Occultation Newsletter

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FROM THE PUBLISHER

For subscription purposes, this is the third issue of 1990. It is the first issue of Volume 5.

The 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. Note that the IOTA dues and O.N. subscription rates increase next year. The following rates are valid only until December 31, 1990 and subscriptions and renewals at these rates may be for one year only.

IOTA membership dues, including O.N. and any supplements	
for U.S.A., Canada, and Mexico	$17.00
for all others to cover higher postal rates	22.00
O.N. subscription (1 year = 4 issues)	
for U.S.A., Canada, and Mexico (Note 1)	14.00
for all others	14.00
by air (AO) mail (Note 2)	
for area "A" (Note 3)	16.00
for area "B" (Note 4)	18.00
for all other countries	20.00
Back issues of O.N. by surface mail	
O.N. 1 (1) through O.N. 3 (13), each	1.00
O.N. 3 (14) through O.N. 4 (1), each	1.75
O.N. 4 (2) and later issues, each	3.50
Back Issues of O.N. by air (AO) mail	
O.N. 1 (1) through O.N. 3 (13), each	1.45
O.N. 3 (14) through O.N. 4 (1), each	2.20
O.N. 4 (2) and later issues, each	5.00

There are sixteen issues per volume, all still available.

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

Local circumstance (asteroidal appulse) predictions (entire currrent list for your location)	1.00
Graze limit and profile prediction (each graze)	1.50
Papers explaining the use of the predictions	2.50

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

at the low price of	1.18
or by air (AO) mail at	1.96

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

Notes:

1. Price includes any supplements for North American observers.
2. Not available for U.S.A, Canada, or Mexico
3. Area "A" includes Central America, St. Pierre and Miquilon, Carribbean Islands, Bahamas, Bermuda, Colombia, and Venezuela.
4. Area "B" includes the rest of South America, Mediterranean Africa, and Europe (except Estonia, Latvia, Lithuania, and U.S.S.R.).

IOTA NEWS

David W. Dunham

The 8th annual meeting of IOTA was held in San Antonio on August 18th; see Gary Nealis' report on page 3. The graze of Jupiter was observed by several of the attendees before the meeting; see Don Stockbauer's article about that event on page 4.

Supplements The database to generate the 1991 grazing occultation supplements for the Eastern and Western Hemispheres are complete, but there will not be time to generate these supplements for distribution with this issue. They will either be distributed with the next issue, or, more likely, be distributed in a separate mailing in November. Edwin Goffin's Asteroidal Occultation Supplement for North American Observers is being distributed with this issue.

Double Stars I was not able to send double star publications and data to Tony Murray until early September, so that he was not able to write the New Double Stars article for this issue. It will appear in the next issue. I also sent the data to David Herald, who plans to make updates with the latest double star catalog data from the U. S. Naval Observatory (USNO), including all speckle interferometric observations that are in the Center for High Angular Resolution Astrometry's (CHARA's) catalog. A copy of the IOTA data sent to Herald was sent to CHARA. If you suspect that any star may be a double from an anomalous occultation that you have observered, please send details (including event position angle) to Tony Murray at Route 1, Box 67; Georgetown, GA 31754; U.S.A., as noted on p. 389 of the last issue.

1989 July 3rd Occultation by Saturn Dan Klos is working on the observations of the occultation of 28 Sagittarii by Saturn, mainly the visual timings at first; see p. 382 of the last issue. I hope to publish a map showing everyone who timed that event in the next issue. So far, we have had only one volunteer to view video tapes of that event to transcribe timings. Two or three more volunteers to help with this are sought, especially if you have access to one of the video time inserters built by Peter Manly. If interested, please contact me at 7006 Megan Lane; Greenbelt, MD 20770; or telephone me at 301,474-4722. Before the end of October, I hope to find time to use my video time inserter to add accurate times to a few of the tapes to get this effort started. More news about the event will undoubtedly be obtained at the DPS meeting noted above, at which time I will see what interest there may be in applying Paul Boltwood's techniques to make a comprehensive reduction of the better video observations.

Next IOTA Meeting The next IOTA meeting is tentatively scheduled for July 9, 1991, in Puerto Vallarta, Mexico; see the article on the 1991 July solar eclipse on p. 12. I hope to also hold a short "official" meeting in Texas, probably in Houston, with a quorum of the board of directors, on the way to or from the eclipse, to satisfy the legal requirements of an annual meeting in Texas.

Occultus and Astrum I recently received a copy of Occultus #22 (1990 September), publication of the working group on occultations of the Netherlands "Vereniging voor Weeren Sterrenkunde". Although it is written in Dutch, only a little of which I can read, it has some interesting articles, including a map, article, and table of grazes of first-magnitude stars in the Netherlands from 1950 to 2020 (the next will be on 1999 March 28, Regulus), and reductions of all occultation timings (totals and grazes) made by their members during the first half of 1990. Issue #93 of Astrum, publication of the Agrupacion Astronomica de Sabadell (near Barcelona), contains several articles on occultations in Spanish, with abstracts in English. Spanish observations of the occultation of 28 Sagittarii by Titan are tabulated and described, along with a couple of figures reproduced from ON. Carles Schnabel described total and graze observations, and asteroidal appulses, observed during 1989, including a photoelectric record of an occultation by (444) Gyptis on March 11th at Observatorio del Teide. Ricard Casas and Rodriguez describe timings of 27 occultations that they and other observers made from three high-elevation sites on Tenerife, Canary Islands, during the passage of the waning Moon through the Praesepe cluster on 1989 October 22 (Joan and I observed and videorecorded some of that event near moonrise south of Wallops Island, Virginia, through breaks in clouds).

South African Time Signals Update In ON 4 (15), p. 360, the planned discontinuance of South African ZUO shortwave time signals, and their replacement with a cumbersome telephone - PC system, was described. According to a note in Monthly Notices of the Astronomical Society of Southern Africa 49 (1&2), p. 17 (February 1990), the continuous shortwave time signals broadcast on ZUO will be discontinued, and details of the telephone - PC system, including an elaborate charging scheme, were given. In June, I wrote to the South African Foundation for Research and Development (FRD), at the suggestion of M. D. Overbeek. I briefly described methods commonly used by amateurs for observing occultations, and their reliance on shortwave time signals. I described the current value of occultation observations, and described some of the special results obtained by South African occultation observers. I received a reply from Dr. Arendt of FRD thanking me for my letter, and that FRD would work with Danie Overbeek to try to devise a practical timing solution for occultation observers in that part of the world.

Travel I did not go to Minnesota for the September 13th graze of Epsilon Geminorum, because the weather forecast was bad. My brother's wife reported that it was raining in Duluth at the time. I also was unable to go to Japan in August. Fortunately, Mitsuru Soma will be visiting me October 21 - 24 in the Washington, DC area following an IAU Colloquium on coordinate systems that he will attend in Virginia Beach the previous week, so that I can get caught up on occultation developments in Japan.

As mentioned on p. 381 of the last issue, I will be attending the 41st congress of the International Astronautical Federation in Dresden, Germany, October 8-12. Paul Maley also expects to be there one day. I will arrive in Hannover Saturday morning, the 6th, where Hans Bode will meet me. We will then drive to either Leipzig or Dresden to join a small regional IOTA/ES meeting.

The American Astronomical Society's Division of Planetary Science (DPS) will be meeting at the University of Virginia in Charlottesville, VA on October 22nd to 26th. I will be attending sessions on the 22nd, 23rd, and 26th. I plan to distribute reprints of the Astronomical Journal 1983 Pallas occultation article to co-authors and observers of that event attending the meeting. Mitsuru Soma will also be at the meetings on the 22nd and 23rd, and Joan wil attend on the 26th.

Next March, I will probably attend meetings on spacecraft missions at the Institute of Space and Astronautical Science (ISAS) in Sagamihara, near Tokyo, Japan. I will inform Mitsuru Soma as I learn more details about it, and I hope to visit ILOC before the ISAS meetings.

Next ON The next issue of ON will probably be distributed in early December, with a deadline of November 19th for receipt of material for that issue. It will include IOTA's predictions of planetary and asteroidal occultations for 1991.

Acknowledgements Joan and I thank Martha and Wayne Warren for helping with mailing for the last issue.

SECRETARY / TREASURER REPORT

Craig and Terri McManus

Here is the news that you have all been waiting for. And probably dreading. Due to the impending postal increase, projected ON size increases, a new ZC Star Name catalog and the production of the new Preliminary Occultation Manual, IOTA has had to raise the dues and consolidate its dues structure. This has been forced upon us for the above reasons and by the fact that we have been unable to pay for the production and mailing of ON's until after a large number of members have renewed after receiving the newsletter. IOTA needs to get on a more substantial financial footing.

The new dues structure is as follows:

Regular IOTA membership North America	$25.00 US
ON subscription only North America	$20.00 US
All others regular IOTA membership	$30.00 US
All others ON subscription only	$25.00 US

The above structure takes full effect January 1, 1991. Up until that time members may renew at the old rates. Renewals must be postmarked by December 31, 1990 to renew at the current rates. Any postmarked after that date must renew at the new rates. Of course any one renewing at the new rates before January 1 would be most welcome!

It has also been decided that IOTA will now allow two year renewals. We must limit this to just two year renewals. If you wish to extend your membership before the end of the year, you may renew the first year at the old rate but the second year must be at the new rate. For example, North American members would be able to renew for two years for a total of $42.00 US. After January 1, 1991, it would be $50.00 US.

On a different note: Please remember IOTA when you move! We have had a number of cases (some several years old!) come up this year where people have moved and the post office will no longer forward their mail. We even had one case where we sent a newsletter to the forwarding address and the member had already moved again! (Does anyone know for sure where Fred Schumacher is? Last reported address was in Caldwell ID.) ANY CHANGE in your address or coordinates should be reported to us as soon as possible or there is a chance that you will miss issues of the ON or will miss the graze and occultation predictions that you are entitled to have.

We have seen and purchased some of the graze patches that Rich Wilds has produced for IOTA. They are really very attractive and colorful. They have been produced independently of IOTA funds to start with, but any profits that accrue from the sale of the patches will go to IOTA. Show your support for IOTA in a very visible way. Thanks, Rich!!

Ed Note: The graze patch was described in the February, 1990 issue, ON IV No. 14 page 339. The patch costs $5.00, payable by check or money order to:
Richard P. Wilds
3630 SW Belle Ave.
Topeka, KS
66614
(913) 271-7187

ANNUAL MEETING OF IOTA

Gary Nealis,
Executive Secretary

The annual meeing was held August 18, 1990 at the Southwest Research Institute, San Antonio, Texas. Seventeen members were in attendance. The meeting was convened at 12:30PM by president David Dunham. After a review of the agenda, Home DaBoll was briefly honored.

Experiences during the Jupiter graze early that morning were discussed. Despite threatening clouds, many saw it in the San Antonio area, the Mexican border, and Houston. See p. 5 for more information about this event.

David Dunham reported on his expedition August 14 to view the Pleiades central passage from Ohio. Despite cloud problems, the expedition was partially successful. David showed a video made in Wyandot, Ohio of the reappearance of Alcyone.

David Dunham discussed the upcoming occultation events for 1990. Articles appeared in Sky and Telescope in January and February, and will appear in the September issue. Significant events include Hermione in the Texas area September 16, Kleopatra on September 27, and Interamnia in mid-November in the Southwest or Mexico. The Pleiades passage of December 28 will produce a graze of Alcyone near Austin, Texas to South Carolina and one of Atlas in the midwest.

Paul Maley and Hans Bode described proposed expeditions to New Zealand and Australia for the January 15, 1991 annular solar eclipse. Paul is organizing an expedition of about 10 people to two sites, one on the North Island, the other on the South Island of New Zealand. The dates are January 5-17, with a cost of about $2600. Hans is organizing an expedition of about 13 people from Europe leaving around Christmas. The observers in his trip are on their own, with some planning to view from Tasmania and others from New Zealand. David Herald is also organizing an expedition to Tasmania. Paul Maley's expedition is constrained to leave after the Vesta occultation in Florida on January 4 and return before the Kleopatra event on January 18-19.

Paul and Hans described proposed expeditions to Mexico for the July 11, 1991 total solar eclipse. Paul's expedition is from Houston to Puerto Vallarta from July 9 to 12, and costs $500. As of the date of the annual meeting, no one had signed up to view from the southern limit. Most wished to observe from the center line. Paul scouted out the facilities and viewing locations shortly before the annual meeting, and showed pictures of the area and sites. Hans is organizing an expedition of about 50 to Puerto Vallarta for southern limit viewing and to San Blas for centerline viewing. Holding some form of annual meeting in Puerto Vallarta was discussed.

David Dunham discussed occultation events for 1991. These include multiple Pleiades passage events (Atlas in Baja California, Alcyone in Acapulco, Pleione north of Puerto Vallarta) in the Mexico area three days before the total eclipse. An occultation by Vesta occurs January 4 with a predicted path from Florida to Wisconsin; Hal Povenmire is organizing observers in Florida and the Bahamas. An occultation by Kleopatra is predicted for January 19 in the northeast, and Antares is occulted by the Moon on February 8.

The expeditions to observe the eclipse of July 22, 1990 were discussed by Hans Bode, Joan and David Dunham, Derald Nye, and Glen Roark. Hans tried to observe from the northern limit in Russia, but various bureaucratic and logistics problems prevented it. No southern limit observations were planned by the Soviets. He observed from above the clouds in an Antonov 26, and reported that it was pretty, but he could not, of course, make limb event timings. David and Joan originally planned to observe from Amukta, an Aleutian island, but could get no transportation to the island (which is uninhabited). They then attempted to go to Russian town of Markova via Nome, Alaska and Provedenya, Russia. They made it to Nome, but were not issued visas to enter Russia. They viewed a partial eclipse from the Anchorage airport on their way home. Derald and Glenn went with an expedition to the Aleutian island of Atka. The volcano they planned to climb to get above the clouds was unclimbable due to deep grass which hid treacherous holes, and mud. The day before the eclipse was beautiful, the day of the eclipse was miserable with 50 kph winds and heavy rain. They showed a video of the shadow. At totality, it got extremely dark, the wind calmed, and the rain decreased. They had an enjoyable time and were treated well by the 100 local inhabitants of Atka.

David Dunham handed copies of the Pallas paper to the coordinators present for distribution to the observers who are not IOTA members.

Hans Bode discussed IOTA/European Section activities. IOTA/ES was planning its 9th Symposium in Jena, Germany for August 24-26. There will be amateur and professional presentations on topics such as photometry, lunar occultations, Jupiter, Comet Austin lensing, data bases, SIT cameras, solar eclipses, and history. The observation of grazes by a single star from both the northern and southern limits was partially successful. Egypt (southern limit) was obscured by dust clouds, England (northern limit) had beautiful weather and several measurements were made. Hans showed the results of the Brixia occultation. It is a mushroom or ellipsoid shape, approximately 56 by 47 km.

David Dunham presented the financial report for the McManus' (See update, this page). As of July 31, there was a balance of $150. That, plus the 20% postal hike due in January, led to the decision to increase the dues. A dues change was approved by the meeting participants as follows:

IOTA Membership - North America	$25.
IOTA Membership - overseas	30.
<u>ON</u> subscription only, North America	20.
<u>ON</u> subscription only, overseas	25.

These rates are effective January, 1991. The surface mail rates and various rates for different overseas locations were eliminated. All overseas subscriptions will be air mail (AO) only. The business meeting was closed at 5:20PM.

Technical projects were then discussed. These included Titan data reduction, automatic reduction of graze data, a double star data base, and the occultation user's manual. Saturn occultation events data have been sent to Dan Klos and Doug Mink for analysis.

Paul Maley discussed Texas activities. The George Observatory was recently opened in Brazos Bend State Park. This 36-inch telescope is open for amateur use and for public open house viewing. Paul is trying to plot the locations of all telescopes and video equipment in the Houston area to permit rapid access to appropriate equipment for events.

The group purchase of the Philips camera was discussed. As of the annual meeting, only one had been assembled. (See related article, p. 12).

The last order of business was discussion of further Texas activities by Rick Frankenburger and Glenn Roark, and of Arizona activities by Gene Lucas and Derald Nye. These included video presentations. (I had to catch a plane, so I missed these.)

The meeting adjourned at 6:45PM. Further discussions were held at local restaurants and hotels.

IOTA FINANCIAL REPORT

Craig and Terri McManus

The following is the summary report of the cashflow for IOTA for the time between 12/29/89 and 9/16/90:

DEBITS		INCOME	
ON Printing	$1,986.46	Member Renewal	$5,574.74
Supp. Printing	56.96	Predictions	3.00
Off. Supplies	357.24	Subscriptions	676.22
Postage	1,805.58	Back Issues	50.25
Bank Card Costs	117.26	POM	5.00
Service Charges	8.50	Interest	37.00
Misc. Debts	5,523.58	Misc. Income	6,036.94
TOTAL DEBITS	$9,855.58	TOTAL INCOME	$10,400.36
BALANCE	$544.78		

The "miscellaneous" debts and income are mostly due to the CCD camera group purchase. Twelve Panasonic CCD cameras were purchased through IOTA. Due to a number of factors, IOTA had to put in funds of its own to complete the purchase and subsequent maining of the cameras. Here is a breakdown of the purchase: The 12 cameras were $390.00 each with $7.00 added for shipping and handling. Total amount received from members buying the cameras was $4,764.00. We incurred the following costs:

Cameras	$4,695.00
Shipping (11 cameras)	55.70
Shipping (1 camera)	12.75
Supplies - boxes, tape and peanuts	16.85
charge for two credit card purchases	30.97
TOTAL	$4,811.27

It cost IOTA $47.27 to fund this purchase. In light of this experience, we make two recommnedations for future group purchases. First, all puchases should be by check or money order. This will save us the 3.9% fee charged IOTA for each credit card order. Second, the shipping and handling should be increased to $8.50. These two steps would have resulted in an almost even transaction for IOTA (+$1.70). Not operating at a loss is highly desirable.

THE JUPITER GRAZE OF AUGUST 18 FROM TEXAS

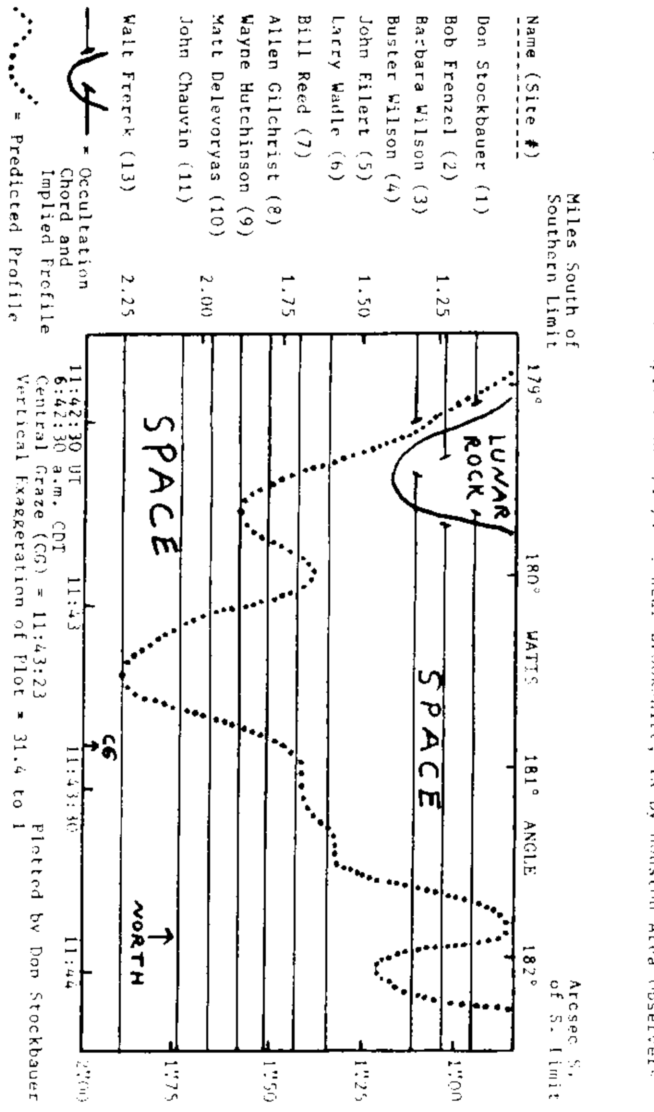
Don Stockbauer

On the morning of August 18, 1990, the southern limb of a 5% sunlit waning Moon grazed the southern limb of Jupiter for observers in Texas along a line from Crystal City (11:40 UT) to Houston (11:43). An expedition of Houston area observers timed the graze from a location several miles southeast of Brookshire, about 35 miles west of Houston. There was some thought that no timings at all would be possible due to the presence of strong twilight (the graze occurred 14 minutes before sunrise) but it turned out to be an easily timed, spectacular sight for most participants. Stations were marked along Woods Road from the predicted region of getting a "miss" (Jupiter never completely vanishing) northward to the area where only a long complete disappearance of Jupiter was predicted. The stations were spread out 1.12 miles in a due north/south direction. Fifteen observers set up at 12 sites.

The weather was very cooperative. While there were intermittent bands of clouds in the general area of the moon before the graze, it was clear to only slightly hazy during the actual event. The Moon became difficult to see as twilight brightened; Jupiter was much easier to see due to its higher surface brightness.

The predicted and observed occultation paths were very different. The predicted profile indicated that most observers would see multiple second and third contacts. The actual path was 0."7 north of the prediction, so that the observers at the southern seven stations saw a miss. Observers with smaller telescopes had difficulty as Jupiter became faint. For some, it faded below the instrument's limiting magnitude before the actual disappearance. Bob Frenzel, Barbara Wilson and I saw Jupiter disappear completely, but had no multiple events. I believe the scatter in our data can be explained by the strong twilight and the fact that the times an observer reports for the second and third contacts of a planetary graze depend strongly on the limiting magnitude of the telescope being used. The bit of planet remaining does not abruptly disappear as does a star during a graze; it fades gradually and sometimes rather indefinitely below the limiting magnitude, producing some uncertainty in the timings. Most probably Bob Frenzel (using an 8" f/24 classical Cassegrain at 200 power) was able to see the planet past the point that the other two stations could, but upon reappearance he may have not been looking at the right spot to call the reappearance immediately. Also timed that morning were the disappearances of (I) IO, (II) Europa, (IV), and Jupiter's first contact. The reappearances of the Gallilean satellites were too difficult to time in the strong twilight. David Dunham believes that the prediction was in error due to the low quality of the profile data. The graze occurred at a latitude libration of -0.6 degrees at a point on the lunar limb which is exactly at the south pole. The data were well into the Cassini region.

Even those who observed misses saw a rare and beautiful sight of Jupiter as a very small, thin, sliver of light at mid-graze. Thanks to all who participated.



IOTA/ES NEWS

The ESOP IX conference was held in Jena, German Democratic Republic on September 1. Nineteen papers were given on a variety of subjects related to occultation observations. The following is a listing of the titles presented. The paper abstracts are available in German and in English from IOTA/ES.

"Photometric Possibility from Si-Photodiodes in Astronomy" - Konrad Guhl

"Photoelectric Lunar Occultation Observations at Lohrmann Observatory" - Gunnar Katerbaum

"Forecast, Observation and Reduction of Lunar Occultations" - B. Stecklum

"Analysis of ILOC Reductions 1986-1988" - Marek Zawilski

"Database System for Lunar Occultations" - G. Lehmann

"Status Report of the Analysis of the Occultation of 28 Sgr by Titan" - Wolfgang Beisker

"Results of Observation and Reductions of Jovian Satellite Phenomena" - S. Molau

"Lensing by Comet Austin's Gas Envelope" - K.-L. Bath

"Live Demonstration of the Small Area Imager TC211" - Wolfgang Beisker

"Occultation Observation Activities in Poland" - Marek Zawilski

"History of Occultation Observations" - Marek Zawilski and Pawel Sobotko

"Report of the July 22 1990 Solar Eclipse and Status of the 1991 Eclipses" - Hans-Joachim Bode

"Occultation Video Demonstration" - Hans-Joachim Bode

"Impressions of Artic Siberia at the Time of the Total Solar Eclipse" - Hans-Joachim Bode

"Data Analysis of Occultation Data using DAS V3.20" - Wolfgang Beisker

"Finland July 1990" - Eberhard Bredner

"Occultation of SAO 147658 by Brixia - First Results" - R. Buchner

Eberhard Bredner reports that several IOTA/ES members have developed their own programs to reduce occultation observation data. The meeting participants want to use those programs to give European observers a more rapid reduction of their observations than is possible from ILOC. To aid in this, they have requested the digitized Watts data. This is available from the USNO as a 9-track IBM binary format tape, which is being provided to them.

DIAMETER AND SHAPE OF MINOR PLANET (521) BRIXIA FROM ITS OCCULTATION OF SAO 147658 ON 1989 OCTOBER 23

Reinhold Buchner, translated by Hans-Joachim Bode

In the early morning hours of October 23rd, 1989, an occultation of SAO 147658 by (521) Brixia would occur in central Europe, based on a last-minute-prediction that had been given by David Dunham to different observers. Five observers successfully recorded this event, so it is possible to determine the shape and diameter of this asteroid.

Basis of Calculation To make the reduction of these data, the JPL-ephemeris of Brixia and the SAO catalogue for the position of the star were used. The actual IAU constants were taken into account to get better positions of both objects for calculating its geocentric ephemeris around the time of occultation. This ephemeris finally was used in a program to determine the topocentric motion of an object of the Solar System relative to a star.

Brixia Ephemeris Corrections Based on the above-mentioned data, you will get an occultation-path in southern Europe. According to a last-minute-prediction, this path shifted to central Europe, and this was confirmed by the observations. The longest duration of the occultation occured close to Freiburg, Germany. Consequently, it seams useful to correct Brixia's ephemeris in such a way that, at this location, there would be calculated a central occultation, as well as a delay of 2 minutes. This leads to corrected values for Brixia as follows:

Diff. R.A. = $+0.^s0678$, Diff. Dec. = $+ 0''.804$

It is only important, for the reduction work below, that the motion of Brixia with respect to the star needs to be correct; it is not neccessary to find out wether the position of the star or the ephemeris of the asteroid is in error.

Positions of the Observers The geographical positions of the observers are given below:

Observer	Longitude E.	Latitude N.	Altitude
Farago	9° 11' 50".9	48° 47' 00".7	354 m
Marx	9 11 51.0	48 47 00.2	350 m
Sutterlin	7 53 28.0	47 53 33.1	1201 m
Agerer	12 08 14	48 28 58	400?m
Sauter	9 00 08.9	47 20 22.7	512 m

Using the corrected ephemeris, it is possible to examine the different results. The distances of the stations relative to the central line in the fundamental plane were determined as follows:

Observer	Location	Distance to central line
O. Farago	Stuttgart, Germany	35 km N.
H. Marx	Stuttgart, Germany	35 km N.
P. Sutterlin	Freiburg, Germany	0 km
F. Agerer	Zweikirchen, Germany	9 km S.
C. Sauter	St. Margarethen, Switzerland	33 km S.

The observer's timings (UTC) are given below:

Observer	Immersion	Emersion	Acc.(I/E)
Farago	2^h 17^m $58^s.6$	2^h 18^m $12^s.1$	$0^s.5/0^s.2$
Marx	2 17 57.9	2 18 12.1	0.3/0.2
Sutterlin	2 17 56.6	2 18 11.4	0.3
Agerer	2 17 36.2	2 17 49.9	0.2
Sauter	2 17 44.0	2 17 55.1	0.3

As Brixia moved with a speed of 6.46 km/sec, the resulting chord lengths at the different stations can be computed:

Observer	Occultation Duration	Chord Length, km
O. Farago	$13^s.5$	87
H. Marx	14.2	92
P. Sutterlin	14.8	96
F. Agerer	13.7	88
C. Sauter	11.1	72

It can be seen clearly that the chord length is decreasing in both directions from the central line; all values are significantly smaller than the estimated diameter of 121 km used for the prediction.

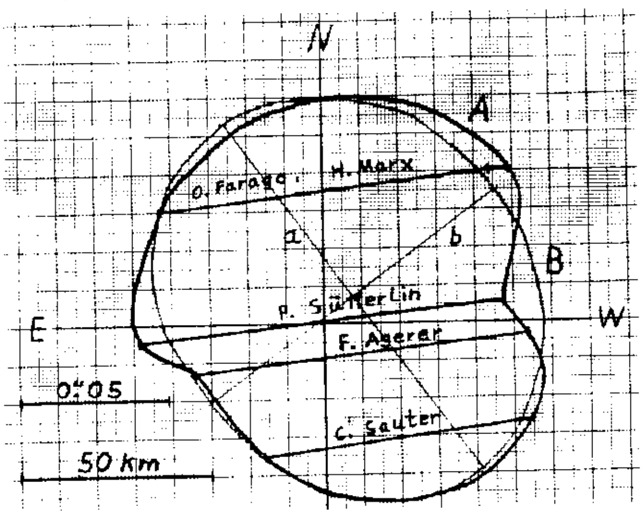
The Shape of Brixia, Step 1 Determing the position of the star relative to the center of the minor planet while using the times of contact of the different observers leads to a profile of Brixia. A square-interpolation had been used to build the shape at those areas where only little information is available. You can see that the north-south-diameter must be somewhat larger than its east-west-diameter. The mushroom-shape is a result of P. Sutterlin's recording - may be it is a timing-error to the next minute, for his duration fits very well.

The Shape of Brixia, Step 2 Next, we tried to find out if the data might fit to an ellipse as well. Therefore, at 16 points the distances to the center of the coordinate system were measured and a Fourier-analysis was made. The result up to the second harmonic is:

$$r = 51.3 + 10.9 * \cos(\text{alpha} + 46°) + 4.5 * \cos(2*\text{alpha} - 73°) \quad [\text{km}],$$

where alpha is the position-angle between direction north and the center of the coordinate system of one point of the Brixia-profile and where r is the distance of this point to the center of this coordinate system. The constant (51.3 km) is the mean radius of the asteroid; the first harmonic value indicates (10.9*cos(alpha + 46°)), that the center of the ellipse does not coincide with the center of the coordinate-system. Evidently the Freiburg station was some kilometers south of the central line. The second harmonic value (4.5*cos(2*alpha - 73°)) describes the form of the minor planet: The semi major axis (a) has a length of 51.3 + 4.5 km, whereas the semi minor axis' length (b) is 51.3 - 4.5 km, therefore its flattening is 1:6.2. The major axis is 112 km and the minor axis is 94 km.

Summary Both solutions fit well, so it should be realistic to assume a diameter of about 103 km with a flattening of about 1:6 for minor planet Brixia. The former value should be corrected. Thanks to all IOTA/ES-members who sent us their data.

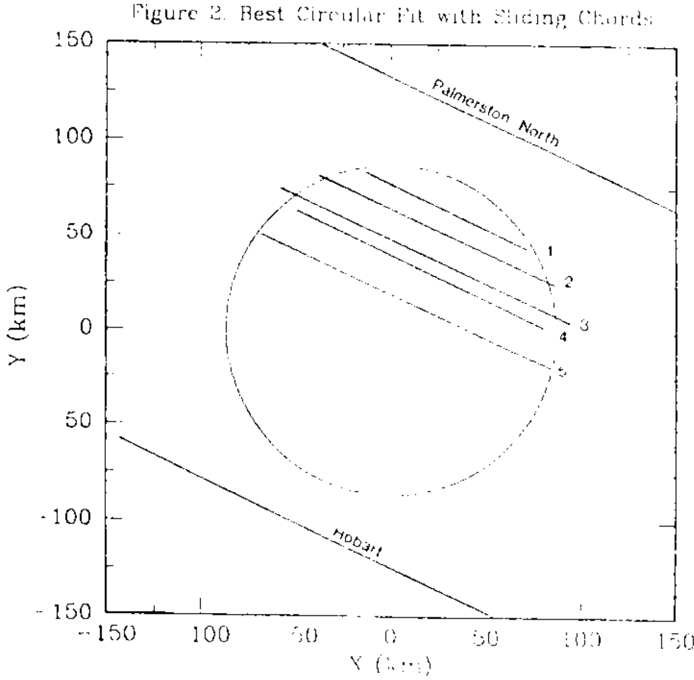


Curve A: Interpolated Brixia profile from contact timings
Curve B: Assumed Ellipse (a/b = semi-major/minor axis)

PROFILE OF (9) METIS ON 1989 AUGUST 6

Observations of this occultation observed in Tasmania and New Zealand were described on p. 389 of the last issue. W. Kissling, G. Blow, W. Allen, J. Priestley, P. Riley, P. Daalder, and M. George performed an analysis of the timings of this event and published them in the Proceedings of the 5th I.A.U. Asian-Pacific Regional Meeting held in Sydney, Australia, in July 1990. They derived a diameter of 173.5 km for Metis from a circular fit to the observations, shown in the figure reproduced below. The editor thanks Graham Blow for supplying the preprint.

Figure 2. Best Circular Fit with Sliding Chords



THE OCCULTATION OF ALHENA BY (381) MYRRHA

David W. Dunham

January 1991 promises to be a banner month for asteroidal occultations, with the occultation of a 7th-magnitude star by (4) Vesta in the Americas the evening of January 3rd, and an occultation by the probable contact-binary asteroid (216) Kleopatra in the northern U.S.A. on January 18th-19th. An organizer in Florida plans to beat even the 1983 Pallas occultation of 1 Vulpeculae by getting out over 500 observers. However, these efforts could be eclipsed by another event that month, the occultation on the 13th (U.T.) of 1.9-magnitude Gamma Geminorum (Alhena = ZC 1016, a star that is never occulted by the Moon), the brightest star to be covered by an asteroid in eight years. It is the second brightest star ever predicted to be occulted by an asteroid, the brightest being Epsilon Sagittarii, which was predicted to be occulted on October 23rd, 1983. The early event was not observed, since the elongation from the Sun was relatively small, preventing any meaningful astrometry and giving a narrow nighttime region of visibility in a sparsely populated part of the South Pacific Ocean.

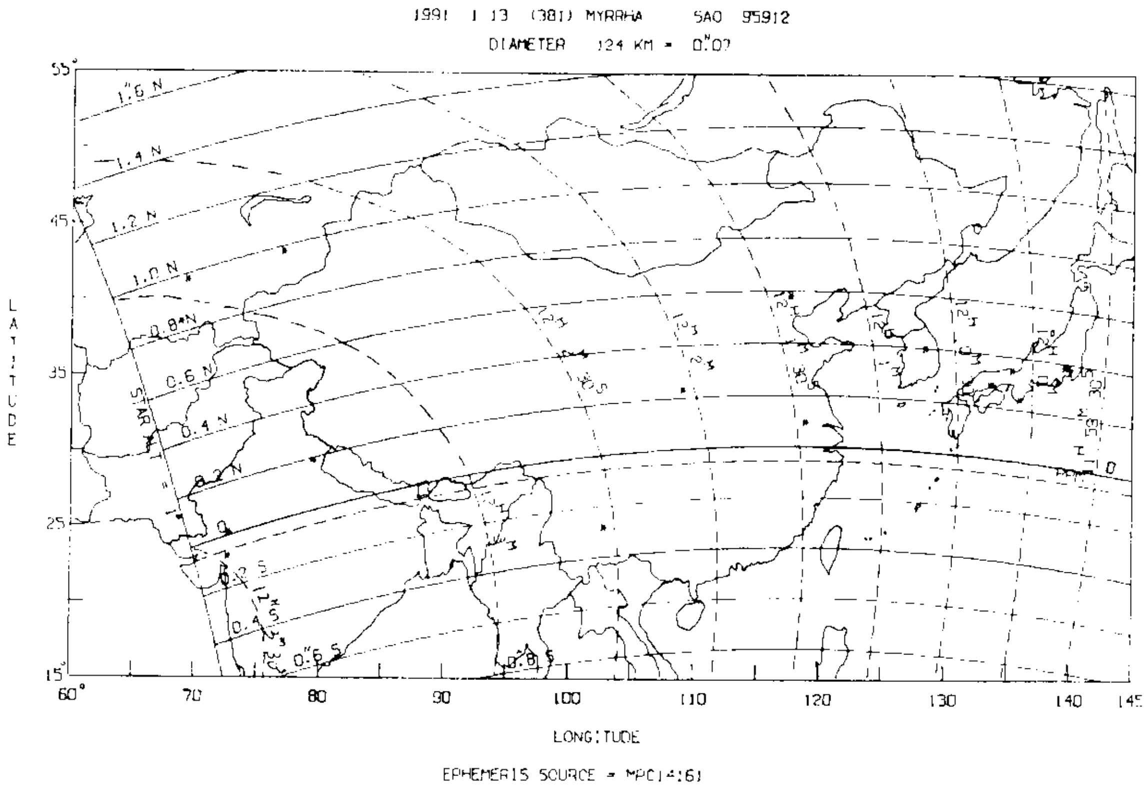
In contrast, the Alhena occultation will occur near opposition, with excellant prospects for good astrometry. And the nominal path crosses the two most populous nations on Earth; about 2 billion people could watch for this naked-eye event! I suggest that IOTA members in the area write articles, including a chart of the sky at the time locating Alhena, for newspapers in major cities in their country, and contact ministries of education to distribute information through the school system and organize student observations. They should also try to arrange for broadcasts of last-minute astrometric path updates by radio and television, and help from radio networks by broadcasting accurate time signals during the event. The star is bright enough that it could probably be videorecorded using TV cameras with telephoto lens like those at most television stations. Television networks might be able to obtain some interesting, high-quality data.

Astronomers at Purple Mountain Observatory in Nanjing organized a nationwide campaign for another naked-eye asteroidal occultation, of 3.0-mag. Sigma Scorpii on 1984 March 4 by (241) Germania. Astrometry for that event was difficult, so the predicted path remained quite uncertain. It was cloudy over large parts of China at the time, but about 3000 observers watched the star, and all had a miss, defining several areas where the occultation did not happen. With favorable prospects for a good astrometric update, we may be able to do much better for the Alhena event.

Information about the good 1991 January events, including the Alhena occultation, was given in the tables in ON 4 (14), pp. 348-349. In case of a central occultation, there would be a nearly 12-magnitude drop for about 16 seconds. Alhena is a spectroscopic binary, so step immersions and emersions are likely. The primary star's angular diameter is 0."0013, which subtends 2.4 km at Myrrha's distance. A central occultation event would last 0.16 second. For a nearly grazing event, the gradual disappearance and reappearance should be very noticeable, lasting a second or more. Those within a 2-3 km wide zone at the northern and southern limits of the occultation will see only a partial occultation of the star.

The map shows the nominal central line of the occultation as a heavy line marked "0", while other isoskiatics show the path in case of error in the prediction at 0"2 intervals. The nominal prediction should be rather accurate, since the star's FK4 positional data were used and the orbit of Myrrha was recently updated. About one path-width south of the 0 line is a dashed isoskiatic for the star's data in the new PPM catalog. But the actual uncertainty in the path is greater, with shifts of a few or even several tenths of an arc second possible. Hopefully, the last-minute astrometry will reduce the uncertainty to 0"1 or better.

In early November, I will distribute computer-generated charts of the sky on January 13th to help in locating Alhena. A campaign for this event could do much to publicize astronomy and occultations.



REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS

Jim Stamm

If you do not have a regional coordinator who forwards your reports, they should be sent to me at: 11781 N. Joi Dr., Tucson, AZ 85737 USA. Names and addresses of regional coordinators are given on the front page of each ON in the "From the Publisher" column.

I summarized all the reports I have received for the first half of 1989 in the following two tables and section of notes. Table 1 lists the 1989 date (all times are in UTC), minor planet, occulted star, IDs of successful observers, and references to any notes. Table 2 lists the observer's ID, name, nearest town to location of observation, country (including state or province for North America and Australia), and the total number of observations made in the period. The notes section details those events that included positive observations, or other significant information that could not be reported in the tables. I am not including notes on those observations that may have been spurious unless there is some sort of confirmation, or the fact that something may have happened that is relevant to another observation. Instead, I will place an asterisk (*) in the REF column to indicated that I have received a report with more than a "no event..." in it.

Notes:

1. Observers were PrCdTfTdSlNbSeBkCnSsBdCaMiGiGkFdBzSgVaBhElHbTrFbRgSxBsDlTpBvSnMtRnKlPi.
2. Observers were SjSoWrKeTgGvSdAgWhMlGaNy. A couple of "probably spurious" disappearances were observed by Morillon (about 2 seconds duration), and Gillain (7.9 seconds duration).
3. See ON 4(16) page 389.
4. Observers were MyHyMbBdTtDnGuTrHbLc. See ON 4(13) page 327.
5. Observers were PjByWaGjRlLeBqCsDpGt. See ON 4(13) page 327.
6. See ON 4(13) page 327.
7. Observers were WeSdRbKsLyOlFmWrMkSj. See ON 4(15) page 370.
8. Observers were CpShOvFzSmMoPsBhGiSsMaTyBuSzKcAyDs.

Table 1. Asteroidal appulses and occultations: Jan.-June 1989.

DATE	MINOR	PLANET	CAT	STAR	OBSERVERS	REF
Jan 03	564	Dudu	AGK3	+02° 0199	LySj	
Jan 04	42	Isis	AGK3	+04° 1659	LmMjJgPnLh	
Jan 06	1266	Tone	AGK3	+24° 1044	GoPi	
Jan 13	53	Kalypso	SAO	97455	Gk	
Jan 14	615	Roswitha	AGK3	+26° 0778	ByStKpGnNeHu	
Jan 14	4	Vesta	SAO	159716	HuAn	
Jan 15	56	Melete	AGK3	+11° 0745	LySj	
Jan 15	62	Erato	AGK3	+17° 0985	LySj	
Jan 20	305	Gordonia	AGK3	+00° 1438	GkGiPn	
Jan 20	2060	Chiron		Anonymous	GiGkHrHo	
Jan 24	275	Sapientia	L	4 1093	LoHtScAn	*
Jan 26	911	Agamemnon	AGK3	+14° 1122	NeScByAnHtSjFm	
Jan 30	245	Vera	AGK3	+12° 1297	35 observers	1
Feb 01	255	Sapientia		Anonymous	Mt	*
Feb 06	3	Juno	AGK3	+02° 0414	En	
Feb 12	106	Dione	AGK3	+16° 1114	HtScAn	
Feb 15	338	Budrosa	AGK3	+02° 1383	Hj	
Feb 19	1143	Odysseus	AGK3	+13° 0909	OvSmVb	
Feb 23	62	Frato	AGK3	+19° 0844	NeBy	
Feb 24	760	Massinga	AGK3	+25° 0979	12 observers	2
Feb 24	283	Emma	AGK3	+26° 0397	Ny	
Feb 25	18	Melpomene	AGK3	+04° 0240	FzVbSm	
Feb 25	69	Hesperia	AGK3	+12° 0528	FzSmVbWk	
Feb 26	138	Tolosa	SAO	184707	Sj	
Mar 05	313	Chaldea	SAO	160730	HfGe	
Mar 11	530	Turandot	AGK3	+20° 0971	ShWlMfSmVb	
Mar 12	44	Nysa	SAO	159702	SjLyNy	
Mar 15	690	Wratislavia	AGK3	+15° 0592	TkCpShOvFzWs MmSmVbMdWk	
Mar 17	790	Pretoria	SAO	185093	Sm	
Mar 18	324	Bamberga	AGK3	-02° 0652	LvKoSjTbDzRs CmGvLg	3
Mar 19	8	Flora	AGK3	+15° 1197	Sj	
Mar 20	13	Egeria	SAO	159572	Sc	
Mar 23	345	Tercidina	AGK3	+12° 0681	JrSiMhBtDsRg GoPiKl	
Mar 26	152	Atala	AGK3	+00° 1651	DsTrHbCvBh	
Mar 26	64	Angelina	SAO	184764	PjDeNe	
Mar 27	60	Echo	SAO	162699	ByHs	
Apr 02	779	Nina	SAO	180910	DePa	
Apr 08	1269	Rollandia	AGK3	+01° 1459	LyNy	
Apr 09	313	Chaldea	SAO	142133	10 observers	4
Apr 10	415	Palatia	AGK3	+03° 0981	OvSmMd	
Apr 11	602	Marianna	SAO	206648	VkDpGmScAnHlRc	
Apr 15	264	Libussa	SAO	165746	ScAn	
Apr 19	213	Lilaea	AGK3	+22° 0858	Gi	
Apr 20	598	Octavia	AGK3	+04° 1744	SjNy	
Apr 20	416	Vaticana	AGK3	+09° 1565	PjPaScAn	
Apr 23	342	Endymion	SAO	158885	10 observers	5
Apr 26	15	Eunomia	SAO	164594	HxHkAbLdGm	6
Apr 27	932	Hooveria	SAO	190447	ScAn	
Apr 30	44	Nysa	SAO	159584	Sc	
May 05	663	Gerlinde	AGK3	+02° 2724	MxDySqGiGkBh	
May 09	273	Atropos	AGK3	+02° 2689	OvMo	
May 09	39	Laetitia			Ny	
May 14	117	Lomia	SAO	229182	HsByGmBeGjSfDp	
May 22	221	Eos	SAO	146702	De	
May 24	412	Elisabetha	AGK3	+01° 1702	CoCpOvFzSmWk	
May 25	694	Ekard	AGK3	+08° 0983	ByScDp	
May 26	481	Emita	SAO	119809	10 observers	7
May 29	171	Ophelia	SAO	139358	EwDtGkPwCoOvPs	
Jun 06	313	Chaldaea	SAO	141914	ScPsVbEn	
Jun 07	852	Wladilena	SAO	254579	Sc	
Jun 12	1385	Gelria	AGK3	-01° 1775	Sj	
Jun 14	205	Martha	SAO	142459	Hs	
Jun 16	346	Hermentaria	SAO	187080	ChOvLaSm	
Jun 22	117	Lomia	SAO	228730	StDeByHtSc	
Jun 26	241	Germania	SAO	158222	DeByScAn	
Jun 29	87	Sylvia	AGK3	-00° 1824	20 observers	8
Jun 30	601	Nerthus	AGK3	+00° 2098	CpSnOvWk	

GRAZING OCCULTATIONS

Don Stockbauer

My goals as coordinator of IOTA's lunar grazing occultation section are:

1. To provide a forum for the exchange of information through these articles;
2. To quality check the reports received and to request any needed clarifications;
3. To publish tabular summaries of each expedition's results;
4. To maintain an independent repository of the reports;
5. To notify David Dunham of updates to the Watts data base identified from plots of observations sent to me; and
6. To provide instructions and materials needed to report grazes, including a paper titled "How to Calculate a Shift"; the methods outlined therein are needed to accomplished item number 5 above.

The 8/18/90 graze of Jupiter near Brookshire, Texas (35 miles west of Houston) was surprisingly easy despite the sun being down only three degrees down at central graze. The observations definitely indicate a 0.7" north shift; this gave all but the northernmost three out of twelve stations misses. More information about this expedition is given in a separate article.

Table 2. Observers and locations of reported events: Jan.-June 1989.

ID	OBSERVER	CITY	COUNTRY	REPORTS
Ag	AIGNER, C.	GRAZ	AUSTRIA	1
Ay	ALOY, J.	BARCELONA	SPAIN	1
Ab	ANDERSON, PETER	BRISBANE	QUEENSLAND - AUS	1
An	ANDERSON, PETER	THE GAP	QUEENSLAND - AUS	9
Bq	BAGUST, PHIL	EVERARD PARK	SOUTH AUSTRALIA	1
Bh	BARTHES, J.	CASTRES	FRANCE	4
Bt	BARUFFETTI, P.	MASSA	ITALY	1
Bv	BENIER, J.	VARADES	FRANCE	1
Bz	BENTLIN	FREIBURG	GERMANY	1
Be	BERESFORD, A.C.	MYRTLE BEACH	SOUTH AUSTRALIA	1
Bk	BERTOLI, O.	TORINO	ITALY	1
By	BLANKSBY, JIM	WANDIN	VICTORIA - AUS	9
Bu	BOURGEOIS, J.	CINEY	BELGIUM	1
Bd	BULDER, H.	ZOETERMEER	NETHERLANDS	2
Bs	BUSQUETS, JA.	LIRIA	SPAIN	1
Cm	CAMPBELL, TOM	SPRING LAKE	FLORIDA - USA	1
Co	CAMPOS, J.	DURBAN	SOUTH AFRICA	2
Cd	CARDIEL, N.	GETAFE	SPAIN	1
Cn	CARPENTER, H.J.T.	WELLING	UNITED KINGDOM	1
Ca	CASAS, R.	SABADELL	SPAIN	1
Cv	CAVAGNA, M.	COLMA D. PIANO	ITALY	1
Ch	CHURMS, JOE	CAPE TOWN	SOUTH AFRICA	1
Cs	COOK, STEVEN	WESTLAKES	SOUTH AUSTRALIA	1
Cp	COOPER, TIM	EAST RAND	SOUTH AFRICA	4
Dp	DAALDER, PETER	LAUNCETON	TASMANIA	4
Dt	DENTEL, M.	BERLIN	GERMANY	1
Dn	DENZAV, H.	ESSEN	GERMANY	1
Dl	DI LUCA, R.	BOLOGNA	ITALY	1
De	DICKIE, ROSS	GORE	NEW ZEALAND	5
Dz	DIETZ, RICHARD	GREELEY	COLORADO USA	1
Dy	DUPOUY, P.	DAX	FRANCE	1
Ds	DUSSER, R.	KALAA SGHIRA	TUNISIA	3
El	ELLIOTT, A.	LEEDS	UNITED KINGDOM	1
En	ENKE, S.	WINDHOEK	SOUTH AFRICA	2
Ew	EWALD, D.	BIESENTHAL	GERMANY	1
Fb	FABREGAT, J.	VALENCIA	SPAIN	1
Fd	FEDERSPIEL, M.	FREIBURG	GERMANY	1
Fz	FRAZER, B.	JOHANNESBURG	SOUTH AFRICA	5
Fm	FREEMAN, TONY	BERKELEY	CALIFORNIA - USA	2
Go	GALLO, V.	SALERNO	ITALY	2
Gb	GARBENI, G.	JOHANNESBURG	SOUTH AFRICA	1
Gi	GARCIA, J.	LISBOA	PORTUGAL	6
Gn	GENOVESE, M.	TORINO	ITALY	1
Gm	GEORGE, MARTIN	LAUNCETON	TASMANIA	3
Ge	GEYER, E.	MERIDA	VENEZUELA	1
Ga	GILLAIN, J.-M.	DAUSSOULX	BELGIUM	1
Gk	GONCALVES, R.	LISBOA	PORTUGAL	6
Gv	GRAHAM, FRANCES	EAST LIVERPOOL	OHIO - USA	1
Gt	GRANT, IAN	SOUTH CROYDON	VICTORIA - AUS	1
Gj	GRIDA, JOE	ABERFOYLE PARK	SOUTH AUSTRALIA	2
Gu	GUESSE, M.	NOUAKCHOTT	MAURITANIA	1
Hy	HAYMES, T.	READING	UNITED KINGDOM	1
Hs	HAYWARD, STEVE	MADANG	PAPUA NEW GUINEA	3
Hj	HERS, J.	SEDGEFIELD	SOUTH AFRICA	1
Hk	HICKEY, DAVID	REDCLIFFE	QUEENSLAND AUS.	1
Hf	HOFFMAN, M.	MERIDA	VENEZUELA	1
Ho	HOLLER, G.	GRAZ	AUSTRIA	1
Hr	HOLLER, K.	GRAZ	AUSTRIA	1
Hb	HUBERT, D.	CHAMONIX	FRANCE	3
Hl	HUSSEY, LIONEL	CHRISTCHURCH	NEW ZEALAND	1
Hx	HUTCHEON, STEVE	PEREGIAN BEACH	QUEENSLAND - AUS.	1
Hu	HUTCHEON, STEVE	WARWICK	QUEENSLAND - AUS.	2
Ht	HUTCHEON, STEVE	SHELDON	QUEENSLAND - AUS.	4
Jg	JUNGFRAUJOCH OBS.	JUNGFRAUJOCH	SWITZERLAND	1
Jr	JURGEN, H.	KLETTWITZ	GERMANY	1
Kp	KEARNEY, PHILLIP	BUNDABERG	QUEENSLAND - AUS	1
Ke	KEITH, LEE	MILWAUKEE	WISCONSIN - USA	1
Ks	KLOS, DANIEL	BRILLION	WISCONSIN - USA	1
Kc	KOCSIS, A.	VESZPREM	HUNGARY	1
Kl	KOHL, M.	USTER	SWITZERLAND	2
Ko	KOPPL, ERNEST	PARADISE HILLS	NEW MEXICO	1
La	LAING, D.	SUTHERLAND	SOUTH AFRICA	1
Lm	LAMBERT, S.	JUNGFRAUJOCH	SWITZERLAND	1
Lg	LANG, MARK	W. RALEIGH	N. CAROLINA - USA	1

Table 2 (Cont.). Observers and locations of events: Jan.-June 1989.

ID	OBSERVER	CITY	COUNTRY	REPORTS
Lc	LASSAUCE, J.-M.	CHAMONIX	FRANCE	1
Le	LEGG, JONATHON	MODBURY NORTH	SOUTH AUSTRALIA	1
Lv	LEVIN, BRUCE	ALBUQUERQUE	NEW MEXICO - USA	1
Lo	LOADER, BRIAN	CHRISTCHURCH	NEW ZEALAND	1
Lh	LORENZ, H.	BERLIN	GERMANY	1
Ld	LOWE, DENNIS	BUNDABERG	QUEENSLAND AUS	1
Ly	LYZENGA, GREG	ALTADENA	CALIFORNIA - USA	6
Mj	MANNA, A.	JUNGFRAUJOCH	SWITZERLAND	1
Mk	MANSKE, ROBERT	BROOKLYN	WISCONSIN - USA	1
Mx	MARECHAL, P.	DAX	FRANCE	1
Mb	MARLOT, C.	GUINES	FRANCE	1
Mm	MARSHALL, G.	JOHANNESBURG	SOUTH AFRICA	1
Mt	MARTI, J.	MATARO	SPAIN	2
Ma	MARTINEZ, P.	TOULOUSE	FRANCE	1
Mh	MARX, H.	STUTTGART	GERMANY	1
My	MAZALREY, P.	VERNON	FRANCE	1
Mf	MICHIE, D.	JOHANNESBURG	SOUTH AFRICA	1
Mi	MIDDLETON, R.W.	COLCHESTER	UNITED KINGDOM	1
Mo	MITCHELL, H.	PENNINGTON	SOUTH AFRICA	2
Ml	MORILLON, E.	POITIERS	FRANCE	1
Md	MULDER, M.	THABAZIMBI	SOUTH AFRICA	2
Ne	NELSON, PETER	KORRUMBURRA	VICTORIA - AUS	4
Nb	NOBEL, W.	AMSTERDAM	NETHERLANDS	1
Ny	NYE, DERALD	TUCSON	ARIZONA - USA	6
Ol	OLSEN, FRANK	CEDAR RAPIDS	IOWA - USA	1
Ov	OVERBEEK, DANIE	EAST RAND	SOUTH AFRICA	9
Pw	PALZER, W.	WIESBADEN	GERMANY	1
Pn	PANNIER, L.	GORLITZ	GERMANY	2
Pa	PATTERSON, GEORGE	CHRISTCHURCH	NEW ZEALAND	2
Pc	PIC-DU-MIDI OBS.	BAGNERES D B	FRANCE	1
Pi	PORCINI, R.	SALERNO	ITALY	3
Pj	PRIESTLEY, JOHN	PUKERUA BAY	NEW ZEALAND	3
Pr	PRIETO, J.	MADRID	SPAIN	1
Ps	PROSSER, G.	PIETERMARITZBURG	SOUTH AFRICA	3
Rg	REGHEERE, G.	GRENOBLE	FRANCE	2
Rn	RENOU, A.	BRISSAC	FRANCE	1
Rb	ROBERTS, BENNY	JACKSON	MISSISSIPPI - USA	1
Rc	ROWE, CLIVE	CHRISTCHURCH	NEW ZEALAND	1
Rl	ROWELL, LYN	ABERFOYLE PARK	SOUTH AUSTRALIA	1
Rs	RUSSELL, WALTER	BOONE	COLORADO USA	1
So	SAMOLYK, G	MILWAUKEE	WISCONSIN - USA	1
Sx	SANCHEZ, F.	CACERES	SPAIN	1
Sh	SCHILLER, D.	EAST RAND	SOUTH AFRICA	3
Sn	SCHNABEL, C.	BARCELONA	SPAIN	4
Sl	SCHOLTEN, A.	EERBEEK	NETHERLANDS	1
Se	SERNE, P.	AMSTERDAM	NETHERLANDS	1
Sy	SLUSARCZYK, J.	NIEPOLOMNICE	POLAND	1
Sm	SMIT, J.	PRETORIA	SOUTH AFRICA	9
Sc	SMITH, CHARLIE	WOODRIDGE	QUEENSLAND - AUS.	14
Sd	SMITH, MIKE	TUCSON	ARIZONA - USA	2
Sq	SOULU, F.	DAX	FRANCE	1
Ss	SPEC. SOLARE TIC.	LOCARNO	SWITZERLAND	2
Si	SPEIL, J.	WALBRZYCH	POLAND	1
St	ST. GEORGE, LOU	AUCKLAND	NEW ZEALAND	2
Sj	STAMM, JIM	TUCSON	ARIZONA - USA	12
Sf	STOECKELER, RALF	LYNDOCH	SOUTH AUSTRALIA	1
Sg	SUTTERLIN	FREIBURG	GERMANY	1
Sz	SZABO, S.	SZOMBATHELY	HUNGARY	1
Tb	TALBUT, DONALD	GREENSBORO	N. CAROLINA - USA	1
Tg	TANGNEY, VIRGIL	MILWAUKEE	WISCONSIN - USA	1
Tr	TERRIER, P.	CHAMONIX	FRANCE	3
Ty	THIERRY, P.	TOULOUSE	FRANCE	1
Tt	THIRIONET, Y.	BRUSSELS	BELGIUM	1
Td	TODONI, P.	ORVIETO	ITALY	1
Tf	TOFOL, T.	BARCELONA	SPAIN	1
Tp	TULIPANI, F.	BOLOGNA	ITALY	1
Tk	TURK, C.	SIMONS TOWN	SOUTH AFRICA	1
Vb	VAN BLOMMESTEIN, P.	CAPE TOWN	SOUTH AFRICA	6
Vk	VINCENT, KEITH	BLENHEIM	NEW ZEALAND	1
Va	VON ALVENSLEBEN	FREIBURG	GERMANY	1
Wk	WAKEFIELD, N.	WALKERVILLE	SOUTH AFRICA	5
Wa	WALLACE, ADRIAN	BERRE	SOUTH AUSTRALIA	1
Wl	WALLACE, R.	JOHANNESBURG	SOUTH AFRICA	1
Wr	WARACZYNSKI, S.	MILWAUKEE	WISCONSIN - USA	2
We	WEIER, DAVID	BROOKLYN	WISCONSIN - USA	1
Ws	WEST, D.	JOHANNESBURG	SOUTH AFRICA	1
Wh	WIESENHOFER, W.	GRAZ	AUSTRIA	1

A very large expedition to observe the Jupiter graze was organized by Rick Frankenburger and Ron Dawes from San Antonio, to observe from a good north-south road about 3 miles east of Crystal City, Texas. As noted on p. 3, several attendees of the IOTA annual meeting, including David Dunham, tried to observe and videorecord the graze. They also reported a strong north shift, with about 2/3rds of their observers missing the graze, but seeing a deep partial occultation. At that location, the sky was dark enough to see the disappearances and reappearances of the Galilean satellites.

Harold Povenmire decided to go another 40 miles farther west, to near El Indio near the Mexican border, to get the darkest possible sky in the U.S.A. at the southern limit. He also decided to position himself farther north than usual, to guarantee emersion well on the dark side, to see if he could see the "glow" reported by Brock during the 1968 graze of Jupiter. Due to the north shift, Povenmire saw two complete disappearances of Jupiter instead of the one long disappearance expected, and he did see a definite glow before the emersions and after the first immersion. The glow may be a Jovian aurora, or light scattered high in Jupiter's atmosphere.

It would be great if we could devise a way to give credit to observers who put a lot of effort into grazes which get clouded out, but this is not easy, especially if the credit is to take the form of an officially filed report. Usually an expedition leader will push for this until the bad luck spell breaks, after which it seems unimportant. IOTA does not make any requirements concerning the degree of activity of its members. I am not concerned if a group is forced to be inactive due either to the weather or to some other reason. If there is any effort being made at all to organize expeditions, one will eventually fall on a clear night (the random, stochastic, vagarious whims of Mother Nature will see to that) and a report will shortly thereafter grace my mailbox.

Graze List as of 9/19/1990

Date YrMoDy	V P	Star #	Mag	% Snl	CA	Location	# Sta	# Tm	S S	Ap Cm	Organizer	N CShS WA	b
890313		0616	56	36+		Pritchardvlle,SC	1	6			Harold J. Carney		
891123		1778	71	20-	17S	Rosiere, WI	1	2	1	13	Daniel Klos	2S195	54
900317		2276	56	70-	10S	Call Junction,TX	6	28	1	14	Don Stockbauer	4S192	71
900428		076945	77	12+	16N	Bedford, OH	4	7	2	9	Robert J. Modic	2N 12	-48
900430	V	1216	73	40+	12N	Newchurch, UK	6	28	2	8	H.J.T. Carpenter	2N 13	-7
900514		2750	21	83-	-2S	Seville, OH	1	6	3	20	Robert J. Modic	7S180	40
900518		3328	70	39-	18N	Avondale,Austrl.	1	2	1	20	P. Kearney	342	-34
900719		076895	78	11-	10N	S.Susana, Port.	2	8	3	12	Joaquim Garcia	1N354	-58
900726		138203	84	18+	1N	Monaca, PA	1	1	2	15	John Holtz	6	58
900728		1858	65	35+	1N	Reddick, FL	1	5	2	20	Tom Campbell	4S 3	72
900814		0522	81	44-	9N	Troia, Port.	3	12	1	14	Joaquim Garcia	5N352	-58
900818		Jupitr	-19	5-	-2S	Brookshire, TX	3	6	1	20	Don Stockbauer	7N180	-7

GRAZING OCCULTATION PREDICTION CHANGES

David W. Dunham

No South Shifts! Graze observations during the past few months have clearly shown that the corrections to version 80J graze predictions detailed on p. 385 of the last issue and in ON 4 (15), p. 361 should no longer be applied. For all combinations of librations and Watts angles, no corrections should be applied to the IOTA/USNO (U.S. Naval Observatory) version 80J graze predictions. There is quite a story involved in arriving at this result, which I hope to describe more next time. In the meantime, I thank Richard Wilds, who first alerted me to the fact that something was wrong with the southward correction; Bert Carpenter in England for faxing me his observed profile showing 13 stations that had essentially a zero shift during a graze of the Pleiades star SAO 76259 on July 18; Henk Bulder, who telephoned me from Holland the day before our August 14th Pleiades passage to report a 0".1 north shift for a graze that he had just observed that morning; and to the many other observers who contributed observations that helped lead to the above-stated conclusion. In any case, it is puzzling, since during the middle of 1989, there were systematic south shifts for many waning-phase northern-limit grazes. And I believe that 1988 was like 1990, since the ZZ87 catalog was used extensively for the first time in 1988, and we used that year's observations to confirm that version 80J should not be altered.

1991 Graze Predictions Data for 1991 grazes have been generated, and will be distributed to the computors at the end of October, nearly a month earlier than for the 1990 distribution. So hopefully you will receive your 1991 predictions in a more timely fashion than you did for 1990. In the limit predictions, the version, or "prediction basis", will be given as ILE, rather than 80J. This is because the file used for the lunar and solar ephemeris that the OCC computer program at USNO uses ends on January 2, 1991, and nobody has been able to figure out how to generate an accurate extension. The lunar ephemeris for the current 80J is an accurate ephemeris that was generated at JPL several years ago, and fitted to lunar laser ranging data available at that time. There is an analytic lunar ephemeris called the New Improved Lunar Ephemeris, that was generated in the 1960's, when there was no lunar laser ranging data, and is known to be deficient by a few tenths of an arc second in declination due to incomplete planetary perturbation expansions. We can use this to generate a file for the OCC program for any period of time that we want, and we have a file that extends to about 2050. This is what we have had to use for the 1991 predictions, and the "80J" empirical corrections incorporated into the OCC program will not be compatible with ILE.

If we leave this current setup alone, the graze predictions for 1991 are guaranteed to be less accurate than those for 1990. If "ILE" appears as the version at the bottom of your ACLPPP profiles, expect errors of 0".4 seconds or more in addition to the usual star position errors. But for the profiles, we hope to do something better, which may give predictions nearly as accurate as this year's. We can probably replace the lunar ephemeris information in the ILE OCC input file with a modern accurate lunar ephemeris, such as the one in JPL DE200, which would be rather close to that used for 80J. Even better would be to replace OCC for this function with another program based on a modern lunar ephemeris and a new analysis of occultation observations that used it. Mitsuru Soma at the National Observatory in

Mitaka, Tokyo, is developing such a program, and if we can install it on USNO's computer when he visits there with me on October 22nd, the problem will be solved. In that case, something different will appear in the "version" for the profile, to be announced later.

GPS AS A POSITION SOURCE?

Joan Bixby Dunham

The Global Positioning System (GPS) is a satellite program supported by the USA Department of Defense to give highly accurate position information for navigation on land, sea, in the air, and in space to users with the GPS receivers. The program includes two modes of access to the position information, a highly precise access that required knowledge of the classified P-code (precision code), and a C/A (coarse/acquisition) access that was to be available to the general public. Hand-held GPS receivers that use the C/A code are available now (approximately $2000) for use in boating, aviation, surveying, and, if desired, determing the position of observing sites.

Testing of the GPS revealed that the C/A code access works quite well. It was expected to give positions with an accuracy of 100 meters, and testing found accuracies of 20-30 meters. Unfortunately, that is too good, since the reason for the lower accuracy C/A was to prevent unfriendly forces from using the position information to locate the GPS spacecraft and destroying them. The decision was made to make the system less accurate for general users with what is called selective availabililty (SA). With SA switched on, the C/A position accuracy is about 120 meters, not sufficiently accurate for occultation observers.

There is a technique for overcoming the SA accuracy denial, but it requires two GPS receivers and more processing of the received signals. Basically, measurements are made simultaneously at two sites, one a location with a known position and one the site to be measured. Corrections are made to the GPS ranges from the known locations and used in the computations of the posiions at the unknown locations. This is a far more expensive proposition than most observers are willing to face, since it requires at least two GPS receivers which include the extra processing capability necessary for this differential correction technique.

Recent press reports have said that the SA accuracy denial was on earlier this year but is currently off. The C/A GPS receivers give position information accurate enough for occutation observation site position determination when the SA is not on. However, it would be difficult for a C/A user to discern when the SA is on and when it is off.

More information on the GPS is available through magazines and newsletters on space and military programs. Three magazines are GPS World, Space News, and Aviation Week.

VIDEO NEWS

David W. Dunham

CCTV Corporation Gives IOTA a Break The Phillips CCD imaging module has been described in recent issues, including IOTA's group purchase on p. 395 of the last issue. A ready-to-use boxed version of the Phillips camera with manual and automatic gain control, sold by CCTV Corp. for $460 (item CCD-505), was described on p. 395 of the last issue. The delayed order mentioned in the last issue apparently resulted from the order being lost in the mail. A phone call to CCTV shortly after the last issue went to press cleared the matter up quickly, and the observer, who lives in this area, had his camera a few days later. Tom Campbell, in Temple Terrace, FL, ordered the GBC505 camera from CCTV by phone a few weeks later, and sent them a copy of the ON article. Campbell found out that the $460 price was a wholesale price, but was being used for retail sales temporarily. Gary Perlin, CCTV System Sales Manager, wrote to me saying that both the CCD-500 (without manual gain control, $395) and CCD-505 were in stock and available for immediate shipment. As a special consideration to IOTA, these prices will remain in effect even for single unit orders. CCTV Corp.'s address is 315 Hudson St.; New York, NY 10013; telephone 212,989-4433 or 800,221-2240, fax 212,463-9758.

Phillips Module News Peter Manly boxed his module, obtained from Phillips as part of IOTA's group purchase in June described in the last issue. Manly wrote instructions for boxing the module and making other necessary connections, and distributed copies of these to the other members who took part in the group purchase. Recently, Manly has developed hardware to integrate images from the module, up to about half a second, to reach fainter magnitudes without image intensification. He will write this up and also distribute it to the IOTA group purchasers. His next project is to cool the sensor, to allow longer integrations, but this requires that the sensor be detachable, a possible option that we did not know to request when we placed the order. At the moment, I do not know of anyone interested in a second group purchase of the Phillips module. If you are interested in such a purchase, you might want to talk to Peter Manly at 602,966-3920 for more information.

Henk Bulder asked me about the possibility of an international group purchase for PAL-format versions of the Phillips module, since most European countries use the PAL format. I referred him to Andrew Elliott; 40 Ryhill Way; Lower Earley; Reading, England RG6 4AZ; phone 44-734-751056. Elliott knows about a group purchase, I believe made by members of the British Astronomical Association, for the PAL version of the Phillips module.

Image Intensifiers Stano Components, which I have mentioned as a source of used image intensifiers, has moved to P.O. Box 2048; Carson City, NV 89702; telephone 702,246-5281. They sell new image intensifiers ranging in price from $1650 to $3000. Stano Components also have a varying supply of used image intensifiers. Their recent catalog describes used equipment from $600 to $1000. A relay lens assembly to transfer the intensifier image to a video camera has to be obtained elsewhere, for example, from Edmund Scientific, which sells a "viewer to TV coupler" order # J-38211 for $350. Peter Manly's comment was that the expense to observers to use intensifiers is gradually dropping, but the prices are not yet spectacularly low.

SOLAR ECLIPSE NEWS

David W. Dunham

1990 July 22, Total Unfortunately, no successful observations were made from the ground near the edges of this eclipse. All efforts to do so were clouded out or, in our case, foiled by failure to secure a Soviet visa. It was cloudy in both Finland and the Chersky area of Siberia, although Hans Bode and others saw part of the total eclipse from airplanes. Eight IOTA members went to Atka, near the southern limit in the Aleutians. Plans to climb mountains on the island to get above the clouds probably would have succeeded the day before or day after the eclipse, although high grass and uneven terrain would have made the actual climb much more difficult than anticipated. However, an intense low pressure area passed over Atka at the time of the eclipse, with strong wind and driving rain; the clouds extended many thousands of feet above the highest mountains. Even so, Glenn Schneider was impressed at how dark it got during totality; the combination of the thick clouds and the eclipse shadow created a midnight-like darkness. I am glad that my plans to go to nearby uninhabited Amukta Island at the northern limit could not be realized.

Joan and I had an enjoyable vacation in Alaska during the week before the eclipse, but our Soviet visas never arrived. We learned later that the Siberian group that sent the invitation did not have the proper authority to issue the invitation, according to a source in the Soviet consulate in San Francisco. Even if we had reached Markovo and videorecorded Bailey's beads from near the path edge, we could cover only one limit. Since all of the other efforts at the limits were clouded out, the effort to measure the solar diameter would have failed, even if we had been successful. Another account of the eclipse is in Gary Nealis' report on p. 3.

1991 January 15, Annular There are descriptions of the observing plans for this eclipse on p. 392 of the last issue, as well as p. 3 of this issue. To date, Paul Maley says that only a few have signed up for his effort, so his group will be able to cover only one of the limits. More people are sought for this effort, possibly by combining forces with an IOTA/ES expedition. Joan will be 8 months pregnant at the time, so we will not be able to go.

1991 July 11, Total Information on this eclipse was given on p. 392 of the last issue, as well as p. 3 of this issue. Paul Maley gave an informative talk about his scouting trip to Puerto Vallarta in early August, and showed a videotape taken during the trip, at the IOTA meeting in San Antonio. There are no plans to impose driving restrictions on the mainland on the day of the eclipse, as opposed to restrictions the Mexican government is planning for Baja. The countryside around Puerto Vallarta is poor, but the people are generally friendly and helpful, and driving seemed quite safe in the daytime. As of mid-August, everyone who had signed up for Maley's bargain-basement Hanssen/Future Travel tour wanted to go to the central line, although they plan on options to observe from both the central line and from locations inside (north of) the southern limit. For more information, contact Paul at 713,488-6871.

Thomas Van Flandern recently announced "The Eclipse Edge Expedition". In a notice about the expedition, he explains the advantages of observing from locations 1 to 4 miles inside the path edge. All dynamic edge phenomena, including Bailey's beads, visibility of the chromosphere, and shadow bands, last about 10 times longer than their central line durations. Yet because of the circular geometry of the eclipse shadow, most observers will have more than a minute of totality for viewing the corona. The expedition will include activities from July 6 to 12 at Puerto Vallarta, including observation of the Pleiades passage on July 8. A room deposit of $150 is required to sign up for the effort, with the full cost (estimated $700/single, $900/double), excluding airfare, due April 15. A block of air reservations has been made from Houston and Dallas to Puerto Vallarta, for some discount on the airfare. For more information, write to: The Eclipse Edge; P.O. Box 15186; Chevy Chase, MD 20815. Airline reservations can be made by Paula at Business Travel Associates, phone 800,443-4502 (or 202,659-8314 in Washington, DC); The Eclipse Edge is working with Business Travel Associates. There is some urgency to make airplane reservations, since flights to Puerto Vallarta are limited, and other expeditions are going there.

The Hanssen/Future Travel (Paul Maley) is certainly the least expensive expedition that has plans for observing at the eclipse limits, and with its brief stay, will be the easiest to justify for IOTA tax deductibility. But if you also want to try the Pleiades passage the morning of July 8th (visible only from Mexico, and the last (and perhaps the best of the current series) passage visible from North America for 14 years, as well as observe near the southern limit, you need to join an effort such as The Eclipse Edge, which I expect to particate in some form myself. Also, Hans Bode's IOTA/ES expedition, and Richard Wild's planned effort from Topeka, KS, may affiliate with The Eclipse Edge.

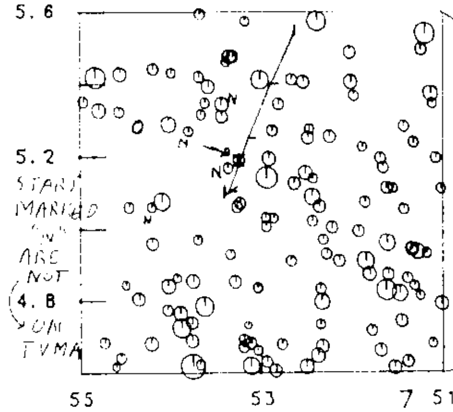
Jay Anderson has provided me with rather detailed cloudcover information for La Paz, Puerto Vallarta, Acapulco, and a few other places. La Paz has the best weather prospects for the Pleiades passage, but Atlas is the only named Pleiad occulted there, with a graze at the northern limit several miles northwest of La Paz. Richard Nolthenius, Aptos, CA, may try that graze; I hope that both it and the ZC 551 graze visible from parts of the city of La Paz might be observed. The Pleione path passes a little north of the eclipse central line north of Puerto Vallarta, being the most accessible graze from that city; I hope that IOTA members can work with The Eclipse Edge to rent one or two of the few rental cars available in Puerto Vallarta to observe that graze. Even better might be the Merope graze southeast of Puerto

Vallarta, but suitable roads may not go in that direction, requiring a much longer drive into the interior where cloudcover may be worse. This needs to be investigated, as does the possibilities for observing the Alcyone graze near Acapulco, and getting to Puerto Vallarta from Acapulco (preferrably by air) afterward. Also, it would be useful to have some IOTA members travel from Puerto Vallarta to Mazatlan, perhaps the morning of July 10, to observe from locations south of the northern limit west of that resort city. I notice in the November issue of Sky and Telescope that a group from Wichita, KS, plans to observe from Mazatlan, so possibly something could be coordinated with them. I would like to make some of these arrangements myself, but the pressure of preparing articles and detailed prediction data for 1991 occultations will prevent me from doing very much. Some help in checking out these options would be greatly appreciated, and I am willing to reimburse, through IOTA, long-distance telephone calls made to try to secure practical arrangements. Call me at 301,474-4722 if you would like to help out with this. I hope that we can distribute more detailed information (including a synopsis of Jay Anderson's reseach on cloudcover for the July 8th Pleiades passage) soon, perhaps with the mailing of the 1991 grazing occultation supplements.

SOLAR SYSTEM OCCULTATIONS DURING 1990

David W. Dunham

This is the last continuation of the article with the same title that starts in ON 4 (14), p. 341 and was continued on p. 396 of the last issue. Of the finder charts published in this issue, only the one for the occultation by (216) Kleopatra on November 17 was compared with the True Visual Magnitude Atlas. Since radar observations indicate that Kleopatra is dumbbell-shaped (probably a contact binary asteroid), the November 17th event has special interest, and chances are good that there will be an astrometric update for it. Astrometry will likely be obtained also for the occultation by (704) Interamnia on November 15th.



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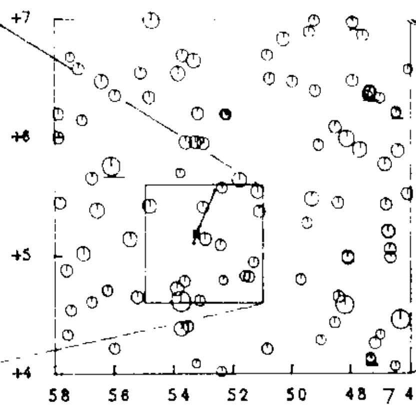
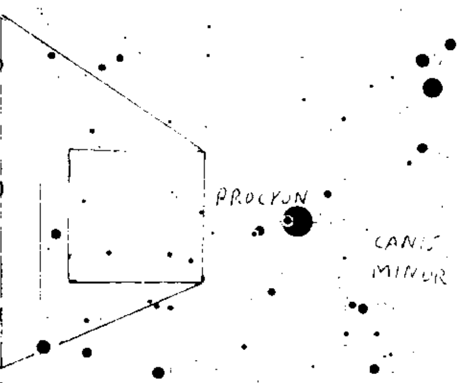
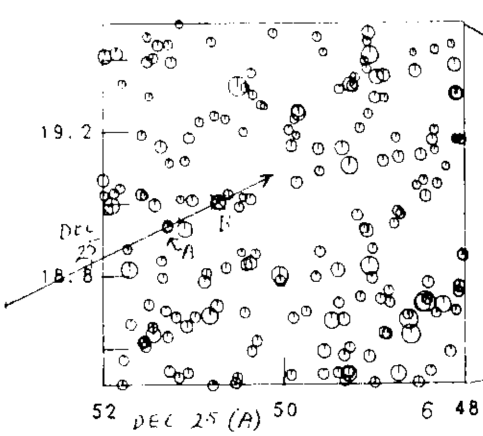
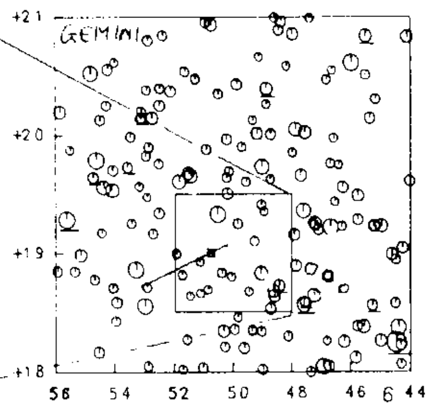


1990NOV17 216 KLEOPATRA





1990DEC26(6)532HERCULINA



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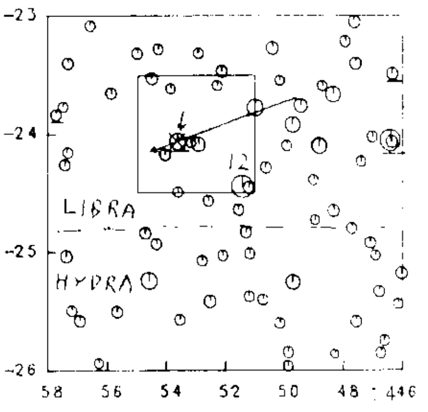
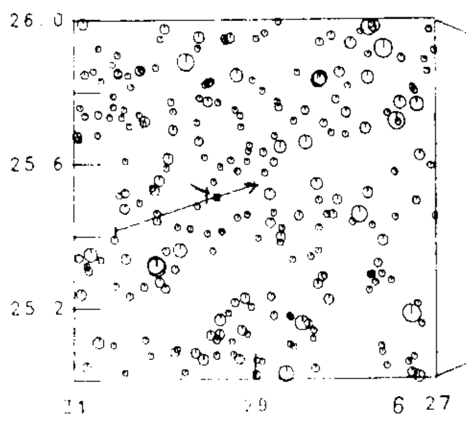
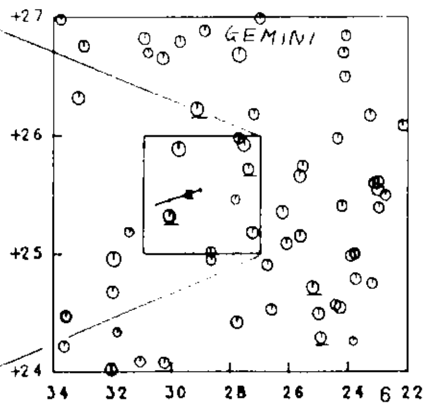


L 1 1939 1990DEC9 134 SOPHROSYNE SAO 183017



1990NOV24 121HERMIONE



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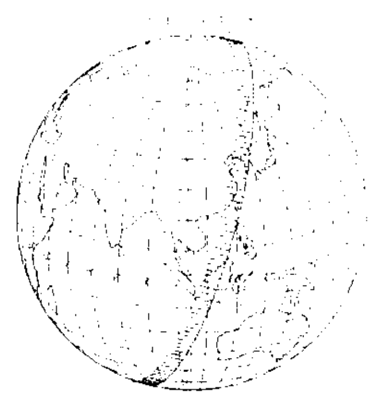
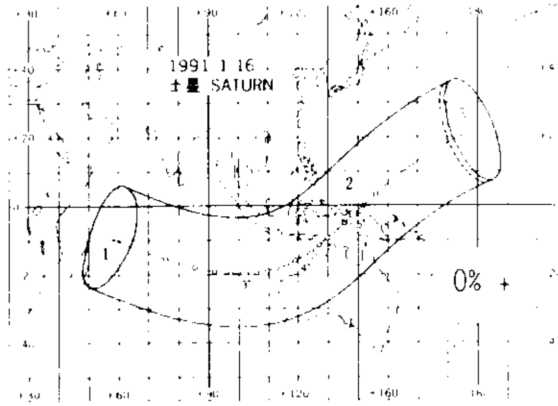
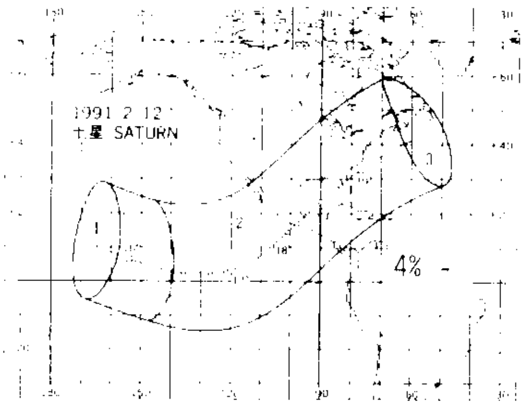

SAO 80375 by Metis 1990 Nov 14

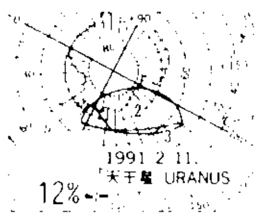
LUNAR OCCULTATION OF PLANETS

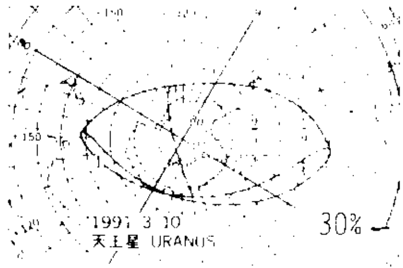
The maps showing the regions of visibility of lunar occultations of planets are reprinted by permission, from the Japanese ephemeris for 1991, published by the Hydrographic Department of the Maritime Safety Agency of Japan. In region 1, only the disappearance is visible; in region 3 only the disappearance may be seen. Reappearance occurs at sunset along a dashed curve, while disappearance is at sunrise along a curve of alternating dots and dashes. We have added a legend to each map indicating the phase of the Moon at event time.

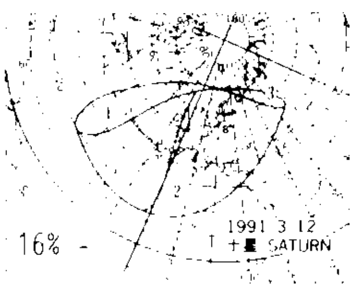
Those interested in observing partial occultations should request predictions at least three months in advance (if possible) from Joseph Senne; P. O. box 643; Rolla, Mo 65401; U.S.A.; phone 314,363-6233.

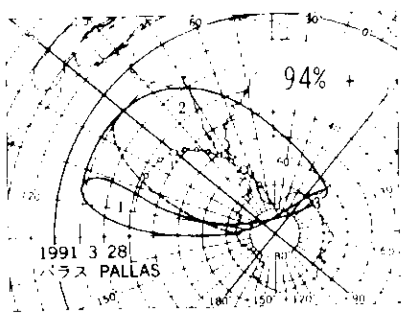


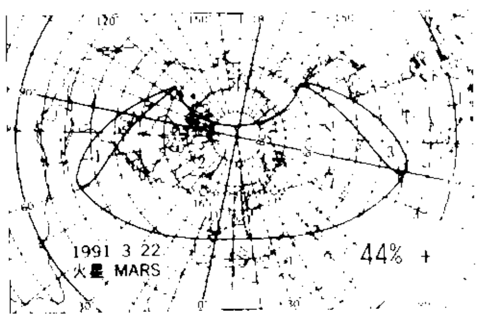


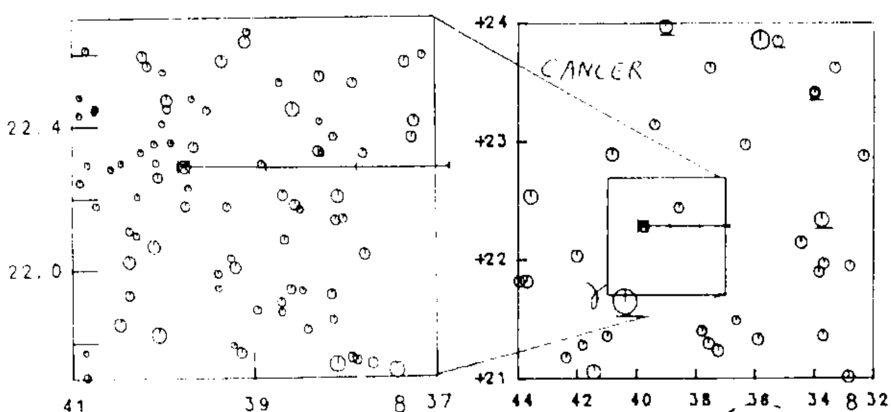




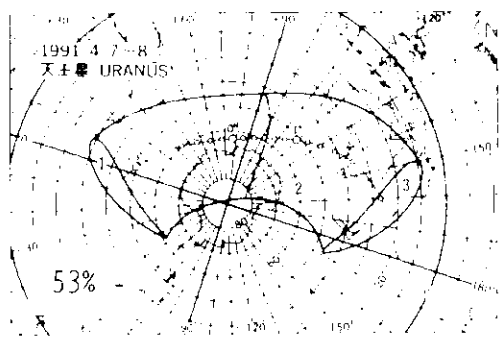


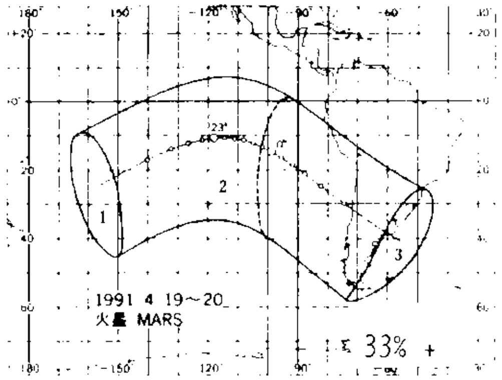


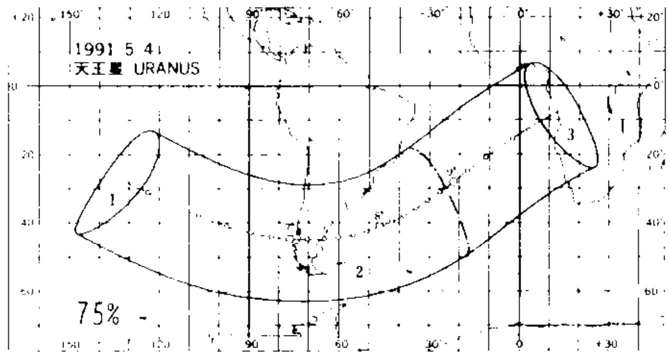


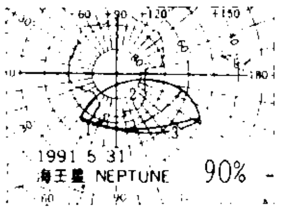


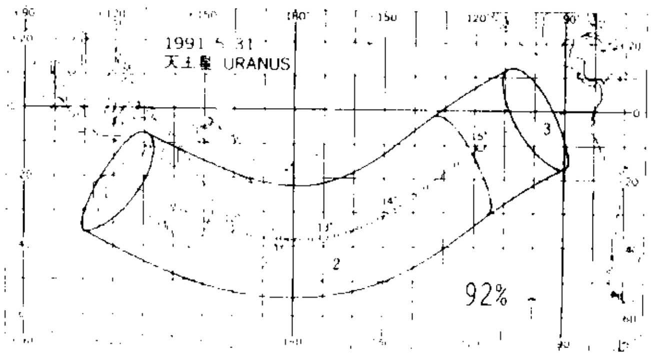
1990NOV14 9 METIS SAO 80375 1990NOV14 9 METIS M44 SAO 80375

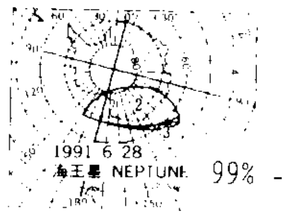


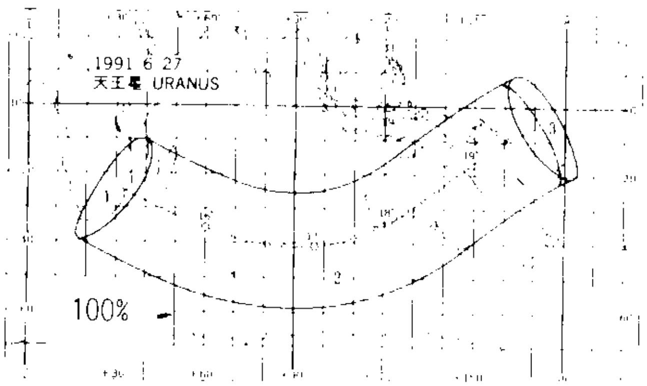

1991 4 19～20
火星 MARS
33% +

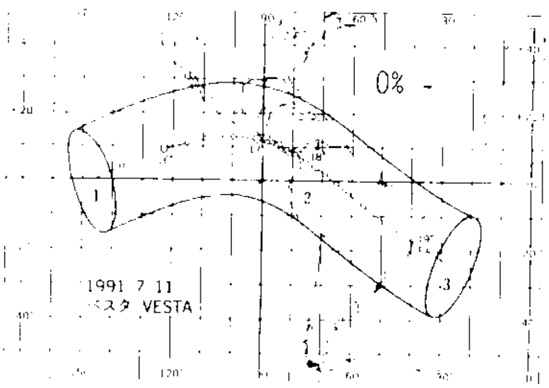

1991 5 4
天王星 URANUS
75% -

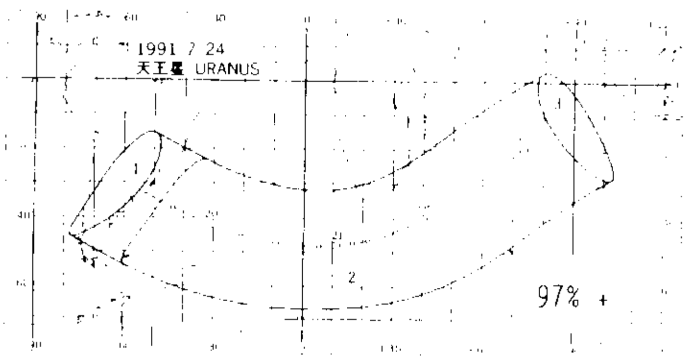

1991 5 31
海王星 NEPTUNE
90% -


1991 5 31
天王星 URANUS
92% -


1991 6 28
海王星 NEPTUNE
99% -


1991 6 27
天王星 URANUS
100% -


0% -
1991 7 11
ベスタ VESTA


1991 7 21
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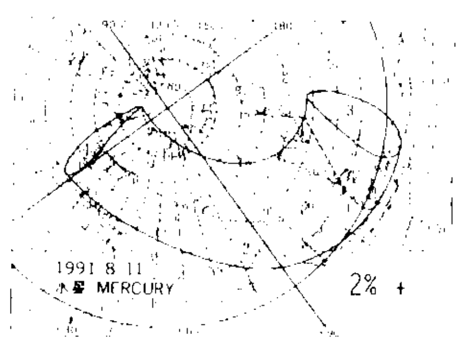
97% +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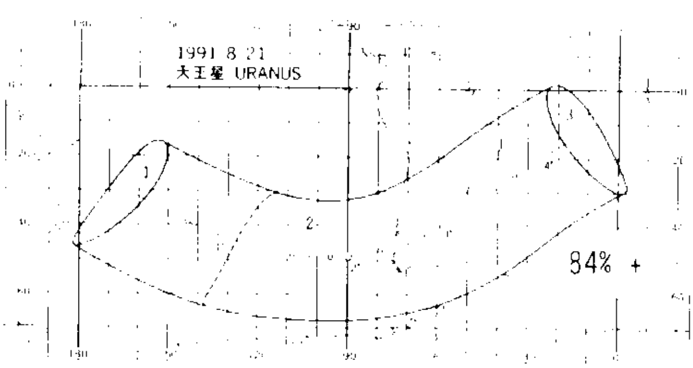
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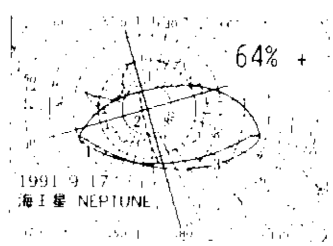
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OBSERVABILITY OF OCCULTATIONS

Henk J.J. Bulder

When can a predicted occultation of a star really be seen with a telescope of a given diameter? No doubt this question has crossed the mind of every observer looking through his telescope searching for a relatively easy occultation and not being able to locate the star. Of course, such instances aren't very troublesome for the experienced observer using a dome or any readily available telescope. But when the telescope has to be mounted for the event or in case you have to travel a major distance, which is quite normal for most grazes, the answer is likely to be of more interest. Although the question in itself is quite simple, the answer most certainly is not because there are a lot of circumstances involved that influence the visibility.

First of all the magnitude of the star is important and, of course, the diameter of the telescope. Then there is the quantity of moon glare, the sky condition and, last, but not least, the observer. To make it more complex these factors are partly interrelated.

The Telescope A telescope's limiting magnitude does increase with its diameter. Although one can give a simple formula to express this dependence, it will only hold when optics are clean and of good quality! The more starlight that is focussed into a point the easier it will be to see the image. Telescopes without central obstructions do have an advantage over other types. Often, however, a lot of diameter can be purchased for a low price to compensate (e.g., Newtonian types).

If optics are damaged or aren't clean, especially when this concerns the ocular, the light of the near Moon will illuminate the field of view in such a way that the star will be lost in it. The same effect will occur when the tube or any parts inside are reflecting light. This effect will increase toward full Moon.

A good telescope has a stable mount. If not, trembling will often cause the star to be lost.

Weather and Sky Conditions Weather doesn't only influence seeing and transparancy, but it also happens to influence the telescope and the observer.

Although clear skies offer more guarantees to observe than cloudy ones, holes in cloudy skies often offer better seeing. Very bright stars can easily be observed through thin clouds or haze and haze mostly guarantees good seeing. (Don't forget to use a dewcap, especially for telescopes with correction lenses like Celestron, etc.)

Wind has a bad effect on seeing and telescopes with large surfaces (such as many Newtonians) suffer heavy trembling. Observing from a dome or shelter is preferred in such cases.

Of course, the telescope needs time to acclimatize to low temperatures as does the observer. Coming from a warm room your eyes will easily water, especially when there is some wind. The occular will dew in such cases when you get too close, as those who observe from light polluted areas will have noticed.

The Moon Although the human eye has an enormous dynamic range, it will get much more difficult to see faint stars in the vicinity of a strongly illuminated body like the Moon. Therefore, a good practice is to have as little of it as possible in the field of view. The closer we get to full Moon the more difficult this will be. For the same reason, observing stars close to the cusps is more difficult.

The altitude of the Moon also plays a role. The lower the altitude, the lower the transparancy and the more background illumination, especially in (light) polluted areas.

The Star The magnitude of the star is the main element that influences visibility. The spectrum (color) of the star might be of interest too, especially when observing at the bright limb of the Moon. The more the color differs from the reflected sunlight the better the star will stand out against the Moon.

The Observer For normal observing, it is of great benefit when the eyes are adapted to the dark. Figure 1 (made by L. Cluyse) shows eye adaptation to darkness with time. Strictly speaking this is of less use when observing near a bright object like the Moon. In those cases, when the illuminated portion of the Moon is outside the field of view, which is typical for phases between 30 and 50% sunlit, adaptation to the dark will play a role that cannot be neglected.If, by accident, the bright Moon gets into the field of view, shift it outside again and simply observe with the other eye. Observing with averted vision can be of help in such cases too. Be aware howeverthat personal equations will be somewhat higher.

Toward full Moon, there is another reason to start observing 5 to 10 minutes in advance (for disappearances only). It is often difficult to find the star near a highly gibbous Moon. Starting early, you are able to fix your eye on the star when it is still easy to locate.

Quality of eyes differs for each individual and is likely to diminish with age. Concentration and visibility can be improved when you take a seat while observing.

Observing reappearances poses another problem because the place of exit is not accurately known,especially when the dark limb isn't visible. Some clever observers have designed a device that can be rotated with position angle and blocks all light of Moon and background, except for a small hole in which the star will reappear. You will agree that such an apparatus highly improves success with reappearances. [This works best when you have a drive that tracks well enough to have the star reappear in this small hole. -- ed.]

USNO Prediction Lists Observability codes used in USNO prediction lists do vary with magnitude of star, altitude, and phase of the Moon, as can be seen in Figure 2. This figure is only valid for Moon altitudes above 10° and Sun altitudes below -12°. From table 1 you can see the direct relation between observability code and telescope diameter.

An observer must realise that USNO prediction lists are complete down to magnitude 9 only, so when conditions allow, it is possible to see more stars then predicted.

My Own Observations Figure 2 contains two performance curves. One concerns a 15-cm Maksutov telescope and is based on 400 observations; the other concerns a 30-cm Newtonian telescope and is based on more then 1000 observations. As you can see best performance with respect to observability codes is reached between 60 and 90% illuminated Moon. Near full Moon, performance decreases while the same tendency can be seen toward new Moon.

To see the effect of cusp angle, Figures 3 and 4 (for 15 and 30 cm) are plotted. As you can see, this effect is more profound toward lower illumination. Especially for cusp angles below 10° the effect is dramatic.

Performance curves for occultations at the bright limb are shown in Figure 5. Those are based on a few observations only (7 for the 15-cm and 14 for the 30-cm), so they are likely to be less exact.

My experience with occultations during twilight and dawn results in performance curves in Figure 6, based on 80 observations for the 15-cm and 160 observations for the 30-cm. As can be seen, USNO observability codes are far too optimistic in thiscase. They hold to Sun altitudes of about -3°. Perhaps the performance can be improved a little by using special daylight or polarization filters.

Grazing Occultations As stated above, for grazing occultations especially, it is preferred to know in advance if you have any chance in seeing the star. Using the information above and experience during a lot of graze expeditions with several instruments, I have drawn a rather conservative Figure 7 that might be of help to you. The figure is only strictly valid for cusp angles of 5° and Sun altitudes below -7°. For higher Sun altitudes, you should consider Figure 6 as well. For bright limb events, you should take magnitude 4.5 as a limit.

To use this figure, you need the magnitude of the star and the percent sunlit for the Moon. Find the intersection that yields needed altitude of Moon and telescope diameter. To make it easier to interpret, I have drawn in only performance levels of 10-, 15- and 20-cm telescopes.

You must realise that I have always been observing from highly light polluted areas in The Netherlands and Belgium, so it could be that Moon altitude values needed in your area are less than the figure suggests.

The author is interested in your experiences or special aids to improve observability. Make a copy of Figure 2 and draw your own performance curve, and send it together with telescope specifications to Henk J.J. Bulder, Mendelssohnrode 72, NL-2717 CS Zoetermeer, The Netherlands. If there are enough responses it will be possible to compare telescope types.

TABLE 1. Relation between Observability Code and Telescope Diameter

obs	telescope	obs	telescope
0	45 cm	6	6.5 cm
2	24 cm	7	5 cm
3	17.5 cm	8	3.5 cm
4	12.5 cm	9	2.5 cm
5	9 cm		

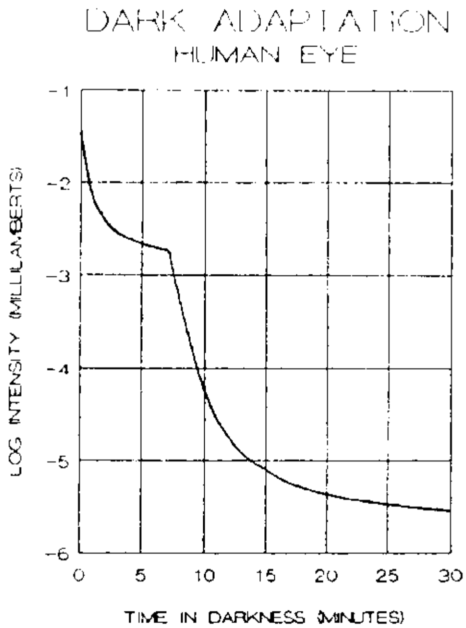


FIGURE 1

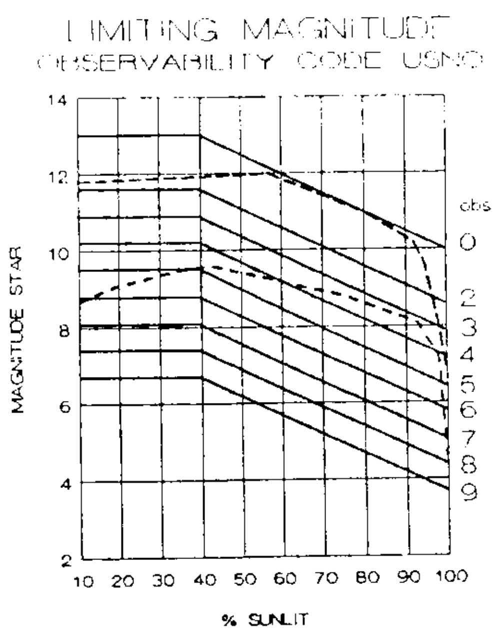


FIGURE 2

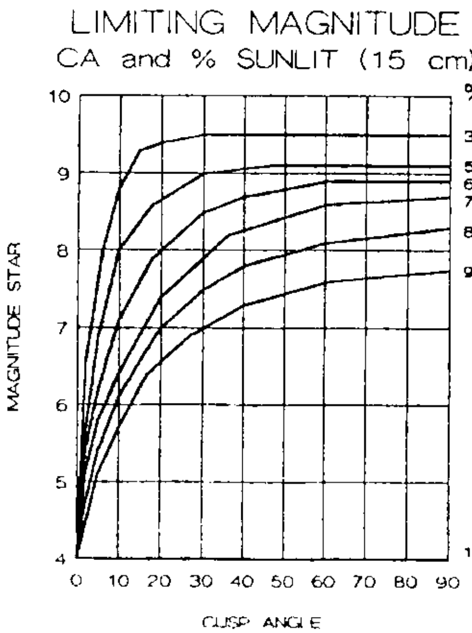


FIGURE 3

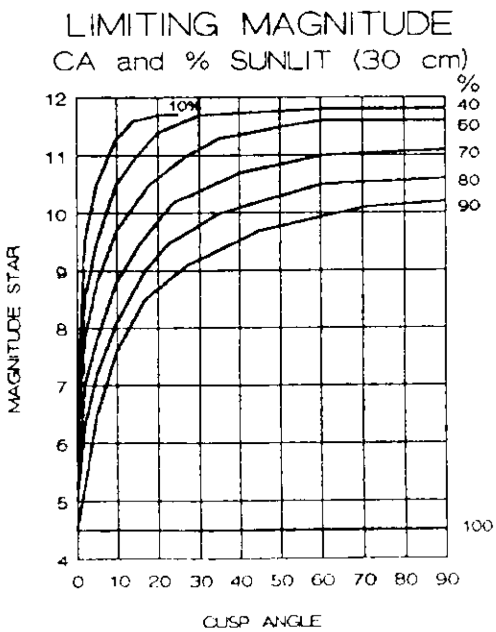
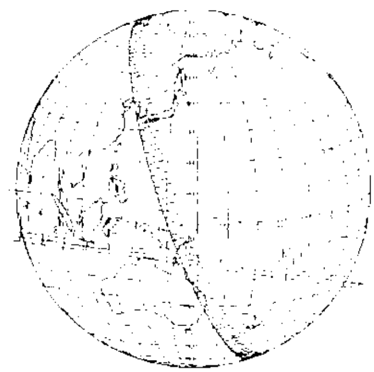


FIGURE 4



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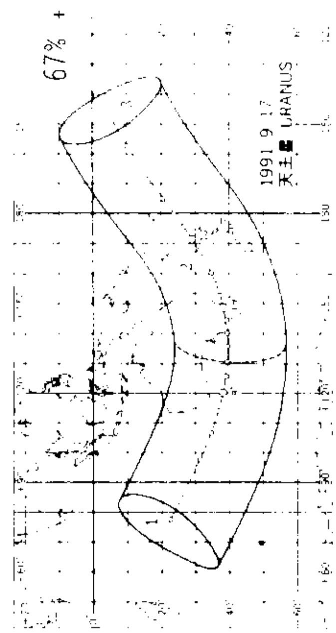


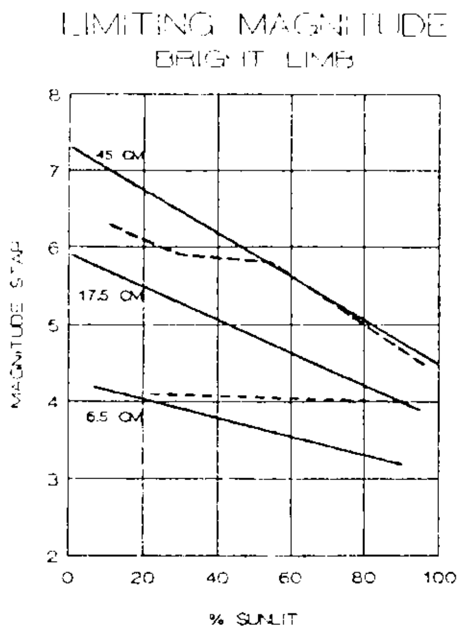


FIGURE 5

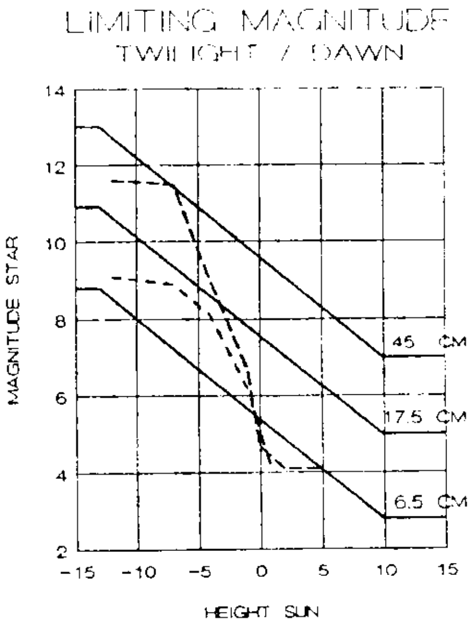
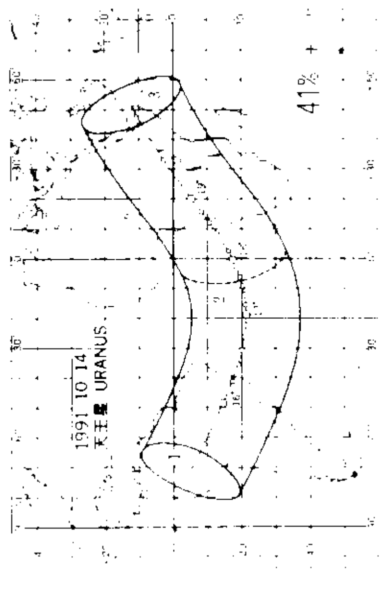
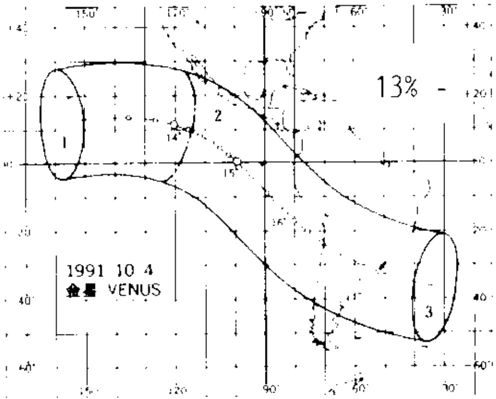
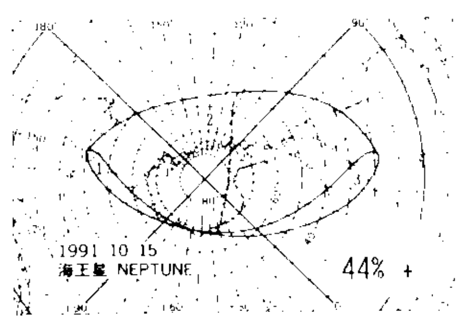


FIGURE 6







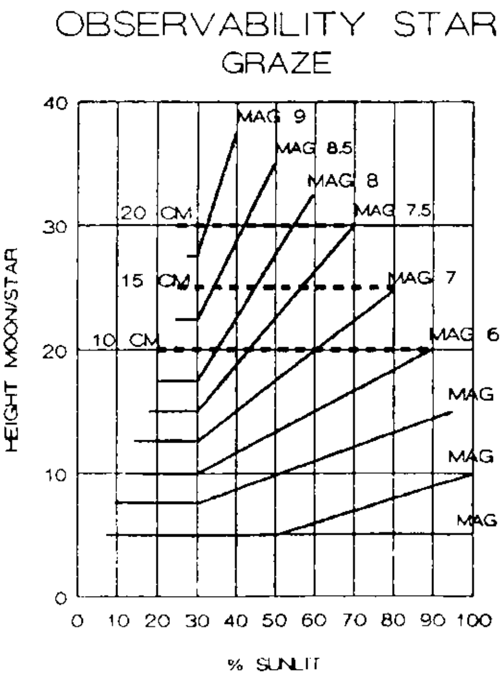
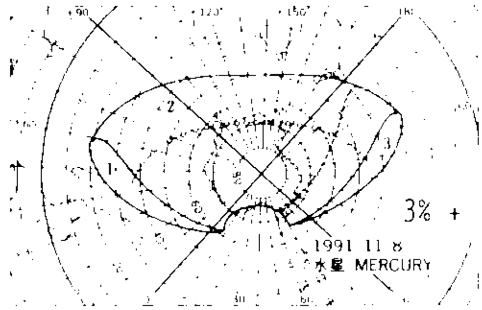
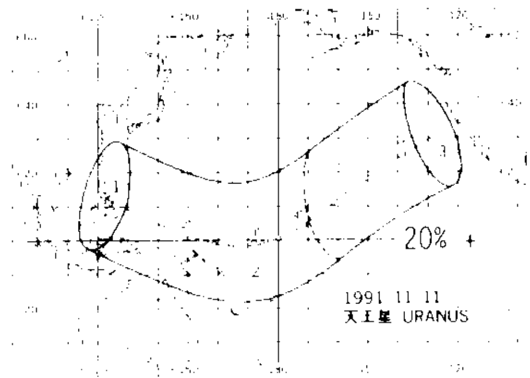
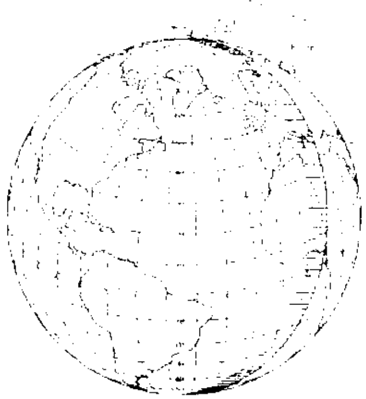


FIGURE 7







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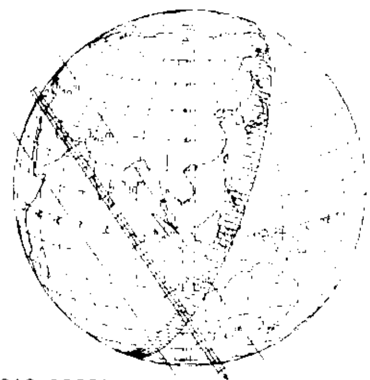

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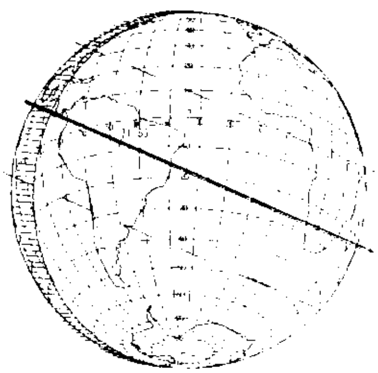

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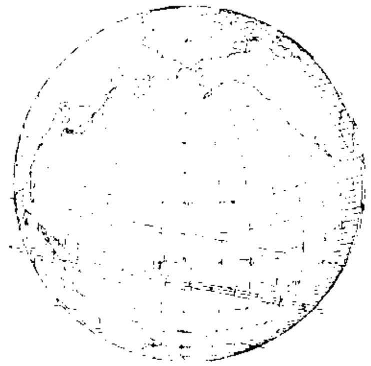

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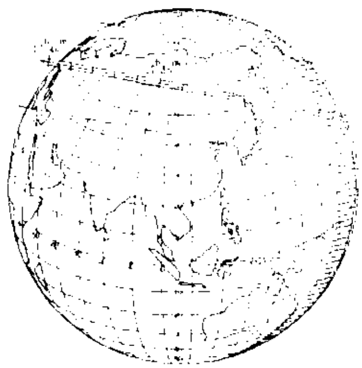

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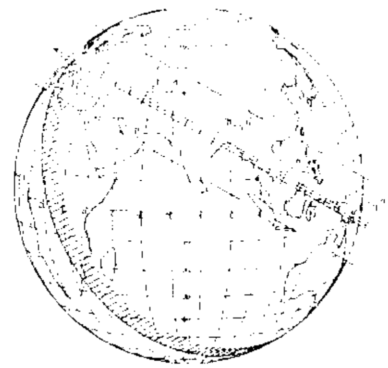


SAO 111204 by Patientia 90 Dec 19

ASTRONOMY AND PERSONAL COMPUTERS

Joan Bixby Dunham

David and I attempted to observe the July 21-22 eclipse, and learned about Mandelbrot sets instead. Our plans were to travel to Siberia from Alaska, and observe in Siberia, near the town of Markovo. The Soviet Consulate in San Francisco would not issue us a visa because, we were told later, our invitation to observe was not issued by a properly formulated group. We spent three days in Nome, Alaska waiting before we gave up and left. (We saw a partial eclipse from the top level of the parking garage in the Anchorage airport.) In Nome, we met Ken Philip, once a radio astronomer, now a lepidopterist studying the similarities and differences of butterflies in Alaska and Siberia. He and his brother are also well-known investigators of Mandelbrot sets. He gave an inpromptu lecture at our bed-and-breakfast hotel on the work they have done, showing many slides of beautiful graphics they have generated with their computers. These were slides he had shown in Siberia, as well as part of a lecture he and his brother had given at several different universities. He remarked that they showed 300 slides at one lecture, 100 while the audience was being seated and 200, 2 at at time, in an hour lecture.

The French mathematictian, Benoit Mandelbrot, first described fractal curves, jagged-edged curves that, when enlarged, are as jagged as the orginal. Snowflakes have fractal edges, as do many other natural objects. The Mandelbrot set is the most famous of the fractals. It is generated from a deceptively simple equation, z*z + q. Both z and q are complex numbers, so that q = x + iy, and z = a + ib. If x and y are coordinates in a rectangular plot (frequently called "X-Y plot" in graphics software), then q represents a single point in the plot. If the graph is a computer display screen, q represents a single pixel. The Mandelbrot set is the set of values of q such that a new value of z is equal to the square of the old value plus q, or znew = (zold)*(zold) + q. The initial value of z is zero, so the first znew is equal to q. The second value of znew is then q*q + q, the third is the square of the second plus q, and so on. For a given value of q, the equation is iterated until either it converges so that the equation is clearly satisfied and q is a part of the set, or it is obvious that the equation will never converge and q is not a part of the set. The computer graphics are generated by assigning colors to the values of q based on how many iterations it takes to satisfy the equation. A black-and--white image is generated by assigning the pixel at q the value of white if it is outside the set, and black if it is inside the set. Very attractive images can be generated with a good color graphics display device. The Philips use top-of-the-line Macintosh and IBM equipment for their work. Even with the powerful PC's they are using, the computations take hours.

There are several recent books on fractals, on what they are and on programming them on PCs, as well as various public-domain programs for the PC, Amiga, and Macintosh available. Programs are available through CompuServe and BIX, as well as various bulletin boards. Two recent articles were published one in the June 1990 issue of Byte, the other in the July 1990 issue of PC- Magazine giving more information on software and books. Since this is a very popular subject, there are undoubtedly other sources of information.

Even more interesting than generating this images would be applying them to understand natural phenomena. Most of the applications so far have been descriptive - the coastline of Britain, for example, looks like it has a fractal nature. There has been an attempt to model the distribution of galaxies as having fractal characteristics. The field is still new, and there is still much to learn.

Computer Repair This summer, we added a second hard disk to our MS-DOS computer, a 20-M "hard card", or hard disk on a card. Installation is simplicity itself, just insert the card an empty slot. Just before we bought this, we had a serial port fail, and could not communicate with the modem, an event that seemed to be linked to power fluctuations we experienced duing a thunderstorm. Curiously, nothing else, including the modem itself, was affected. We bought another communications card (and a line conditioner. Surge protectors give some protection, but adding a line conditioner is much more protection. They cost 10 times as much, though, $250 and up.) So I opened the computer, cleaned out accumulated dust and cat hairs, replaced the communications card, and added the hard card, with some juggling to get cables and cards to fit.

Everything worked well after the computer was turned on, and we transfered files to the new disk. About a week later, we started having trouble with one of the floppy disk drives. It would work in some circumstances, but not others. It got worse, and then one of the hard disks failed. We could not boot the computer. I took off the top, and tried again. With the top off, the floppy disks worked fine, although not the hard disk. As I tried commands, I noticed that cables were moving when the "bad" floppy drive was reading a disk. A cable to the "bad" hard disk was caught in the floppy drive mechanism. Once cables and cards were rearranged, the problems went away. The first thing I did after everything was reassembled? Back up the hard disk!

Software Upgrades We wanted another hard disk to upgrade our FORTRAN, C, and Pascal compilers with the latest versions, as well as to give ourselves enough room to add a new word processor. It is one of the rules of computer science that new versions of software always require more disk space than the old versions. Each program came with example files, help files, library files. The C and the FORTRAN each have associated debugger programs. The Pascal and the C have their own editors. Everything has marvelous features, many more than we will ever have time to learn to use. And all of this takes space. We filled the entire 20-M hard disk. Now, instead of having a nearly full 22-M hard disk, we have a nearly full 22-M hard disk and a nearly full 20-M hard disk. We also have a shelf of manuals to explain how to use all these features. (As well as a box of now useless manuals that explained the features of the old versions.)

These programs are difficult if not impossible to use without a hard disk. That might be understandable for a compiler, where most of the users are likely to have hard disks on their computers. It is less acceptable in a word processor. I find it particularly aggravating to find that new improved versions of software we have can no longer be used with our floppy-only portable.

The new (to us) word processor is WordPerfect. We have had it for several months, both at home and at the office, but have not made much progress in learning to use it. We are attempting to use it for typing the text for this issue of the ON, and we think it will make preparing the newsletter easier. It is supposed to handle equations well, can incorporate graphics, and has the ability to generate columns. I have noticed in this (and other cases) an ironic fact of software use: It is much easier to learn to use a piece of software when there is no other option. If you can make do with an older, less-capable, program, somehow there is never enough time to learn to use the new and better program. We would probably make much more progress in learning to use WordPerfect if I deleted PC-Write from our disks.

PALLAS PAPER CORRECTIONS

These are corrections to the paper, "The Size and Shape of (2) Pallas from the 1983 Occultation of 1 Vulpeculae", Astronomical Journal, 99, 5, 1636-1662 (May 1990)

In March, a preprint of this paper was submitted to the editorial review board at the U. S. Naval Observatory (USNO). The members of the board performed a very thorough review of the paper, and found several errors, most of them minor. Some of the errors were stylistic errors that were corrected by the journal as it was typeset. Unfortunately we did not receive the USNO board's comments until after the paper had gone to press. Some important clarifications and errors that were not corrected are listed below.

p. 1639, Table II, 3rd line (May 18), under Universal Time, 5^h should be 4^h.

p. 1647, Station 88, "Air Forece should be "Air Force".

p. 1648, Station 233 is repeated (data given twice, on two lines).

p. 1649, State for sta. 253, "C" should be "CA" and for sta. 301 and 302, "AK" should be "AR".

p. 1650, At end of Table V, add: 318 Georgetown, GA D 31.8569 85.0417 430. F T. Murray. There may be a few other observers in Georgia who should be listed in Table V, but are not because we were not forwarded their reports.

p. 1653, 1st line of Fig. 3 caption, "error bars photoelectric" should be "error bars. Photoelectric"

p. 1657, just under Fig. 17, "Morrison et al. 1971" should be "Morrison and Appleby 1981".

p. 1658, last paragraph on left side. These remarks about eye-and-ear timings apply only for very unusual, "startling" events such as asteroid occultations, especially for inexperienced observers. For more routine lunar occultations, the eye-and-ear method has been found to be the best by many experienced visual observers.

p. 1661, 3rd paragraph, 1st line, Jean Meeus notes that 0.35 revolution is near apastron for a highly eccentric orbit such as the one for 1 Vulpeculae, not near periastron. The phrase saying that it is reasonable to suggest near periastron refers to applying the negative error (-0.21 rev.), and also the fact that all of the spectroscopic orbital elements were only marginally determined. If the secondary star was near apastron of the orbit with the spectroscopic eccentricity given, the discrepancy with the published parallax would be even worse.

p. 1661, 3rd paragraph, 5th line, it was noted that Michelson interferometry would be better than speckle interferometry at this separation.

p. 1662, 14th line of right side, "R. Plooard" should be "R. Pollard".

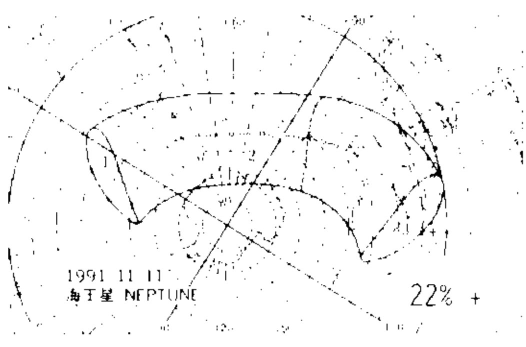
p. 1662, REFERENCES, "Morrison, L. V. and Appleby, G. G., (1971)" should be "Morrison, L. V. and Appleby, G. M., (1981)"

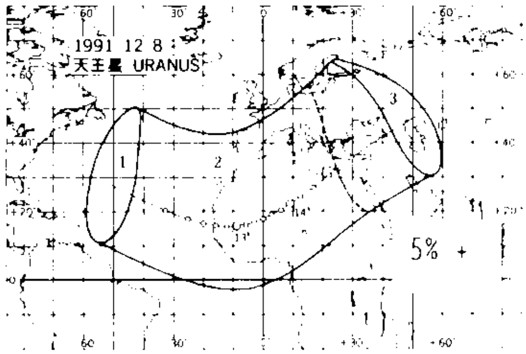
p. 1662, REFERENCES, "O'Leary, B. (1972). Science 174," should be "O'Leary, B. (1972). Science 175,"

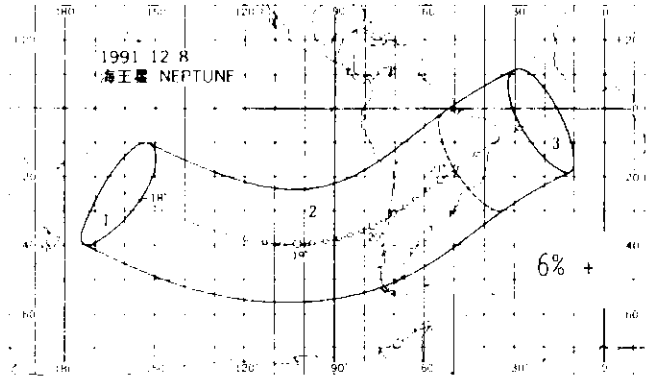
p. 1662, REFERENCES, "Taylor, G. (1981). Astron. J. 86, 6" should be "Taylor, G. E. (1981). Astron. J. 86, 903"

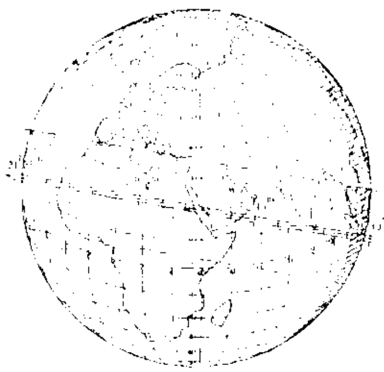
p. 1662, REFERENCES, "Sullivan, W. . ." is not cited in the article. It was a good popular newspaper account of the event shortly after it happened. At an early stage of writing the article, we had intended to mention it, as well as Sky and Telescope and Planetary Report accounts that appeared a few months after the event, so it was added to the reference list. Unfortunately, the appropriate sentences were either written and later deleted, or were never written, but the reference was never deleted.

David W. Dunham and Joan Bixby Dunham,
1990 October 1

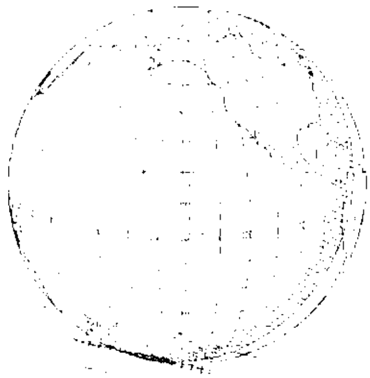








Anon by (121) Hermione 1990 Dec 19



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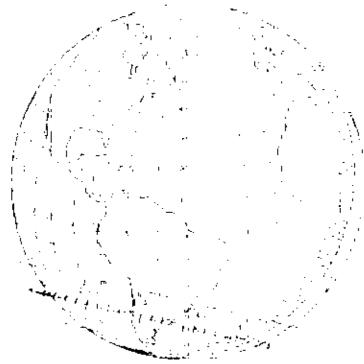

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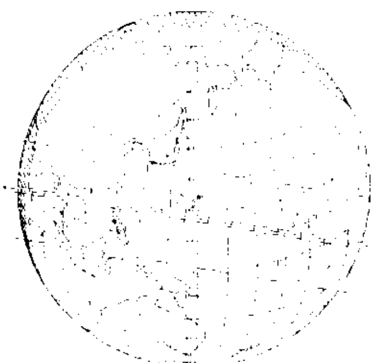
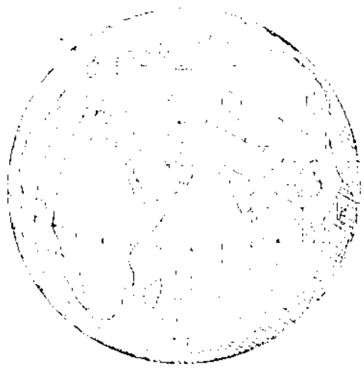
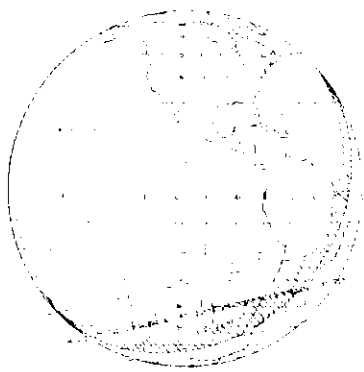


Anon. by (121) Hermione 1990 Dec 25



Anon. by (532) Herculina 1990 Dec 25



+1° 1888 by (216) Kleopatra 1990 Dec 2

IOTA

The International Occultation Timing Association was established to encourage and facilitate the observation of occultations. It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids, 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 officers of IOTA are:

President	David W. Dunham
Executive Vice President	Paul Maley
Executive Secretary	Gary Nealis
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VP for Grazing Occultation Services	Joe Senne
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VP for Lunar Occultation Services	Walter Morgan
ON Editor	Joan Bixby Dunham
IOTA/European Section President	Hans-Joachim Bode
IOTA/ES Secretary	Eberhard Bredner

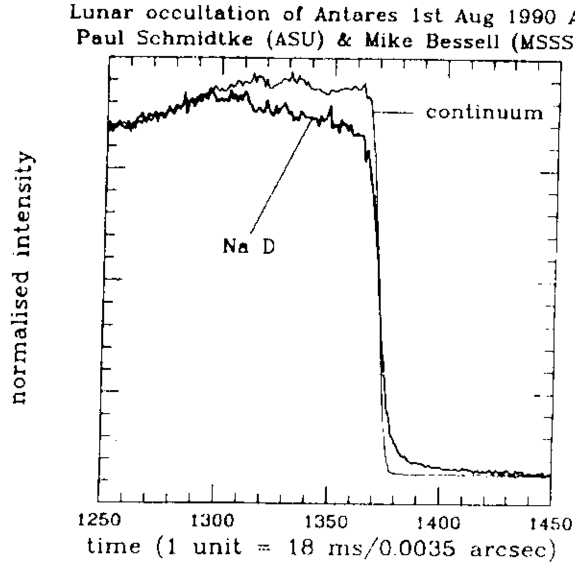
Addresses, membership and subscription rates, and information on where to write for predictions are found on the front page. The address for IOTA/ES is

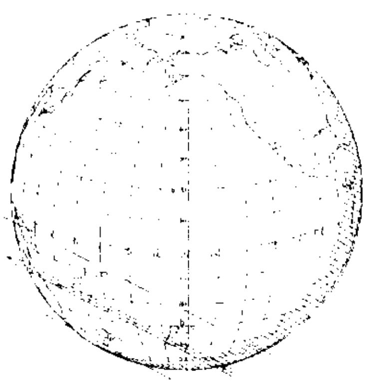
Eberhard Bredner
Astrag VHS Hamm
PO Box 2449-41
D-4700 Hamm 1
Germany

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

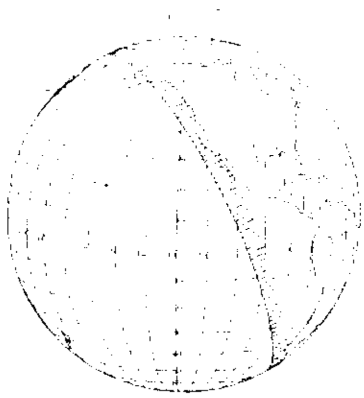
ANTARES OCCULTATION

The figure shows the of the lunar occultation (disappearance) of Antares observed on August 1, 1990 by Paul Schmidtke and Mike Bessell at the Anglo Australian observatory. They used a Thompson CCD on the RGO spectrograph to monitor the sodium D lines and continuum as the star disappeared. The weather was described as "fickle", totally overcast except for a fortuitous clear spot. This figure is reprinted from the Anglo Australian Observatory Newsletter No. 54 (July-August, 1990).





L 1 1939 by (532) Herculina 1990 Dec 26



Anon. by (704) Interamnia 1990 Dec 27