I think vindicates the general concept of "last-second" astrometry (although some actual occultation observations would do that even better).

The different predictions relative to the nominal prediction, and relative to Viscome's prediction (actually, "postdiction"), are below:

Obs. Date May.UT	Rel.to occ'n, days	Dist. from star	Observer	Relative to Viscome Separation "	Widths	Time, min.
2.83	-1.26	20.4	Pravec	+0.15	+1.4	-0.1
3.20	-0.89	14.4	Rogers	+0.28	+2.6	0.0
3.82	-0.27	4.4	Pravec	+0.04	+0.35	+0.1
4.12	+0.02	0.4	Viscome	0.00	0.0	0.0

There seems to be a southward shift in the path with time, perhaps due to the GSC-based reference frame being skewed. So in the future when observations with a similar distribution of distances from the star are available, it might be possible to extrapolate to the event time to get a more accurate prediction. But we shouldn't depend on that too strongly, since the mean error of Viscome's path is ±0".03 from the statistics (some of this might be due to his positions being reported only to a precision of 0.01s in R.A. and 0".1 in Dec.). The predictions might be even better for some of the future events where the motion is slower.

Pravec's observations on May 2.8 consisted of separate observations of the star and Eugenia; the two objects were not yet close enough together to appear on the same CCD frame, but many of the same reference stars could be used.

Rogers' observations were made with a smaller

telescope that had a wide CCD field, allowing both objects to be imaged on the same frame. Although the results are less accurate, the increased warning time provided can be valuable, and the wide field of such systems can be used in the future to obtain additional non-GSC field star positions for reductions of narrower CCD fields, and link separate narrow CCD fields of the target star and asteroid.

Pravec's message giving his May 3.8 observations, 6 hours before the occultation, was sent about an hour after the observations were made. Unfortunately, it arrived at our fileserver at 5:17 pm local time, and the PC that handles my e-mail had been shut off for scheduled power maintenance at 5:00 pm. The power was restored shortly after 9 pm, about an hour and a half before the event, but by then I was 50 miles away setting up to video record a grazing occultation that occurred about 40 minutes before the Eugenia appulse (the graze was quite successful). So I received those data the morning after the event.

Meridian circle observations also give promise for updating asteroidal occultations, and can give much more warning, even weeks, than CCD observations. For the 654 Zelinda occultation in the USA in January, meridian circle observations made at USNO-Flagstaff were used by Larry Wasserman to predict the path of the occultation, which was observed from two stations, to an accuracy of 0".02 or so. Unfortunately, three photographic exposures made at Lowell Obs. the night before the event indicated a path about two path-widths (almost 0".3) farther south, and most mobile observers set up according to this erroneous information. Meridian circle updates require that the target star and asteroid be visible on the meridian in a dark sky during the weeks before the event (so the solar elongation of the event should be greater than 90°), and the asteroid must also be bright enough to observe with the meridian circle telescope. After Zelinda, we are becoming more distrustful of photographic astrometry, which has been used to improve the predictions for many other past events (some quite successfully). But photographic observations are more difficult to make than CCD observations, although they have the advantage of being able to use accurate PPM reference stars rather than the much less accurate GSC reference stars, if the field size is large enough.

Another approach to astrometry is described in an article, "Minor Planet Astrometry with a Flat Bed Scanner and a Quadratic Reduction Procedure", by Paul Comba; 1411 Galaxy Lane; Prescott, AZ 86303; published in **The Minor Planet Bulletin, 22** (2), pp. 13-15 (1995 April). He describes using a 35mm camera with a 2800mm focal length telescope. A high-precision flat bed scanner, with 1200 dots per inch now available for about $600, is used to scan an enlarged print of the photo. Finally, he describes quadratic reduction software that, with his system, gives smaller mean errors than standard linear reduction algorithms.

LET'S CATALOG ALL OBSERVATORIES FROM WHICH ASTEROIDAL OCCULTATIONS MIGHT BE OBSERVED

David W. Dunham

IOTA is trying to identify and measure coordinates of all observatories from which these events might be observed, since more observed chords give better resolution of an asteroid's shape. Portable telescopes not in observatories are also included, as long as they are equipped with suitable finders so they can be used to find at least 9th-mag., and preferably 10th-mag., stars. Any observer who can find variable stars and obscure deep-sky objects can also locate asteroidal occultation target stars and can contribute to this program. E-mail addresses of potential observers are useful, since e-mail is the most efficient means of notifying large numbers of observers about last-minute updates in the predictions. These events can be predicted most accurately when the objects are in the same CCD field of view usually only a day or so before the event (Do I have YOUR e-mail address? If not, please send it to David_Dunham@jhuapl.edu). Those with e-mail are encouraged to obtain positions and telephone numbers of other observers in their area who do not have e-mail, and those without e-mail are encouraged to find a friend or colleague who has e-mail and would be willing to pass on time-critical information. Although intensified video, photoelectric, and CCD observations are preferred, visual observations are also needed from as many locations as possible to get a dense enough set of observations to trace the asteroid's profile. Visual timings can be made with simple equipment such as tape recorders and camcorders (essentially used as tape recorders). If you, or someone you know, can contribute to this effort, please contact me, preferably by E-mail. The IOTA occultation line at 1-301-474-4945 can be used to obtain late updates for possible events in your area, especially when lack of time or other circumstances prevent direct e-mail notification (for example, if you only have e-mail access at your office and the update doesn't become available until the evening of the event).

The May issue of **Sky and Telescope** contained, on p. 74 with finder charts of 3 potential May occultations, a brief request for e-mail addresses for update notification. About two dozen have responded to that relatively

inconspicuous request, and I hope to be able to add many more during the coming months. Members of IOTA should be aggressive in identifying potential observers in their region, and providing me with at least their approximate coordinates and, when available, e-mail addresses. For prediction purposes, and for reporting most appulse observations, coordinates accurate to a minute of arc (about a mile or 2 km) are sufficient, and can be obtained in the USA by knowing the name of the nearest town, and the approximate north-south and east-west distance from its center. I have a database of the longitudes and latitudes of all cities and towns in the USA, and would be interested in obtaining similar files for other countries.

Local observers can be told that the sizes and shapes of asteroids can be determined from timings of occultations of stars from two, or preferably many more, locations. To encourage them, show them an example of a sky-plane plot showing observations of an asteroidal occultation, such as one of the unusual M-type asteroid 216 Kleopatra shown on p. 73 of the January 1992 issue of **Sky and Telescope**. Basic information about the better events expected for North America during 1995 have been published in an article on pages 72-74 of the February issue of **Sky and Telescope**, which also includes finder charts for these events in their Celestial Calendar section each month there are events predicted.

I already have several files of stations, starting with the file of IOTA stations used for our current grazing occultation predictions. I also have a file of stations from which photoelectric occultation recordings have been obtained or attempted, IOTA/ES stations, old IOTA stations, the observatory list in the **Astronomical Almanac** (supplied by Marie Lukac at USNO), and stations from which asteroidal occultations (and some misses) have been observed in the past. But the largest file is the station file ("p-file") created at USNO for analysis of lunar occultations, and for "Evans" lunar occultation predictions. It includes stations from which lunar occultations have been observed even more than two centuries ago, as well as recently-added stations. These files use four different formats. A standard format or database needs to be established. For asteroidal occultations, I have begun editing a copy of these files, appending a flag that indicates a station whose owner (or user) can be notified by e-mail and/or one who has photoelectric and/or video recording capabilities. Eventually, the different files need to be combined and sorted in longitude order to eliminate duplicates. Then there will be a long process of removing inactive stations, as well as adding new ones as described here. For both tasks, I will need the help of local and regional coordinators. The resulting file will be used by my "kloem" program that computes the distance of each station from an updated asteroidal occultation path, then sorts the list by distance from the updated line, and also gives the updated time of closest approach for each station. This is valuable for coordinating coverage of these events, identifying those that should be notified and allowing targeting of mobile observers to gaps in the fixed-site coverage of the event.

A good example of what should be done is given by Paul Maley's and Paul Hanagriff's article for Houston-area observers below.

THE BIGGEST TELESCOPES IN THE HOUSTON AREA

Paul Maley and Paul Hanagriff

For years there has never been a comprehensive summary of the biggest scopes in the region. Now there is. The map shows the location of a selected group of strategically placed telescopes that we know of as of November 1993. **We would like to appeal to readers of this article who know of anyone with a 12 inch or larger telescope located in a place within the confines of the map to contact Paul Maley at 4886871 so that we can add the telescope location to the list.** Since some telescopes are located so close to each other we elected not to plot everyone, but each telescope site we know of that is either in existence or on the drawing board is plotted. Of great importance are areas in which there are no telescopes known to exist: between site #6 and Huntsville, between Houston and Beaumont, between site #7 and College Station, between Porter and Lake Livingston, between Angleton area and Bay City.

Vital projects to observe eclipses of stars by asteroids hinge on a geographic distribution of telescopes. By knowing the locations of the observatories and homes of amateur astronomers we can contact those persons in critical areas so that they can contribute useful information that might help us successfully map the shape and size of a minor planet. Such programs also depend highly on mobile observers; but because some scopes are so large that they cannot be transported, this map will help us to identify those critical resources. If you would like to see your site added to this list, please call us.

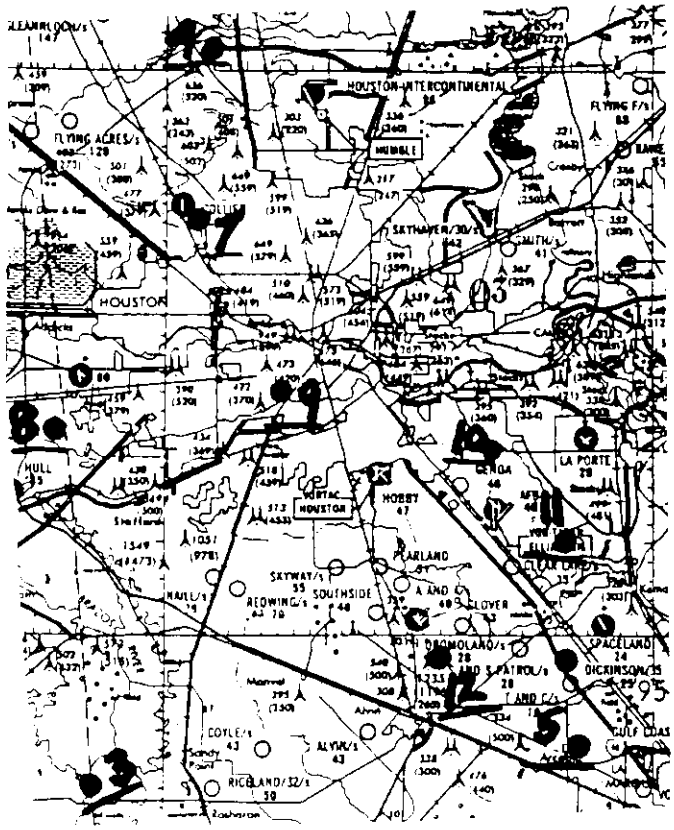
To be of value to a project like this you need to have a sizable telescope, be able to find a 9th or 10th magnitude star using star charts such as those published in **Sky and Telescope** for asteroid occultation events, have a portable tape recorder (or camcorder that can be used as a tape recorder, ignoring the video) and most importantly a short wave time signal receiver.

To make the scientific value of observations more effective we have conducted a Global Positioning System

satellite survey of local Houston area observers. Information below describes the name of the location, instrument apertures there (in inches) and the respective latitude and longitude (degrees, minutes, seconds) based on the GPS readings conducted mainly by Paul Hanagriff. At least 4 satellites were simultaneously used to provide the instantaneous solution. In some instances we were not able to measure the exact locations because observers did not provide the information to find their site.

A couple of observers will eventually have larger telescopes and so we have included their sites here. We want to thank Houston Lighting and Power Co. for allowing us to utilize their portable GPS receiver over a period of many weeks.

[ed. Only a part of the table and map are shown here, just to give an idea of what was done. With some planning, it is not necessary for each observer to have a short-wave radio. If someone makes a master tape by tape recording short-wave time signals and an agreed-upon strong standard broadcast AM station, then others throughout the region can record the AM station as a calibrated time base. Comparison with the master tape will allow determination of the U.T. times of each event recorded by others who used the AM station. This technique has been used successfully during many grazing occultation expeditions.



NAME	NUMBER ON THE MAP	SCOPE SIZE	LAT	LON
GEORGE OBSERVATORY	3	36,17,13	29°22′30″	95°35′37″
DANCIGER OBSERVATORY	1	32	29 15 42*	95 51 54
LLOYD OVERCASH	4	25,28,14	30 01 24	95 27 43
BILL CHRISTIAN	15	25		
ANDY SAULIETIS	5	24	29 24 51	95′05 40
KEN DRAKE	6	24,13	30 10 45.4	95 24 20.7
LARRY MITCHELL	7	36 SOON 24	29 51 50	95 28 37
BARBARA WILSON	8	20,13	29 41 11	95 35 57

BILL REIDENOUER		11	29 23 56	94 55 44
PAUL HANAGRIFF		10	29 31 53	95 09 47
DICK MILLER		10	29 34 45	95 03 55
JAN RAILSBACK		10	29 34 27	95 08 44

* = means it is not a GPS position

This article was written several months before the ones on use of GPS given on pages 126-135 of the last issue, so the authors did not know the limitations of GPS measurements when the Houston area survey was made. Single GPS measurements are satisfactory for prediction purposes (and this must be stated when the coordinates are reported), but they are not accurate enough for reporting observations, especially for lunar events. After observations are made from a site whose positions have been determined from single GPS measurements, a more accurate position should be determined either by measuring an accurate topographic map, differential GPS measurements, or averaging several hours of single GPS receiver measurements.]

DIFFERENTIAL CORRECTIONS INC.

Joan Bixby Dunham

The basic conclusion of the articles about the Global Positioning System (GPS) on pages 126-135 of the last issue is that, unless one can accumulate data for several hours at a site, differential GPS (DGPS) measurements are needed to meet IOTA's positional accuracy requirements. A relatively inexpensive system for accurate (DGPS) measurements is now, or soon will be, available in many areas of the world. The system depends on DGPS information broadcast on the sub-carriers of many FM radio stations, now 144 in the USA. A receiver sold by Differential Corrections, Inc. (DCI) connects to a TTL or RS-232 port on a differentially ready GPS receiver. The special FM receiver (RDS-1000 or RDS-3000) sells for $375, while the lowest-accuracy basic (10m) DGPS service costs $75/year. This is less than the 30m requirement for positions of occultation stations and also less than the 45-foot national map accuracy standards of 1:24,000-scale topographic maps in the USA. This could certainly help graze observers, but the system will not work for some distant expeditions beyond the range of the FM stations that use the system (this will become less of a problem as more stations are added). Complete, or nearly complete, coverage is planned for several other nations, including Germany, Sweden, the Netherlands, and the U.K., and extensive networks will also be set up in Australia and Canada. More information can be obtained from DCI; 10121 Miller Ave., Suite 201; Cupertino, CA 95014; phone 1-800-446-0015; fax 1-408-446-8383; the European office can be contacted at 44-428-661229, fax 44-428-642187.

Before investing very much in DGPS, one might want to see if anything develops from a recent strong recommendation to turn off S/A, given in a National Academy of Sciences report to the U. S. Congress, "The Global Positioning System, a Shared National Asset: Recommendations for Technical Improvements and Enhancements". If that happens, then the accuracy of even the relatively inexpensive navigation GPS receivers would drop below the IOTA requirement of 30m without the need for differential measurements.

A good general article discussing the accuracy and availability of GPS by Bill Brogdon has been published on pages 39-45 of the 1995 issue of **Ocean Voyager**, which is an annual publication of a bimonthly magazine called **Ocean Navigator**. IOTA member Mark Trueblood has published another interesting article in the June issue of **GPS World**, pp. 33-40, "Avoiding Clouds: GPS Keeps Astronomers under Clear Skies". It discusses some of the new GPS - map display software and the possibilities for overlaying weather satellite images on such maps, not trivial due to differences in the map projections used. **GPS World** is distributed without cost to qualified professional workers.

PRIORITY ASTEROIDAL OCCULTATIONS

David W. Dunham

Astrometric updates have been requested for the asteroidal occultations listed below. Most valuable are meridian circle observations (events suitable for these are indicated with an "x" under the "M" column of the 2nd table) and sidereal-rate strip CCD observations (with an "x" under the "S" column, for events with small motion in declination). "V" after "asteroid" is the predicted V-mag. of the asteroid at the time of the occultation. The 3rd table specifies the approximate location. There are no useful events in June or August. A list covering October through December will be given in a later issue. More details about these can be obtained from Edwin Goffin's charts. Charts for a few new 1995 events, mainly occultations identified by Larry Wasserman at Lowell observatory and not given in the supplements distributed late last year, are either enclosed or will be sent soon separately.

1995 Event Date	U.T.	Asteroid	V	Star
Jul 1	3:50	88 Thisbe	10.4	PPM 237754
Jul 6	9:00	1567 Alikoski	15.6	SAO 147546
Jul15	4:51	37 Fides	12.8	SAO 158085
Jul15	5:01	3566 Levitan	17.2	GSC555200938
Jul20	1:46	146 Lucina	13.8	SAO 099387
Jul23	16:50	5145 Pholus	18.0	GSC144001954
Jul31	6:46	387 Aquitania	9.8	PPM 238914
Sep 8	20:47	29 Amphitrite	10.6	PPM 094556
Sep23	1:30	387 Aquitania	10.9	PPM 736636

Date	UT h	Star mag.	R.A. (J2000) h m s	Dec. ° ′ ″	M	S
Jul 1	3	9.9	204000.296	-152443.85	x	
Jul 6	9	5.8	005843.878	-112247.75		x
Jul15	4	7.5	134059.698	-124658.62		
Jul15	5	10.8	134055.080	-124915.80		
Jul20	1	7.4	105908.269	+174936.53		
Jul23	16	11.9	114008.790	+222304.50		
Jul31	6	10.5	212931.023	-180647.47	x	
Sep 8	20	8.3	054035.783	+285836.74		
Sep23	1	9.6	210618.157	-280042.04	x	

Date	UT h	Notes & nominal region of visibility
Jul 1	3	Iberia, Labrador
Jul 6	9	Star= ϕ4 Ceti. Nevada to the Carolinas
Jul15	4	s.e. Canada
Jul15	5	n.w. USA A curious nearby double event with previous one
Jul20	1	Mexico City, Central America
Jul23	16	Chiron object South Africa
Jul31	6	s.e. Manitoba, central USA, cen.Mex. Poor for visual observers
Sep 8	20	Ukraine, Belarus, W. Russia
Sep23	1	Ontario, Mid-Atlantic USA, e. Venezuela, near Sao Paulo, Brazil

1995 APRIL 29TH ECLIPSE, SOUTHERN LIMIT

Paul D. Maley

We succeeded in getting excellent bead data at 2 sites (0.2km apart) along the south edge [of the path of annularity near Iquitos, Peru]. Skies were perfectly clear at eclipse time and both videos were with CCD's, one with a C5 (P.Maley & J.Palmer) and the other with a Meade 4 (R.Nugent). Base site data were taken by A. Sims and L. Sims from the Amazon Camp, while J. Palmer recorded all rover site files with a second Trimble Navigation GeoExplorer. WWV was poorly received on 15MHz. The site spacing was necessary due to logistics and other factors in the area along the Napo River. It is interesting to note that about 5.5 hours after central eclipse it began to rain and did not cease until 18.5 hours later! All data are being sent to Trimble today for analysis. This will also be a test of long range Trimble base station software reduction techniques that are being attempted using base sites in Puerto Rico, Miami and Chile to compare with our rover data. We do not yet know if this will succeed. [ed. A 3-page article giving a more thorough description of this expedition, "Ring Eclipse in the Rain Forest", by P. Maley, has been published in **The Philastropher, 21** (9), pp. 7-9 (June 1995; published by the San Antonio Astronomical Association; PO Box 701261; San Ant., TX 78270.]

37 FIDES-3566 LEVITAN DOUBLE EVENT

Alister Ling

As a member of the yet-to-be-successful-aster oid-occultation-gang in the Edmonton Centre RASC, I was looking at a simulation of the July 15th 37 Fides event to check out the starfield. Using the Guide v3 software, I confirmed the possibility of the event, but much to my surprise, I noticed that the faint asteroid 3566 Levitan would possibly occult a 10.8 mag. (from the GSC) field star only 3′ away, within a few minutes of time of the 37 Fides event! I realize that the main event will be tough to begin with, since it will occur in bright twilight, but our group does sport several telescopes larger than 30cm. It may be worth looking into, if just for the possibility of a double event (of a different kind). Quite the coincidence, pity about the sky brightness.

Edwin Goffin's plot of the Levitan occultation is truly remarkable. The Levitan event will take place 10 minutes after the Fides event, and the nominal Levitan occultation path is only about 200 km south of the Fides path on the fundamental plane. The uncertainties are enough that the Levitan occultation might really be seen from the Fides occultation path! But with a diameter of 10.5 km = 0.″01 and max. duration of only 0.7 seconds, the chances of really seeing the Levitan occultation are very small. The motion of Levitan is also almost in the same direction as Fides, but with a parallax of 4.″19, Levitan is closer, compared with Fides' value of 3.″15 on July 15. [There is no need to include a chart for this event, since the star is shown on the Fides plot on p. 25 of the 1995 Planetary Occultation Supplement to **ON** for North American Observers distributed last December. The Levitan target star, GSC 5552 0938, is just inside the circle drawn around SAO 158085 (the Fides target star) and mainly south, and a little west, of SAO 158085, at J2000 coordinates R.A. 13h 40m 55.08s, Dec. -12° 49′ 15.″8. The path is parallel to that for Fides and nominally passes a little south of Seattle. Δm is 7.2 and μ is 35.″95/h. According to a new orbit for Fides computed by Edwin Goffin last year, the path for the occultation of SAO 158085 will miss the Earth's surface by 0.04 Earth radius or 0.″14, less than the possible error in the star's position so that an occultation is still possible in southwestern Canada, but now less likely. Also using the new orbit given in **Minor Planet Circular** 23598, Jim Hart of Pickering Anomalies confirms the new calculations by Goffin for both events.]

1995 APRIL 29TH ECLIPSE, NORTHERN LIMIT

Patrick Poitevin, Chairman, Eclipse Section,
Vereninging voor Sterrenkunde, Belgium

I am just (a few hours) back in Belgium from my Ecuadorian adventure to the northern limit of the April 29th, 1995 annular solar eclipse. Believe it or not, but the story below is not fiction, it is a true story...

April 19 and two days before departure to Quito, the capital of Ecuador, I received a request to observe near the northern edge of the annular eclipse. The German [IOTA/ES] expedition cancelled their trip, so no other station was intented to be in the southern part of Ecuador or anywhere near the northern limit. Paul Maley with his group would be on the southern line in the north of Peru. At that time, I did not have the detailed northern limits, an accurate map, a GPS or a decent WWV receiver. Actually, for all previous eclipses I tried to be as close as possible to the maximum line and did meteorological and photometric measurements. The receiver I had was not a portable one and also a GPS receiver could not be taken from any colleague in Belgium. Everyone found it too risky considering the way I was travelling, not to mention that the location was near a disputed border area.

The night before departure I received the corrected lines from Alan Fiala via David Dunham and had telephone contact, direct with the Belgian Embassy in Quito, which would help me out with accurate maps and eventually a decent radio receiver and GPS. I could leave in peace...

The first 3 days in Ecuador I prepared the line on the acurate maps I got from the Military Geometric Institute. Of course I could not get any maps of the disputed border area. I had contacts with the Observatory of Quito and also with some people of the University, but no one could give me a decent time receiver or even a GPS. The receiver the observatory had, received the signals during the night only, was about 2 meters tall and could not be transported. The clock telephone did not work either and the radio did not send out time signals either.e-mail was known at the University, but not installed yet and GPS receivers were only used by the Military, which did not trust the whole situation. Certainly not when I spoke about a second station in the north of Peru. No one had the intention of going to the central or even the northern line of this eclipse due the the absence of funds. Ecuador is currently in a deep economic recession where scientific work, like eclipses, is of no value. The topic of every day was the conflict situation and the war with Peru.

In spite of all the above, the weather forcast was dramatic, so I headed southward. I changed plans and instead of Guayaquil, where I would visit and take clothes and toys to a Plan International child, I went to Cuenca. I had some friends in Cuenca who could probably help me. However, neither there, nor at the University, was a shortwave (for time signals) or GPS receiver available. I gave two amateurs, who wanted to go to the central line, some filters and exact data about the location. It was sad to see how little these people had for equipment, or even information about the eclipse. They thought the central line was in Loja. But this was closer to the northern edge.

I went farther south, to Loja and again, contacted the University. Same story as before. But I went to the calculated northern limit. I took all the advice given by David Dunham, and went a little north of the predicted line, considering the altitude (1700 meters). Having the position measured as accurately as possible, I selected a location that could easily be found again. On that spot the line crossed a small road and a spring (Quelle de la Concha) near a small village, San Pedro de la Bendita. This was the place to be. The digital clock I had would do for the timings and would be adjusted to time signals after the eclipse. I tried several times to catch the radio time beeps or the clock telephone. Timings of every picture would be recorded on tape.

With a bus I went from Loja to Catamayo, some 20 kilometers farther. Then a camionetta (pick-up) to San Pedro, and the last stage, some 2 kilometers walking to the line crossing. An ideal spot to do the work I had never done before, but for which I was happy to be of any assistance. But the weather gods were not on my side. The sky stayed cloudy for days with only occasionally the Sun being visible. The day before, I inspected the observation site at the same time as the eclipse and indeed, the Sun would be seen far above the small mountains. But clouds prevented seeing it. San Pedro de la Bendita has a microclimate that could be compared with the climate of Vilcabamba. Vilcabamba has many more tourists, but also at San Pedro, people have lived for more than a hundred years. Of course, the short period I would be there would not reflect on me. Although, ... , I was dreaming about the year 2057, when there will be 2 total eclipses and one annular eclipse (in one year!). Then I will be 99 years old. Would not that be great!

I was very curious about the line that I had drawn on the map and if the Baily's beads would be optimal at this spot. The morning of the eclipse, unbelievable but true, it was a blue sky. I went to the spot as described above (from Catamayo where there was a small accommodation) and installed all my equipment, a C90 (f=1000mm) telescope. A half hour before first contact, clouds disturbed the view and it became worse. In the camera I could hardly follow the eclipsed Sun. The

eclipsed Sun could be seen through the heavy clouds directly without filters. Now and then, there was a strong wind and it changed the pattern and flow of the heavy clouds. The recorder for registering the timings of the pictures could be tested. The microphone did not function anymore. The transport in Ecuador was very rough on this equipment and there was no way to fix it. I could not remember the number of the next plan to which I had to switch, but I decided to take pictures at a fixed interval. Every 5 seconds a picture of the Baily's beads would be taken and could be used for analysis later.

Only ten minutes to go to central eclipse and suddenly the clouds dissapeared and a magnificent blue and transparent sky appeared. The light intensity and meteorological measurements I made at previous eclipses had not been done, but it was obvious it was becoming darker. The small crescents were visible under the tree on white paper and on the ground. It would not take long now. At that time, I was still wondering if the predicted northern limit line was correct or not.

Yes indeed! A super view of the broken annulus, the Baily's beads were visible.Whereas the ring on the bottom part of the Sun was thicker, the upper part was very thin, small and broken. This was beautiful; this was nice. I had seen annular eclipses before, but this was as beautiful as the total-annular I had seen on May 30, 1994 in the States. I did not know why such a small crew of "crazy people" always went to the southern and northern limits of an eclipse... Now I knew. As programmed, I would take a picture on an exact timing of 5 seconds one after another. All went well and the eclipse could be followed under ideal circumstances. This was really beautiful and I was lucky the sky became blue just 10 minutes before maximum. Before and after maximum, I tried to find Venus and Mercury, but the sky was not dark enough. I have to admit, I did not spend that much time looking for them. A half hour after maximum, the weather changed again and the sky became cloudy... This was unbelievable! Of course I was hoping all pictures went well and the analysis by David would be succesful too. My only concern was adjusting the digital clock to a decent time signal.

Making this story complete, and it still is a true story, the same week I travelled to the Galapagos for a couple af days. Till that time, I still was not able to adjust the digital clock. San Cristobal is a quiet island. So when the clock dropped on the floor, and exploded into several pieces, all animals woke up... I did not have a decent time reference anymore. It was the day before I would go to Quito and back home. I believe I was a little too lucky with all the above?

I still hope the pictures are succesful and maybe something can be done with the interval shots of Baily's beads [ed. There is a chance of this, but it will take some work. We recommend a backup time reference with a digital wristwatch with seconds display, set to time signals before the trip and calibrated when possible after the eclipse. This is sometimes useful for grazes as well.] I certainly will take into consideration, with the next annular eclipse, to be on the edge of the path of annularity. Of course, the spectacle of the totality I will not miss.

OTHER ECLIPSE NEWS

David W. Dunham

1995 Oct. 24, total: Efforts to observe this eclipse from near the edges of the path of totality in India are being organized by Paul Maley (whose main group will be near the central line near Agra, but with at least two observers setting up near one of the limits, probably the northern one) and Hans Bode. If you are interested in joining these efforts, contact Paul at the address or phone on p. 144 or Hans at the address and phone on the last page, or by e-mail at bode@kphunix.han.de. Dr. Narayan Rana at the Inter-University Centre for Astronomy and Astrophysics in Pune is also organizing Indian observers to time the contacts near the path edges. He is chairman of the Scientific Advisory Committee of the Confederation of Indian Amateur Astronomers, a new umbrella organization for 50 amateur astronomical societies active in India. Dr. Rana is planning to set up an extensive network of simple photometers to bracket each limit at 50m-intervals.

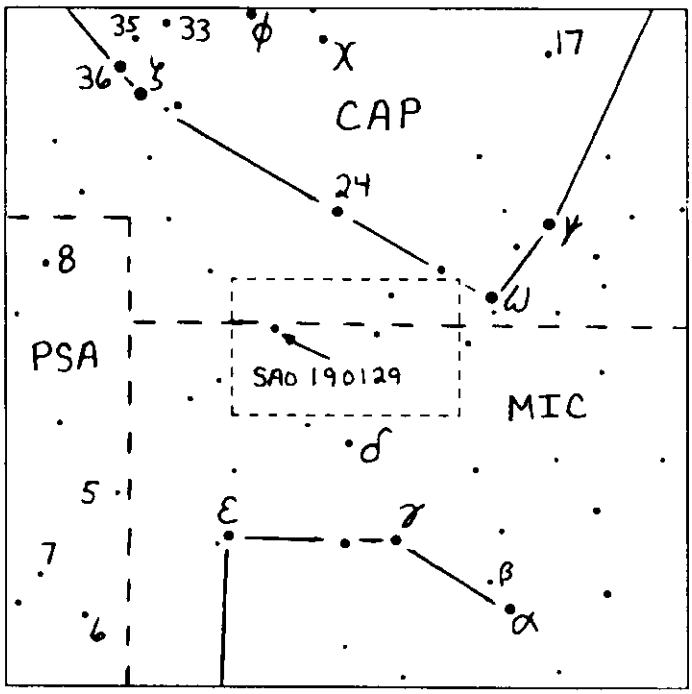
The Oct. 24 eclipse has a short duration of totality, and correspondingly enhanced Baily's bead phenomena, especially for locations near the edges of the path of totality. For Baily's beads, it is thus the best eclipse since the broken-annular eclipses in 1984 May in the southeastern U.S.A. and in central Africa in 1987 March, and there will not be one as good or better until a similar short total eclipse at low altitude in South Australia shortly before sunset on 2002 Dec. 4.

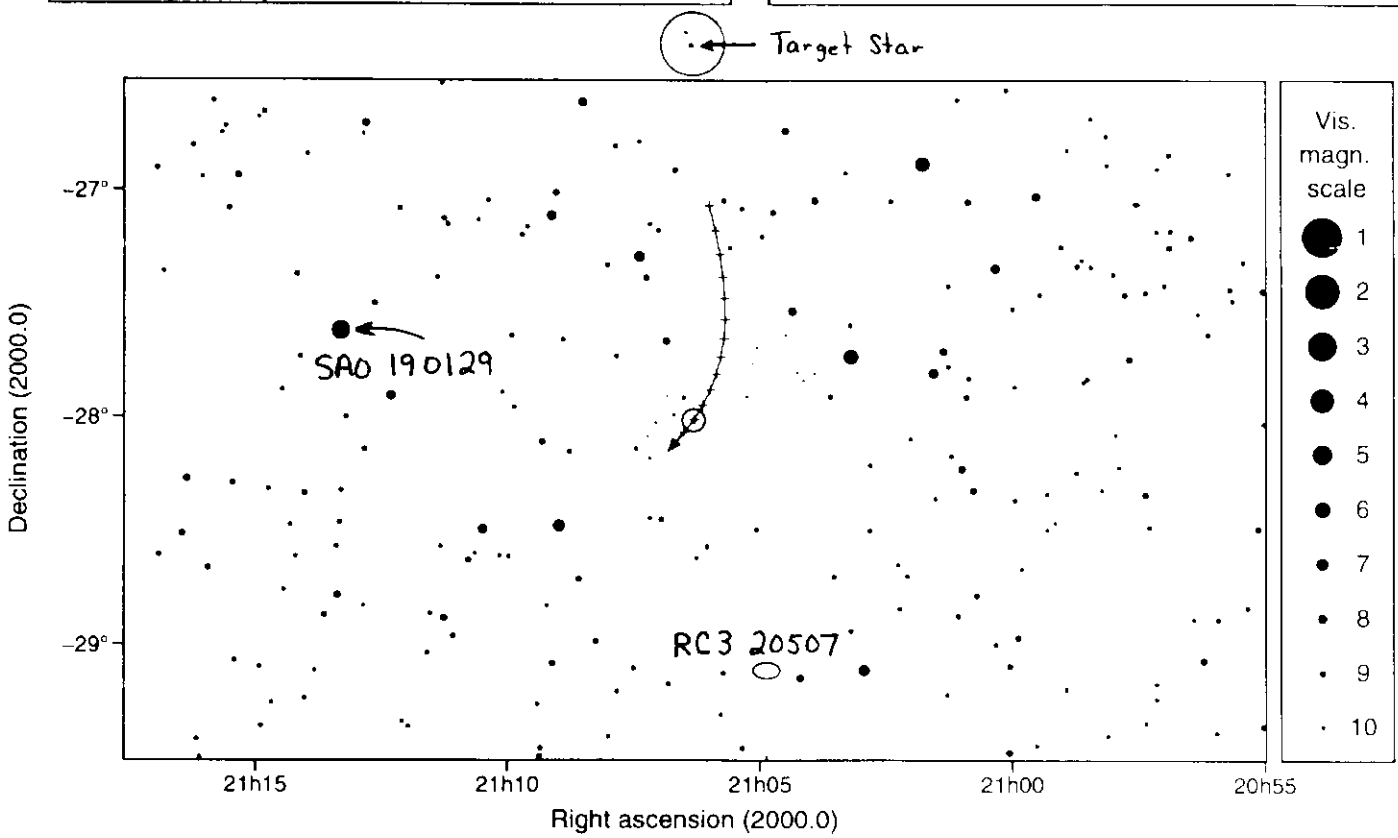
Eclipse Composite Video: Paul Maley created a composite videotape from about twenty American videos of the 1994 May 10th eclipse observed at the edges of the path of annularity; see **ON 6** (2), pp. 35-36. Hans Bode sent me a composite of the six videos of that eclipse made in the U.S.A. by German members of IOTA/ES. I had the tape converted from PAL format to American NTSC format and added the result to Maley's composite. For comparison, I also added parts of a central-line video made by Greg Shanos in El Paso. Comparison of it with the edge videos shows the advantages of observations near the path edges for observing Baily's beads. I have

387 Aquitania – PPM 736636

1995 sep 23 1h29.5m U.T.

Minor planet :			Star :	Source kat. PPMS
V. mag. = 10.94	Diam. = 106.0 km = 0.10"		α = 21h06m18.157s	δ = −28°00'42.04"
μ = 10.99"/h	π = 6.11"	Ref. = EG94-041	V. mag. = 9.60	Ph. mag. =
Δm = 1.6	Max. dur. = 33.2s		Sun : 130°	Moon : 148° , 3%





Plot 38 : 20-MAR-95 19:43:39

added our video made near the northern limit of last November 3rd's total eclipse in Bolivia, and before distributing it, videos from Paul Maley's expedition to Peru for the April 29th eclipse will be added. Some lunar and asteroidal occultation videos will be included to fill the two-hour tape. Tom Harmon, an observer in Harwood, VA with much better video equipment than I, has agreed to clean up the video and add some labels before it is distributed to contributors and put on sale to others.

IN MEMORIAM

We regret to report the passing away of another long-time IOTA member, Richard Sweetsir, on February 17th. Richard helped organize graze expeditions in the Jacksonville, Florida, area.

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

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

The Dunhams maintain the occultation information line at 301-474-4945. Messages may also be left at that number. When updates become available for asteroidal occultations in the central U.S.A., the information can also be obtained from either 708-259-2376 (Chicago) or 713-488-6871 (Houston).

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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