Occultation Newsletter

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Co-editor for this issue: Joan Bixby Dunham; 7006 Megan Lane; Greenbelt, MD 20770.

FROM THE PUBLISHER

For subscription purposes, this is the first issue of 1990. It is the fifteenth issue of Volume 4.

Since moving our headquarters to Topeka, we have been unable to re-establish our VISA and MasterCard capability. Payments to IOTA should temporarily be made only in check, money order, or cash form. You could check on progress by phoning (913)232-3693.

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There are sixteen issues per volume, all still available.

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

Local circumstance (asteroidal appulse) predictions (entire current 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 ather areas will be available from Jim Stamm (11781 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. See also p. 337 of the last issue.

[1] Single issue at ¼ of price shown
[2] Price includes any supplements for North American observers.
[3] Not available for U.S.A., Canada, or Mexico
[4] Area "A" includes Central America, St. Pierre and Miquelon, Caribbean Islands, Bahamas, Bermuda, Colombia, and Venezuela. If desired, area "A" observers may order the North American supplement by surface mail at $1.18, or by air (AO) mail at $1.50.
[5] 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 most time-critical item in this issue is coverage of the Pleiades passage the night of March 2-3 visible from Canada and the U.S.A., especially the northern States. Because the last issue took a little longer to produce than expected, this issue is being put together under even greater time pressure, even though it is a smaller issue. The next issue, the last of Volume 4, is planned for late May or June.

Errata. Although we asked the printer to reduce our originals by 75%, he did not write that on the order, and instead produced it to fit well on the page. The actual reduction was about 79%. We apologize for the inconvenience that the resulting narrower margins causes those who bind O.N.. The units of the numbers at the bottom of p. 340 for the graph of the McCool Junction graze should be arc seconds; some of the " were lost, not by the printer but by a truncation of the copy of the figure that we used. On p. 351, left side, 24 lines from the bottom, "However, it is" should be "However, it should". On p. 352, under Notes about Individual Events, the first 3 lines for Jan. 8 were repeated. On p. 338, "attendies" in a few places should be "attendees". Wayne Warren has pointed out a few other minor spelling errors and typos that escaped Joan's and my attention in the rush to finish the last issue.

Occultation Observability Information Sought. Brad Schaefer, known for his work on first visibility of the crescent Moon after new moon, has developed an algorithm for calculating the observability of stars on the dark side of the Moon as a function of lunar phase. He is seeking observational data to calibrate his equations. If you have some data on the faintest stars whose occultations you have timed at different lunar phases, Schaefer would like to receive it at 1511 Pinelake, Bowie, MD 20716.

Occultation Double Star Coordinator Sought. During the 1970's, Don Stockbauer and I created the first version of a zodiacal double star catalog including stars suspected of being binaries from gradual or step events seen during occultations. For about six years, I updated the database and wrote "New Double Star" articles in O.N., but had to discontinue this work with the press of other jobs that had to be done. In 1987, Don Stockbauer updated a file of zodiacal binaries with orbital elements, merged the various zodiacal double star files into one file, and wrote a program, still used, to read the file to automatically insert duplicity information into the datasets used for calculating graze predictions. But the database has not been systematically updated with new occultation discoveries made during the 1980's. A volunteer is sought to maintain and update the IOTA zodiacal double star database, receive reports of step and gradual occultations from observers, and resume the "New Double Star" articles in O.N.. I will soon send David Herald diskettes with the IOTA zodiacal double star catalog and the latest version of the speckle interferometry catalog produced by the Center for High Angular Resolution Astronomy (CHARA), so that he can add the latter to the former. CHARA is also interested in the occultation doubles in the IOTA catalog, which they plan to publish jointly with us.

South African Time Signals Discontinued. Times are changing in South Africa, unfortunately not for the better for occultation observers, according to M. D. Overbeek. The continuous time signal ZUO was broadcast by the South African Posts and Telecommunications Dept. for the S. A. Council for Scientific and Industrial Research, whose functions have been taken over by the Foundation for Research and Development (FRD). Because the time service cannot be made to pay for itself, it has been decided to discontinue the broadcast. A telephone time service is offered as a substitute, requiring a personal computer and modem, as well as software and use fees. The FRD is contemplating manufacture of a portable clock at an as yet undetermined price, to be set by computer and modem. These alternatives are not accessible, or are too costly, for most occultation observers in southern Africa. I will soon write a letter to FRD explaining the value of occultations, and asking if ZUO might be at least partially restored. It sounds similar to the problems Australians had with discontinuation of VNG a couple of years ago. If any of our Australian readers have any advice, please write to Mr. Overbeek at P.O. Box 212; Edenvale 1610; Republic of South Africa. Australians can often receive WWVH, but this and other time signals can rarely be received in South Africa.

Star Catalogs. Within one or two weeks after this issue is mailed, I will send magnetic tapes containing star catalogs, especially the 80J version of the XZ catalog described in O.N. 4 (10), to three who requested them. I will also give copies of these catalogs to Wayne Warren, who will then distribute them from the Astronomical Data Center (ADC); Code 633; Goddard Space Flight Center; Greenbelt, MD 20771; USA; phone 301-286-8310; SPAN nssdca::warren; BITNET w3whw@scfvm. In the meantime, I give permission to anyone else who already has copies of star catalogs from me to distribute them to others, as long as the catalogs will not be used for commercial purposes.

Some important new catalogs are now available that should be incorporated into the XZ, my combined catalog for planetary/asteroidal occultations, etc. The Positions and Proper Motions (PPM) catalog from the Astronomiches Rechen Institut, Heidelberg, contains improved data for all AGK3 stars. A high-accuracy subset, probably about 10% of the stars, includes recent photoelectric meridian circle observations which should result in current-epoch positions more accurate than the Zodiacal Zone (ZZ) catalog. In addition, the final version of the ZZ itself, correcting errors that I found for a few hundred stars in the (1987) preliminary edition, should become available in April. Similarly, the final version of the Southern Reference Star (SRS) catalog should replace Perth 70 catalog data. Later this year, the 2nd Cape Photographic Catalog (CPC2), reduced with SRS data, should greatly improve the positional data for most southern-hemisphere SAO stars.

Concerning catalogs with faint-star coverage, a new version of the northern Astrographic Catalog (AC) has been received at the ADC from Heidelberg. The positions in the new AC have been improved by reduction with AGK3R data, but they still suffer from the lack of proper motions and the early AC epoch. The new AC includes the Algiers zone, extending the AC coverage to -2° declination, and also the original AC designations, also lacking in the current (FAC) version. However, before the new AC can be used, it needs to be sorted in R.A. order and duplicates need to be combined or eliminated. A similar job, which will be no trivial task, is needed for the Guide Star Catalog (GSC), described in "The World's Biggest Star Catalogue" on p. 583 of the December issue of Sky and Telescope, before it can be used routinely for occultation work. The ADC plans to obtain a CD reader to read the GSC soon. The GSC positions are not as accurate as AC positions at the AC epoch, so a solution to obtain high-accuracy data for faint stars rests with completion of computerizing the AC, and obtaining recent positions for the AC stars (to derive good proper motions) reduced with SRS and AGK3R data. That will be years in the future. In the meantime, I hope to create a subset of the GSC sorted in R.A. and containing stars down to 12th or 13th magnitude for asteroidal occultation predictions. After that, a zodiacal version to mag. 11 could be created for lunar occultation predictions, perhaps going down to mag. 12.5 or 13 within ±1°.2 of the ecliptic for lunar eclipse star fields. These would need to be cross referenced with the current XZ and combined catalogs, which have more accurate positional data than the GSC (which also does not include the brighter stars). These are projects for which I might be able to use some help, but even so, they probably will not be ready in time for the 1991 predictions. But maybe for 1992. . .

Travel. Currently, three overseas business trips are on my 1990 agenda: Early May, to ESTEC, Noordwijk, the Netherlands; late August, for meetings at the Institute of Space and Astronautical Science, Sagamihara, Japan, and in the western part of Japan; and early October, to attend the 41st congress of the International Astronautical Federation in Dresden, German Democratic Republic. I also expect to travel to Florida in April or May, perhaps in conjunction with the HST launch. I plan to conduct some IOTA business during each of these trips, and will inform local IOTA coordinators when meeting dates are established. In addition, for IOTA, I plan to go to Siberia for the July solar eclipse, to San Antonio for the annual meeting tentatively scheduled for August 18-19, and to Duluth, MN, for the September 13th graze of Epsilon Geminorum.

Acknowledgements. Joan and I thank Pat Trueblood and Richard Taibi for helping prepare the mailing for the last issue.

GRAZING OCCULTATION PREDICTIONS

David W. Dunham

Corrections to Version 80J Graze Predictions. The multiple events zones for northern-limit grazes are usually quite narrow, making them especially sensitive to prediction errors. In late 1988, the XZ catalog was updated with improved positional data for most of the stars. In addition, empirical corrections in the ACLPPP, the computer program used for generating predicted graze profiles, were updated in response to systematic errors noticed in the graze predictions during the previous two years. Together, these were the main improvements for the 80J version of the IOTA - USNO graze prediction system. It was used for all 1989 predictions. In order to preserve continuity in the basis for reported shifts in Don Stockbauer's graze expedition summary lists, the 80J program versions were also used for 1990 predictions. This was done in spite of large south shifts that occurred for some waning-phase events during 1989, which resulted in many observers seeing close misses.

I have examined the available shift information for all 1989 observed northern-limit grazes, breaking them into waxing phases (Watts angle, or WA, of central graze generally ranging from 0° to 20°) and waning-phase (WA of central graze usually 340° to 360°) events. For the waxing phases, 12 events with large negative latitude librations were available, with an average shift of 0."15 north, indicating that for these events, the 80J predictions were quite good, needing no adjustment (the average is 0."08 south if one questionable event is disregarded). There were also three waxing-phase events with positive latitude librations that also had an insignificant average shift of 0."10 north. But for the waning-phase grazes, the results were more significant, with six events showing an average south shift of 0."26 at an average latitude libration of -5.°8.

Consequently, until further notice, you should apply a correction to all northern-limit dark-limb waning-phase grazes (specifically, those with Watts angle of central graze in the range of 340° to 360°) of the following magnitude:

0."045 x (latitude libration in degrees).

Some typical values for this correction are:

latitude libration	correction
-6.°0	-0."27
-5.0	-0.22
-4.0	-0.18
-3.0	-0.14
-2.0	-0.09

This means that significant south shifts are expected (the actual graze zone will be south of its predicted 80J location) when the latitude libration has large negative values. These librations occur when the Moon is in the region from Aquarius to Gemini, where most northern-limit waning-phase grazes now occur. The above formula is probably also valid for events with large positive latitude librations, but no such events with observed shifts were reported in 1989. To err on the side of safety (that is, avoid risking a miss), the correction might be ignored for latitude librations with values greater (more positive) than -2.°0. Note that the latitude libration is given in the lower right part of each ACLPPP profile, and the correction is in arc seconds, the vertical scale on the left side of the ACLPPP profile [to convert the correction to distance on the ground perpendicular to the limit, for use with the right-side ACLPPP scale, divide it by the VPS ("/km or "/mile, depending on whether your profiles use kilometers or miles) given in the ACLPPP footer information].

It is important for these studies that the observed shift be reported to Don Stockbauer on your graze observation report forms, and we very much appreciate this information that is provided by many expedition leaders. Unfortunately, I have not yet had time to merge and sort all of the scan files needed to produce the lists of upcoming grazes that Don Stockbauer uses for "real-time" updates to the predictions based on received reports. This service should resume in mid-March. See Stockbauer's article for other information about efforts to improve our graze predictions.

Beware of Double Stars. The positions of double stars with a magnitude difference less than 2.0 and separations less than about 10" can have errors much larger than the "probable error of declination" given in the limit predictions. If you have a prediction for a graze of such a star, scan the recent observed graze lists to see if a significant previously-observed shift should be applied to your prediction. If not, and if you plan an expedition with at least 3 stations for the graze, contact either me or Don Stockbauer to see if there is a difference between either the ZZ87 or Lick position and the old XZ position. For two grazes of doubles in this category during 1989 with catalog differences of about 0."7, ZZ87 was correct in one case and the old XZ in the other. For such events, it is best to play it safe and use the prediction closest to the Moon's center (that is, use the more southerly prediction for a northern-limit event). Try to extend your coverage for both possible profiles, if there are enough observers.

Corrections to Graze Supplements. In the hemispheric graze supplements for 1990 distributed in late 1989, the computor for the N-region should be Hutcheon, not Morgan. On p. 7 of the 1990 European Graze Supplement, track #99 near the Finland-USSR border is incorrectly terminated in an S. The path actually extends farther south, bending back slightly towards the southeast, passing near Leningrad, 180 km west of Moscow, and ending in a low-altitude (8°) condition near Voronezh. R Leonis is a large-amplitude Mira variable. I have been informed by the AAVSO that the star is at maximum light in February and December this year. On May 2, the date for track #99, the mag. should be 7.3 ±0.4.

Electronic Mail. Graze predictions were affected by the overall delays in my work for predictions for 1990. Fortunately, these were alleviated to some extent by use of electronic mail, which was used to transmit data rapidly to computors in Australia and Mexico. A working arrangement to Japan has also been made. I now check my SPAN account every working day, and with Wayne Warren's help, have become more proficient at sending messages, especially to other networks. E-mail will greatly facilitate future transmittal of graze prediction data.

A COMPLETE SYSTEM FOR $970; OTHER VIDEO NEWS

David W. Dunham

Complete System. A complete system of video equipment that can record occultations of stars as faint as 8th magnitude with an 8-inch telescope can now be purchased for under $1000. If you already have a standard AC-power VCR, you can subtract its price from the total, whose breakdown is below:

Phillips CCD Camera	$400
VCR (standard AC power)	250
Power Inverter	140
Small TV Monitor	80
Cables and adaptors	100
Total	970

The Phillips camera assumes a group purchase; see p. 357 of the last issue. This camera, or an equivalent Panasonic camera, can be purchased individually for about $500. The main breakthrough, as also detailed in the video article in the last issue, is Statpower Technologies Corporation's Model III Pocket Power Inverter, which enables you to run 100 watts (continuous) of standard 120-volt 60-cycle AC-powered equipment from your car battery. I notice that my standard AC-powered VCR is rated at 19 watts, so there should be plenty of capacity for running the other electrical equipment. If you already have a small portable TV as well as a VCR, you can subtract these items from the list, leaving only about $640 of equipment to buy. I have heard that small TV monitors with 4-inch or 5-inch screens can be purchased for as low as $50, but the usual prices for these items at outlets like Radio Shack and Circuit City seem to be around $80. Most of these seem to have RF connectors rather than the better-shielded video phono, RCA, or BNC connectors, but that is not a major problem. The miscellaneous cost, for cables and connectors, includes a C-to-T-mount adaptor, a T-mount (standard camera) adaptor for your telescope (both available from many telescope dealers), and cables to connect the camera and monitor to the VCR.

Image Intensifiers. These were described in O.N. 4 (12), p. 292. A few months ago (and a few months after that O.N. article was written), an inquiry was made to Stano Components about availability of image intensifiers. They said that the price was $750, and that only gridded models were available. If that is still the case, the price is still much lower than other sources that I know about, and a grid, although a nuisance, would normally not be a show-stopper. Occasionally, an occultation might be lost when a faint star happened to drift over a grid line at just the wrong time, but slightly brighter stars would probably shine right through the line. During the comparisons described below, we found that the sliding screw system for the Astrolink HAL 19 relay lens assembly was difficult to focus, especially relative to the sleeve focus of my Litton relay lens assembly. But the HAL 19 costs only $275, compared with $650 that I paid Litton.

Video Time Inserter. Peter Manly sold me one of the first editions of his video time inserter. It functions as advertised in O.N. 4 (12), p. 291, triggering from the WWV minute pulse with little difficulty. Now, when I have time, I can go back and derive accurate timings from the occultations that I have videorecorded in the past, and later, this can be done for other's videotapes. The price is about $700.

Comparisons. On January 8, I bought a Panasonic Model 400 black-and-white CCD surveillance camera to try to record the lunar occultation of Ceres with a nearby 16-inch telescope. We did not succeed, due to problems with connectors, pointing, and focusing, but these were overcome about 20 minutes after the event to provide some nice views of the 93% sunlit Moon. I knew that my Ultricon camera would not be up to this task. Did you observe the occultation of Ceres? I have received only one report, from an observer in NJ who used a 12-inch reflector to time the event visually.

One clear night late in January, Mark Trueblood brought his Astrolink system and GV-8 Video Walkman to our house, where we made comparisons with both of my cameras and my Litton image intensifier and relay lens housing. The tests were all performed with 8-inch Schmidt-Cass telescopes. The Video Walkman's small size and weight made it very handy, but we found that its LCD display lost more than a magnitude relative to my 5-inch JVC monitor. The Sony camera used with the Astrolink system is rated at 7 lux, so it was less sensitive by a little more than a magnitude relative to my cameras. The Sony-Astrolink system was designed for a wide field of view, which it delivered, 0°8, giving it more area for locating asteroidal occultation target stars. However, this is a disadvantage for lunar occultations, since the wider field of view sees a lot more glare when the Moon is gibbous or a fat crescent. Both of my cameras have a horizonal width of 20', and have the same sensitivity. They "saw" exactly the same stars in a test starfield, including all of the Trapezium stars without the image intensifier. The stars seemed a little brighter, but with a fuzzier background, with the Ultricon. The Panasonic CCD camera gave a crisper view, facilitating focusing. The "popcorn" image intensifier noise was readily seen with the Panasonic camera, but was never seen with the Ultricon, due to the latter's fuzzier background and designed lag to include information over 3 or 4 frames. The smearing evident when panning an ordinary view (faintly-lit room) with the Ultricon was virtually absent with the Panasonic. The new CCD cameras are clearly superior. The cheaper Model 200 Panasonic CCD surveillance camera has the same specs as my Model 400, but has a smaller field of view, probably about 15' with my telescope. The 400 is only available in a relatively heavy AC model, while a 12-volt DC model is available for the Panasonic 200. The Phillips camera has similar specs to the Panasonic 200, but the camera controller can be put in a box separated from the imaging model, which is very small and light-weight (less than half a pound), posing no balancing problems for virtually any telescope. There is a "0.7-lux" Panasonic camera of similar design, but I do not know its cost. When one of our local observers gets a Phillips camera, we can compare it with my Panasonic, but I expect that their sensitivities will be similar.

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; and
4. To maintain an independent repository of the reports.

In order to help IOTA accomplish these goals, please send a copy of your graze report to me at 2846 Mayflower Landing; Webster, TX 77598; U.S.A. (Make a copy for yourself, of course). Sending a copy to ILOC in addition is very helpful; their address is International Lunar Occultation Centre; Geodesy and Geophysics Division; Hydrographic Department; Tsukiji-5, Chuo-ku; Tokyo, 104 Japan. Data on diskette should be sent to ILOC; if you prefer this medium, please send me a printout of your data file only. Total occultation data in any format should only be sent to ILOC, as I do not need it to produce this article.

Several recently-received reports will be included in my expedition summary list in the next issue.

I have started to look through all the profiles that I have on file for discontinuities in the Watts data with observations that span them. I'm also keeping an eye out for observations that indicate bad Watts data of any form (that is, major discrepancies, such as missing mountains or valleys with vertical extent of 0.″5 or greater). If you remember any such discrepancies in your own observations that haven't been specifically mentioned in one of my articles, please send me a brief note giving details. In a few months, I will send all of the "major discrepancy" data to David Dunham, who will update the correction database used by the ACLPPP program that generated the predicted profiles. That database was last updated nearly 9 years ago, so another update is overdue. For this project, having a copy of your predicted profile with your observations plotted on it is very useful; without it, time-consuming calculations at USNO and manual plotting are needed. Procedures for plotting your observations on the predicted profile are described in my paper, "How to Calculate a Lunar Grazing Occultation Shadow Shift", available upon request.

If you still have not sent me a detailed report of your expedition's observations of the 1988 November 30 graze of Regulus, please do so as soon as you can. We want to prepare a comprehensive reduction profile of all observations of this graze, by far the best-observed graze in history, before the event gets too "old" and fades from observers' memories.

Please give SAO numbers on your report for grazes of non-Z.C. stars. Many observers just give the USNO X-number for these stars, but I need the SAO number for the expedition summary lists. If the X-number is used in columns 16-23 (star name), please give the SAO number either at the top of the form, or at the bottom of the back side with the graze summary list information.

If a graze is recorded photoelectrically or with video equipment at one or more stations in your expedition, please write a note to this effect (such as, "video at sta. a and c") at the bottom of the back of the form (in the "graze summary list information" area). We want to include the appropriate "V" or "P" in the summary list, but I can easily overlook doing this if the information is only in the relatively inconspicuous MR (recording method) column for the appropriate station on the front part of the IOTA/ILOC report form.

I would like to emphasize strongly that timings of lunar grazing occultations without the aid of photoelectric and/or video equipment, or by one individual instead of a coordinated group are still of great scientific value. By no means should someone quit doing grazes just because he or she observes alone visually. A single observer can determine the rela-

Date	V/P	Star #	Mag.	% Snl	CA	Location	# Sta	# Tm	S S	Ap Cm	Organizer	C	St	WA	b
1986															
1208		146509	7.3	48+	15S	Foothill Coll,CA	1	6	1	32	Rick Baldridge		2S	164	41
1987															
0320		2251	7.5	75-	13S	Pleasanton, CA	2	13	2	20	Rick Baldridge		2S	197	56
0501		076841	7.5	9+	14N	Manteca, CA	8	28	2	15	Rick Baldridge		4N	7	-58
1988															
0425		1402	7.5	62+	18N	Pleasanton, CA	6	33	2	15	Rick Baldridge		1N	20	-33
0907		080293	8.5	11-	6N	Castle Rock, CA	3	16	1	8	Rick Baldridge		2N	359	-40
1989															
0727		0538	5.6	29-	11N	Hollister, CA	3	13	2	9	James H Van Nuland		0	351	-61
0727		0538	5.6	29-	11N	Hollister, CA	4	58	1	8	Rick Baldridge		0	351	-61
0810		2174	6.4	54+	3N	Milpitas, CA	4	23	2	20	Rick Baldridge		1N	3	77
0817		3181	5.9	0E	U	Novalaise, France	4	42	1	12	Roland Boninsegna				
0817		3181	5.9	0E	U	Aiguebelette, Fr.	3	40	1	10	Roland Boninsegna				
0920		076764	7.8	62-	5N	Bastogne, Belgium	1	2	2	25	Jean Schwaenen		3S	347	
0921		0773	7.1	58-	7N	Mound City, MO	1	3	1	9	Robert Sandy	>	5S	353	-57
1007		2617	4.7	40+	15S	Spring Lake, FL	3	32	2	20	Tom Campbell		2S	166	60
1008	V	187716	7.0	50+	14S	McCool Jct., NE	5	34	1	15	Richard P. Wilds		0	165	50
1022		1282	6.6	44-	5S	Tremelo, Belgium	4	8	1	12	Jean Schwaenen			186	-16
1022		1282	6.6	44-	7S	Jahnsback, DDR	1	0	1	6	Viertel/Büttner	>	9N	188	-16
1022		098190	7.2	40-	13S	Wedron, IL	1	6	1	13	Robert H. Hays, Jr.		2S	195	-11
1023		098654	7.6	32-	1S	Saxonburg, PA	1	3	2	15	John Holtz		6S	184	0
1104		187318	7.8	25+	19S	Houston, TX	15	51	1	13	Stockbauer/Rimes		3N	162	50
1104		2879	6.6	33+	16S	Klondike, IL	1	11	1	15	Daniel Rothstein		5N	165	40
1123		1778	7.1	20-	20S	Clinton, PA	1	4	2	15	John Holtz		2S	198	54
1205		3252	7.0	39+	15S	Flush, KS	3	8	2	20	Richard P. Wilds		7N	164	-9
1206		146396	8.8	49+	16S	Alexandria, VA	1	8	1	36	Robert N. Bolster				
1990															
0204		076472	7.5	67+	9N	Elmont, KS	7	54	1	20	Richard P. Wilds		0	11	-60

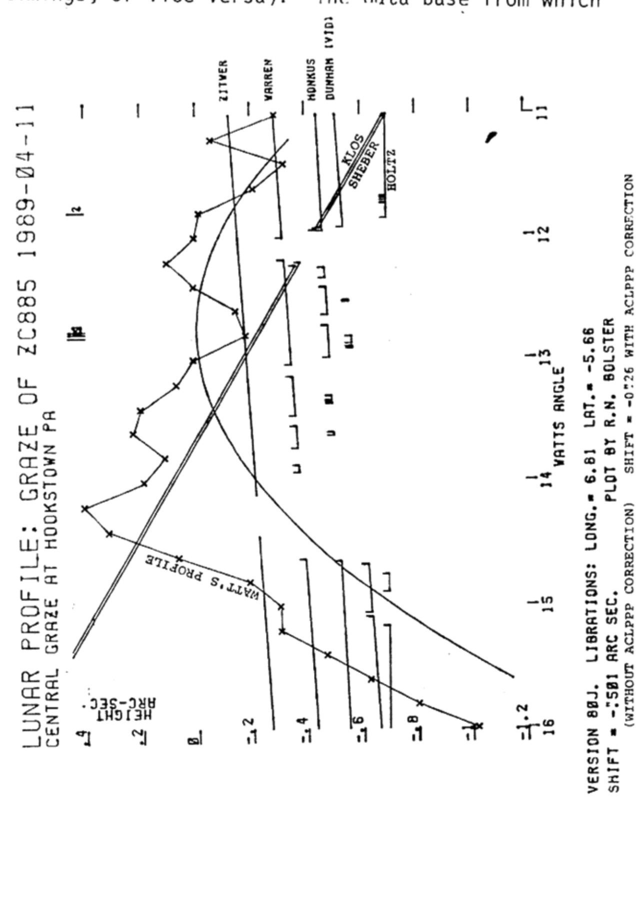
tive position of the Moon and star to 0".1, which is an excellent piece of reference information. Each of a single observer's timings has just as much value as a timing made by a coordinated group, since all observations made by all observers in all expeditions can be combined mathematically into a unified whole. And while photoelectric/video recording methods are highly accurate, visual timing accuracies are more than adequate for grazes, due to to a grazing occultation's unique geometry. The main role that timings play in the reduction of grazes is to identify which mountain on the Moon caused a particular disappearance, and for this purpose extreme accuracy is not needed (N.B.: Please continue to maintain all the accuracy you can during your graze reductions in spite of this, since it will surely be utilized eventually.) For grazes, the limiting factor is currently the accuracy of one's reported geodetic coordinates, which should be known to at least ±40 feet, and even ±10 feet if possible.

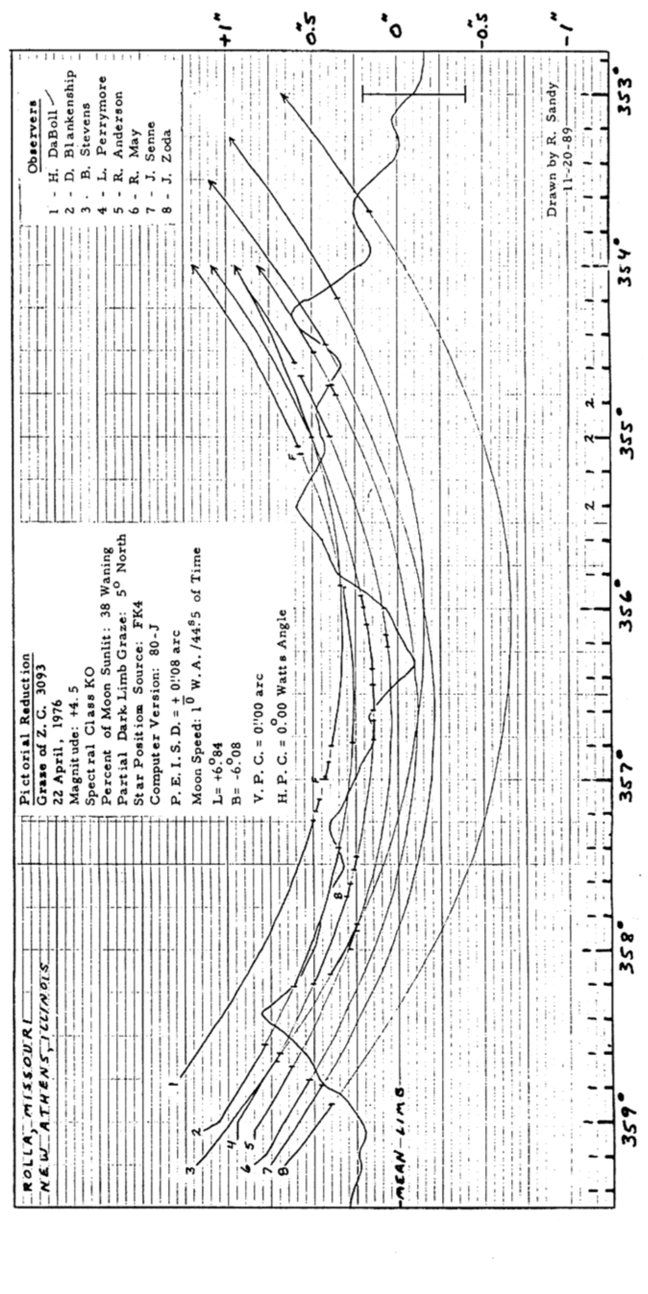
The column St in the graze list is very important; it is the distance (in tenths of an arc second) and direction (north or south) that the observed lunar shadow shifted from the predicted shadow for a graze expedition. It is essentially the residual of the entire graze; it allows us to judge the accuracy of a current prediction by direct comparison to past results. I have a paper available free upon request which outlines the entire process of plotting one's observations and determining the shift; it is not that difficult and should be a natural part of the observing process. It is not any more difficult than what an expedition leader must do to set up the graze in the first place.

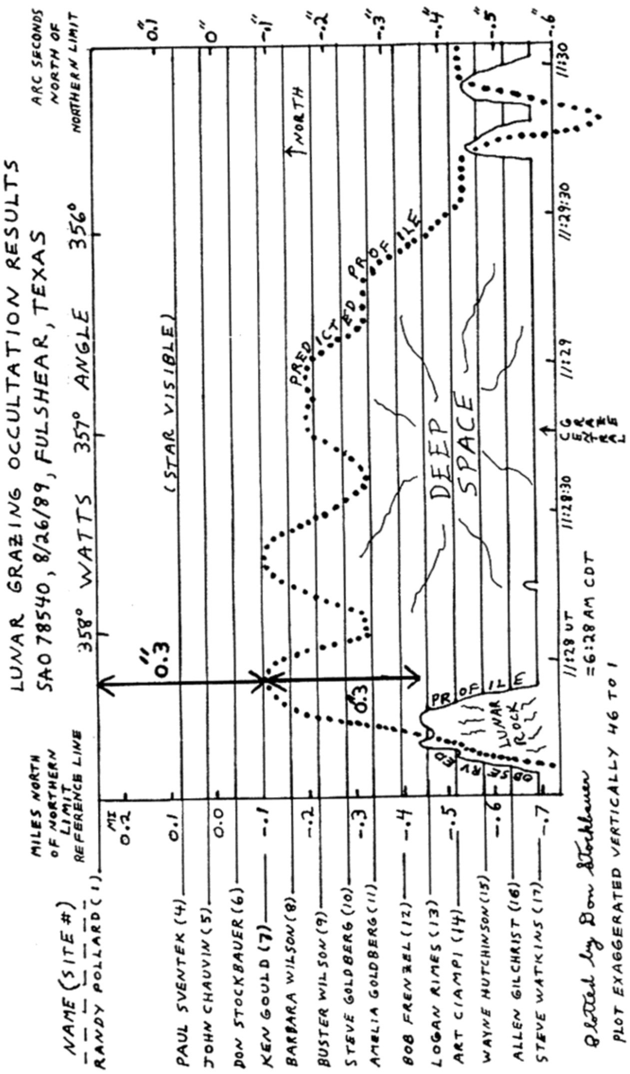
Some sort of shift should always be estimated and reported even if the match of your observations to the predicted profile is not very good (e.g., the profile shows mountains that are not present in your timings, or vice-versa). The data base from which profiles are generated (the Watts data) contains quite a few inaccuracies, so one should not treat it as gospel; do a rough visual estimation in this case. Freely move the observations vertically and horizontally as a group to get the best fit. The question, 'Was my shift due to a bad profile or to a bad star position?' is often asked. Grazes measure only the relative position of the Moon's limb and the star, so the two factors cannot be untangled until one or the other is known accurately. In any case, please report some estimation of the shift in these somewhat ambiguous cases rather than none.

Corrections

In *O.N.* 4 (13), my two 0".3 shifts mentioned in the body of the article for ZC 1013 on 8/26/89 should add to 0".6, not 0".5. In the graze list for that issue, SAO 073309 on 8/26/89 should be SAO 078309.







THE 1989 JULY 3RD OCCULTATIONS OF 28 SAGITTARII

David W. Dunham

A workshop on the 1989 July 3rd occultations of 28 Sagittarii by Saturn and by Titan was held in Providence, RI, in late October, just before the American Astronomical Society's Division for Planetary Sciences annual meeting. I was prepared to briefly discuss IOTA's efforts for these events, especially to show parts of a videotape by Paul Boltwood, Stittsville, Ontario. The tape demonstrated his sophisticated techniques for processing videotapes of the occultation by Saturn to obtain lightcurves of the variation of 28 Sagittarii's brightness as Saturn's rings and atmosphere passed in front of it. Boltwood analyzed the data obtained by him and by other members of the Ottawa Centre of the RASC with their 24-inch telescope. In spite of mediocre to poor seeing, he was able to derive a lightcurve with a signal-to-noise ratio of about 10.

Unfortunately, my flight from Baltimore that morning was cancelled due to fog. I was put on a later flight, but did not arrive at the workshop until it had just ended. Although I did not get to show Boltwood's tape, some of the main workshop participants had already seen a copy of it. Parts of Sky and Telescope's spectacular Mt. Wilson tape were shown at the meeting, impressing the attendees. But in subsequent discussions, I got the impression that the workshop participants were most concerned about reducing and publishing preliminary analyses of their own data, and did not have plans for a comprehensive analysis of even the better Saturn videotapes obtained by IOTA and by other amateurs.

Saturn; with your help, we could make a valuable analysis of the data. A comprehensive analysis could be performed by digitizing all of the videotapes and processing the data with Boltwood's software. This would be a large undertaking, involving use of expensive equipment for long periods of time. A grant and some help from professional astronomers would be needed to accomplish it. Eventually, we may have time to write a proposal to obtain the necessary grant, but even if such a proposal is accepted, many months of work will be needed to complete the job.

In the meantime, a quicker analysis could be performed that would give results to bolster the proposal mentioned above. This would involve simply playing back the videotapes to obtain the times of all significant fadings and brightenings to about half a second accuracy. If you have such a videotape and have not already played it back to obtain a written record of the events, please do so, and send the report to me at 7006 Megan Lane; Greenbelt, MD 20770-3012. Also, volunteers are sought to put the written reports into machine-readable form (a few are already on ILOC forms, with one on diskette, but a simpler format could be designed for this job by those performing it). Doug Mink, Center for Astrophysics, who generated predictions of the Saturn occultation for IOTA members, is interested in analyzing timings of this event that we send him. He is also interested in the visual timings, so help in putting at least some of that data in machine-readable form is also sought. Since not everyone who made a videotape of the Saturn event is probably willing to prepare a written report of the timings, volunteers (anyone with a VCR) are sought to view tapes made by others to prepare written reports.

One first step is to just know what videotapes exist. Those making videotapes were requested to send them to Carolyn Porco at the University of Arizona, in our article in last June's issue of Sky and Telescope. Peter Manly informs us that during a brief visit to Porco's office a few months ago, there was a pile of 20 or more videotapes, most in their unopened mailing packages. As far as we know, no acknowledgement has been sent to those who sent the videotapes, and Porco has not replied to a letter that I sent her in late November, asking her to complete a list that I sent her of videotapes that I know about. This list, in longitude order and published with this article, is explained below:

F is the form of coordinates, where
- D is ±DDD.DDDD (degrees and decimals of degrees)
- M is ±DDDMM.MM (deg., min. of arc, and decimals)
- O is ±DDDMMSS.S (deg.,min.,sec.of arc &decimals)
- H is ±HHMMSS.SS (hr., min., sec. of time for longitude, same as form O for lat.)

Latitude is positive north (often approximate)

Longitude is positive east of Greenwich
Scope   Aperture of telescope used
M Method V= videorecord, C= CCD, P= photoelectric, I= image-intensified video
Height above sealevel, meters (not always available)

If you know of a Saturn videotape that is not mentioned on the list, please let me know. For example, I presume from the picture on p. 231 of this month's Sky and Telescope that Alan MacFarlane has a tape of the event, probably at Seattle, WA. I don't have any information about observations made at observatories such as Mauna Kea or Cerro Tololo, and only know that the Kuiper Airborne Observatory was somewhere over the Pacific. In the next issue, I plan to publish a map of the USA and southern Canada showing all known observations of the Saturn event, like the one for the Titan event in O.N. 4 (13), p. 323.

Titan. Information about this event is much more advanced than that for Saturn. Some of the best photoelectric observations, and preliminary analyses, of the occultation by Titan have been published in Nature 343 (6256), p. 351 and 354, and in O.N. 4 (13), p. 324. A table of video and photoelectric observations of the Titan event is given here in the same format as the table for Saturn above. I believe that this table is complete, but please let me know if you know of other observations. I will do what I can to facilitate a comprehensive analysis of all of the video and photoelectric data as soon as I receive the Soviet data, which A. Osipov is collecting. Roland Boninsegna is trying to collect all of the visual observations; in a recent letter, he lists several French observers that are not shown on my map in O.N. 4 (13) 323. So I may need to produce an updated version of at least part of that map.

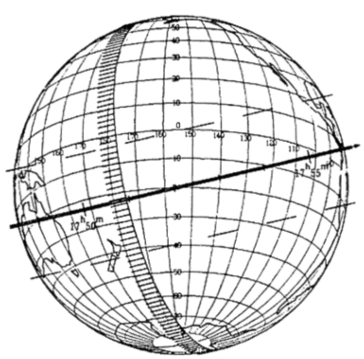
Automatic recordings of the occultation by Saturn

Location	F	Latitude	Longitude	Observer	Scope	M	Height
Blenheim, N.Z.	M	-4132.	+17357.	W. Allen		P	
Bethany, CT	H	412537.	-45156.3	M. Deubaty	20in	V	213.
Sperry Obs., NJ	O	403958.5	-741925.7	R. Tuthill	24in	V	30.
sw of Ottawa,Ont.	O	445034.0	-760851.5	P. Boltwood	24in	V	130.
near Toronto,Ont.	D	43.7	-79.4	G. Nason	11in	V	
Chiefland, FL	O	292431.7	-825138.9	D. Hatch	14in	V	12.
Minneapolis, MN	D	44.9	-93.2	C. Cole	10in	V	300.
Powell Obs., KS	O	383846.	-944159.	T. Martinez	30in	V	325.
Friendswood, TX	M	2933.	-9511.	A. Kelly	17.5in	V	
Mayetta, KS	O	392024.7	-954052.6	R. Wilds	14in	V	339.
Boulder, CO	M	4000.	-10516.	A. Kiplinger	18in	C	1650.
Kitt Peak, AZ	O	315746.9	-1113558.2	M. Rieke	90in	C	2071.
Palo Verde Ob.,AZ	M	3331.	-11202.	P. Manly	14in	V	378.
San Diego, CA	D	32.8467	-117.1650	J. Smith	50cm	V	183.
Mt. Wilson, CA	O	341328.4	-1180323.6	D. DiCicco	60in	V	1737.

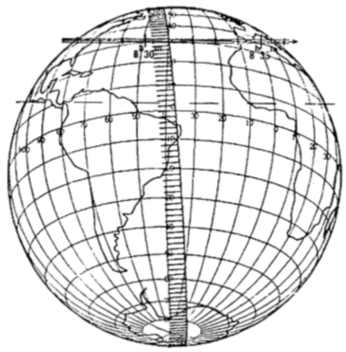
Automatic recordings of the occultation by Titan

Location		F	Latitude	Longitude	Observer	Scope	M	Height
LUEBECK, D	43	M	5352.	1044.	I. REIMANN		P	22.
HANNOVER, D	52	M	5220.	943.	HANS BODE	40cm	I	85.
BREMEN, D	53	O	525837.	91102.	M. NEZEL	12in	P	20.
ESSEN, D	61	M	5125.	704.	H. DENZAU	14in	P	94.
HOHER LIST, D	63	M	5009.8	651.0	E. H. GEYER	106cm	P	553.
RHEDEN, NL	71	M	5203.	606.	J. M. WINKEL		V	40.
LEIDEN, NL	85	M	5209.	429.	H. ROMYN		P	50.
HERSTMONCEUX	112	M	5052.3	20.3	G. APPLEBY		P	34.
READING, GB	118	O	512508.6	-5639.7	A. ELLIOTT	10in	I	72.
BRACKNELL	119	O	512526.	-4719.4	T. PLATT	12in	I	70.
Reading, GB	120	O	513223.	-4531.	T. Haymes	8in	V	80.
CAMBERLEY	121	M	5118.8	-44.4	J. COOK	3.5in	V	76.
ST. EDMUNDS	122	O	520959.	4624.	M. MOBBERLEY	14in	V	118.
SALFORD, GB	123	M	5328.	-218.	K. IRVING	18.5in	V	
WOOLTON PK,GB	124	O	525943.	-33110.	E. STRACH	8in	V	250.
TENERIFE, E	138	M	2818.	-1630.	M. KIDGER	50cm	P	238.
HEIKENDORF,D	139	M	5421.	1005.	E. RIEDEL	6in	P	10.
MATERA, I	140	M	4042.	1642.	W. BEISKER		P	
PIC DU MIDI	141	M	4256.2	08.540	J. LECACHEUX	200cm	P	2861.
ODESSA, R	142	M	4628.6	3045.5	PE		P	
CRIMEA, R	143	M	4432.1	3401.0	PE		P	
KHARKOV, R	144	O	500010.	361355.5	PE		P	
MITZPEH RAMON	156	O	303545.	344545.	WISE OBSERVATORY	40in	P	900.
EIN HAROD,IS	157	M	3234.	3523.	UNIV. OF ARIZONA	14in	P	
VATICAN OBS.I	158	M	4144.8	1239.1	UNIV. OF ARIZONA		P	450.
MEUDON, F	159	M	4848.3	213.875	J. ARLOT	100cm	P	162.
CAMBRIDGE,GB	160	M	5212.8	5.7	J. SHANKLIN	20cm	P	30.
NAPLES, I	162	H	405146.	5701.	M. CORBISIERO	30cm	P	
MAJDANAK OBS.	167	H	384200.	42730.	K. ZDANAVICIUS		P	2540.
LYON, FRANCE	174	H	454141.0	1908.52	VIDEO		V	299.
CATANIA, I	175	O	374130.	145842.0	SERRA LA NAVE OB.	91cm	P	1725.
HERTFORD, GB	176	O	514628.	-00534.	HATFIELD POLYTECHNIC O.		P	

BD +13° 757 by Winchester 1990 Mar 19

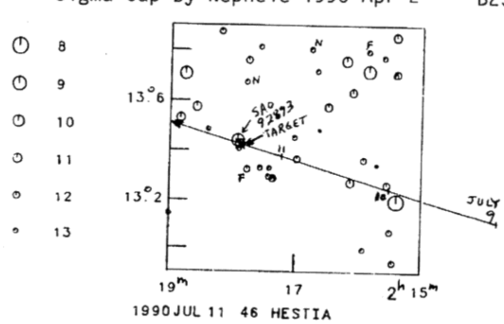


Sigma Cap by Nephele 1990 Apr 2



B23° 74398 by Semele 1990 Apr 2

Anonymous by Melpomene 1990 Apr 15



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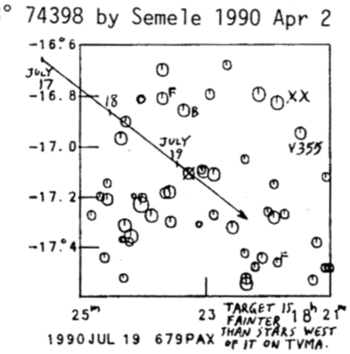

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THE PLEIADES PASSAGE OF 1990 MARCH 2-3

David W. Dunham

From 2^h to 5^h U.T. of March 3 (Friday evening, March 2nd, local time), the 39% sunlit Moon will occult the northernmost part of the Pleiades cluster as seen from most of North America. Canada and the northern States will be favored for this passage. Much information about this passage, including predicted Universal Times of disappearances of stars down to mag. 8.5 and other data, are included in my article about the passage in the March issue of Sky and Telescope.

The chart of the Pleiades shows the topocentric paths of the Moon's center for several cities, like the one described in O.N. 4 (7), 158. Use of apparent-place (equinox of date) coordinates for the chart facilitates use with the detailed USNO total occultation predictions, which list the apparent R.A. and Dec. for each occulted star. The motion is from right to left, with integral hours of Universal Time indicated by small numbers above tickmarks along the paths. The paths end at moonset with a circled "A". The path for Anchorage, Alaska, starts with a circled "S" at sunset; the passage is over there by the time the sky darkens enough for observation. The chart shows stars down to mag. 11.0, with stars brighter than 10th mag. numbered to the right. Numbers below 510 are USNO P-catalog numbers, 536-562 are Zodiacal Catalog (ZC) numbers, and numbers greater than 4000 are USNO XZ-catalog numbers. Underlined stars are known or suspected doubles. SAO numbers and named stars are indicated on the chart in Sky and Telescope. The Moon diagram, produced by Bob Bolster using a modified version of John Westfall's MOONVIEW program, is oriented with north up. The position angle of the north cusp will be 346° and the P.A. of the center of the bright limb will be 256°.

Although the Moon will be brighter, the basic geometry of this passage is nearly identical to that for the 1989 April 8-9 passage described in O.N. 4 (11), p. 261. Since the Moon again passes far to the north, the southern parts of the Pleiades are not shown in the chart, as they were omitted from the earlier chart. The topocentric paths on the two charts are nearly identical, with this year's paths 2' south of last year's. This means that the graze paths on the Earth's surface will also have a similar geometry, only passing about 170 miles farther south this time. The times of moonset are only about 20 minutes later, in position relative to the stars, than last year, although except for Alaska, the sun sets well before the passage in 1990.

Remember that the main goal of observations of Pleiades passages is to time as many contacts as possible around the entire circumference of the Moon's disk. Hence, the priority for observing Pleiades passages should be: first, bright-limb grazes of Alcyone (and of other bright Pleiads, if conditions permit bright-limb timings); second, time as many total occultations as you can with the largest-available telescope; and third, dark-limb grazes. If your telescope is portable and there are no suitable bright-limb grazes nearby, and especially if trees or other obstacles make your home location unsuitable for observing total occultations, you may as well try the closest dark-limb graze.

The graze of 5.6-magnitude 18 Tauri (ZC 538) will be the best during the passage; the northern limit is shown crossing southern Canada, northern New York,

The graze of 5.6-magnitude 18 Tauri (ZC 538) will be the best during the passage; the northern limit is shown crossing southern Canada, northern New York, and southern New England on page 69 of the January issue of Sky and Telescope. The graze path passes only 13 miles north of downtown Boston, MA; a 1:250,000-scale map showing the path was enclosed with the last issue for O.N. subscribers in the area. The path goes over Milford and Nashua, NH; and in Massachusetts, it goes about 2 miles north of Lowell, over North Reading, 1 mile south of Danvers, and over the southern parts of Salem and Marblehead. Contact Steve O'Meara at 617,325-3501 about joining a possible expedition, which might be joined by an effort from the DC area, depending on the weather. The path also passes near Ottawa, Ont.; contact Brian Burke at 613,521-8856 for a possible effort. IOTA members in upstate NY may also try the graze.

The northern limit for 5.9-mag. 7 Tauri (ZC 518) will cross the northernmost parts of New Brunswick, Prince Edward Island, and Nova Scotia just after sunset. The RASC Observer's Handbook for 1990 also shows three other dark-limb northern-limit grazes of the 6.8-mag. stars ZC 555 (path passing near Calgary, Alberta, contact Andrew Lowe, phone 403,286-0854 for a possible expedition; near Kankakee, IL, contact Berton Stevens, 708,398-0562; and over Dayton, OH, contact Basil Rowe, 513,561-4987), ZC 571 (path over Portland, OR, contact Anthony George, 503,362-2212, and between Ogden and Salt Lake City, UT), and ZC 574 (path over Mt. St. Helens, contact Richard Linkletter, 206,479-1191, and near Brigham City, UT).

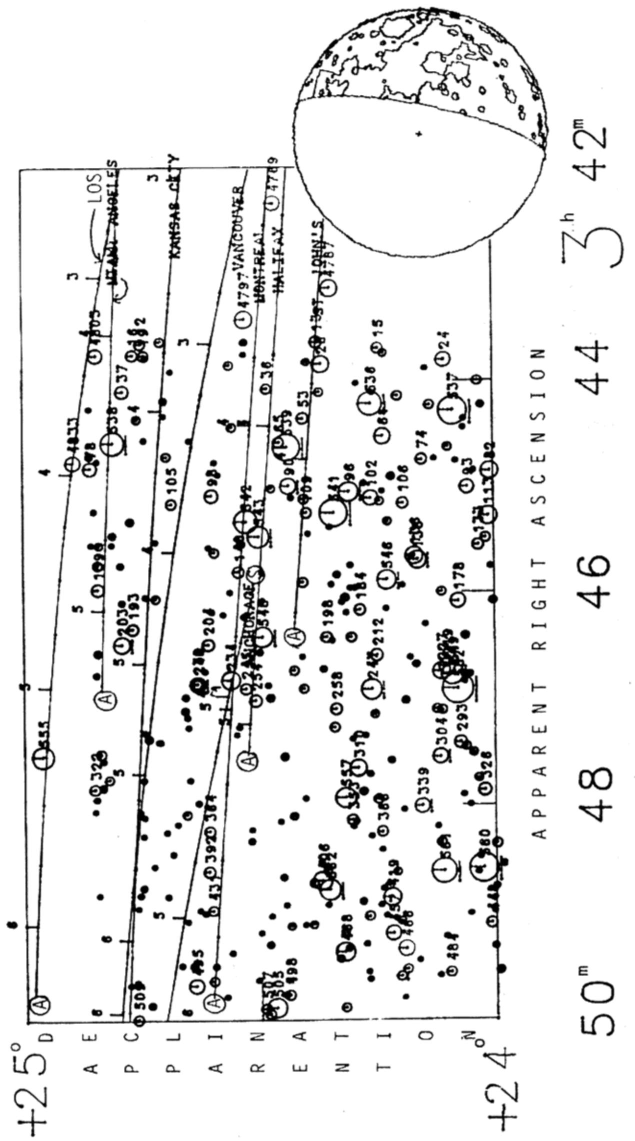
The following dark-limb northern-limit grazes of fainter stars will be easily seen with moderate-size telescopes: SAO 76046, mag. 7.5, path passing near Duluth, MN, south of Ottawa, Ont., over Barre, VT, and near Portland, ME; SAO 76081, mag. 7.9, near Flagstaff, AZ, Albuquerque, NM, contact MacPherson Morgan, 505,296-3983, Ardmore, OK, contact Edward Vinson, 405,255-7852, Shreveport, LA, Valdosta, GA, and Jacksonville, FL, contact Harold Carney, 904, 645-9310; SAO 76102, mag. 7.9, San Rafael, Richmond, and Stockton, CA, contact Walter Morgan, 415,443-9660 or Rick Baldridge, 408,374-4573, Los Alamos, NM, 40 mi. n. of Dallas, TX, contact Don Stotz, 214,223-1140, Shreveport, LA, Pensacola, Fl, nortn of Tampa, FL. contact Tom Campbell, 813,985-1842, and south of Ft. Pierce, FL, contact Harold Povenmire, 407,777-1303; and SAO 76142, mag. 8.8, north of Milwaukee, WI, near Augusta, MI, Canton, OH, contact Robert Modic, 216,731-0522, and Alexandria, VA, contact me, 301,474-4722.

If atmospheric seeing is very good, timings might be obtained during the bright-side graze of 4.0-mag. Maia (ZC 541). The southern limit for Maia passes north of Calgary, Alberta, contact Andrew Lowe, 403,286-0854; south of Regina, Sask.; 80 mi. n. of Minneapolis, MN; near Green Bay, WI; over Flint, MI, contact Richard Walker, 313,239-6769, and Ashtabula, OH, contact Robert Modic, 216,731-0522; north of York, PA, contact Robert Young, 717,234-4616; and over parts of Wilmington, DE, contact Cliff Bader, 215,696-7361 and me for a possible effort from the DC area, and Atlantic City, NJ. The southern limit for 4.4-mag. Taygeta (ZC 539) passes near Salem, OR; north of Idaho Falls, ID; just north of Kansas City, MO; north of Nashville, TN; and 15 miles south of Columbia, SC. The star is almost certainly too faint for effective timing of bright-limb events, even if atmospheric conditions are perfect. The disappearance of these stars will be on the bright side near the southern cusp for locations 15 or more miles north of these paths; farther to the north, the dark-side disappearance will be spectacular.

During the few nights after March 2nd, numerous occultations can also be seen as the first-quarter Moon crosses rich Milky Way fields. On the evening of March 3rd (just after sunset), a favorable northern-limit graze of 6.5-mag. ZC 701 will be visible from Pittsburgh (contact John Holtz, 412, 262-3452) and Reading, PA, and near Harrisburg, and also near New Brunswick, NJ. Contact Young and Bader, phones above, and myself for an expedition from the DC area to near Harrisburg.

More information about possible expeditions for any of the above-mentioned grazes might be obtained by phoning the IOTA occultation line at 301,474-4945. Call me at 301,474-4722 if you want me to put your specific expedition plans on the IOTA line.

On April 26, the 4% sunlit Moon will pass through the Pleiades for observers in much of North America. Unfortunately, the events will not be observable, since they will occur in daylight, with the Sun only 24° away from the Moon. However, the passage will be spectacular in the U.K. and western Europe. During the next few days (over a weekend), the thin crescent Moon passes through rich Milky Way fields, giving many opportunities for favorable grazes and total occultations. Consult your own predictions. We have a very good graze of a 7.7-mag. star by the 12° sunlit Moon over the northern and eastern suburbs of DC on Friday evening, April 27. The next day is Astronomy Day in the USA, and may provide an opportunity to show other amateur astronomers and the public some occultations by the 21% sunlit Moon.



THE PLEIADES PASSAGE OF 1990 JULY 17-18

David W. Dunham

From 23^h U.T. of July 17 to after 1^h U.T. of July 18 (Wednesday morning, July 18th, local time), the 22% sunlit waning Moon will centrally occult the Pleiades cluster as seen from most of Europe. Since many will be travelling to Finland to see the total solar eclipse four days later, the event is of more than local interest. In addition, the good geometry with a thin crescent Moon makes it the most favorable Pleiades passage of 1989. The U.K., and central and southeastern Europe, and the Middle East are the best locations for this passage. Since reappearances will be on the dark limb, predictions will be important for this passage. For this event, total occultation predictions can be obtained either from Hans-Joachim Bode in Hannover (IOTA/ES); Kyril Fabrin, Raadsherrevej 2, DK-9000 Aalborg, Denmark; or Marie Lukac at USNO.

The chart of the Pleiades shows the topocentric paths of the Moon's center for several cities, like the one described on p. 367 for the March 2-3 passage. The paths begin at moonrise at the circled A's, and the path for Moscow ends with a circled S north of Pleione (ZC 561). The topocentric paths for Kiev and Moscow are identical, with events at Moscow occurring several minutes later than the same events at Kiev. Not shown is the topocentric path for Stockholm, which is exactly the same as the path for Hannover, where the events occur earlier by several minutes. However, the sky is much darker, permitting more occultations to be observed, at Hannover than at Stockholm, where the Sun is already 6° below the horizon by the time Merope (ZC 545) reappears. The twilight is even stronger, rendering virtually all of the occultation events unobservable, at Helsinki. Finland is just too far north for this summertime passage. Similarly, little of the passage will be visible from Iberia, where the Moon will just be leaving the cluster at moonrise. The position angle of the north cusp will be 351° and the P.A. of the center of the bright limb will be 81°. Also, note the observational goals described in the article about the March passage.

Many spectacular grazes that occur during this passage are shown on the map on p. 7 of the European Grazing Occultation Supplement for 1990. The best will be the northern-limit dark-limb graze of 4.0-mag. Maia (ZC 541), track #119 on the map. This path crosses Greece from near Patras to the northeast corner of the country, passing about 150 km northwest of Athens (altitude then 8°). It crosses the northwestern Crimea and 50 km from Donetsk in the Ukraine. The path passes about 140 km from

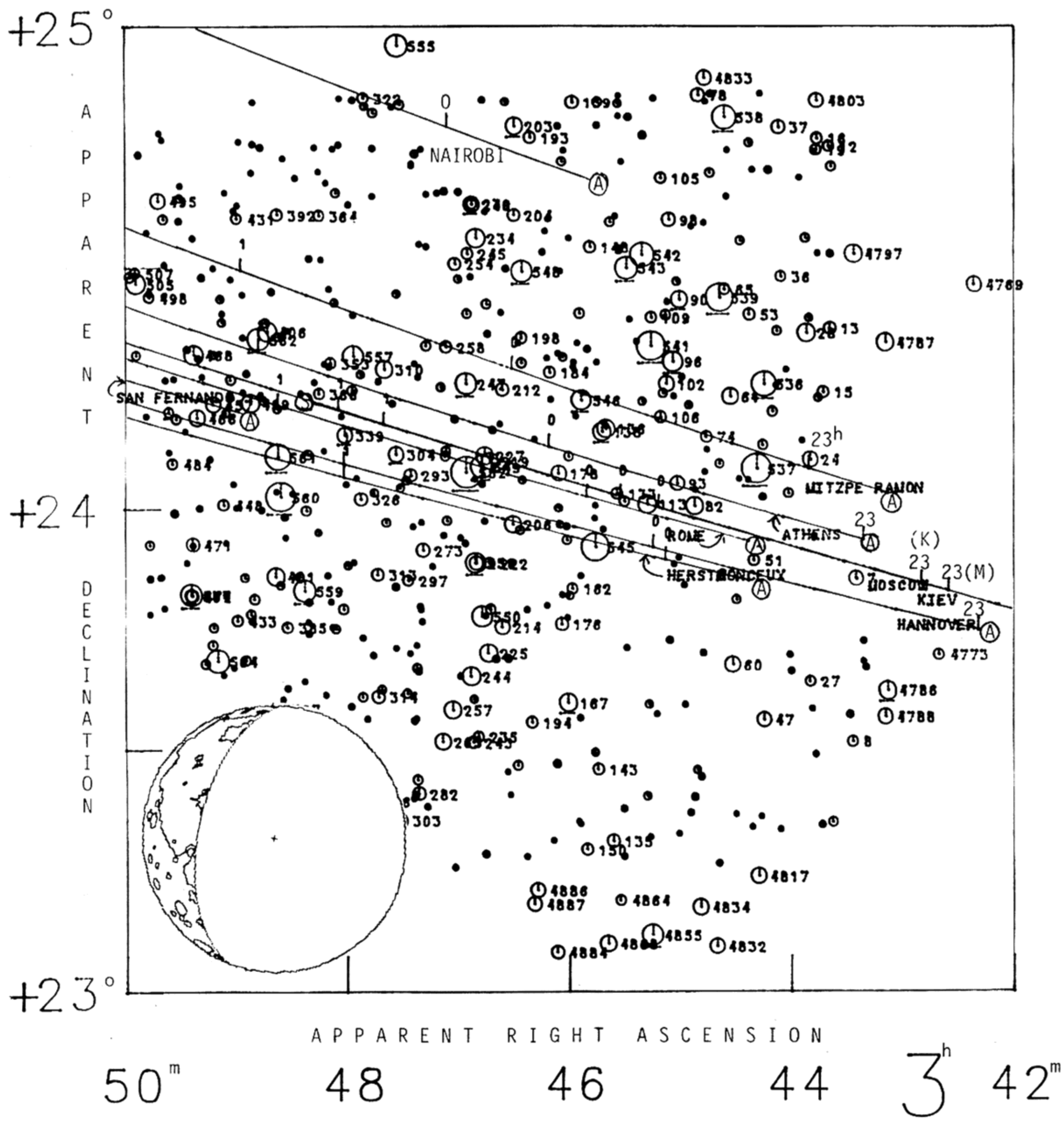
Voronezh in Russia, about 500 km southeast of Moscow, where the Sun's altitude will be -6°. If logistics permit, some members of IOTA's planned expedition to Siberia for the July 22nd solar eclipse might also try to observe the Maia graze.

The southern-limit graze (#125) of Alcyone misses Europe, crossing northern Saudi Arabia, Iraq, and Iran. The spectacular northern-limit graze (#118) of Taygeta crosses the southern Negev of Israel, Jordan, northern Iraq, and northwestern Iran. The paths for four 7th-mag. stars cross the British Isles, including one path (7.3-mag. SAO 76259) just south and east of London (near Herstmonceux).

April 26th Passage. Another good Pleiades passage will occur Thursday evening, April 26, visible from the U.K. and western Europe. The Moon will be only 4% sunlit, so stars of 9th-magnitude and fainter will probably be difficult to observe due to bright Earthshine and low altitude. At a given place, the whole passage can not be seen, since the Moon will be visible high enough above the horizon in a relatively dark sky for only about an hour. Nevertheless, the view should be quite striking.

The European graze supplement shows a spectacular graze of Maia (path #78) crossing Northern Ireland, England (near Liverpool, Birmingham, and London), and northern France (where Belgian observers are sure to organize an expedition). The path for Taygeta (#77) crosses northern Spain, ending at low altitude above the horizon near Barcelona. A good graze of 5.4-mag. Celaeno (ZC 536, track #75) is likely to be attempted by an IOTA/ES expedition near Hamburg, Germany. Two 6th-mag. grazes (#79 and #80) occur in Portugal.

If time permits, we will produce and distribute a Pleiades chart for the April 26th passage.



REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS

Jim Stamm

All times in this report are Coordinated Universal Time (UTC).

(448) Natalie and SZO 208532, 1987 Sept. 30: Jim Blanksby reported a "no event" from Wadin, Victoria, Australia.

(305) Gordonia and AGK3 +10° 0223, 1987 Nov 21: A negative report was received from Jim Blanksby observing from Wadin, Victora.

Following are all of the positive reports that I have received and not summarized previously:

(90) Antiope and SAO 186402, 1988 Jun 11: Four updates indicating a northward shift and a time 2 or 3 minutes earlier were obtained by Rob McNaught at Siding Spring Observatory, Queensland. On his way home from the June 9th Pluto event, Steve Hutcheon waited in Rockhampton, Queensland where the update put the track. A cloud band formed late in the afternoon, forcing Steve to the south. When he realized the band was following him, he went as far east as possible, hoping the cloud would clear the east in time for the event. Finding the double star target just one minute before the predicted time, Steve watched one of the stars dim 30 seconds later (10:14:25.6) for 7.9 seconds. The reappearance took 0.7 seconds, and Steve feels that the observed duration, compared to the predicted duration of 14.5 seconds, indicates a chord close to the limb. The slow brightening may well have been due to a limb feature. Negative reports came from Peter Nelson (Nilma, Victoria), Bruce Tregaskis (Mt. Eliza, Victoria), Jim Blanksby (Wandin, Victoria), Ian Grant (South Croydon, Victoria), and Charlie Smith (Woodridge, Queensland).

(1206) Numerowia and SAO 209910, 1988 Aug 13: Although a combination of equipment and observing difficulties prevented Harry Moller from getting exact times, he did record a disappearance of about 3 seconds beginning at about 13:55:34. Negative observations were made by Charlie Smith (Woodridge, Queensland), Jim Blanksby (Wandin, Victoria), Peter Anderson (The Gap, Queensland), and Peter Daalder (Launceton, Tasmania).

(324) Bamberga and SAO 138118, Mar. 18, 1989: Ernst Koppl recorded a disappearance at 04:07:49.5 which lasted 8.1 seconds. He observed under a partially cloudy sky, but states the event was "positive" because of a confirmation by another observer "north and east" of him.

(313) Chaldea and SAO 142133, Apr. 9, 1989: See the article from EAON by Roland Boninsegna in this issue.

(481) Emita and SAO 119808, May 26, 1989: David Weier timed a 3.9 second occultation beginning at 05:35:34.1 from Madison, Wisconsin. He reports many "undulations" beginning 10 minutes before the main occultation, and counted 4 steps in the disappearance and 5 steps in the reappearance. Mike Smith in Tucson, Arizona, thought the star dimmed one or two magnitudes (4.4 mag. drop predicted) for 8 or 9 seconds. Negative reports came from Benny Roberts (Jackson, Mississippi), Daniel Klos (Brillion, Wisconsin), Greg Lyzenga (Altadena, California), Fronk Olsen (Cedar Rapids, Iowa), Tony Freeman (Berkeley, California), and Sally Waraczynski (Milwaukee, Wisconsin).

(521) Brixia and SAO 147658, Oct 23, 1989: Roland Boninsegna reports that he has received a total of 5 positive observations to date, with 2 sets of "last minute" predictions and micrometer measures. The final predictions from Lick Observatory were particularly good. More information on this event will follow when Roland submits his analysis.

(146) Lucina and FAC 212517, 24 Oct, 1989: Two positive observations were received by Boninsegna, one a visual and the other a video observation made at Pic-du-Midi Observatory. More will come later.

The tables 1 and 2 accompanying this note are addenda to the two tables in O.N. 4, 12, p. 296. Table 1 reports the asteroidal appulses and occultations for January to July, 1988. Table 2 has the observers and locations of reported events for the same time period.

I have summarazed all of the reports that I have received for the last half of 1989 in the tables 3 and 4 and the section of notes. Table 3 lists the 1988 date, minor planet, occulted star, IDs of successful observers, and references to any notes. Table 4 lists the observer's ID, name, nearest town to location of observation, country (includes state or province for North America and Australia), organization through which the report came, 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 confirmation, or the fact that something may have happened is relevant to another observation. Instead, I will place an asterisk (*) in the REF column to indicate that I have received a report with more than a "no event..." in it.

Table 1. Asteroidal appulses and occultations: Jan.-June 1988.

DATE	MINOR PLANET		CAT	STAR	OBSERVERS
Jan 15	12	Victoria	SAO	137799	Lo
Feb 12	426	Hippo	AGK3	+24° 0899	By
Feb 28	949	Hel	AGK3	+30° 0649	Lo
Mar 03	60	Echo	SAO	139163	Pj
Mar 08	121	Hermione	SAO	186959	GwByNeKa
Mar 10	2	Pallas	AGK3	+07° 2808	HsAnHt
Mar 16	502	Sigune	AGK3	+34° 1170	NeScHtAn
Mar 23	101	Helena	SAO	210436	PjLo
Mar 25	65	Cybele	AGK3	-01° 1686	ScByPjBw AbLbHtAn
Mar 25	101	Helena	SAO	210500	PjHs
Mar 28	93	Minerva	AGK3	+31° 0565	Sc
Mar 28	90	Antiope	SAO	186340	Sc
Apr 14	361	Bononia	SAO	182831	ScAn
Apr 21	139	Juewa	SAO	157598	ScHtKrAnBpBy
Apr 23	65	Cybele	AGK3	+00° 1567	LdByPjBwKr HuNiAnBr
Apr 27	754	Malabar	AGK3	+05° 2851	ScHt
Apr 28	192	Nausikaa	SAO	207188	Sc
May 08	19	Fortuna	AGK3	-00° 1679	KaLdByScHtAn
May 09	93	Minerva	AGK3	+30° 0718	AnHt
May 10	701	Oriola	SAO	184704	ScHtAn
May 21	58	Concordia	AGK3	+18° 0803	ScAn
Jun 08	521	Brixia	SAO	185407	HvScBb
Jun 15	792	Metcalfia	SAO	182745	Sc
Jun 23	508	Princetonia	SAO	208706	Sc

If you do not have a regional coordinator who forwards your reports, they should be sent to me at 11781 N. Joi Drive; Tucson; AZ 85737 U.S.A. Names and addresses of regional coordinators are given in the "From the Publisher" on the front page.

Table 2. Observers and locations of reported events: Jan.-June 1988.

ID	OBSERVER	CITY	COUNTRY	GROUP	No
Ab	ADCOCK, BRUCE	VIEWBANK	VICTORIA - AUS	RASNZ	1
An	ANDERSON, PETER	THE GAP	QUEENSLAND - AUS	RASNZ	10
Br	BARTHOLOMEW, J.	ROCKHAMPTON	QUEENSLAND - AUS	RASNZ	1
Bb	BEMBRICK, COL	BATHURST	N.S.W. - AUS	RASNZ	1
Bp	BIRCH, PETER	PERTH	W. AUSTRALIA	RASNZ	1
By	BLANKSBY, JIM	WANDIN	VICTORIA - AUS	RASNZ	8
Bw	BLOW, GRAHAM	WELLINGTON	NEW ZEALAND	RASNZ	2
Gw	GRANT, IAN	S. CROYDON	VICTORIA - AUS	RASNZ	2
Hs	HAYWARD, STEVE	MADANG	PAPUA NEW GUINEA	RASNZ	2
Ht	HUTCHEON, STEVE	SHELDON	QUEENSLAND - AUS	RASNZ	8
Hv	HUTCHEON, STEVE	ROCKHAMPTON	QUEENSLAND - AUS	RASNZ	2
Hw	HUTCHEON, STEVE	DALBY	QUEENSLAND - AUS	RASNZ	1
Kr	KEARNEY, PHILLIP	BUNDABERG	QUEENSLAND - AUS	RASNZ	2
Ka	KRUIJSHOOP, A.	MT. PLEASANT	VICTORIA - AUS	RASNZ	2
Lb	LOADER, BRIAN	BLACK BIRCH	NEW ZEALAND	RASNZ	1
Lo	LOADER, BRIAN	CHRISTCHURCH	NEW ZEALAND	RASNZ	5
Ld	LOWE, DENNIS	BUNDABERG	QUEENSLAND - AUS	RASNZ	2
Ne	NELSON, PETER	KORRUMBURRA	VICTORIA - AUS	RASNZ	3
Ni	NIVEN, B.S.	WOODRIDGE	QUEENSLAND - AUS	RASNZ	1
Pj	PRIESTLEY, JOHN	PUKERUA BAY	NEW ZEALAND	RASNZ	6
Sc	SMITH, CHARLIE	WOODRIDGE	QUEENSLAND - AUS	RASNZ	15
Tb	TREGASKIS, BRUCE	MT. ELIZA	VICTORIA - AUS	RASNZ	1

EAON ASTEROIDAL OCCULTATIONS RESULTS

Roland Boninsegna

All times in this report are Coordinated Universal Time (UTC).

(356) Liguria and AGK3 +32° 0828 on 1988 November 14: Nine observers from different stations reported their observations. Meudon Observatory made a video recording which was analyzed and reduced by the AVIA system, reported by J. -E Arlot et. al. in Celestial Mechanics 45, 129, 1989. Many observers noted that the minor planet was late. Negative reports were received from Frederic Courbin (Vernon, France), Michel Guesse (Nouackchott, Mauritania), Bertrand Thooris (Wervik, Belgium), F. Van Loo (Genk, Belgium), S. Lecompte (Mainvilliers, France), S. Szabo (Szombathely, Hungary), and J. Garcia (Lisboa, Protugal). In Vernon, Richard Heidmann was waiting for the final separation between the two objects at 4:37 - 4:48 when he saw two short occultations of 1.5 to 1.6 seconds. Unfortunately, he could not record the exact time, and the duration was deduced from the cyclic noise of the telescope motor. No confirming observation was made. The Meudon Observatory observations would indicate that the star and minor planet were separated by about 4."5 at that time.

(313) Chaldaea and SAO 142133 on 1989 April 9: Nine observers from seven stations reported their observations. In Vernon, France, Paul Mazalrey recorded two blinks with a total duration of less than 0.5sec, followed immediately by a total occultation, beginning at 4:19:28.5 and lasting 8.5 seconds. Negative reports were received from T. V. Haymes (Reading, United Kingdom), C. Marlot (Guines, France), H. Bulder (Zoetermeer, Holland), Y. Thirionet (Bruxelles, Belgium), H. Denzav (Essen, W. Germany), , M. Guesse (Nouakchott, Mauritania), P. Terrier, D. Hubert, and J-M Lassauce (Chamonix, France).

Table 3. Asteroidal Appulses and Occultations
July - December 1988

DATE	MINOR PLANET		CAT	STAR	OBSERVERS	REF
Jul 09	250	Bettina	AGK3	+17° 1127	CpOvFzSmWk	1
Jul 17	415	Palatia	SAO	94054	Dv	
Jul 22	270	Anahita	AGK3	+07° 0068	Vn	
Aug 09	626	Notburga	AGK3	+36° 0304	BkPtPdRgSnSi	*
Aug 11	2	Pallas		Anonymous	FbHk	
Aug 12	63	Ausonia	SAO	164745	MuFbBnBhPtSn	
Aug 13	567	Eleutheria	SAO	158749	ScAn	
Aug 13	1206	Numerowia	SAO	209910	MhScByAnDp	2
Aug 15	53	Kalypso	AGK3	+19° 0482	Wl	
Aug 19	735	Marghanna	SAO	228290	Fd	
Aug 24	554	Peraga	AGK3	+25° 0452	VbDkSpSmSn	
Aug 29	75	Eurydike	SAO	183524	St	
Aug 30	371	Bohemia	AGK3	+05° 3346	ScHtAn	
Aug 31	566	Stereoskopia	SAO	93151	FmLyDz	
Aug 31	356	Liguria	AGK3	+30° 0692	OvSm	
Sep 01	134	Sophrosyne	AGK3	+09° 0060	SuSc	
Sep 02	545	Messalina	SAO	210092	ScAn	
Sep 03	482	Petrina	AGK3	+10° 0581	ScHtAn	
Sep 06	177	Irma	AGK3	+24° 0579	Sq	
Sep 06	769	Tatjana	AGK3	+26° 0493	VrVn	
Sep 07	381	Myrrha	SAO	190834	Sq	
Sep 08	236	Honoria	SAO	161013	Sq	
Sep 17	236	Honoraria	SAO	161115	Cw	
Sep 19	43	Ariadne	SAO	185447	Mc	
Sep 21	690	Wratislavia	A	2250203	StFm	
Sep 22	735	Marghanna	SAO	228922	CpOvFzVpDkSp	
Sep 23	31	Euphrosyne	SAO	214623	StLo	
Sep 23	150	Newa	SAO	146096	LoLdHwScAn	
Sep 29	480	Hansa	AGK3	25° 2781	Sc	
Sep 30	579	Sidonia	SAO	147307	Rt	
Oct 05	202	Chrysis	AGK3	+15° 0728	CpOvShSm	
Oct 05	70	Panopea	SAO	208693	DeScHtAn	
Oct 08	198	Ampella	AGK3	+25° 0785	EwRtSr	
Oct 13	192	Nausikaa	SAO	184566	ScHtBm	
Oct 14	381	Myrrha	SAO	190672	Sj	
Oct 14	628	Christine	AGK3	+00° 0292	TlSy	
Oct 16	1072	Malva	SAO	190784	SiLy	
Oct 25	952	Caia	SAO	164782	Ly	
Oct 25	270	Anahita	AGK3	+05° 0022	Sm	
Oct 25	3	Juno		Anonymous	An	
Oct 30	566	Stereoskopia	AGK3	+09° 0234	ChCpMdWk	
					SgSkEwPwPh	
Nov 09	53	Kalypso	LJ	04192	DtHfPg	
Nov 11	256	Walpurgia	AGK3	+05° 1022	Ov	
Nov 13	89	Julia	SAO	187992	Md	
Nov 14	356	Liguria	AGK3	+32° 0828	BdCuVlGi	2
					GuHmLsSzTh	
Nov 16	1263	Varsavia	SAO	171550	Sc	
Nov 17	284	Amalia	AGK3	+18° 0482	Gt	
Nov 17	112	Iphigenia	AGK3	+24° 0329	StLySk	
Nov 20	246	Asporina	SAO	164862	St	
Nov 23	945	Barcelona	AGK3	+62° 0091	St	
Nov 24	397	Vienna	AGK3	+14° 0355	Mu	
Nov 24	66	Maja	SAO	92660	St	
Nov 28	25	Phocaea	SAO	112763	FmLy	
Nov 29	257	Silesia	AGK3	+27° 0707	Sc	
Dec 04	175	Andromache	SAO	078770	SkPiRvVd	
Dec 10	535	Montague	AGK3	+11° 0280	ByAn	
Dec 11	690	Wratislavia	SAO	96218	StVc	
Dec 14	175	Andromache	AGK3	+27° 0707	StEw	
Dec 14	446	Aeternitas	AGK3	+32° 0485	BoBkBzClDbDt	
					EwKcAoMaPiTlZk	
Dec 18	423	Diotima	AGK3	+30° 0739	CvDlGkRvTpVd	
Dec 22	781	Kartvelia	AGK3	+02° 0636	Mg	
Dec 25	410	Chloris	SAO	147128	Vb	
Dec 26	345	Tercidina	AGK3	+08° 0662	Mg	

Table 4. Observers and Locations of Reported Events
July - December 1988

ID	OBSERVER	CITY	COUNTRY	GROUP	No.
An	ANDERSON, PETER	THE GAP	QUEENSLAND-AUS	RASNZ	8
Ao	ARCHENHOLD OBS.	BERLIN	EAST GERMANY	GEOS	1
Bo	BARONI, S.	MILANO	ITALY	GEOS	1
Bz	BARRUEZO, JOSE	GRANADA	SPAIN	GEOS	1
Bh	BARTHES, J.	CASTRES	FRANCE	GEOS	1
Bm	BEMBRICK, COL	SYDNEY	N.S.W. - AUS	RASNZ	1
Bk	BERTOLI, O.	TORINO	ITALY	GEOS	2
By	BLANKSBY, JIM	WANDIN	VICTORIA - AUS	RASNZ	3
Bn	BONINSEGNA, R.	DOURBES	BELGIUM	GEOS	1
Bl	BULDER, H.	ZOETERMEER	NETHERLANDS	GEOS	1
Cv	CAVAGNA, M.	COLMA D. PIANO	ITALY	GEOS	1
Ch	CHURMS, JOE	CAPE TOWN	SOUTH AFRICA	ASSA	1
Cl	COLOMBA, A.	REGGIO CALABRIA	ITALY	GEOS	1
Cp	COOPER, TIM	EAST RAND	SOUTH AFRICA	ASSA	4
Cu	COURBIN, F.	VERNON	FRANCE	GEOS	1
Dp	DAALDER, PETER	LAUNCESTON	TASMANIA	RASNZ	1
Dk	DE KLERK, J.	POTCHEFSTROOM	SOUTH AFRICA	ASSA	2
Db	DEBENEDEMO, G.	REGGIO CALABRIA	ITALY	GEOS	1
Dt	DENTEL, M.	BERNAN	EAST GERMANY	GEOS	2
Dv	DEVGUN, CHANDER	NEW DELHI	INDIA	ARP	1
Dl	DI LUCA, R.	BOLOGNA	ITALY	GEOS	1
Ds	DICKIE, ROSS	GORE	NEW ZEALAND	RASNZ	1
Dz	DIETZ, RICHARD	GREELEY	COLORADO - USA	ARP	1
Ew	EWALD, D.	BIESENTHAL	EAST GERMANY	GEOS	4
Fb	FABREGAT, JUAN	VALENCIA	SPAIN	GEOS	2
Fd	FIELD, R.	DURBAN	SOUTH AFRICA	ASSA	1
Fz	FRAZER, B.	JOHANNESBURG	SOUTH AFRICA	ASSA	2
Fm	FREEMAN, TONY	BERKELEY	CALIFORNIA - USA	ARP	3
Gi	GARCIA, J.	LISBOA	PORTUGAL	GEOS	1
Gt	GARDE, T.	SHURUGWE	SOUTH AFRICA	ASSA	1
Gk	GONCALVES, R.	LISBOA	PORTUGAL	GEOS	1
Gu	GUESSE, M.	NOUAKCHOTT	MAURITANIA	GEOS	1
Hm	HEIDMANN, R.	VERNON	FRANCE	GEOS	1
Hf	HOFFMAN, M.	SCHALKENMEHREN	WEST GERMANY	GEOS	1
Hk	HOLLER, K.	GRAZ	AUSTRIA	GEOS	1
Ht	HUTCHEON, STEVE	SHELDON	QUEENSLAND-AUS	RASNZ	4
Hw	HUTCHEON, STEVE	DALBY	QUEENSLAND-AUS	RASNZ	1
Kc	KOCSIS, A.	VESZPREM	HUNGARY	GEOS	1
Ls	LECOMTE, S.	MAINVILLIERS	FRANCE	GEOS	1
Lo	LOADER, BRIAN	CHRISTCHURCH	NEW ZEALAND	RASNZ	2
Ld	LOWE, DENNIS	BUNDABERG	QUEENSLAND-AUS	RASNZ	1
Ly	LYZENGA, GREG	ALTADENA	CALIFORNIA - USA	ARP	5
Ma	MARTINEZ, P.	TOULOUSE	FRANCE	GEOS	1
Mg	MCGAHA, JAMES		SOUTH KOREA	ARP	2
Mc	MCRAE, A.	RUSTENBURG	SOUTH AFRICA	ASSA	1
Mh	MOLLER, HARRY	KINGSLEY	W. AUSTRALIA	RASNZ	1
Ml	MULDER, M.	THABAZIMBI	SOUTH AFRICA	ASSA	2
Mu	MURRAY, TONY	GEORGETOWN	GEORGIA - USA	ARP	2
Ov	OVERBEEK, DANIE	EAST RAND	SOUTH AFRICA	ASSA	5
Pw	PALZER, W.	WIESBADEN	WEST GERMANY	GEOS	1
Pd	PARADOWSKI, M.	LUBLIN	POLAND	GEOS	1
Pg	PIGULSKI, A.	WROCLAW	POLAND	GEOS	1
Pt	PIRITI, J.	NAGYKANIZSA	HUNGARY	GEOS	2
Pi	PORCINI, R.	SALERNO	ITALY	GEOS	2
Rg	REGHEERE, G.	GRENOBLE	FRANCE	GEOS	1
Rt	RICHTER, S.	EBERSWALDE-F.	EAST GERMANY	GEOS	2
Rv	RODRIGUEZ, D.	VILLAVICIOSA	SPAIN	GEOS	2
Rh	ROTHE, W.	BERLIN	EAST GERMANY	GEOS	1
Sh	SCHILLER, D.	EAST RAND	SOUTH AFRICA	ASSA	1
Sn	SCHNABEL, C.	BARCELONA	SPAIN	GEOS	3
Sk	SHANKAR, ARUN	NEW DELHI	INDIA	ARP	3
Sg	SINGH, JASJEET	NEW DELHI	INDIA	ARP	1
Sv	SLUSARCZYK, J.	NIEPOLOMN[illegible]E	POLAND	GEOS	1
Sm	SMIT, J.	PRETORIA	SOUTH AFRICA	ASSA	5
Sc	SMITH, CHARLIE	WOODRIDGE	QUEENSLAND-AUS	RASNZ	12
Sw	SMITH, CHARLIE	WARWICK	QUEENSLAND-AUS	RASNZ	1
Sr	SOSTERO, G.	TOLMEZZO	ITALY	GEOS	1
Si	SPEIL, J.	WOLBRZYCH	POLAND	GEOS	1
Sp	SPOELSTRA, J.	POTCHEFSTROOM	SOUTH AFRICA	ASSA	2
Su	ST. GEORGE, LOU	AUCKLAND	NEW ZEALAND	RASNZ	1
Sj	STAMM, JIM	LONDON	KENTUCKY - USA	ARP	2
Sq	STAMM, JIM	WESTFIELD	MASSACHUSETTS	ARP	3
St	STAMM, JIM	TUCSON	ARIZONA - USA	ARP	9
Sz	SZABO, S.	SZOMBATHELY	HUNGARY	GEOS	1
Th	THOORIS, B.	WERVIK	BELGIUM	GEOS	1
Tl	TORRELL, S.	BARCELONA	SPAIN	GEOS	2
Tp	TULIPANI, F.	BOLOGNA	ITALY	GEOS	1
Vb	VAN BLOMMESTEIN	CAPE TOWN	SOUTH AFRICA	ASSA	2
Vp	VAN LAUN, P.	JOHANNESBURG	SOUTH AFRICA	ASSA	1
Vl	VAN LOO, F.	GENK	BELGIUM	GEOS	1
Vc	VELASCO, P.	NAVAS DEL RAY	SPAIN	GEOS	1
Vr	VENABLE, ROGER	AUGUSTA	GEORGIA - USA	ARP	1
Vd	VIDAL, J.	MONEGRILLO	SPAIN	GEOS	2
Vn	VINSON, ED	DUNCAN	OKLAHOMA - USA	ARP	2
Wk	WAKEFIELD, N.	WALKERVILLE	SOUTH AFRICA	ASSA	2
Wl	WALLACE, R.	JOHANNESBURG	SOUTH AFRICA	ASSA	1
Zk	ZALEZSAK, T.	VESZPREM	HUNGARY	GEOS	1

Notes to tables:

1) On the East Rand, T. Cooper and D. Overbeek obtained good chords. In Johannesburg, B. Fraser observed a disappearnace and reappearance which was untimed, but consistent with Cooper's and Overbeek's timings. J. Smit observed a definite miss in Pretoria, while N. Wakefield obtained a good reappearance timing.

2) Harry Moller observed an occultation from Kinksley, Western Australia, but drift problems kept him from getting an exact time on either contact. His best guess at the time the 3 second occultation began is 13:55:35.3.

3) See the article from EAON by Roland Boninsegna on p. 371

NEWS FROM EAON

Minor Planets: Preparing Last-Minute Predictions

IOTA/ES now has its own measuring engine: ZEISS-PSK. The accuracy has been determined to be 1 micrometer. It was once used to generate data for a mainframe program with an automatic key punch. Work is being done to change this device to input data to a micro computer, but this will take some time.

It would be good to receive astrographic input from observatories at several locations, so that bad weather at one site does not prevent last minute predictions. Participating observatories should plan to send negatives within 2 days before the event to IOTA/ES-Hannover. The astrographic equipment should consist of a telescope with minimum focal length of 1500mm and minimum diameter of field of view of about 2 degrees. To test the equipment that will be used and allow determination of its program constants, a test negative of the Pleiades cluster should be sent to IOTA/ES

If you are interested, please send the data to Hans-J. Bode; IOTA-ES; Bartold-Knasut-Str. 8; D-3000 Hannovor 91; W. Germany.

SAO 99210 by Klotho 1990 Apr 21

SOLAR SYSTEM OCCULTATIONS DURING 1990

David W. Dunham

This is a continuation of the article with the same title starting on p. 341 of the last issue. The quarterly maps in this issue show all events that will occur during July, August, and September. These maps also include earlier events marked with an asterisk after the date in Tables 1 and 2 of the last issue, since these events were not included in the quarterly maps in the last issue.

Major Planets on Finder Charts. During most of 1990, Jupiter is in the northern Milky Way, while the next three outer planets are in rich star fields of Sagittarius. So this year, chances are good that one of the bright major planets will appear on a finder chart for an asteroidal occultation. I sent daily ephemerides for Venus, Mars, Jupiter, and Saturn for 1990 to David Werner. He is using the ephemerides, along with the star charts showing the paths of Uranus and Neptune for 1990 published on pages 66 and 67 of the January issue of Sky and Telescope, to plot the positions of these major planets on the asteroidal occultation finder charts published in O.N., when appropriate. Werner has also checked the charts in Goffin's supplement for 1990 asteroidal occultations for North American observers. The results are given in Table 6 below. "S&T" is given for the "coordinates" for Uranus, since its location can be found by comparison with the chart in Sky and Telescope mentioned above.

Table 6. Major Planets on the Small 15° Charts.

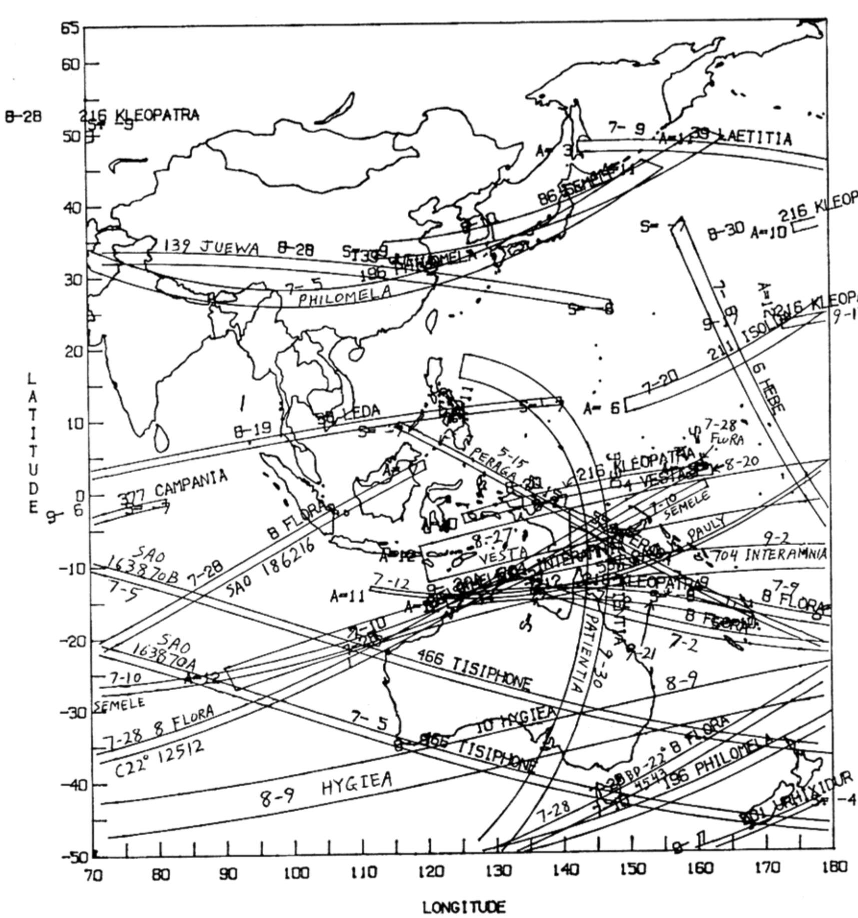
1990 Date	Asteroid	Planet	R.A. (1950)	Dec.
Feb. 25	Richilde	Jupiter	$6^h\ 1^m.1$	+23° 27'
Mar. 13	Semiramis	Jupiter	6 2.9	+23 29
Mar. 16*	Padua	Uranus	S&T	
Apr. 21	Lucina	Jupiter	6 20.9	+23 28
Apr. 30	Ceres	Jupiter	6 27.2	+23 25
June 10*	Octavia	Uranus	S&T	
July 11	Hestia	Mars	1 49.3	+9 3
July 19	Pax	Uranus	S&T	
July 29	Flora	Uranus	S&T	
Sept. 2	Pax	Uranus	S&T	
Oct. 7	Flora	Uranus	S&T	
Oct. 8	Pax	Uranus	S&T	
Oct. 28	Padua	Saturn	19 22.8	−22 9
Nov. 4	Padua	Saturn	19 24.9	−22 5
Nov. 6	Thisbe	Uranus	S&T	
Nov. 19	Eunomia	Jupiter	9 1.8	+17 28

An asterisk (*) following the date indicates that the major planet is also on the large chart covering 3° of declination. For next year's predictions, we plan to plot the major planets on the charts before they are copied and distributed.

Notes about Individual Events.

Mar. 19, (747) Winchester: A finder chart is on p. 357 of the last issue.

PLANETARY OCCULTATIONS. 1990 JULY - SEP.



58 Aqr by Mars 1990 Apr 28

SAO 146135 by Leda 1990 May 3

May 3, (38) Leda: The star is ZC 3308.

May 16: The star is 74 Virginis = ZC 1941.

June 25: The southern limit just barely touches the Earth's surface in the northern Canadian archipelago; an unlikely south shift of 3" would be needed to cause an occultation to be visible from populated parts of North America. Disappearance would be on the sunlit side of Venus' 82% sunlit disk. The defect of illumination is only 2"3. At the southern limit, central graze would be 2° from the south cusp on the "dark" side, which would be only a few tenths of an arc second wide at best and overwhelmed by irradiation.

July 2, (8) Flora: The star is ZC 2679.

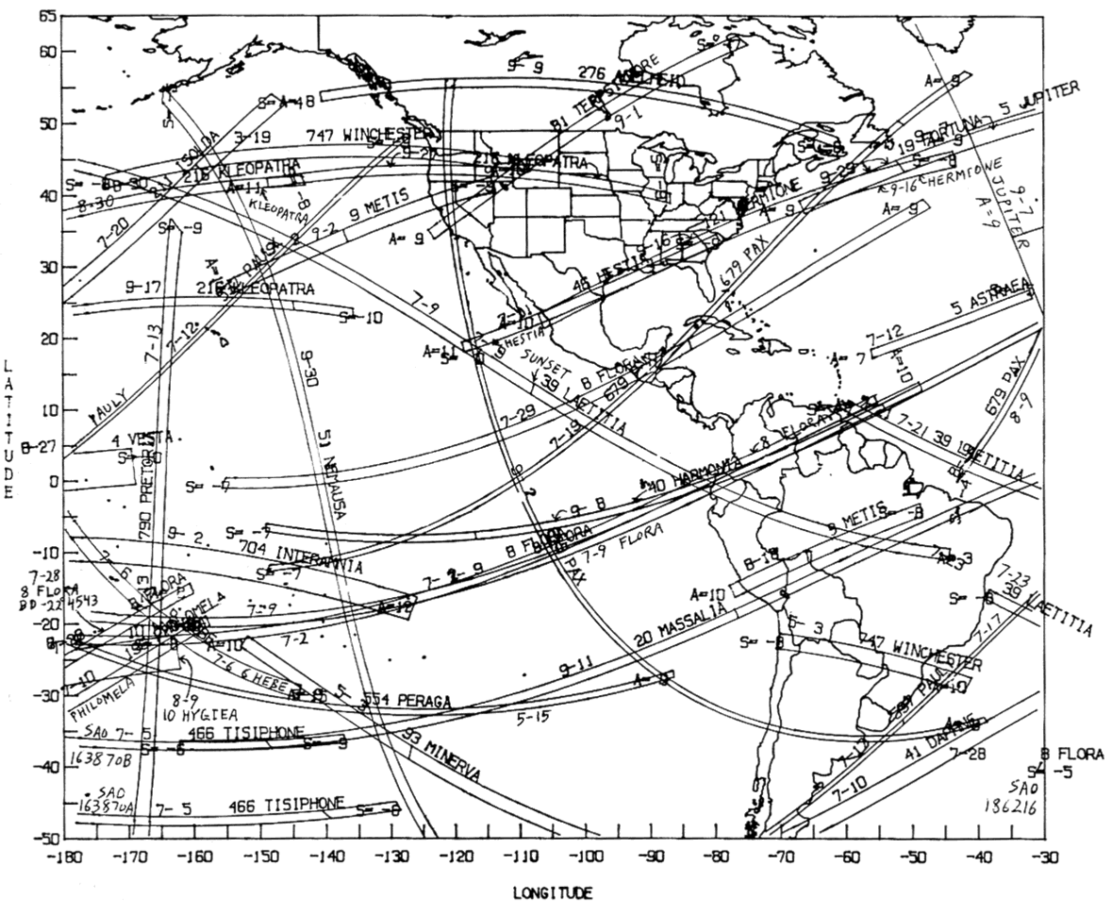
July 5, (466) Tisiphone: The double star is ADS 14267, with separation 2"8 in p.a. 114°; separate predictions are given for the two components. If seeing is so bad that the stars cannot be resolved, the effective magnitude drop will be 2.2 if the primary (A star) is occulted. The drop would be only a couple of tenths if the B star disappeared in very bad seeing. However, bad seeing is likely to cause the pair to appear elongated rather than completely merged, and the elongation would abruptly disappear to form a round image if the B-star is occulted.

July 9, (39) Laetitia: The star is Delta Virginis = Auva, the brightest star predicted to be occulted by an asteroid in 1990. The event might be seen by the naked eye, in spite of a nearly full Moon, and would be easy to observe with binoculars. Perhaps a special effort could be made in South America to enlist the aid of the general public to obtain dense coverage for this important occultation. Astrometry should be attempted, since a reasonable north shift would cause the path to cross Mexico or even the U.S.A. The star is so large that there will be 20-km-wide partial occultation zones at the northern and southern limits, and even a central disappearance would cause a 1.1-second fade, as indicated in Table 3 on p. 350 of the last issue.

July 11: The target star is 83" away from the brighter (8.8-mag.) star SAO 92893. The target star is south of SAO 92893, in p.a. 213° from it. Both stars have the same B.D. number, so the AGK3 number (N13° 190) should be used to uniquely identify the target star, which is also X03168 in the USNO XZ catalog. A fainter star is also south of the target star, as shown on the FAC 1° chart in this issue.

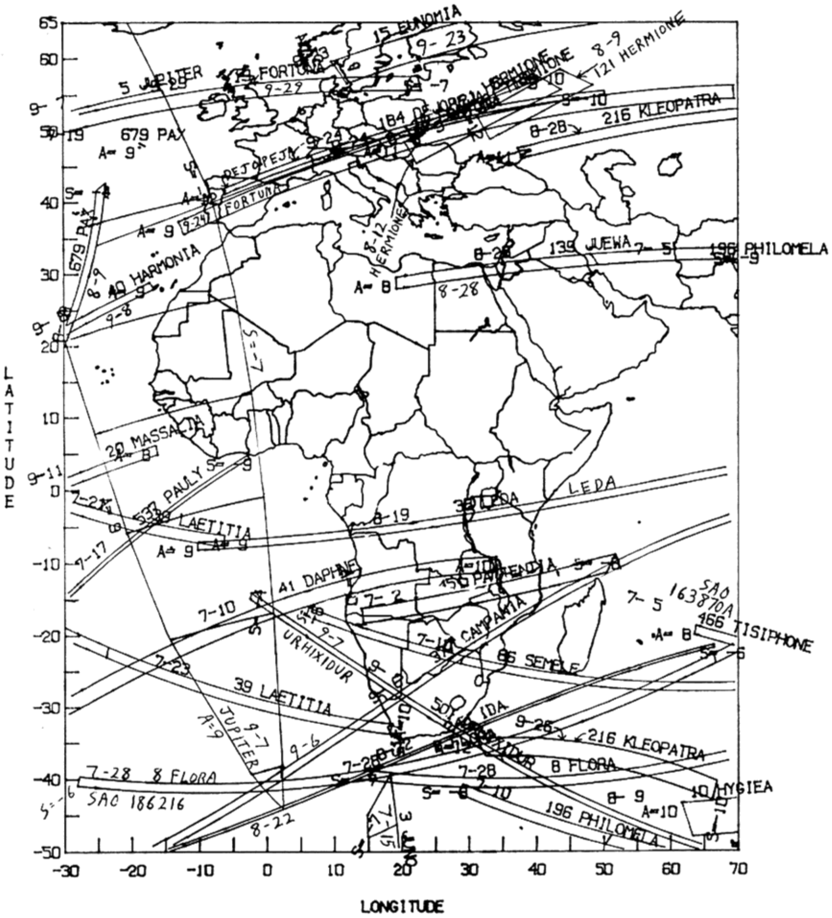
July 20: The star is ZC 89 = 136 B. Piscium. A fade reported during a visually-observed lunar occultation indicates that the star is possibly a close double.

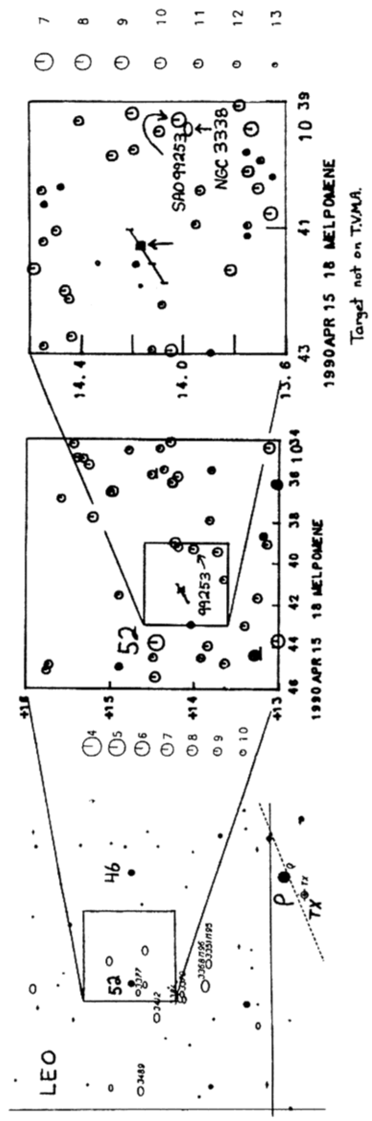
PLANETARY OCCULTATIONS. 1990 JULY - SEP.

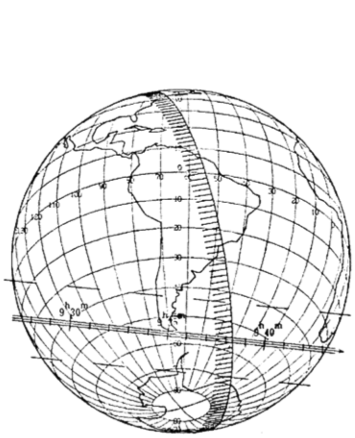


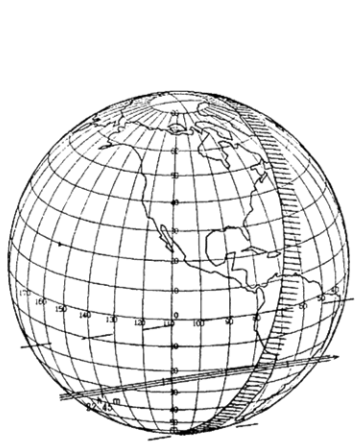
July 28-29: Four stars will be occulted as (8) Flora transits the small open cluster NGC 6531. I need to change my star-chart plotting program to blow up this field to clearly identify the stars. I plan to do this for the next issue, which will include notes for August and later events.

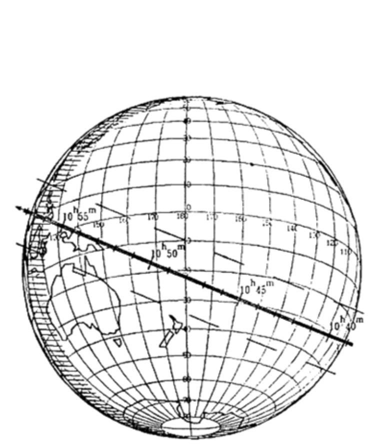
PLANETARY OCCULTATIONS. 1990 JULY - SEP.











SAO 211865 by Minerva 1990 May 3 A19° 48053 by Winchester 1990 May 3 SAO 158578 by Peraga 1990 May 15

AMAZING GRAZE

Richard J. Taibi

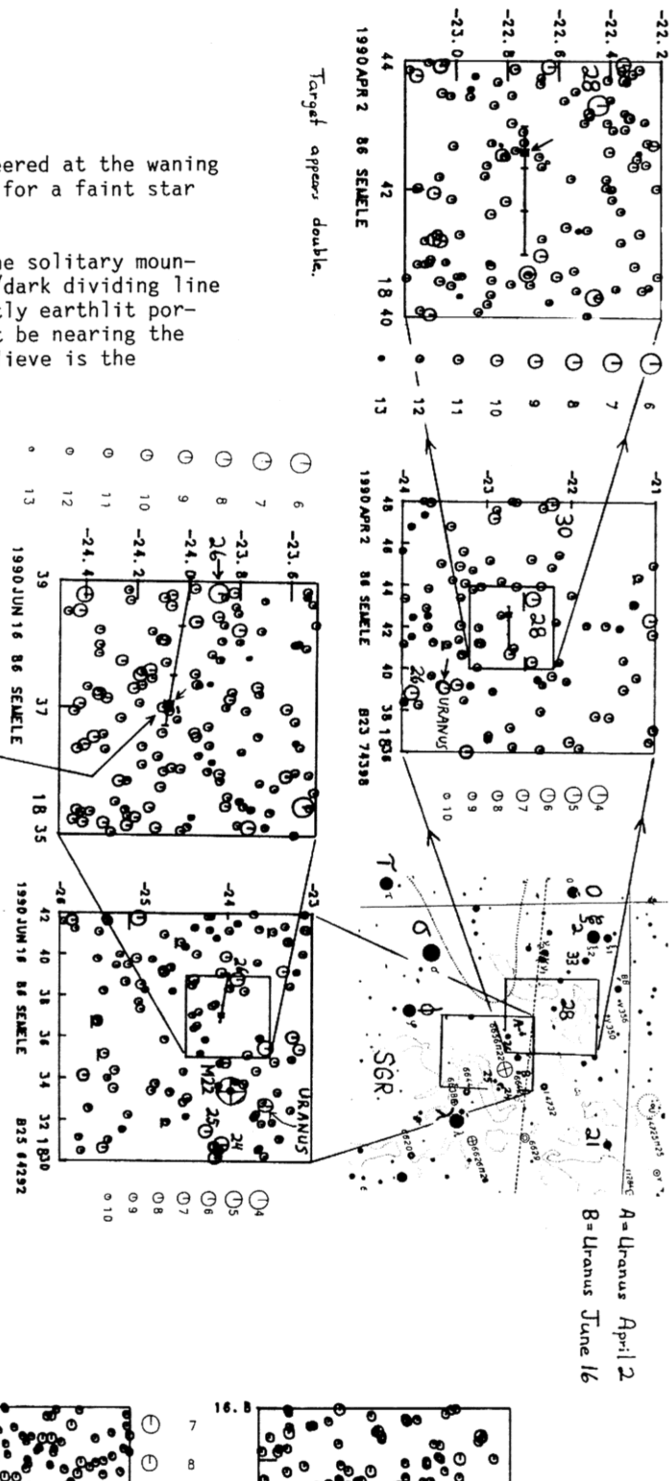
Waning cresent Moon
parting a calm star-filled sky
brushed a star aside

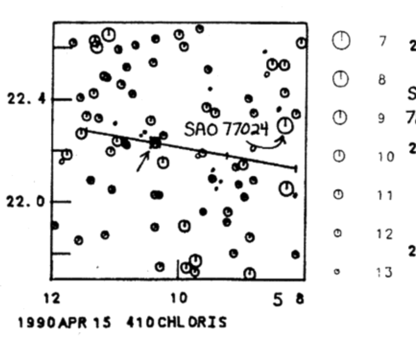
Squinting into a moonlight-filled telescope a man peered at the waning crescent Moon low in the southern sky. He searched for a faint star which would soon graze the earthlit rim of the moon.

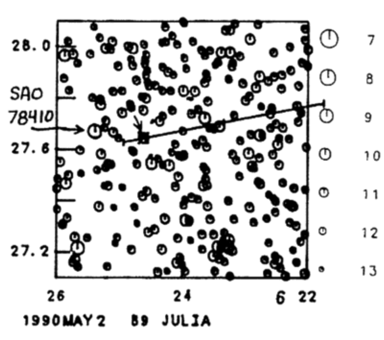
When he had found it, the star had barely cleared the solitary mountain peaks which still caught sunlight on the light/dark dividing line of the crescent. It was now skimming over the ghostly earthlit portion of the moon's dark side. He knew the star must be nearing the unseen mountains which exist on what most people believe is the billard ball smooth edge of the moon.

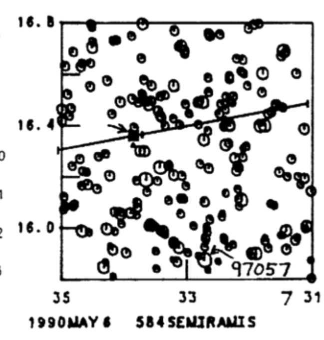
Layers of air with differing temperatures made the star pulsate in brightness and change shape. Bluish starlight, gyrating at our atmosphere's whim, beguiled the pre-dawn viewer. He began to fantasize about the changing star being being an alien craft on an exploratory cruise by our moon. It vanished! An unseen moon mountain had blocked the starlight as the moon swept through space on its orbit. He chided himself for being caught woolgathering when he should have been alert for this sudden disappearance. Caught unaware again! The star flashed and vanished a second time! He hurried to report his sighting into a tape recorder which also captured radio time announcements. There would be no instant replays so he must do his job right the first time.

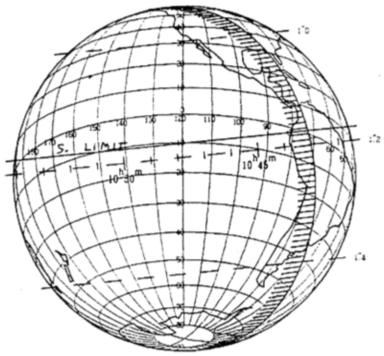
Made indelible by the recorder, his eye-witness account would make a credible scientific report. The taped events would also reasure him that he had not been hypnotized by the pulsating star and the pre-dawn peace around him. It had been real. Because moon shadow and clock beats leave no trace, he was relieved that the tape would hold fast in its magnetic memory the wonder he had seen.



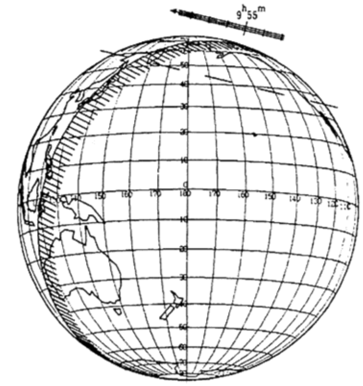








N 57 by Neptune 1990 May 25



74 Vir by Dione 1990 May 16

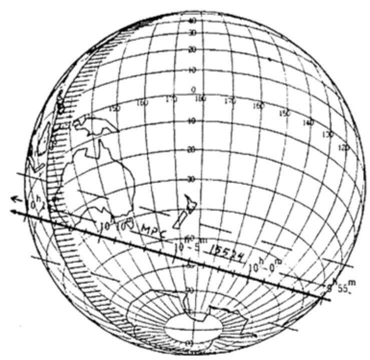
Anonymous by Gaspra 1990 May 28

SAO 110334 by Vesta 1990 Jun 7

SAO 118131 by Hegwig 1990 Jun 14

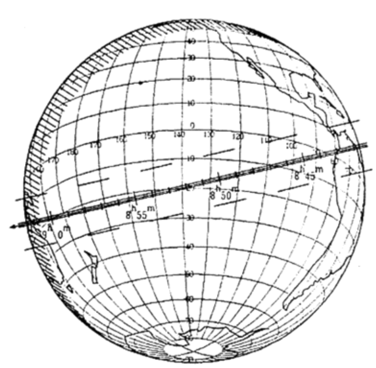
B25° 64292 by Semele 1990 Jun 16

SAO 93670 by Venus 1990 Jun 25



SAO 207573 by Pandora 1990 Jun 28

Anonymous by Patientia 1990 Jul 2

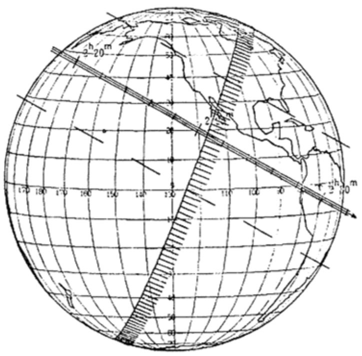


SAO 186885 by Flora 1990 Jul 2

C27° 12439 by Philomela 1990 Jul 5

SAO 163870 by Tisiphone 1990 Jul 5

SAO 120195 by Hebe 1990 Jul 6

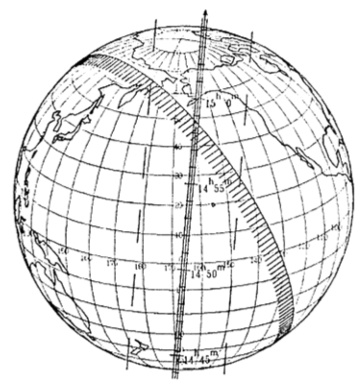


Delta Vir by Laetitia 1990 Jul 9

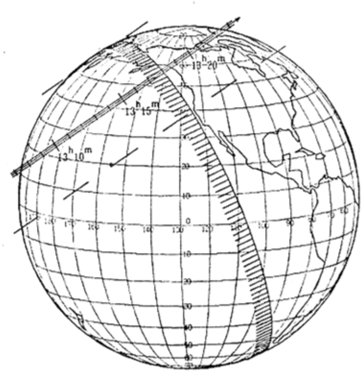
Anonymous by Daphne 1990 Jul 10

L 3 2191 by Philomela 1990 Jul 10

SAO 93962 by Astraea 1990 Jul 12

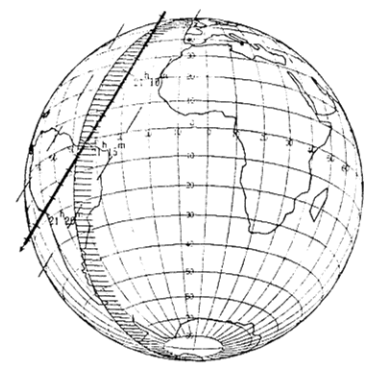


N22° 2519 by Pretoria 1990 Jul 13



SAO 109369 by Isolda 1990 Jul 20

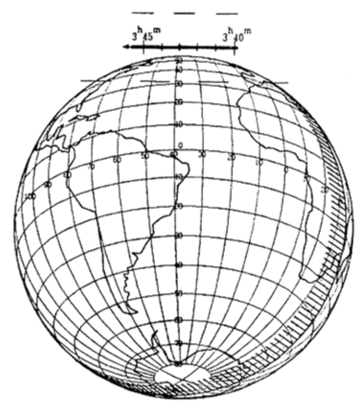
+2° 2624 by Laetitia 1990 Jul 23



SAO 186343 by Pax 1990 Aug 9

Anonymous by Hermione 1990 Aug 9

Anonymous by Hermione 1990 Aug 12



\O 191313 by Urhixidur 1990 Aug 13