Occultation Newsletter

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FROM THE PUBLISHER

This is the third issue of 1983.

Please note the changes wrought by the recent changes of officers; see the masthead and IOTA NEWS. The Tinley Park address should no longer be used. The St. Charles address should be used for editorial matters, renewals, address changes, and reimbursement requests. The Columbus address should be used for new memberships, new subscriptions, back issues, and any special requests.

O.N.'s price is $1.40/issue, or $5.50/year (4 issues) including first class surface mailing. Back issues through *Vol. 2*, No. 13, still are priced at only $1.00/issue; later issues @ $1.40. Air mail shipment of *O.N.* back issues and subscriptions is 45¢/issue ($1.80/year) extra, outside the U.S.A., Canada, and Mexico.

IOTA membership, subscription included, is $11.00/year for residents of North America (including Mexico) and $16.00/year for others, to cover costs of overseas air mail. European and U. K. observers should join IOTA/ES, sending DM 20.-- to Hans-J. Bode, Bartold-Knaust Str. 8, 3000 Hannover 91, German Federal Republic.

IOTA NEWS

David W. Dunham

The major news about IOTA is described in the article about our incorporation and finances on p. 98. We were fortunate in that the fees charged for the incorporation were less than $300, well within our budget and not requiring any additional contributions, as was indicated might be the case in the last issue. The officers of IOTA are listed in Maley's and Phelps' article about the incorporation. The most important change is the Corresponding Secretary, who will be Mark Allman. He will serve as the main point of contact for IOTA, mainly processing requests for papers, special predictions, and inquiries from those seeking to join IOTA or subscribe to *O.N.* He will take over those duties from John Phelps in late October, when IOTA's new address, P. O. Box 3392, Columbus, Ohio 43210-0392, U.S.A., will appear in the November issue of *Sky and Telescope* then being distributed. Since H. F. DaBoll will maintain the IOTA records as one of his duties as Treasurer, changes of address and station data, and membership and subscription renewals should be sent to him; see FROM THE PUBLISHER on this page. William Stein, Fredericksburg, VA, has volunteered to take over Berton Stevens' job of maintaining IOTA's machine-readable records for producing address labels and station card input for lunar grazing occultation and local planetary/asteroidal appulse predictions. Since some software development is needed, Stevens will continue to do this work at least for another month. When Stein assumes the job, he will update the files according to data supplied by DaBoll.

A copy of IOTA's by-laws is enclosed with this issue, for members. Also enclosed with this issue, for members, is a ballot, and envelope for sending it to the Executive Secretary, Charles H. Herold, 9207 Kirkmont, Houston, TX 77089. You do not need to send the ballot if you plan to attend IOTA's meeting in November (see p. 100), since it will be a triennial election meeting. Although there is essentially no choice on the ballot, members are urged to complete and send them to Herold, since we need to have ballots cast by 30% of the membership for the election to be valid. Please vote in favor of the revisions to the bylaws; these were needed since the bylaws had to be written hurriedly in order to include them (as required) with our application to obtain tax-exempt status before an August 31st deadline. Since the application was filed, members of the board of directors decided that the changes given on the ballot were needed to manage IOTA more efficiently.

Most of the graze reports which were not processed by HMNAO were transcribed to the forms of the International Lunar Occultation Centre (ILOC) a few months ago. During July, Richard Taibi completed the considerable task of duplicating the reports and sorting them into chronological order; they include some events observed as early as 1974, although most were observed after 1976. The reports were sent to ILOC by the U. S. Naval Observatory. ILOC sent me a letter thanking us for the reports, and indicated that some changes had taken place. Akio Senda has taken over Dr. Kubo's job of Director of ILOC, which is now in the Geodesy and Geophysics Division of the Japanese Hydrographic Department, rather than the Astronomical Division. I do not know whether the Astronomical Division was eliminated or simply absorbed by the Geodesy and Geophysics Division. Unfortunately, this will mean even further delays in the distribution of residuals to observers. Senda apologizes for these delays, and asks for "even greater cooperation."

Guillermo Mallén, Cerrada Providentia 43, 10200 Mexico D.F., telephone 905,595-6368, most likely will be the Mexican coordinator for the 1984 May 30 annular solar eclipse. Americans and others planning to observe this eclipse from Mexico, where the weather prospects are better than in the U.S.A., should contact Mallén.

Extended-coverage USNO total lunar occultation predictions for the remainder of 1983 finally were computed and distributed to observers in August, in time for the early September Milky Way passages for most Americans. If you want these predictions and have not received them, write to me at P.O. Box 7488, Silver Spring, MD 20907, U.S.A. The most interesting event included in these predictions is the passage of the waning crescent moon across scores of faint stars in M-35, the morning of September 29th, as seen from Hawaii and the Pacific coast of North America. The extended-coverage predictions are meant to supplement the usual USNO total occultation predictions for those with access to large telescopes; if you want the extended predictions, you also should have the regular USNO predictions, obtainable from Marie Lukac, U.S. Naval Observatory, Washington, DC 20390, U.S.A. Unfortunately, I did not have time to process any more of the Southern Astrographic Catalog data, so the extended-coverage predictions include only C-catalog stars described in *o.N.* *2* (14) 188 and *2* (16) 222. I hope to be able to process more of the S.A.C. data and compute more comprehensive extended-coverage predictions early in 1984.

The paper, "Solar Radius Change Between 1925 and 1979" by S. Sofia, A. D. Fiala, J. B. Dunham, and me was published in the 1983 August 11 issue of *Nature*. We showed that, on 1979 February 26, the solar radius was approximately 0."5 (375 km) smaller than it was on 1925 January 24, according to our analysis of timings of the total solar eclipses on those dates. Both durations timed near the center of the paths and observations made near the path edges to determine their widths gave essentially the same result. the timings of both eclipses are listed in tables. Unfortunately, when the tables of observations were typeset, *Nature* gave all the longitudes in degrees, minutes and seconds of arc, although the longitude values for some observatories, where the 1925 eclipse was timed, were given in hours, minutes, and seconds of time. Since all the observations were made in North America, one only has to remember to change "arc" to time for longitudes less than 10 "degrees" (should be hours) west. Roy North pointed out this error.

IOTA INCORPORATION EFFORT

Paul D. Maley and John D. Phelps

On 1983 August 19 IOTA officially incorporated in the state of Texas. The incorporators are Paul Maley, Charles Herold, and Don Stockbauer. This means that now the organization has by-laws and a charter. An annual meeting will be held, with election of officers every three years. The final step in the process is for the I.R.S. to approve IOTA's tax exemption status. Application was made at the end of August for such an exemption, but it has not yet been ruled on. *If approved*, IOTA will be a non-profit organization devoted, as it has been over the last eight years, to scientific studies of occultation and eclipse phenomena.

What would this mean to IOTA's members? In the USA, expenses incurred in connection with a non-profit tax-exempt organization *may be* tax deductible. In this connection, we offer the following exerpt, which is an *interpretation* of such a guideline. It is up to each IOTA member to determine whether his participation in an IOTA expedition or effort falls into the category of a charitable contribution. If you have any doubts, you should consult a tax accountant. IOTA cannot offer any legal opinion, but based on the interpretation in this February 9, 1983 *Standard Federal Tax Report Bulletin*, it would appear that expenses incurred in connection with occultation expeditions and eclipse expeditions may be tax deductible by those persons who have the appropriate background, experience, or aptitude. This would serve to make doing scientific observational astronomy more affordable and, we hope, create new interest in pursuing grazes, asteroid occultations, and solar eclipse north/south limit edge phenomena.

¶8626 Research Expeditions: May a Volunteer Deduct Cost as Charitable Contribution?

Various tax-exempt organizations enlist the aid of volunteers to assist in scientific and historical research projects that are conducted throughout the world. May a taxpayer who acts as a volunteer for a tax-exempt organization and pays his own travel to one of these research projects claim the cost as a charitable contribution? This article sets forth the standards that would be used by the IRS and the courts in making this determination.

Donated Services

Subject to certain limitations, taxpayers are allowed a tax deduction for charitable contributions that they make to or for the use of certain qualified tax-exempt organizations.[1] Basically, a tax-exempt organization is considered to be qualified if it is organized and operated exclusively for religious, charitable, *scientific*, literary, or educational purposes or for the prevention of cruelty to children or animals.

Although a taxpayer may not deduct the value of his services to a qualified organization as a charitable contribution, unreimbursed expenses made incident to the rendition of services to a qualified organization may constitute deductible contributions. For example, *out-of-pocket expenses that are necessarily incurred in performing donated services are deductible as charitable contributions, as are the cost of meals and lodging incurred while away from home in the course of performing donated services.*[2] Thus, it would appear that a taxpayer who serves as a volunteer in a research project conducted by a qualified tax-exempt organization is entitled to a charitable deduction for the cost of his transportation to the research site or for the cost of his meals and lodging while at the site. However, such may not always be the case.

Dominant Motive

The key question in determining the deductibility of a contribution is whether the contribution was really "charitable" in nature. A contribution made for charitable purposes to a qualified organization is generally deductible. But, if a contribution is not made for a charitable purpose, then it may not be deductible even though it is made to a qualified organization.

Generally, the term "charitable contribution," as used in the tax law, has been held to be synonymous with the word "gift."[3] A gift must be motivated by respect, charity, or similar impulses rather than in anticipation of some economic or personal benefit to the donor. Naturally, the donor may derive some pleasure or personal satisfaction from the act of giving, but, where his personal benefit was the underlying or primary motive for his actions, he has not made a "gift."[4]

In applying these principles to the situation of a taxpayer who incurs expenses while rendering service to a qualified organization, the dominant motive behind the taxpayer's actions determines whether his contribution was made with a donative intent or primarily for his personal benefit. Thus, a taxpayer was permitted to deduct the cost of an African safari as a charitable contribution because his primary motive in incurring the expenses was to collect animal specimens for a museum.[5] Conversely, another taxpayer was denied a deduction for similar expenses for a similar purpose because his primary motive was personal rather than charitable.[6]

Selection Process

In determining whether a taxpayer's motive in rendering volunteer service to a qualified organization was primarily charitable, the selection process used in selecting the volunteers may be relevant. Upon finding that neither work experience nor aptitude was considered in the selection process, a court has denied a charitable deduction claimed by a taxpayer for travel expenses incurred while he was a volunteer for a qualified organization because the court found that the volunteer service had, in reality, been a vacation for the taxpayer.[7]

Conclusion

Taxpayers who render volunteer service to qualified organizations engaged in research projects can serve an important social function. If the volunteers are able to convince the IRS that their motives in undertaking the volunteer work were primarily charitable, they generally will be able to deduct the costs they incurred as volunteers to qualified organizations.

However, if such volunteers are unable to prove that their motives were primarily charitable, the IRS may disallow the expenses incurred. Back reference: ¶1864.0103.

[1] Code Sec. 170.
[2] Reg. § 1.170A-1(g).
[3] *K. M. Channing*, CA-1, 67 F2d 986, cert. denied, 291 US 686.
[4] *M. Duberstein*, SCt, 60-2 USTC ¶ 9515, 363 US 278.
[5] *H. Jersig*, DC Tex., 69-1 USTC ¶ 9311.
[6] *J. LaGarde*, DC Ala., 76-1 USTC ¶ 9248.
[7] *G. Tate*, 59 TC 543, CCH Dec. 31,810.

As a matter of public record, we also have included a table of IOTA's finances, provided by John Phelps.

Quarter Ending	Sec'y-Treas'r Expenses (post'g, stat., & PO box)	Sec'y-Treas'r Publica. Expenses (print'g & post.)	Expenses Reported to Sec.-Treas'r (c'mputr postage)	*Occult'n Newsl'tr* Expenses (pub., print'g, & post.)	Income (dues and subscriptions)	Balance End of Quarter	Net IOTA Balance
Initial							$1371.01
9/78	$12.13	$0.00	$134.59	$166.09	$430.50	$117.69	1488.70
12/78	15.19	0.00	26.26	235.98	456.69	179.53	1668.23
3/79	52.31	0.00	183.07	179.30	416.02	1.34	1669.57
6/79	54.48	0.00	73.00	179.35	257.93	(48.90)	1620.67
9/79	29.98	0.00	138.23	163.06	385.35	54.08	1674.75
12/79	26.21	0.00	80.22	728.76	526.35	(308.84)	1365.91
3/80	52.41	0.00	55.11	0.00	639.44	531.92	1897.83
6/80	76.56	0.00	26.00	260.07	653.75	291.12	2188.95
9/80	81.79	0.00	94.63	389.76	382.72	(183.46)	2005.49
12/81	56.75	133.00	6.31	105.97	186.16	(115.87)	1889.62
3/81	80.15	173.25	123.01	722.63	638.86	(460.18)	1429.44
6/81	90.44	0.00	96.09	0.00	319.99	133.46	1562.90
9/81	55.44	0.00	164.36	468.54	667.90	(20.44)	1542.46
12/81	43.38	0.00	0.00	259.18	524.30	221.74	1764.20
3/82	68.69	0.00	98.47	234.33	891.28	489.79	2253.99
6/82	65.40	0.00	137.42	651.36	557.32	(296.86)	1957.13
9/82	54.57	0.00	181.99	213.20	829.65	379.89	2337.02
12/82	37.98	249.50	30.22	999.22	456.73	(860.19)	1476.83
3/83	51.03	0.00	168.75	628.34	1240.25	392.13	1868.96
6/83	62.60	0.00	162.15	0.00	535.70	310.95	2179.91

The board of directors for IOTA (David Dunham, Homer DaBoll, Paul Maley) has approved a slate of temporary officers, who will hold office until a formal election is held. The officers are:

President	David Dunham
Executive Vice President	Paul Maley
Executive Secretary	Charles Herold
Treasurer	Homer DaBoll
Corresponding Secretary	Mark Allman
V. P. for Grazing Occultation Services	Joseph Senne
V.P. for Planetary Occultation Services	Joseph Carroll
V. P. for Lunar Occultation Services	Walter Morgan
Newsletter Editor	Homer DaBoll

PAPUA NEW GUINEA TOTAL SOLAR ECLIPSE EXPEDITION

Paul D. Maley

A total eclipse of the sun is set for 1984 November 23. In connection with this, I am organizing an IOTA expedition to Papua New Guinea, for the purpose of recording the Bailey's beads phenomena at the north edge. The expedition cost is expected to be about $3300, with perhaps as much as *2/3 of this amount covering the IOTA expedition expense.* The itinerary calls for spending most of the time in New Zealand, and two of the sixteen days in the eclipse area. Persons interested in joining should write to me at 15807 Brookvilla, Houston, TX 77059, USA (713, 488-6871 after 6 P.M.). If IOTA's exemption status is approved, under the guidelines previously described, about $2000 could be deductible for IOTA observers who observe at the edge (not at the central line).

IOTA ANNUAL MEETING TO BE HELD IN HOUSTON ON NOV. 11

David W. Dunham and Paul D. Maley

According to State law, IOTA needs to hold one meeting each year in Texas. The meeting for 1983 will convene on Friday, November 11th, at 7 p.m. in the Hess Room of the Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX, near the Johnson Space Center. Although a major purpose for the meeting is organizational, primarily for the first triennial election of officers, a scientific program will include presentation of results from the occultations by Pallas in May and by Nemausa in September, preliminary planning for 1984's occultations and solar eclipses in May and November, and the latest video recordings of occultations and eclipses. Originally, we planned to have the meeting on Saturday, November 12, in accordance with the bylaws, but the facilities of the Lunar and Planetary Institute were not available then. Although State law requires that we specify when and where our annual meeting is held, we have been advised by our attorney that the actual time of the meeting and/or its location within Texas can be modified due to extenuating circumstances. In practice, at least informal discussions probably will continue on Nov. 12, held in local members' homes or perhaps at a nearby motel. More information about the meeting can be obtained from Paul Maley, 15807 Brookvilla, Houston, TX 77059, telephone 713,488-6871.

EUROPEAN OCCULTATION MEETING

Hans-Joachim Bode

A meeting to discuss plans for observing occultations of stars by asteroids in and near Germany will be held Saturday, 1983 October 15, in Kiel, German Federal Republic. Leif Kristensen, Aarhus, Denmark, will describe the successful observations of the occultation by (106) Dione observed in Denmark, Germany, and the Netherlands on 1983 January 19. More information can be obtained from me at Bartold-Knaust Str. 8, 3000 Hannover 91, German Federal Republic, telephone 0511,424696.

GRAZING OCCULTATIONS

David W. Dunham

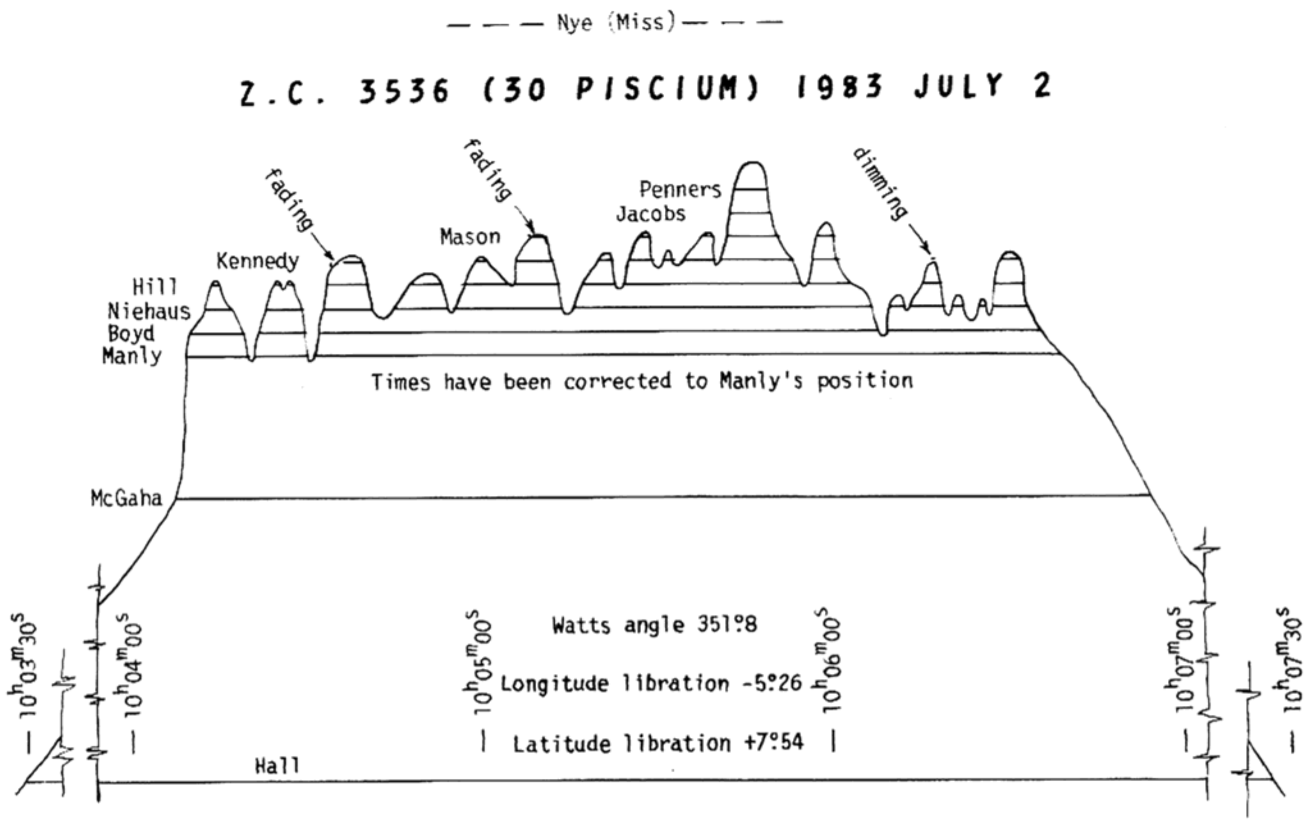
Substantial differences in the USNO version 80F and 78A grazing occultation predictions for northern-limit waning-phase events were noted in last issue's articles, "Graze Caution' on p. 81 and "Graze Caution Update" on p. 89. Northern-limit grazes were observed in Ohio and Texas on July 31 and Aug. 3, in Maryland on Aug. 4, and in North Carolina on Aug. 5, during five separate small expeditions led by Mark Allman, Don Stockbauer, and me. The observations roughly agreed with 80F at the beginning of the period, but with 78A at the end. These observations, plus the July 4th graze and one observed in Oklahoma on 1982 Aug. 14 (expedition led by Carl Schweers; it was the only 1982 event where there was a large 80F - 78A difference), indicate that the north shifts from 78A depend on the latitude libration. North shifts are applied automatically for waxing-phase dark-limb northern-limit grazes in the ACLPPP, according to the linear relation of 0".08/degree of latitude libration, but this has not been done during the waning-phase dark-limb northern grazes due to lack of clear prior observational evidence that it occurred. It seems to be even stronger than for the waxing-phase events, and will be incorporated into ACLPPP for the 1984 predictions. In the meantime, for this year's northern-limit waning-phase grazes, I suggest that you shift the path north by 0".12/degree of latitude libration, only if the the latitude libration is positive (southward corrections already are applied if it is negative). For example, for the graze of Z.C. 249 (Nu Piscium) by an 81%-sunlit waning moon on Aug. 28 in Florida and Georgia, the latitude libration given in the lower right part of the profile is 6.26. The expected north shift is then 0".12 × 6.26 = 0".75. Since the vertical profile scale (VPS, given in lower middle part of the profile) is 0".48 per mile, the linear shift of the path on the ground is 0".75/0".48 = 1.56 miles north. The profile indicates that multiple events might occur in the area 2 to 4 miles south of the northern limit; the expected north shift indicates that the actual area probably will be between ½ mile and 2½ miles south of the northern limit. This particular graze actually was observed by Katy Isor and Harold Povenmire, who said there was a north shift considerably smaller than predicted by the above formula. Povenmire also reported a miss for a graze on Aug. 31, also implying a south shift from the prediction. On the other hand, Philip Dombrowski, Glastonbury, CT, had a five-minute occultation for a graze of Z.C. 3458 on Aug. 25, in apparent confirmation of the large north shift expected at the high latitude libration for that event. I plan to reduce these late-August observations soon. In the meantime, it should be safe to use the formula above; the observed departures from it may be caused primarily by star position errors resulting from the combination of Perth-70 data with inaccurate older catalog data. In any case, the corrections from 78A should be small (probably negligible) for most of the favorable northern-limit waning-phase grazes during the rest of 1983, since the moon will be at low or negative latitude librations during these events. The prediction differences are most evident when the waning-crescent moon is at high latitude librations from May to July.

We observed the Aug. 5th graze mentioned above, of 6.5-mag. Z.C. 859 by a 16%-sunlit moon, from the Outer Banks of North Carolina. We were on a narrow sand spit in essentially a marine environment. During the summer, this sometimes gives a weather advantage; we could see extensive cloud cover caused by adiabatic cooling, as predicted, over the land west of us. We tried to record the graze with our television equipment, but this attempt failed, due to a loose camera power cord connection, we discovered several days later. This was unfortunate since 18 events occurred at the site; it was a pretty graze. We were concerned about determining accurate positions, since the nearest buildings were in the town of Salvo, 5 km to the north; we had no choice about the site. We decided to position ourselves to about 100-m accuracy using automobile odometers and set up our stations near telephone poles. We then were going to write down any identifying numbers on the poles and count them to the nearest intersection or other prominent landmark in Salvo. We figured that we could obtain low-altitude aerial photographs showing the poles to determine our positions on the 1:24,000-scale topographic maps of the area. Fortunately, this was not necessary. The telephone poles were conveniently numbered sequentially and were accurately set at 400-foot intervals. We knew this because the road recently had been surveyed; wooden stakes 200 feet apart gave the distance in hundreds of feet back to Salvo! It appears that phone poles often can be used for interpolation of accurate positions between landmarks along long stretches of road, although some information might need to be obtained from the telephone company or from aerial photographs. I have been told that British Columbia has been especially helpful; they give the longitude and latitude on every telephone pole in the province.

If you have not been receiving any graze predictions when you believe that you should be getting them, complain first to the computor who is supplying predictions for your area, and then to me if the matter is not resolved. Remember that if you have travel radii 30 miles or smaller for favorable events, no grazes will pass close enough and be predicted for you often during a half-year interval. But also, mistakes are sometimes made in the station files; you can verify your coordinates from the planetary/asteroidal appulse predictions distributed by Joseph Carroll. Even if they are correct, station cards sometimes are filed under the wrong region, which also results in no predictions. The computors for the D, E, F, R, S, and XB regions (southeastern, south-central, and northwestern U.S.A., southwestern Canada, Russia, South Africa, and the Canadian Atlantic Provinces) have experienced difficulties with computing and distributing predictions, especially for the current quarter. Consequently, we extended the IOTA membership of all current members in those regions by one quarter due to the failure in service. We are working to prevent a similar failure during the last quarter of this year, and hope that the service will be more reliable next year, when computors in Dahlgren, VA, and Urbana, IL, become operational.

Some information about the July 2nd graze of Z.C. 3536 (30 Piscium) observed from 11 stations at Corona de Tucson, AZ, was given by expedition leader Derald Nye in the "Graze Caution" article in the last issue. It was mentioned that Richard Hill timed 24 events at station 6, the second-largest number of events ever timed during a graze (the record is 28). But remarkably, Dan Kennedy and Duane Niehaus, at the surrounding stations 5 and 7, each about 200 meters from station 6, both timed 22 events. These often were caused by different small hills, as shown in the diagram by Nye and the editor. There are only three previous grazes where as many as 22 events were timed by one observer. The lucky July 2nd central graze Watts angle was 351°8, and the librations were +7°54 in latitude and -5°26 in longitude.

Unfortunately, lack of time, and urgent deadlines, again have prevented preparation of a table of observed grazes since the last table was published last year.



MORE ON THE OCCULTATION OF 1 VULPECULAE BY PALLAS

David W. Dunham

I now have timings of the May 29th occultation of 1 Vulpeculae by (2) Pallas made at 129 stations. A little more information other than that given in the preliminary report of p. 76 of the last issue appears on p. 270 of the September issue of *Sky and Telescope*. 31 of the observed chords are shown in a plot, as well as a photograph of the star trail interrupted by the occultation, taken by University of Northern Colorado students who traveled to Texas for the event. Additional favorable publicity for IOTA appears in Walter Sullivan's article, "In Astronomy, the Amateur Still Makes his Mark," published in the Science Times section of the *New York Times* of 1983 July 19. The article, featuring a stylized drawing of Pallas with 9 of the observed chords, was reprinted in some other newspapers around the country.

I will be giving a paper discussing the size and shape of Pallas determined from the occultation at a meeting of the American Astronomical Society's Division of Planetary Science to be held at Cornell University, Ithaca, New York, October 17-20. At the Cornell meeting, we plan to have a meeting to discuss formal publication of the results. My preliminary mean diameter of Pallas' outline is 521 km, with a flattening of only about 4 km. Individual surface irregularities (deviations from the elliptical outline) seem to be nearly as large as the flattening in most areas. The spectroscopic companion was northwest of the primary star and separated from it by about $0''.003$. About 105° of the outline circumference is missing due to the lack of successful observers in the southernmost part of the path. For the final diameter and shape analysis, we plan to examine visual observations close to the photoelectric and video chords where we can compare actual and reported reaction times. This should allow more realistic values to be used for the visual timings made very close to the northern limit and elsewhere far from the photoelectric or video chords. Then, only those observations and the photoelectric and video data will be used for the final size and shape determinations. Various subsets can be compared, such as visual only and photoelectric/video only. We eventually want to get coordinates and observing times for everyone outside the path who was able to monitor the star, so that we can map the region around Pallas that was covered (and not covered) in the search for satellites of the asteroid. The "possibly spurious" secondary occultation reported at Tempe, AZ, mentioned in the last issue is essentially ruled out by the negative observation covering the same time period at Westmoreland, CA, on a path only 3 km from the Tempe path on the sky plane at Pallas.

JUST WHEN YOU THOUGHT IT WAS SAFE TO FORGET ABOUT ASTEROIDAL SATELLITES

Graham L. Blow and David W. Dunham

No confirmed secondary occultation observations, or even good unconfirmed observations of such events, were reported during the favorable occultation and appulse of 1 Vulpeculae by Pallas on May 29th, in spite of a very large observational effort. Although substantial areas south of the asteroid were not observed, the otherwise dense coverage does show that, at least for Pallas, there are very few, if any, satellites. Direct visual observations with large telescopes also have cast considerable doubt on the possibility of a large satellite of (9) Metis. We now are concentrating mainly on obtaining the best coverage for determining the size and shape of asteroids from occultations by them. But we believe that the following observation reinforces our expectation in trying to obtain confirmed observations from closely separated (by a kilometer or so) pairs of stations, especially for those with a relatively small chance of seeing the main occultation.

On August 8, Blow photoelectrically recorded a brief occultation of SAO 158213 using a 61-cm reflector at Mt. John Observatory, near Lake Tekapo on the South Island of New Zealand. The 0.8-second extinction began at $6^{h}34^{m}28^{s}.1$, only twenty seconds before the predicted time of closest approach by (10) Hygiea. The predicted distance of closest approach was $1''.7$ north of the star, but this could have been considerably in error; there were no astrometric refinements of the prediction. Although the event is sharp and deep, it is not possible to confirm this matched the predicted 2.0-mag. drop for an actual occultation since it was observed in strong evening twilight. Data were collected in digital form, with a 0.2-second integration time, from $6^{h}33^{m}57^{s}.4$ to $6^{h}43^{m}42^{s}.6$, during which time (other than the 0.8-second extinction) the combined light of the star, Hygiea, and sky background decreased in a smooth curve as the sky darkened. Identification of the star was not certain before the observing run, due to the twilight, but it was confirmed to be the correct star afterward, as the sky darkened further and Hygiea was seen moving away.

A 0.8-second occultation by an object moving near Hygiea would imply a 20-km chord. But Hygiea is one of the largest asteroids, with a diameter estimated to be 443 km. There would be only about one chance in one thousand that Mt. John Observatory would have been close enough to the actual northern or southern limit to have such a short occultation by Hygiea itself. We know that the observatory was not near the southern limit, since Brian Loader was able to monitor the star visually from $6^{h}27^{m}$ to $6^{h}43^{m}$ and saw no events. We have received no reports from anyone south of Mt. John Observatory who was able to observe the appulse, and we expect none. The evening twilight conditions made it virtually impossible to find the correct star for those without accurately calibrated setting circles. Could the extinction have been caused by an airplane, or instrumental defect? The latter seems unlikely since nothing similar has appeared in hundreds of hours of observing with the same equipment, and it would be remarkable that either would occur so near the predicted time of closest approach.

PRELIMINARY RESULTS OF THE OCCULTATION OF 14 PISCIUM BY (51) NEMAUSA

David W. Dunham

The occultation of 14 Piscium by (51) Nemausa on 1983 September 11, predictions for which were given in articles by Kristensen and me on p. 81 of the last issue and on p. 236 of the September issue of *Sky and Telescope*, was observed from perhaps as many as 50 stations from southeastern Alabama to southeastern Virginia. Photoelectric observations were made with portable 36-cm Schmidt-Cassegrain telescopes operated by Ted Dunham and Richard Baron (Massachusetts Institute of Technology) at sites near Emporia, VA, and in eastern NC. Another portable photoelectric station recorded the occultation at the Mark Smith Planetarium at Macon, GA; Glenn Schneider of the University of Florida directed the effort. A fourth photoelectric record was obtained with the 41-cm Cassegrain at the Skywatchers Observatory at the NASA Langley Research Center, Hampton, VA. Joan and I obtained a television record of the occultation at Essex Meadows, VA, a southern suburb of Norfolk. Immersion was at $7^h45^m00^s.2$ and emersion at $7^h45^m13^s.4$ UTC, $\pm0^s.1$, at our longitude of $76°14'.29$ W, latitude $+36°44'.85$, height less than 15 meters.

Coverage of the occultation was planned according to "tracks," each track corresponding to a shift value of $''.001$ and numbered southward from the nominal 0 line shown on the maps published with the prediction articles. Regional and local coordinators for the occultation were sent lists of coordinates for central shift values at intervals of $0''.05$ (or every 50th track) for plotting tracks on moderately detailed maps of their areas. The track numbers of those planning to observe from fixed sites were determined. The mobile observers, most of whom had been sent maps beforehand, or were given them at meetings held several hours before the occultation, were directed to unique tracks not covered by other fixed-site or mobile observers. Most of the track assignments were made after the last astrometric path prediction was made, about ten hours before the occultation. Each track was nearly 1.2 km wide, and the shadow was expected to be 140 tracks wide.

The northern limit was effectively defined by Mark Croom at track 120 (shift value $0''.120$ south) in Yorktown, VA; he timed a $2^s.3$ occultation. A few other short chords, 6 to 9 seconds lond, also have been reported from tracks a little farther south. Harold Landis, who observed photoelectrically from his home in Locust Grove, GA, at track 118, had no occultation. Bob Melvin obtained the longest chord reported so far, $13^s.5$, on track 176 in central NC. This corresponds to a linear distance of about 160 km, a little larger than Nemausa's expected mean diameter of 153 km. Ed Seykora and others at Eastern Carolina University in Greenville, NC, observed an 8.2-second occultation at track 225, the southernmost one reported so far. (unfortunately, no other observers within the path farther south from the center are known to have attempted timings). Seykora, using a 20-cm Schmidt-Cass, said that the star flashed back into view at 80% of its brightness for about half a second 1.9 seconds after the disappearance, apparently when the star briefly reappeared in a deep valley, similar to McGaha's grazing occultation observation during the Pallas occultation in May. The same phenomenon was seen by another observer using a 13-cm Schmidt-Cass nearby. Fresnel diffraction could cause the star to appear at less than full light. "Dim flickering" seen before the reappearance also might have been due to diffraction, but more likely was simply an observation of Nemausa. A computer-controlled photoelectric observation also was made with a 36-cm Schmidt-Cass, but unfortunately the data were lost due to a computer malfunction. The duration was $9^s.3$ for Phil Manker at track 222 at Georgia Southwestern College in Americus, GA. About 75° of the circumference on the southern side was not observed, less than the 105° missed on Pallas' circumference; see p. 270 of the September issue of *Sky and Telescope*. The available observations imply that the southern limit was near track 240, with the path about 120 tracks or 130 km wide. Hence, Nemausa's long axis was oriented approximately in the asteroid's direction of travel; there also may be substantial departures from an elliptical outline. The mean diameter of Nemausa's outline apparently was smaller than expected. Alan Harris recorded Nemausa's rotational lightcurve at Table Mountain Observatory, CA, during 4 nights in July and August, obtaining a synodic period of 7.780 hours and total range of less than 0.2 mag., with 3 broad maxima. The occultation was expected to occur near an average position, at neither a maximum nor deep minimum on the lightcurve. Harris also planned observations near the time of the occultation, especially after he heard that the event had been observed.

Two or three other observers have reported "very strong scintillations" or other variations when Nemausa was very close to the star, similar to Seykora's impressions. A few reported secondary extinctions are probably due to atmospheric seeing or transparency variations, or photoelectric guiding errors.

Extensive cloud cover prevented any observations from the path in Mexico or within about 100 km of the Gulf of Mexico, including a large effort organized by Paul Maley in Louisiana, and fixed-site observers at Fort Walton Beach, FL, which would have been near the southern limit. But probably more of the mobile observers missed the occultation due to the error in my final prediction, and I apologize for that. The final prediction, which was broadcast on WWV, was $0''.12$ south ($\pm0''.03$), which was where the northern limit actually was, not the center, which was actually near $0''.18$ south. A relative paucity of last-minute data, and inexperience with the data we did have, led to the misjudgment, described below. We learned from the experience, and should be able to issue better predictions, at least with more realistic error estimates, for future events. Preliminary astrometry for the occultation was described on p. 82 of the last issue. In a letter dated August 23, L. Kristensen reported observations made early that month with the photoelectric transit circle at Bordeaux, France, which gave a shift of $0''.25$ south (this, and all other shifts quoted here, are relative to Kristensen's 1982 orbit and the FK4S star position, which were used for the published maps and path coordinates sent to the coordinators). Kristensen indicated that calibration problems could result in path errors of $0''.1$ or more, stating: "It is likely that these problems will not be settled well in time for the September 11 occultation, so the last-minute predictions must be based only on astrometry in the United States." Eight exposures taken at Lick Observatory on Sept. 1 gave a path shift of $0''.15$ south $\pm0''.06$, after downweighting two suspicious northern data points; without weighting, I would have calculated $0''.11$ south. The time correction was 0.1 minute late, very close to the truth. Klemola measured faint secondary reference stars near Nemausa's path to be used for any last-minute long-focus astrometry which might be obtained. For virtually all of the well-observed recent events, the last-minute long-focus astrometry was done with the 155-cm reflector at the U. S. Naval Observatory in Flagstaff, AZ; it predicted the Pallas occultation to within about 0".01 and the others to, at worst, 0".03. Unfortunately, photoelectric observations were scheduled for that telescope during the mid-September dark run, so that photographic observations could not be made. Even if they were, Lowell Observatory's computer, used to measure the plates automatically, still was broken (a replacement computer had just arrived, but the software conversion to make it operational would not be completed until the end of September). I checked the availability of other astrometric telescopes; the only positive response came from Brian McNamara of the University of Virginia, who said he could use the 66-cm refractor at Charlottesville (his data for Pallas, where he used the 101-cm reflector at Fan Mountain, combined with Van Vleck Observatory data for 1 Vulpeculae, predicted the May 29th occultation to about 0".04 accuracy). On Sept. 8, we received a telex from Kristensen reporting observations on 12 nights with the Bordeaux transit telescope; they gave a prediction of 0".22 south, but we decided to rely on the photographic astrometry, not knowing the true accuracy of the Bordeaux data. On Sept. 9, McNamara obtained 4 exposures of Nemausa, which was too far from 14 Piscium to photograph both on a plate. These data for Nemausa combined with Klemola's Sept. 1 data for the star gave a shift of 0".05 south; including Klemola's asteroid data as well resulted in 0".12 south ±0".05, which was broadcast on WWV late the evening of the 9th. On Sept. 10, the night before the occultation, skies remained clear at Charlottesville, where four more exposures were taken. These were centered on the star, whose light then could be reduced with a rotating sector (used also for their parallax work) to give measurable images. Nemausa was then 15' from 14 Piscium and about 5' from the edge of the plate, which was 40' on a side. McNamara said that Nemausa's images looked all right, and that the field was flat enough, and reference stars distributed well enough, so that useful results might be obtained for it as well as the star. Nevertheless, Klemola (who reduced McNamara's measurements) and I decided that it might be best to use the Sept. 9 data for Nemausa and Sept. 10 data for the star. This gave a prediction of 0".10 south. Since slight errors in the faint reference star positions could bias the Sept. 9 results relative to those of Sept. 10, I also computed a prediction based on the four Sept. 10 exposures (asteroid and star) alone. The individual shifts were 0".13, 0".17, 0".10, and 0".29, all south. The last result looked bad (maybe a faint star biasing the asteroid image), so I ignored it to obtain 0".13 south. This was in good agreement with the previous calculation, which I considered with less weight to give 0".12 south for the final prediction. If I had used only all the Sept. 10 data (in retrospect, a logical decision, since they were the only long-focus connected star-and-asteroid data), I would have predicted 0".17 south ±0".04, which would have been only 0".01 (¼ sigma) from the truth, rather than 0".06 (2 sigma). If we had had more exposures, there probably would have been a more even distribution of the individual values, implying that all should be retained. At USNO-Flagstaff, they take 8 or 12 exposures, which then can be measured quickly with automatic equipment (when the computer works). At Charlottesville, the measurement is not automated, so that only a few exposures can be measured in the limited time available before the result must be distributed.

The last Bordeaux result was only 0".04 in error, a very good result. If we had had data from any previous event from them, such as Pallas and 1 Vulp., we might have considered their results with greater weight, which would have helped the prediction. Bordeaux transit data could be very useful for future events, since they can be obtained 2 or 3 weeks in advance, rather than only 1 or 2 days. I do not know the limiting magnitude of the Bordeaux instrument; they probably can not observe 14th-mag. asteroids, but if they can observe 12th-mag. Nemausa, they could obtain data for many of the better asteroidal occultations.

I thank Kristensen, Klemola, McNamara, Harris, Binzel, and the workers at Bordeaux, who contributed astrometry and photometry for this occultation. I also thank all those who attempted observations, and the regional and local coordinators, for their efforts.

OBSERVATIONS OF ASTEROIDAL APPULSES AND OCCULTATIONS

David W. Dunham

Information about the May 29th occultation by Pallas, the August 8th occultation by Hygiea, and the September 11th occultation by Nemausa are given in separate articles, all on p. 102. Information about the other events is fairly complete since the last issue was distributed, and also since March, for events not already mentioned in the last two issues of *O.N.* Some information is also given for some earlier events not reported before, but the coverage is far from complete. A more complete accounting will have to wait for a future issue.

(14) Irene and SAO 93544, 1982 December 13: The actual path for this event was north of the one predicted from the astrometry mentioned in *O.N. 3* (3) 53. Ferruccio Ginelli used a 32-cm reflector with drive to time the 13.9-second occultation which occurred at his location starting at UTC $2^h57^m23^s.9$. This compares well with the 14-second predicted central duration. Ginelli observed from Fortaleza-CE, Brazil, at longitude 38°30'02".1 W., latitude -3°43' 53".5, height 36 meters. Ginelli also may have seen an occultation of θ Aurigae by (250) Bettina on 1982 March 20, details of which will be published later.

(106) Dione and SAO 80228, 1983 January 19: L. Kristensen has drawn a sky-plane plot of the observations of this occultation, mentioned also in *O.N. 3* (3). The event was timed visually at ten stations, 7 in Denmark, 2 in the Netherlands, and one (mentioned before) in Kiel, German Federal Republic, making it the best-observed asteroidal occultation outside North America. Four of the observers were able to time only the immersion or only the emersion. Fortunately, there were observers with very short chords close to both the northern and southern limits, and an elliptical outline fits the observations rather well. A paper giving the results and details of the observations has been submitted for publication.

(71) Niobe and SAO 98016, April 21: Astrometry by Klemola at Lick Observatory on April 4 gave a path shift of 0".58 N ±0".15, in the Pacific Ocean off the coast of California. The time correction was 4.7 minutes early. The data for Niobe alone gave a shift of 0".44 S, near the EMP 1982 path for the May

6th occultation of SAO 117178 and implying that that event also would be in the Pacific Ocean, well south of North America.

(704) Interamnia and SAO 204221, May 9: Lick astrometry on May 3 indicated a path shift of 1".1 S ±0".1, crossing Western Australia but passing too far from known observers to be of much use; as far as we know, the occultation was not observed. The data also showed that the occultation of Lowell 692719 the next night would miss the earth's surface to the south.

(521) Brixia and SAO 159459, May 14: A single Lick exposure on May 3 indicated that the path would be at 1".0 S, crossing the southern Philippines and the Pacific Ocean near the equator. Several observers in western North America reported a miss, as expected from the Lick data. The time correction was 4.4 minutes early.

(80) Sappho and B.D. +17 229, July 26: Three Lick exposures taken July 20th indicated a shift of 0".73 S ±0".1, crossing Sonora and southern NM. The time correction was 1.2 minutes late. Astrometry by Penhallow on July 23rd gave a path 1".7 S ±0".4, crossing north-central Mexico and the southernmost part of TX. Bad weather prevented observations in most areas, but an observer in Tucson, AZ, was able to monitor the appulse, and felt that Sappho went south of the star, implying a path south of the one computed from the Lick data.

(1) Ceres and Lowell 680439, July 31: Two Lick exposures on July 20 indicated a path at 1".27 S ±0".06, so that Venezuela, the Virgin Islands, and the eastern half of the Caribbean Sea might have been in the path. No observations of this difficult event have been reported.

(747) Winchester and SAO 162242, August 5: Lick astrometry for this path indicated a shift of 0".1 s ± 0".1, possibly crossing the northeastern U.S.A. Plates taken by Penhallow on Aug. 3 indicated a shift of 0".5 N ±0".2, off the earth's surface. Poor weather throughout the possible area prevented observation of the appulse.

(372) Palma and SAO 74064, August 21: Three exposures by Penhallow on Aug. 16 gave a path shift 3".4 east ±0".2, indicating that it would be off the earth's surface, with closest approach about 6" in eastern North America.

(120) Lachesis and SAO 208888, September 1: Two Lick exposures on Aug. 12 gave a path shift of 0".9 N ± 0".1, off the earth's surface; the time correction was 6.6 minutes late.

(53) Kalypso and SAO 146920, September 9: Three Lick exposures on Sept. 1 gave a path shift of 0".75 N ± 0".04. This shift was broadcast on WWV on Sept. 6, along with the shift for the 14 Piscium/(51) Nemausa event, for which the WWV broadcast permission had been obtained. Potential observers were asked to contact Richard Linkletter, the coordinator for the northwestern U.S.A., since the predicted path now was expected to include most of OR, MT, and Saskatchewan. Linkletter and Andrew Lowe, Calgary, Alberta, said that low altitude and widespread cloudiness prevented any observation of the occultation. A couple of reports of the appulse seen from the Midwest have been received.

(451) Patientia and Lowell 680066, September 14: Two Lick exposures on Aug. 12 gave a path shift of 2".1 S ±0".1, over Lima, Peru and northwestern Brazil; the time correction was 5.3 minutes early.

(120) Lachesis and SAO 185970, October 1: Although the star was near the edge of his Aug. 12 plate, Klemola measured one of its images, which combined with those for Lachesis give a shift of 0".97 N and time correction 1.4 minutes early. The implied path is over equatorial Africa.

OCCULTATION OF A STAR BY AN ARTIFICIAL SATELLITE

Dennis DiCicco

On 1983 May 13 U.T., while observing Comet IRAS-Araki-Alcock, I saw an occultation of 30 Monocerotis by an artificial satellite at my location in Sudbury, MA. The star blinked out very briefly.

THREE NEW HIGH-SPEED OCCULTATION PHOTOMETERS

Russell M. Genet

Details on three new high-speed occultation photometers were given at the Fourth Annual Fairborn Symposium, which was entitled "Microcomputers in Astronomy." The first of these was a system designed by Richard G. Schnurr and Michael F. A'Hearn, both from the University of Maryland, Astronomy Program, College Park, MD 20742. This system is based on the popular Apple II + microcomputer, and is capable of recording 1% photoelectric data (16-bits) at one-millisecond intervals for tens of minutes without any breaks. The actual recording is done on a 3M HCD 75 tape recorder. Software allows viewing of the data or WWV pulses on the monitor. Interference to the WWV receiver is essentially eliminated by a 100-foot optical fiber linking the receiver to the rest of the occultation system.

The second system was developed by J. L. Hopkins, S. S. Johnson, and M. S. Kronick, all of the Hopkins Phoenix Observatory, 7812 W. Clayton Drive, Phoenix, AZ 85023. This system is based on the Advanced Micro Devices AM9513 System Timing Controller chip. This highly useful chip has five programmable counters, each of which can count up or down in binary or Binary-coded decimal. Information on this chip can be obtained from Advanced Micro Devices, P. O. Box 453, Sunnyvale, CA 94086. In the Hopkins Phoenix Observatory (HPO) system, the AM9513 was mounted on an S-100 board along with other components, and was used in a Heathkit S-100 system. Details are available from Jeff Hopkins.

The third system is under development by Douglas M. Varney at the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109 [Ed: See *O.N.* *3* (4) 85.]. This flexible system is entirely self-contained, and does not rely on any external computers. It uses three microprocessors, and includes controls for a tape recorder, printer, etc. Details are available from D. M. Varney at JPL.

Other papers at the symposium, on microcomputer control of telescopes, instrument control, and data analysis, may also be of interest to *O.N.* readers. The proceedings of the entire symposium have been published as a 256-page, 30-chapter book entitled *Microcomputers in Astronomy*. It is available from me at Fairborn Observatory, 1247 Folk Road, Fairborn, OH 45324.

O. N. readers are cordially invited to the Fifth Annual Fairborn Symposium on 1984 July 12-14. The topic will be "Microcomputers in Astronomy II," and there are bound to be more papers on the use of microcomputers in high-speed occultation photometry.

USNO/WWV TELEPHONE TIME WARNING

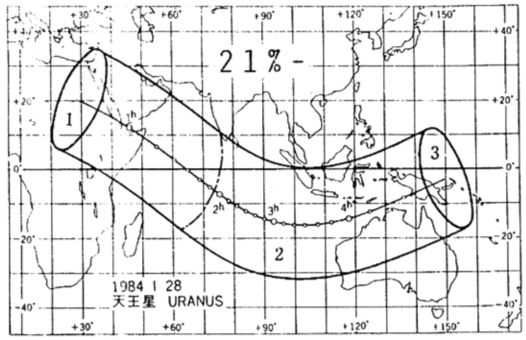
Victor J. Slabinski and David W. Dunham

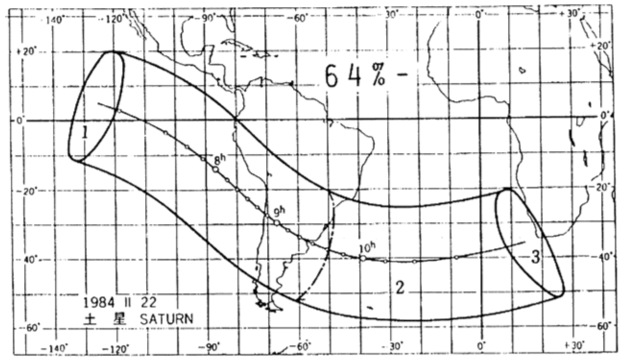
In articles about the occultations by Pallas and by Nemausa, telephone numbers were given for WWV (Fort Collins, CO) and the U. S. Naval Observatory master clock (Washington, DC), mainly for the purpose of calibrating digital watches. Unless you live within the local calling areas of these places, we recommend that you avoid using these telephone numbers, except perhaps for lunar grazing occultations, where timing accuracies of 1 second suffice. This is because AT&T often routes domestic long-distance phone calls via the COMSTAR communications satellite. In that case, the time signal travels approximately 38,000 km from the earth to the satellite and another 38,000 km back to the earth, with a resulting propagation path delay (uplink plus downlink) of 0.25 second. If you have no alternate way for timing occultations, subtract 0.12 second from your long-distance telephone timing and add 0.12 second to your estimated uncertainty (accuracy) to take into account the possible (but unknown) COMSTAR propagation delay.

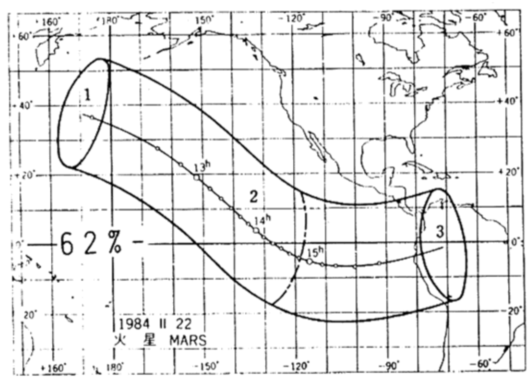
LUNAR OCCULTATIONS OF PLANETS

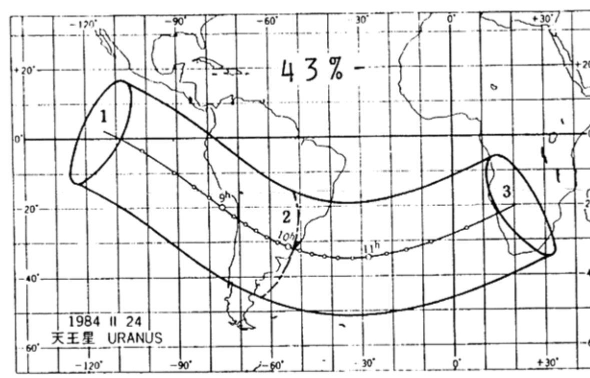
The maps showing the regions of visibility of lunar occultations of planets are reprinted by permission, from the Japanese Ephemeris for 1984, published by the Hydrographic Department of the Maritime Safety Agency of Japan. In region 1, only the reappearance is visible; in region 3, only disappearance 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 the time of the event.

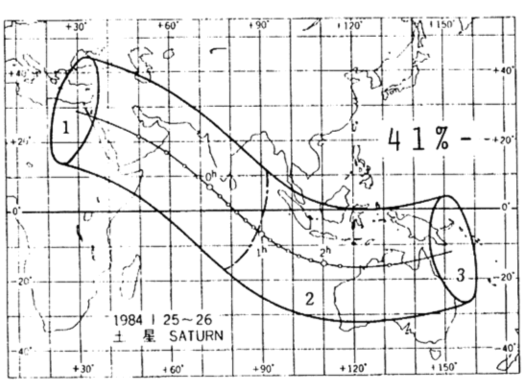
Observers interested in observing partial occultations should request predictions at least three months in advance, from Joseph Senne; P.O. Box 643; Rolla, MO 65401; U.S.A.; telephone 314,364-6233.

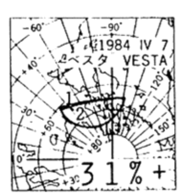


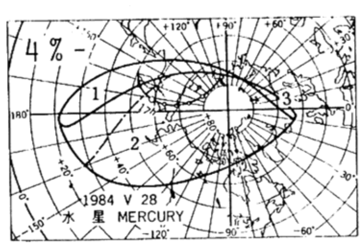


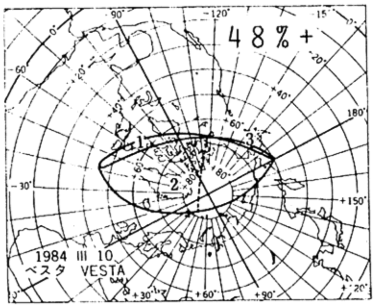








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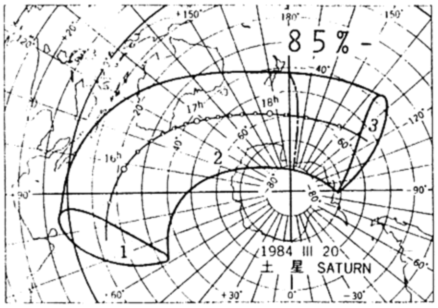
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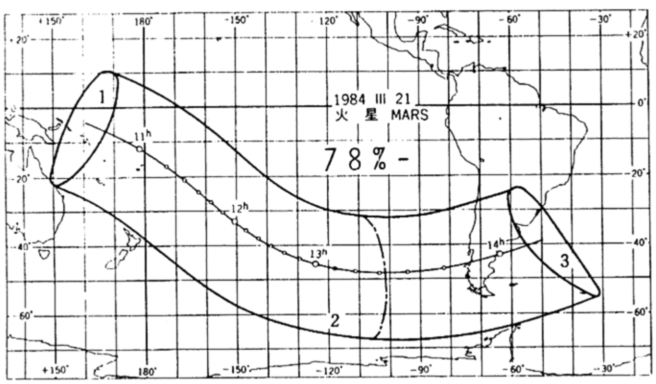
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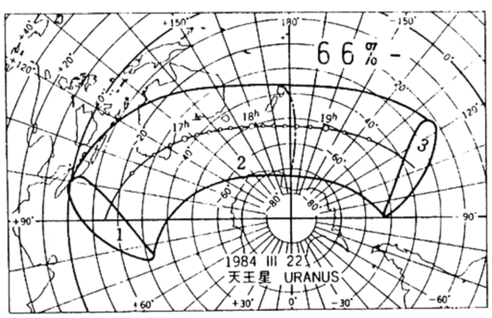
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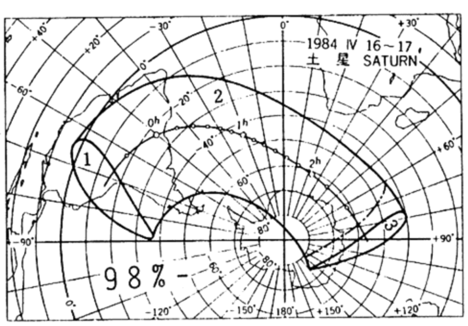
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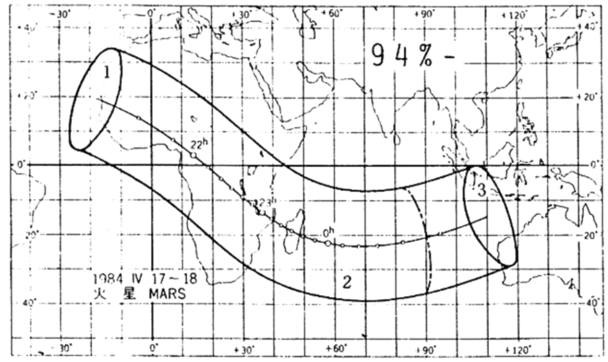
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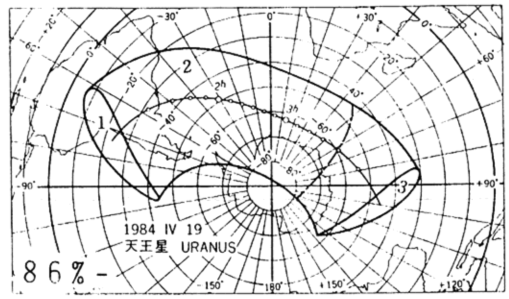
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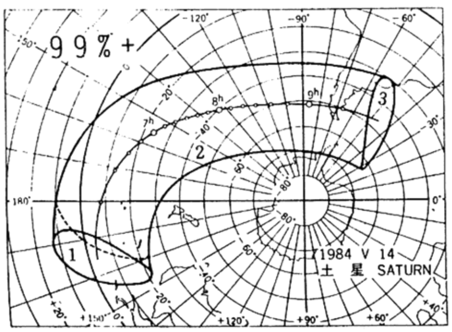
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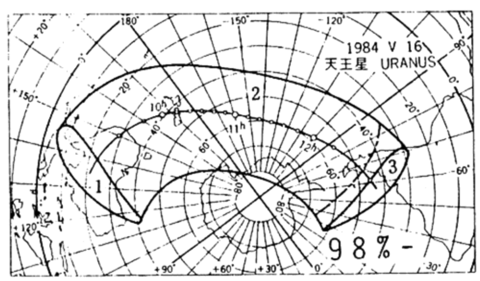
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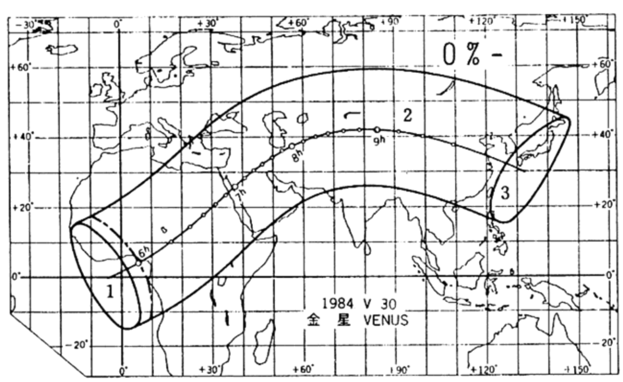
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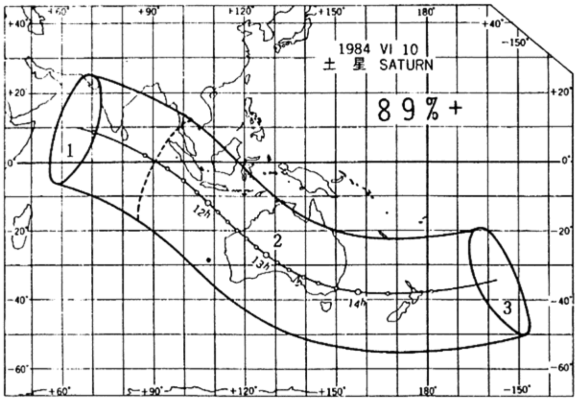
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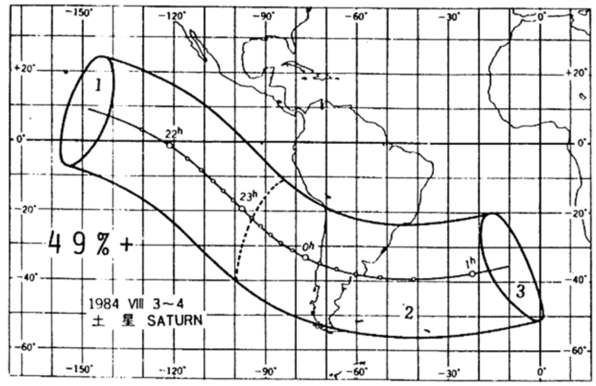
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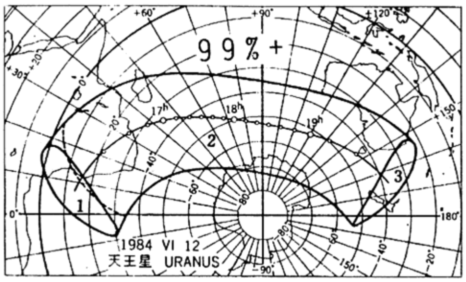
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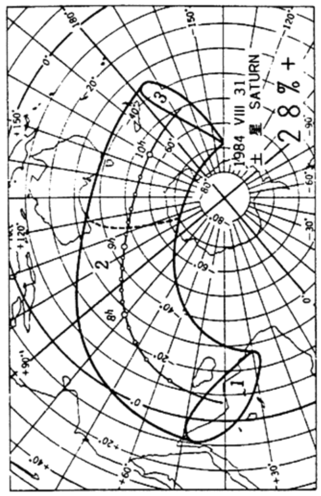
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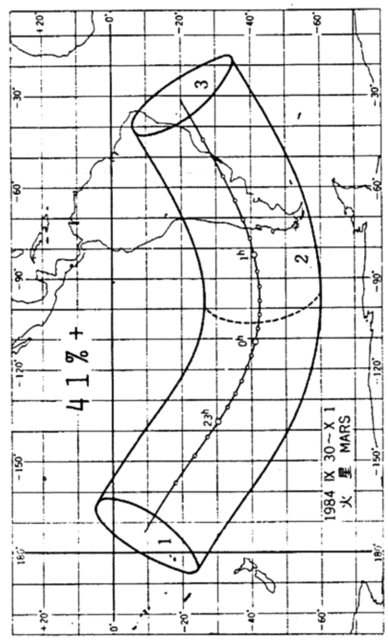
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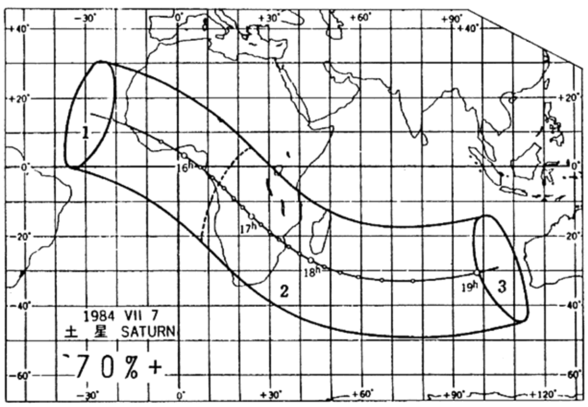
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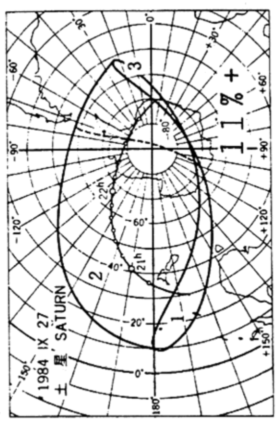
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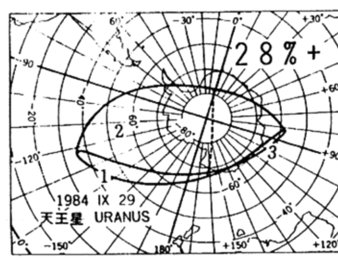
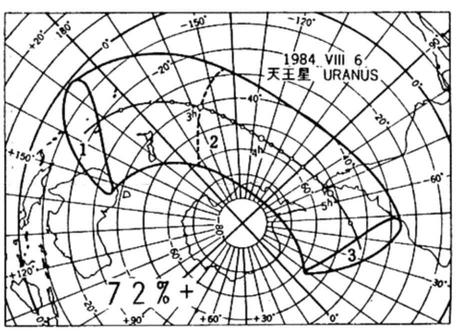
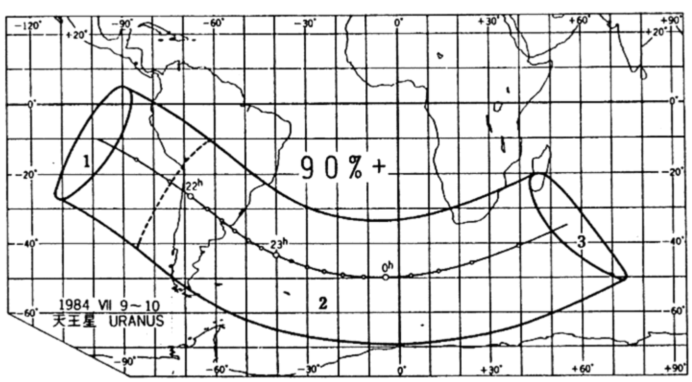
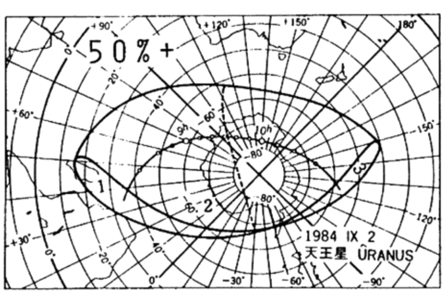
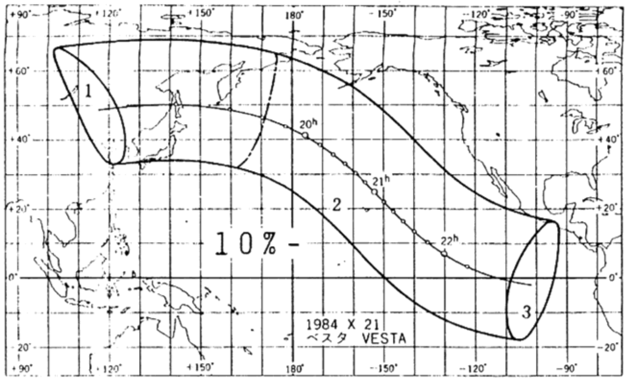
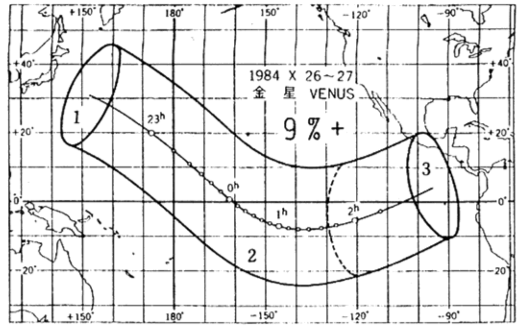

28%+
1984 IX 29
天王星 URANUS

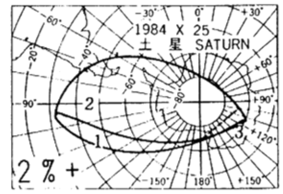

1984 VIII 6
天王星 URANUS
72%+

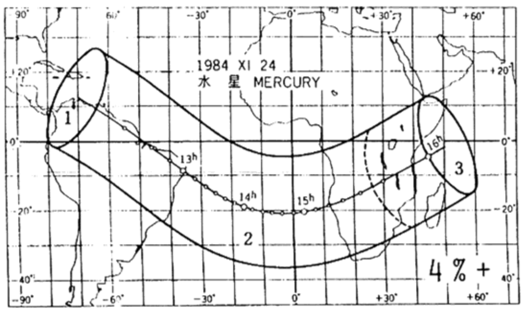

90%+
1984 VII 9~10
天王星 URANUS

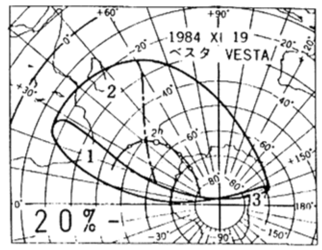

50%+
1984 IX 2
天王星 URANUS

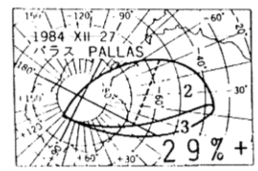










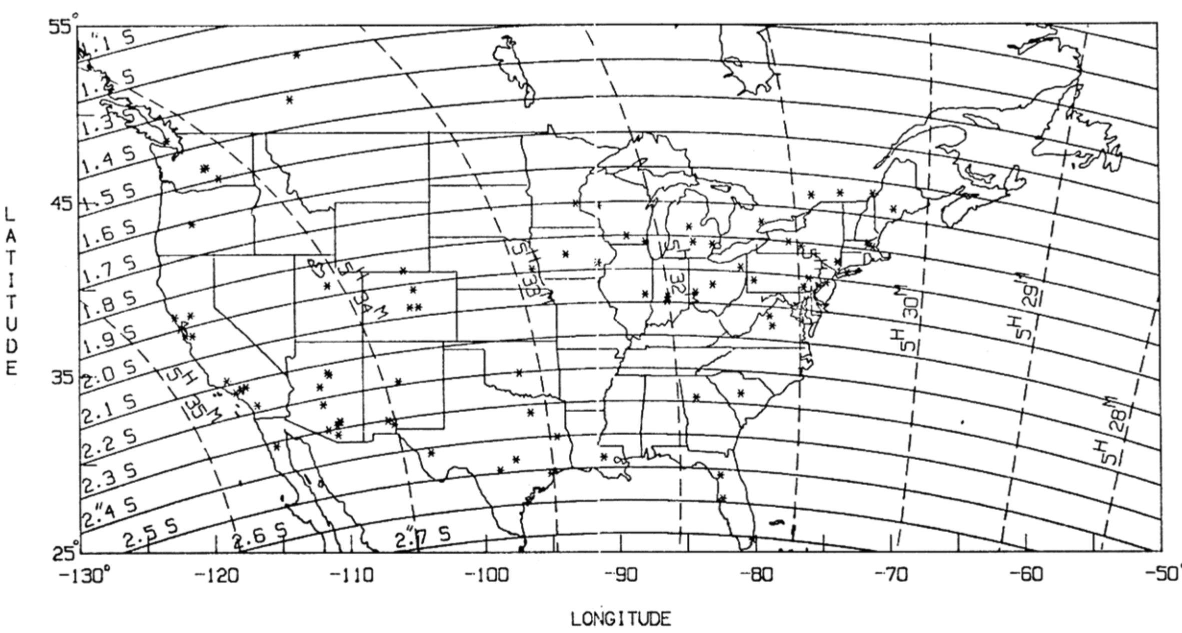


PLANETARY OCCULTATION PREDICTIONS FOR 1983

This is a continuation of the earlier articles bearing on this subject (see *O.N.* 3 (1) 9, (2) 25 and 37, (3) 54 and 60, and (4) 77 and 89). The figures consist of world maps by Sôma, and regional maps and finder charts by Dunham.

1983 11 20 (199) BYBLIS SAO 78120

DIAMETER 101 KM = 0.″05



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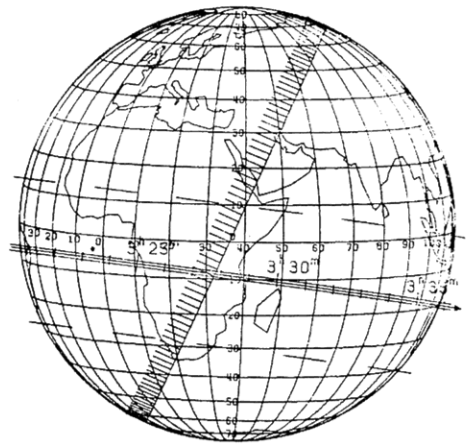
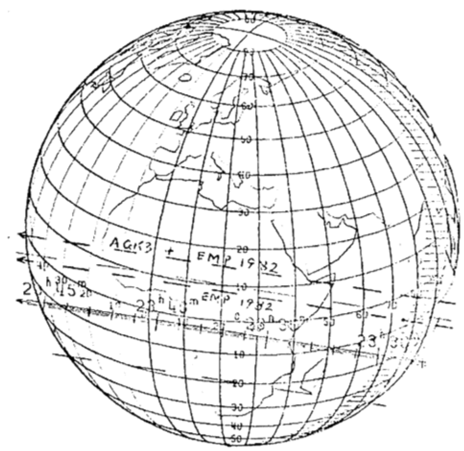


+05 2460 by Ino 1983 Dec 10



SAO 78799 by Lacrimosa 1983 Dec 14

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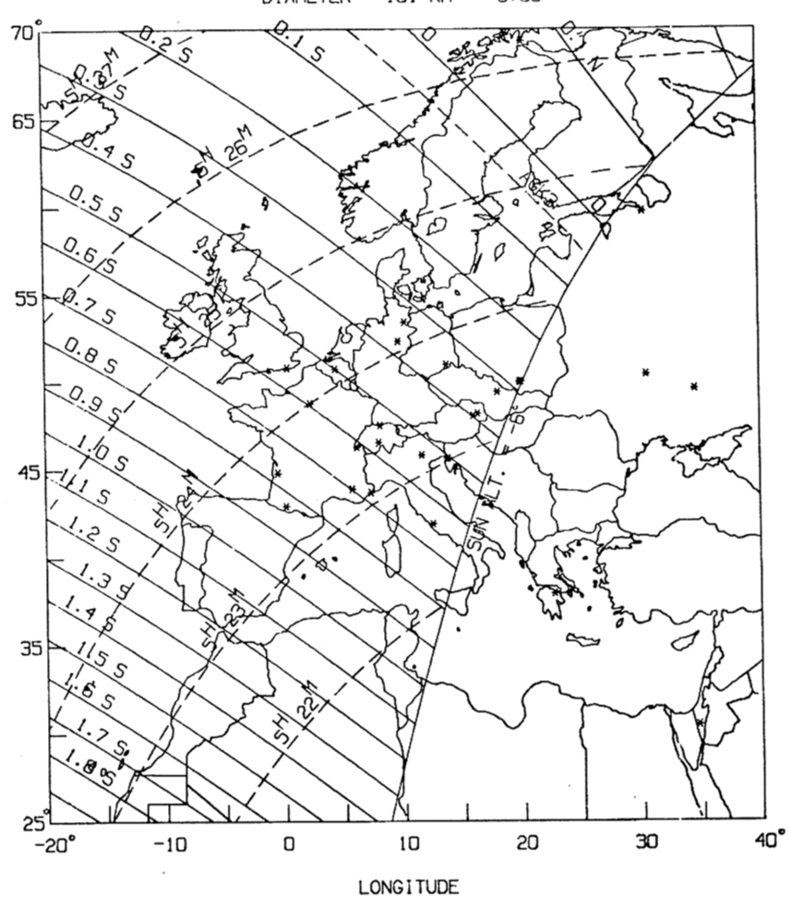

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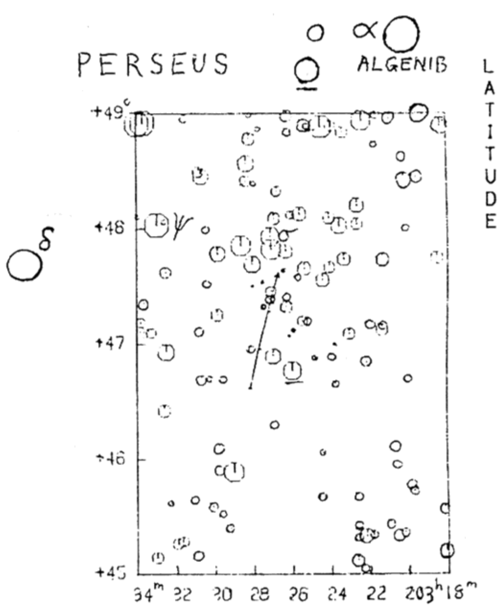
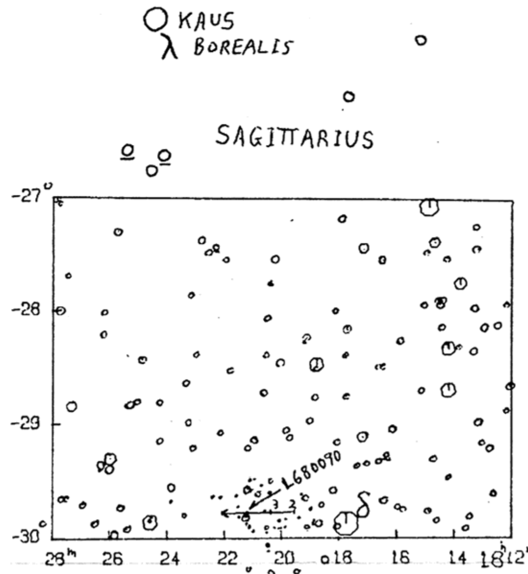
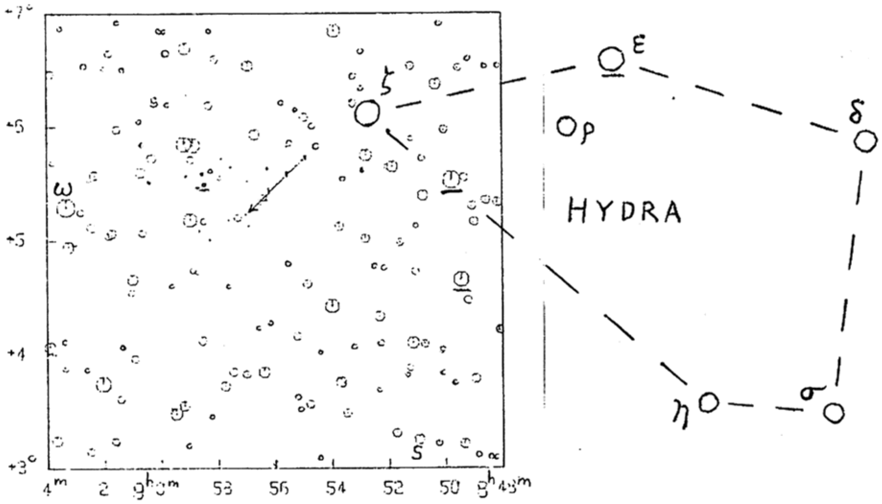


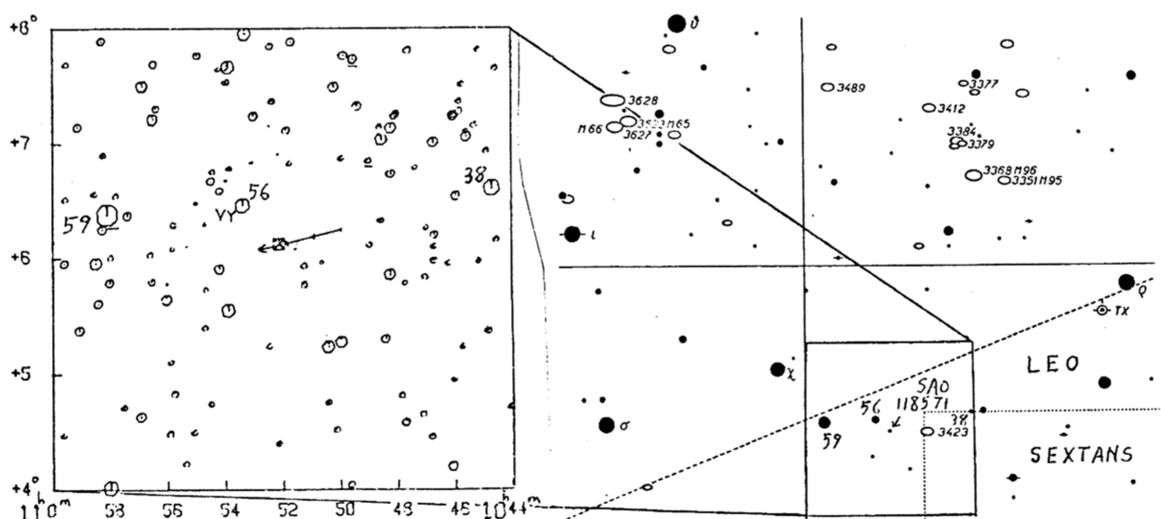
1983 OCT 10 (247) EUKRATE
SAO 38894



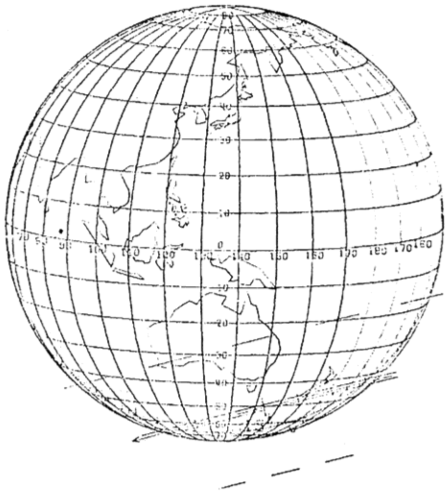
1983 OCT 4 (451) PATIENTIA L680090



1983 NOV 5 (683) LANZIA SAO 117317

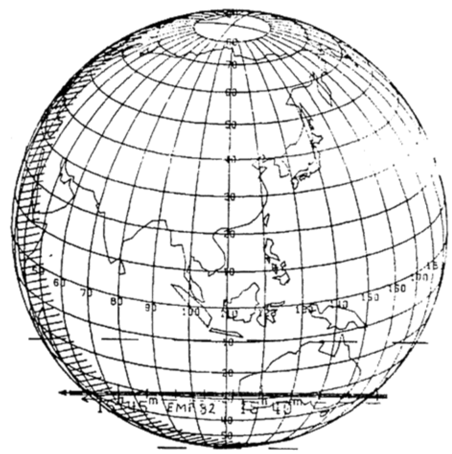


1983 NOV 17 (173) INO SAO 118571



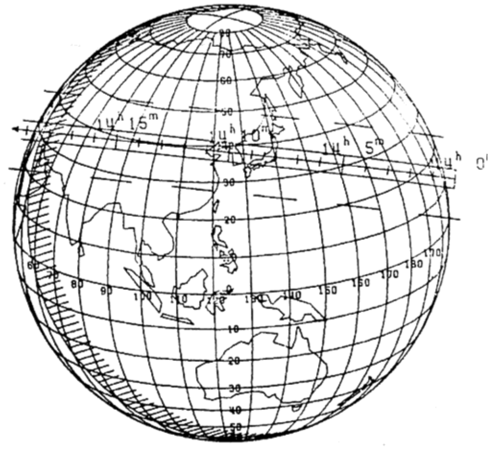
SAO 113068 by Ara 1983 Dec 16

SAO 118937 by Erato 1983 Dec 25

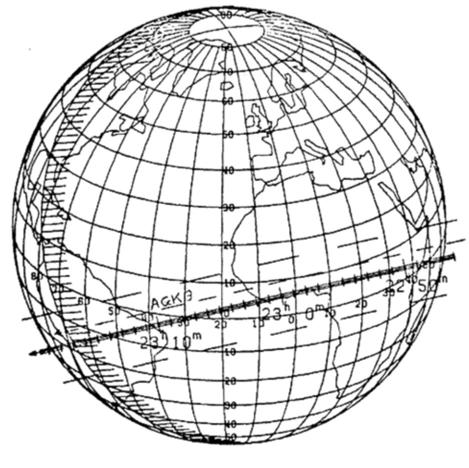


+21 812 by Siwa 1983 Dec 25

+05 2507 by Euterpe 1983 Dec 26



+18 775 by Vesta 1983 Dec 30



SAO 76615 by Aegina 1983 Dec 30