Occultation Newsletter

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Edited and Published for I. O. T. A. by H. F. DaBoll at 6 N 106 White Oak Lane, Saint Charles, Illinois 60174, U. S. A.

KAPPA GEMINORUM, EROS, AND PHOTOELECTRIC PHOTOMETRY OF OCCULTATIONS

David W. Dunham

The observations of the January 24th occultation of Kappa Geminorum by (433) Eros are well-described in "The Eros Flyby" on pp. 162-3 of the March issue of Sky and Telescope. In Connecticut, the path width was apparently 7 miles or 11 km, estimated mainly by the observations at sites 5 and 14. Due to Eros' relatively low altitude and azimuth compared with the direction of motion of the shadow, the observed width must be multiplied by a projection factor of about 0.7 to yield the minor planet's width in the direction perpendicular to its apparent motion in the sky, or 8 km. This is close to the 7-km minimum dimension quoted for Eros on p. 223 of the October issue of Sky and Telescope. Alain Porter, the New England coordinator for observations of the event, computes that this width would correspond to a 1.4-second occultation if it were aligned with its motion rather than perpendicular to it. The observed occultation times therefore indicate a width parallel to the motion a little over twice the perpendicular width, or slightly more than the 16-km second-smallest dimension quoted in October. Since the minor planet was near minimum light, the longest axis must have been pointing almost at the Earth. More detailed analyses are being undertaken by others.

Dr. Clark Chapman, Planetary Science Institute, Tucson, Arizona, issued a press release to many northeastern U. S. papers, a few days beforehand, giving details of the event and encouraging anyone with binoculars to try to observe it. A few useless negative reports were received from eastern New England. Apparently, none of the newspapers in Connecticut or western Massachusetts, where the project might have had some success, published the story.

Plans for Dr. Seville Chapman's inexpensive photodiode device were sent to area coordinators in early January, as described in the last issue. George L. Fortier, the coordinator for Quebec, reports that two of Chapman's devices were constructed by the Montreal Centre of the RASC, but clouds prevented any observations. Dennis di Cicco tried tried to use Chapman's prototype in eastern Massachusetts, but no occultation occurred there.

If any lunar occultations of bright stars are successfully recorded with the constructed photodiode devices, the results will be published here. Some workers with photometric experience have expressed the opinion that occultations of stars bright enough to be detected by photodiodes would be too infrequent to justify their use, but that the technology may improve to make them practical in the future.

Amateurs or groups with sturdily mounted clock-driven telescopes of about 20-cm aperture or larger might consider building regular photoelectric systems - the prices for the electronics are now rather reasonable. If you are interested, and don't have the necessary knowledge in electronics, try to find someone who does, to work with you. A *Manual for Astronomical Photoelectric Photometry* was issued in 1967 (with a *Transistor D.C. Amplifier Supplement* in 1968); it is available for $1.00 from the A.A.V.S.O., 187 Concord Ave., Cambridge, Massachusetts 02138. On p. 14, it lists the total photometer parts estimate (1961) as $288, including $54.50 for a 1P21 photomultiplier. I've been told that a 1P21 can now be bought for as little as $25, and some of the other components are probably correspondingly less expensive. Costs might be reduced further by using some of Dr. Seville Chapman's ideas for signal amplification and using a tape recorder and shortwave radio time signals for recording the event (a timing accuracy of 0^{s}01 should be fairly easy to achieve this way).

For disappearances, the star can be centered in advance, so that guiding only needs to be accurate enough to keep the star in the diaphragm for the several seconds just before the event. If one tries to observe a graze photoelectrically, the guiding problem might be more difficult with portable equipment, but hopefully would be good enough to catch any reappearances or flashes which occur within several seconds after a disappearance. This way, at least half of the events probably can be recorded, but visual observations might also be made, for a complete record. Offset guiding, on another (unocculted) star, might be used to get a complete photoelectric record of a graze.

INTERNATIONAL OCCULTATION TIMING ASSOCIATION

David W. Dunham

We have had very little trouble in obtaining sufficient time on large computers for computing predictions of grazing occultations and special events, such as data for total occultations of faint stars during lunar eclipses. In fact, at present, we have a significant excess, which we plan to use to develop a substantial lead time with the predictions. Unfortunately, we have had little success in obtaining funding for all other aspects of the program, mainly postage and duplication of papers, since January, when the Astronomy Department of the University of Texas had to curtail most of its support, due to the drain on its meager operational budget. We are seeking outside support, but prospects for obtaining it in the near future are not good, especially considering the general economic situation.

Consequently, we are forming a dues-supported organization, called International Occultation Timing Association (IOTA). MOST OBSERVERS WILL HAVE TO JOIN IOTA IN ORDER TO RECEIVE GRAZE PREDICTIONS FOR JULY, 1975, AND BEYOND. Privileges of membership in IOTA will include subscription to Occultation Newsletter; receipt of grazing occultation predictions, and predictions for certain other special occultation events, on a regular basis, regardless of the observational constraints described in O.G.O. VIII; and various papers. The latter include a detailed zodiacal double star list (see the NEW DOUBLE STARS) section), to be published in early July or before, and a rewritten, up-to-date version of the grazing occultation papers, targeted for September (this has to be done because we are nearly out of the current graze papers). Other papers will be published, as needed.

Annual dues, in U.S. currency, are $7.00 for residents of Hawaii and North America, and $9.00 for others, the extra to cover air mail postage. Make checks or money orders payable to International Occultation Timing Association, and send to David Dunham, whose address after May 22, 1975, will be:

Cincinnati Observatory
Observatory Place
Cincinnati, Ohio 45208, U.S.A.
(Telephone: 513, 321-5186)

Subscribers to Occultation Newsletter may apply a discount to their dues for any issues beyond this one, for which they have paid. For instance, if your subscription started with issue #2 (issue #1 was free to those in the initial distribution, and to those who requested it before publication of issue #3), you are paid through issue #5, and may apply a $0.50 discount. For those whose subscriptions started with #3, the discount would be $1.00. Those who made overpayment on their original subscriptions, or who sent extra payment for air mail postage, are entitled to corresponding discounts.

Graze predictions for July-September, 1975, are being computed for all observers who have returned observer information forms (the July, 1974 edition will be used as the application form for IOTA, at least for the time being) or observations after June, 1973. However, except in those cases where the computor's postage expenses are paid locally, the predictions will not be mailed by the computor until he has been informed by Dunham that the observer has paid his dues. Postage for graze predictions is being paid by the South African National Research Laboratory and the U.S. Naval Observatory, for data computed at those institutions for observers in Australia, the Middle East, New Zealand, southern Africa, and part of the northeastern United States. Observers in those areas are encouraged to join IOTA for the other benefits of membership, although subscription to Occultation Newsletter and special IOTA papers can be purchased separately. The situation for Great Britain and Europe is uncertain at present, and will depend on Hans-Joachim Bode, the computor for the area, and the Astronomische Arbeitskreis Hannover. It is possible that a European subsection of IOTA will be formed to minimize transatlantic financial transactions. This will be clarified in the next issue.

Observers who are not now subscribers to Occultation Newsletter and who received graze predictions for April-June, 1975, are being informed of IOTA and the need to join in order to continue receiving predictions. Notices intended for publication in the July issues are being sent to Sky and Telescope and R.A.S.C. Journal. These will also state that a prediction for each graze requested will cost $1.50, and a copy of the graze papers $2.50, payable to IOTA, with these costs applicable towards membership if the requester decides to join. This policy will start immediately (mid-May).

Subscribers are being asked to send initial IOTA dues payment to Dunham, so that he can quickly inform the computors to send predictions to paid members. However, most financial and secretarial aspects of IOTA will be handled by H. F. DaBoll and other Chicago-area amateur astronomers. Officers and other details will be announced in the next issue. We have set the dues at a fairly high level, in order to cover the costs for the special papers we plan to publish this summer and for the expected increase in postage rates. If the experience of our first year of operation shows that we can reduce dues next year, we probably will do so. Of course, dues will be reduced if we get more outside financial support. Dues might be lowered later, perhaps to $5.00, but with new observers having to pay a $2.00 initiation fee to obtain the basic papers. Since IOTA is just now being formed, any ideas you may have concerning its operation are welcome.

STAR CATALOG ERROR DISCOVERED

Thomas C. Van Flandern

On October 20, 1974, a seemingly routine occultation of Z18431 was timed by Rick Binzel in Syracuse, Indiana, and by Robert Hays, Jr. in Chicago. Both observers noticed that the event definitely took place some ten seconds before the predicted time, which had a stated accuracy of four seconds. Alertly, they reported this large discrepancy with the predictions to USNO, and the matter was investigated. It was found that there was a large error in the proper motion of the star, as printed in the SAO catalog. This proper motion was based upon positions measured at the Yale Observatory in 1934, and a position from an older star catalog measured in 1896. This latter turned out to be an erroneous position; so even though the catalog position of the star was correct in 1934, the proper motion, based on a linear fit to the two positions, was greatly in error. The accumulated error in predicted position of the star for 1975 is $6\overset{s}{.}1$ in right ascension and $1\overset{''}{.}1$ in declination, which fully accounts for the observed ten-second discrepancy. Such large discrepancies between well-observed timings and the predictions are rare; but when they occur, they should be reported separately, so that they can be investigated. Usually, no error is found. But when the star catalog is at fault, computer programs at both USNO and HMNAO would automatically reject the observation because of a large residual, unless there is some reason to suspect the star catalog position. Small discrepancies in the accuracy of a prediction need not be reported. Although these are also sometimes due to the star catalog, one or two observations are not usually sufficient to separate this from other possible error sources.

HMNAO COMPONENT CODE

On p. 17 of the 2nd issue, David Dunham says: "There is an ambiguity in the extended HMNAO component code, with 'F' used for two items. To avoid this, replace 'B' with '1' for 'Brighter component' and 'F' with '2' for 'Fainter component' (secondary). HMNAO uses 'F' and 'f', but keypunch machines usually don't distinguish between upper and lower case, so I do not know how HMNAO takes care of this."

L.V. Morrison, of HMNAO, replies as follows: "Regarding our code for double stars, we would ask that observers continue to enter the letters F or f on our report forms, as appropriate. When punching the observations, we inspect this column and consult our records on double stars manually before deciding whether or not the observed component corresponds to the catalogue position of the star."

LUNAR OCCULTATIONS OF PALLAS

David W. Dunham

The only two occultations of the four brightest minor planets during 1975 occur in July, both of Pallas, then 9th magnitude. The first one, on July 1st at about 6^h U.T. by a 54% sunlit waning moon, will be visible in a dark sky from that part of Antarctica which is south of South America and the Atlantic Ocean. The northern limit crosses South Africa, but the event occurs well after sunrise there. The other occultation occurs on July 28th at about 18^h U.T. by a 74% sunlit waning moon, visible only from a small part of the U.S.S.R. between the White Sea and Ural Mountains north of latitude 60° N. Predictions of these events were provided by Dr. Sinzi, of the Japanese Maritime Safety Agency.

OCCULTATIONS OF STARS BY PLANETS

David W. Dunham

During June 25th, Jupiter will occult 8.8-mag. SAO 109812. In Hawaii, the disappearance will occur at $11^h 57^m$ U. T. in P.A. 101° at altitude 8°. This should also be visible, at about the same time, with Jupiter higher in the sky, along the west coast of North America. The reappearance will occur at $13^h 28^m$ in P.A. 218° in Hawaii, and after sunrise in North America.

8.1-mag. Ceres will occult 8.6-mag. SAO 93633 at about 15^h U.T. of July 19th, visible from a section of the south Pacific Ocean around 150° west longitude. New Zealand might be in the path, but Ceres may be too low to see at the time.

Mars will occult 8.3-mag. SAO 76625 as seen from the Indian Ocean and southern Asia on August 28th. D at Naini Tal, India, will be at $22^h 19^m$ U.T. in P.A. 23°, with the R four minutes later in P.A. 315°.

Juno (mag. 9.6) is expected to narrowly miss 8.4-mag. SAO 117225 as seen from Antarctica at $20^h 34^m$ U.T. of September 13.

Predictions of the above events were supplied by Gordon Taylor at HMNAO.

WWV SALE

The Radio Shack "Timekube", which receives WWV or WWVH at 5, 10, and 15 MHz is on sale, during the month of May, for $30.

D. W. D.

OCCULTATIONS DURING THE LUNAR ECLIPSE OF MAY 24-25, 1975

David W. Dunham

The chart on p. 282 of the May issue of Sky and Telescope shows the eclipse star field only for North America, and shows only B.D. stars. The chart published here shows many non-B.D. stars, down to about the 11th magnitude, and is applicable for the whole world. Unfortunately, β Scorpii is occulted only for Antarctica and ν is not occulted at all. The southern limit for the occultation of ω^1 passes about 100 km south of Buenos Aires and just north of Maldonado on the south coast of Uruguay. The northern limit for the occultation of ω^2 passes near Medellin, Columbia, while the southern limit passes about 500 km north of Rio de Janeiro.

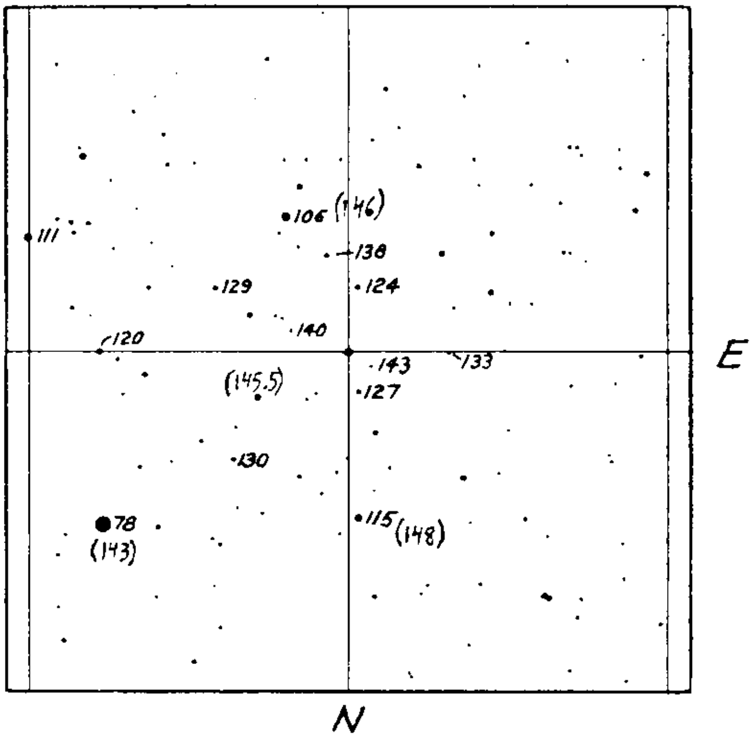
On the chart here, star index numbers are given in order of increasing right ascension in 1/2°-strips of declination, from the north strip (-19° to -19 1/2°) to the south. Numbers are given only for every 10th star and where ambiguities may arise. The table gives the star's index number and its Greek or Roman letter, Z.C. number, SAO number, or BD number, in that order. These names are used to identify BD stars in the predictions. Other stars not in the table are only identified by index number, being non-BD stars of about 11th magnitude. Stars which are not occulted during the umbral eclipse, or are occulted only in Antarctica, are not included in the table.

Reappearing stars can be located either with the help of nearby stars shown on the chart, or lunar features. Subtract 282° from the P.A. given for the event in the enclosed predictions to obtain the selenodetic latitude at which the star will reappear at the moon's western limb. Features near this point, shown on a lunar chart, can then be used to estimate the point of emersion.

The Mira variables X and Z Scorpii will be occulted for much of North America. Both stars are expected to be near 12th magnitude during the eclipse, according to the A.A.V.S.O. Unfortunately, W Scorpii will be about 14th magnitude for New Zealanders. The portions of AAVSO charts for X and Z show an area 30' on a side, centered on the variable. The numbers are AAVSO magnitudes given to the nearest tenth, without showing the decimal point. Numbers in parentheses are our index numbers for the stars; south is up.

Unfortunately, the paths for no grazing occultations of SAO stars cross the United States during favorable phases of this eclipse. The southern limit of the occultation of 7.8-mag. Z.C. 2304 (index no. 178) will pass near Sept-Iles, Quebec, at 5^h 37^m U.T. If time permits, I will compute fairly accurate predictions for some of the limits of occultations of non-SAO stars. For instance, the southern limit for Z Scorpii will apparently pass near Kansas City (near the start of totality) and Norfolk, Virginia.

X Scorpii



Z Scorpii

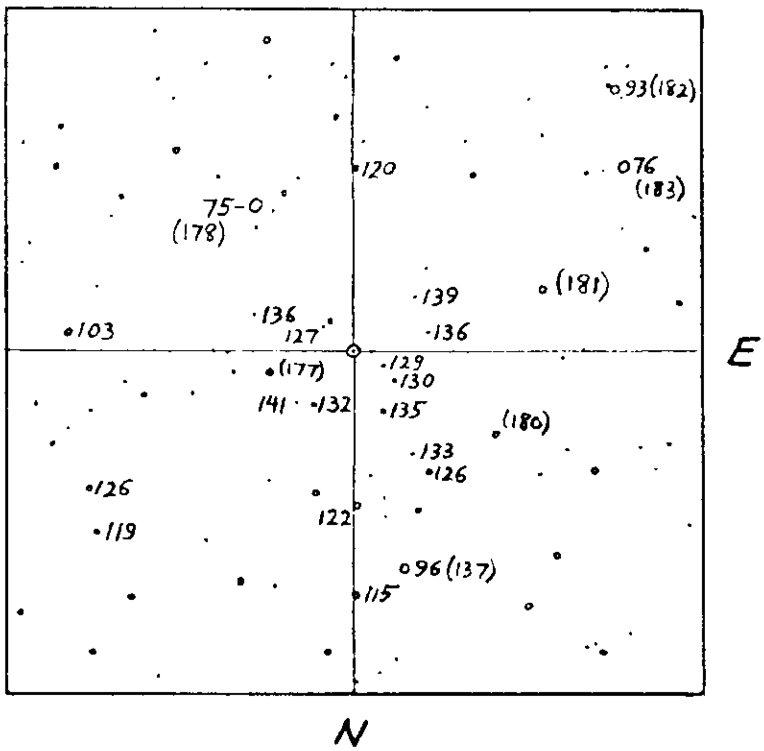


TABLE OF 114 STARS OF THE BONNER DURCHMUSTERUNG WHICH WILL BE OCCULTED DURING THE TOTAL LUNAR ECLIPSE OF MAY 24-25, 1975

Index No.	Star Name	Index No.	Star Name	Index No.	Star Name	Index No.	Star Name	Index No.	Star Name
12	BD -19° 4286	46	BD -20° 4398	80	SAO 184093	122	BD -20° 4383	165	BD -20° 4434
13	4288	47	SAO 184105	82	BD -20° 4397	123	-21° 4260	166	4435
14	SAO 159642	49	109	84	4400	127	-20° 4389	167	4436
16	654	50	BD -19° 4313	86	4403	128	SAO 184086	168	4439
17	Z.C. 2296	52	4318	89	ω^1 Scorpii	133	BD -20° 4401	169	-20° 4438
20	BD -19° 4304	54	4319	92	ω^2 Scorpii	137	SAO 184115	170	Z.C. 2327
21	4306	55	4320	93	SAO 184137	138	BD -20° 4404	171	BD -20° 4441
26	SAO 159719	56	4321	94	BD -20° 4410	139	4406	175	-21° 4265
27	BD -19° 4324	57	SAO 184176	95	SAO 184145	140	4407	176	4266
28	SAO 159753	59	BD -20° 4420	98	149	141	-21° 4278	178	Z.C. 2304
30	BD -19° 4328	60	4421	101	159	143	SAO 184141	179	Z Scorpii
31	4329	63	SAO 184199	105	BD -20° 4415	144	BD -20° 4410	181	BD -21° 4273
33	BD -20° 4378	65	W Scorpii	106	4416	145.5	BD -21° 4280	182	SAO 184121
34	4379	66	BD -19° 4331	107	4418	146	4282	183	125
35	-19° 4283	67	4336	110	SAO 184194	147	X Scorpii	186	BD -21° 4277
36	4287	68	4338	111	BD -20° 4425	151	BD -21° 4285	187	SAO 184171
38	SAO 184050	69	4339	112	4426	152	4286	190	193
39	063	70	SAO 184257	113	4427	153	-20° 4419	191	BD -21° 4298
40	BD -19° 4301	71	BD -20° 4381	114	SAO 184212	157	4424		
41	SAO 184089	72	4382	115	214	160	-21° 4292		
42	BD -20° 4393	73	SAO 184044	116	BD -20° 4431	161	SAO 184207		
43	4394	76	BD -20° 4386	117	4433	162	BD -20° 4430		
44	4395	77	4387	118	Z.C. 2330	163	SAO 184218		
45	SAO 184102	79	4391	120	2293	164	BD -20° 4432		

DOUBLE STARS TO BE OCCULTED IN THE UMBRA DURING THE TOTAL LUNAR ECLIPSE OF MAY 24-25, 1975 (Data from I.D.S., Lick Obs.)

Index No.	A.D.S.	Primary Mag.	Secondary Mag.	Separation	P.A.	Remarks
34	9871	9.3	11.3	2".3	36°	
16		9.0	13.4	2.9	17	
44	9914AB	9.5	11.8	2.2	110	C (Index No. 43) is 65" away in P.A. 304°
183		8.2	12.7	1.9	231	
57	9936	8.6	11.8	2.7	65	

The apparent lunar track calculations, such as the curves for the various cities shown on my chart in Sky and Telescope, are only accurate to about 25", while the enclosed University of Texas occultation predictions should attain an accuracy about ten times better. So it is best to use the latter in conjunction with the enclosed charts.

If you have USNO total occultation predictions for your site, the times given in them will be more accurate than the ones in the enclosed predictions, since USNO takes into account the height of the lunar features in their predictions, while we do not. Unlike the enclosed predictions, USNO does not calculate to see if the event will actually occur against an eclipsed portion of the moon's limb or not. Therefore, some USNO-predicted events will take place well outside the umbra, and hence, will be unobservable and not included in the enclosed predictions.

Please send me a copy of any observations you obtain, in addition to reporting them to HMNAO. Please indicate on your report whether a copy has been sent to HMNAO or not. Observers will be listed in an article about the results in the next issue, and a summary of all observations will be sent to Sky and Telescope. If you time any unpredicted occultations, indicate as carefully as possible the star's position, on one of the enclosed charts.

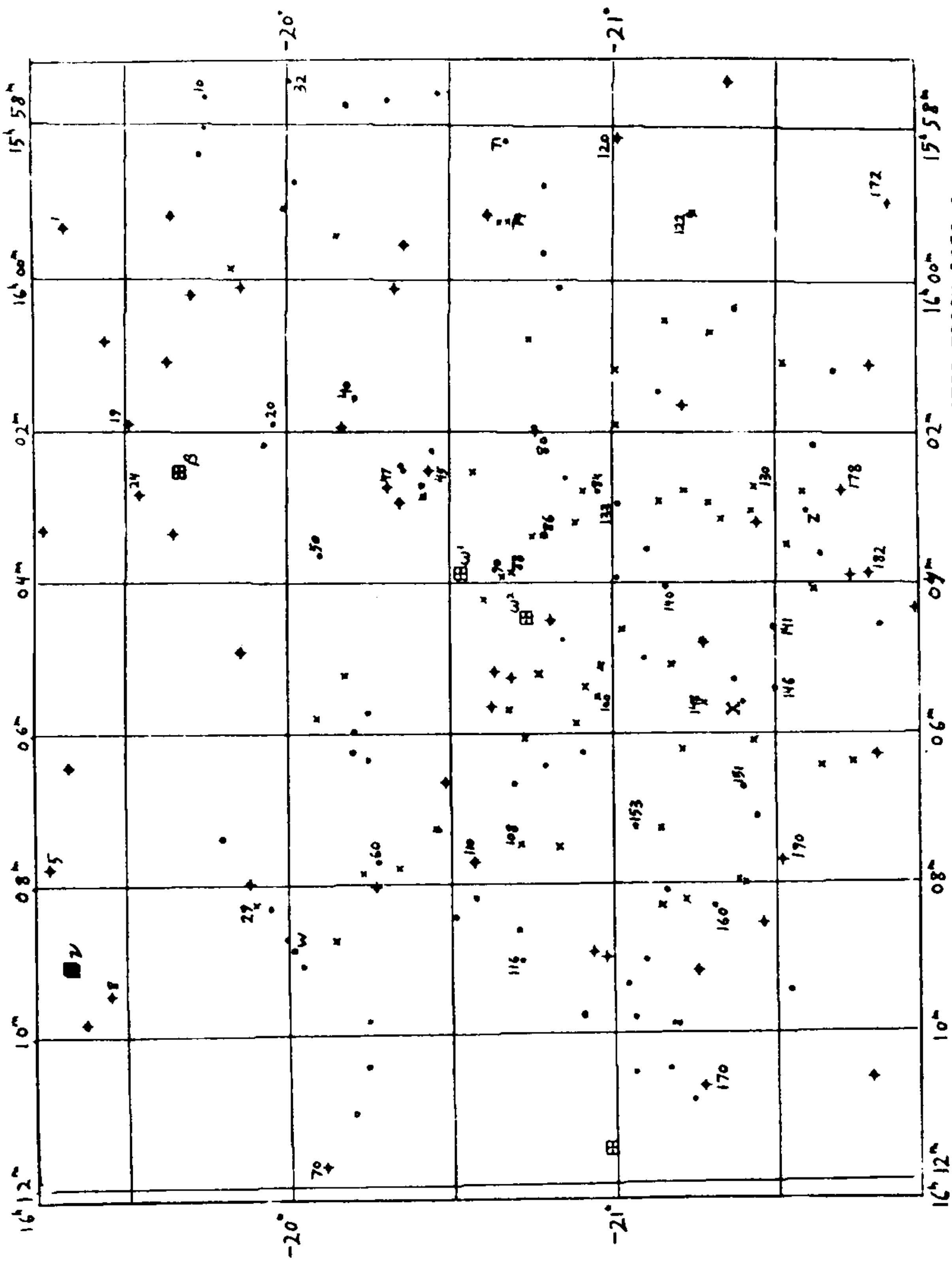
If you decide to change sites for observing the eclipse in order to observe a graze of a non-SAO star, predictions for which you may receive only a few days before the eclipse, call me at 512, 471-4471 or 476-5126 to give me the coordinates, and I will try to get predictions for your new site to you before the eclipse. There probably will not be time to get detailed profile data for these events, in which case, use USNO predictions for the librations, and to find the difference between WA and PA (to estimate the WA of graze from the PA of graze) so a profile can be plotted manually. Compute VPS with the formula

$$\text{VPS} = \text{miles per second of arc} = \frac{1}{1.158 \times \sqrt{\frac{\sin^2 D}{\sin^2 a} + \cos^2 D}}$$

where "a" is the moon's altitude and "D" is the difference between the moon's azimuth and the azimuth of the predicted limit line (the same angle, "D", used in the correction for height above sea level). Since the latitude libration will be close to zero, we don't have to worry about any of the special profile corrections. Use VPC = ± HT = zero (to the accuracy of these predictions for the non-SAO stars, that will be good enough).

When I measured the Palomar plates, I discovered that some of the stars (mostly non-BD) were double, with separations ranging from about 5 seconds to 30 seconds of arc. In most cases, only the primary was measured. The index numbers of these doubles, followed by an estimate of the difference in magnitudes of the components, are as follows; 53, 3; 62, 1.5; 72, 1.5; 81, 2; 88, 3; 106, 2; 112, 1.0; 113, 0.2 (wide, components measured separately); 125, 0.5; 126, 3; 128, 3; 131, 0.3; and 150, 0.3. Star number 159 is possibly variable, but more likely is a plate defect. Three of the Palomar plates show it as a faint star of the 13th or 14th magnitude, but one shows it about 10th magnitude. However, that one contains the image of an even brighter "star" right next to it, which isn't present on any of the other plates, one of which was taken the same night.

I gratefully acknowledge the help of Michael McCants and Richard Abbott, who keypunched the plate measures and reduced them to right ascensions and declinations, respectively, and NSF grant MPS 74-23135 (photoelectric occultations) for computer time.



STAR FIELD DURING LUNAR ECLIPSE OF 1975 MAY 25. COORDINATES EPOCH 1950.0

David Dunham

⊞ Z.C. and SAO Stars, Mag. 2.9-6.5

✦ SAO Stars, Mag. 7-9

• Non-SAO B.D. Stars, Mag. about 10

× Non-B.D. Stars, Mag. about 11

GRAZES OBSERVED IN 1974-5 REPORTED TO IOTA

David W. Dunham

Note my new address on p. 27; reports of future graze observations should be sent to Cincinnati, rather than to Texas. Also, note that most observers will have to join IOTA in order to continue receiving graze predictions; see p. 27.

Reports of 1974-5 expeditions not listed in previous issues are listed here, in the same format. Reports of many grazes observed overseas have been received. For the graze on 1975 Feb 22, D.B.R. signifies the German Federal Republic, and D.D.R. is the German Democratic Republic. The graze of 1975 Jan. 17 was observed from latitude +68° 58' 35".1, certainly the most polar observation of a graze made to date. The observers were from the Auroral Observatory at Tromsoe, Norway. Unfortunately, it was partly cloudy, and only one event was observed between clouds.

I believe that a record number of expeditions were successful in observing four grazing occultations of outlying Hyades stars during U.T. date 1975 March 19. Not since a Pleiades passage have so many grazes been observed in one night. Expeditions for ZC 633 near Albuquerque, New Mexico (2 stations) and on the east coast of Florida (9 stations), are not included since their reports have not been received. The ZC 633 (53 Tauri) graze will make the top dozen, but its exact rank (probably 4th or 5th) will not be known until the reports of all six expeditions are in. The expedition for ZC 633 at Italy, Texas, was the most successful single expedition during the first quarter of 1975. It was jointly led by Morrison and Dunham, with 13 stations from Dallas-Ft. Worth and 14 from Austin.

The ZC 633 graze was the first serious attempt at setting up a "graze shift hotline" to get word of a shift observed by a western expedition to an eastern expedition down the path in time that they might be able to move a few stations a short distance to get a better record of the graze. The site for Walter Morgan's expedition in Nevada was in the desert, 45 minutes from the nearest telephone, so he made arrangements to bring a radio ham with portable equipment to the site. Morgan timed the duration of his main occultation with a stopwatch and checked his predicted profile to deduce rapidly that the actual shadow had passed about 1/2 mile north of the prediction. This was radioed to Las Vegas immediately after the event, and a telephone call to the prearranged message center in Austin, Texas, was completed six minutes after the event, when the graze was in Arizona. At Italy, Texas, one of the observers talked by CB radio with a co-worker at a telephone two miles from the graze site, but in the confused logistics of deploying 27 stations, they made the call to Austin a few minutes too early. With such a large expedition, it would have been difficult in any case

Mo	Dy	Star Number	Mag	% Snl	CA	Location	# Sta	# Tm	C C	Ap cm	Organizer	St	WA	b
1974														
3	4	1175	5.0	82+	N	Nemours, France	2	2			Jean Meeus			
6	30	2172	4.7	83+	N	Wellington, N.Z.	1	6	4	41	B. M. Lewis			
8	14	Z05368	7.5	19-		Carvalhos, Portugal	1	1		15	Jose Osorio			
9	9	0709	4.3	53-		Sandton, S. Afr.	6	20	9	8	Jan Hers	0		
9	30	3453	4.9	98+	30S	Daytona Bch., FL	2	4		15	Harold Povenmire			
10	7	0843	7.2	65-	N	Boulder City, NV	3	3	5	8	Walter Morgan			
10	20	Z17949	7.8	28+	S	Pretoria, S. Afr.	3	9	2	8	Jan Hers			
10	21	Z18492	8.0	31+	13S	Las Vegas, NV	2	6	6	10	Walter Morgan			
10	21	Z19577	7.7	38+	S	Alberton, S. Afr.	4	19	6	8	Jan Hers			
10	23	3027	7.0	59+	S	Anadia, Portugal	1	2		15	Jose Osorio			
11	5	1124	6.9	69-	S	Yulee, FL	3	3	8	15	Karl Simmons			
11	7	1359	5.1	49-	S	Solre St. Géry, Belgium	2	6			Jean Meeus			
11	9	1590	6.9	27-		Ponte da Barca, Portugal	1	2			Jose Osorio			
11	23	3340	7.5	60+	16S	Rockledge, FL	6	37		25	Harold Povenmire			
11	30	0847	3.0	98-	S	Lund, Sweden	1	2		10	Peter Linde			
12	3	1198	6.2	84-	N	Sussex, WI	2	3	6	25	Paul Murn			
12	4	1359	5.1	72-	9S	Milan, MO	2	11	8	15	Robert Sandy	0	193	67
12	18	Z22507	9.1	17+	8S	Satellite Bch, FL	1	1		41	Harold Povenmire			
12	19	Z23388	8.3	24+	8S	Vero Beach, FL	1	0		15	Joe Huertas	20N	168	-64
12	20	Z24128	9.0	34+	10S	Tucson, AZ	1	0		15	R. Woltheníus	16N		
12	24	0244	6.9	72+	0N	Riverview, FL	3	3	6	6	Thomas Campbell	2N	7	-45
1975														
1	3	1670	5.1	66-	8S	Garden City, GA	1	5		15	Harold Povenmire			
1	4	Z11913	7.8	54-	7S	El Paso, IL	4	9	5	25	Homer DaBoll	8N	187	65
1	4	1788	6.7	53-	6S	Valley Wells, CA	3	9	7	10	Walter Morgan			
1	7	Z14335	7.7	22-	6S	Hebron, IL	4	15	6	15	Homer DaBoll	10S	183	29
1	7	Z14335	7.7	22-	6S	Washington CH, OH	1	2	7	10	Rick Binzel		183	29
1	16	3272	5.8	11+	-0N	Cambridge, MN	1	7	8	11	Don Tate		354	-63
1	17	3453	4.9	23+	S	Kilpisjärvi, Finland	1	1		9	Jan-Erik Solheim			
1	20	Z01443	7.1	48+	3N	Uji Kyoto, Japan	1	4			Akita			
1	20	Z01443	7.1	48+	3N	Shizuoka C., Japan	2	1		6	Motonobu Tonomura			
1	23	0709	4.3	82+		Parys, S. Africa	5	13	4	20	Jan Hers			

to do much with the slightly more than twenty minutes of warning we would have had. Observers in Florida would have had almost forty minutes of warning. Overcast skies at Tampa discouraged most prospective participants of a large expedition that was planned by Tom Campbell, but four observers who made the trip south were able to observe most of the graze through thin clouds. They selected a site only half a mile from a telephone, but when they got there on March 19 U.T., the phone did not work! The radio hams in Las Vegas planned to submit a note about the effort to the national amateur radio magazine QST.

The day before the graze, I learned that observers in California who were going to attempt a graze of another star later that night might also phone the Austin message center and use the observed ZC 633 shift, which might be similar for their graze. Then I realized that I should have sent information about the message center to leaders of expeditions for the grazes of of other ZC stars in the Midwest, but it was too late to do it by mail and too expensive otherwise. As it turned out, the shifts observed by the expeditions for the Midwest grazes were similar to that for ZC 633.

We tried the idea again for the graze of ZC 755, on April 16. Since time was even shorter than for ZC 633, we made arrangements to communicate directly from Len Taylor's observing site in the Sierras in California to Joe Magee's site in the expedition from Austin, using mobile equipment. The communication worked well, but four feet of snow and overcast skies prevented observation in California. The Texan observers reported an unusually large north shift. Due to a last-minute overly pessimistic weather forecast, two separate expeditions from Austin were formed, and we obtained more timings and better coverage to the north than if we had followed the original plans for one effort.

Although there aren't any opportunities as favorable as March 19th during the rest of 1975, North American expedition leaders might check the graze maps in the Occultation Supplement to see if it might be possible to set up future "shift hotlines" for grazes which they plan to lead. Since lunar occultation shadows always move from west to east in temperate and tropical latitudes, the burden should generally be on eastern leaders to make arrangements for communication with groups to the west, since the eastern observers will benefit. However, the shoe usually will be on the other foot for two separate grazes in a night, since the earlier graze most often will occur in the East. Communicating between two grazes like this is simply an extension of the idea for the two grazes we observed during 1974 Dec. 6 (see p. 24 of the last issue), where a correction to the path for the second event was computed enroute between them from the observations of the first graze. In the case of two separate grazes, the shifts will be similar only if they both are northern or both are southern limits. It also helps to have the same position source for both stars, such as both Yale or both Z.C. The communication to be used (long-distance telephone, local radio relay/long-distance telephone, or direct radio between expeditions) will depend on the urgency (how much time between events?) and what portable ham radio equipment is available. Amateur radio operators generally seem to be eager to participate in projects such as this. The coordinator in the first expedition should figure out beforehand what will happen at his site for different shifts from the prediction. Often, especially for northern limits, the shift can be estimated fastest from the U.T. of the first event, determined by stopwatch or eye-and-ear, to avoid the time needed to play back a tape.

HMNAO is now plotting the observations of grazing occultations and fitting them by hand to Watts' predicted profile. Copies of the results are sent to observers, who should check them and their reports to detect any possible errors. This is a big improvement over sending only the calculated residuals for each event. Robert Sandy noticed recently that during one graze, an observer indicated that he had no occultation, while two observers with larger telescopes farther outside the path timed events, showing that the former must have had at least a short occultation. Mr. Sandy suggests, and I agree with him, that observers should treat a "miss" as an event, and indicate how sure of having no occultation they are by using the certainty code (1, 2, or 3). Incidentally, on 1975 April 3, Mr. Sandy observed a fourth graze from his home.

The grazes observed in Texas on 1975 Feb. 21 involved the quadruple system A.D.S. 4277; see the double star list on p. 36. In the predictions, the Yale position was used for Z 04733, while G.C. was used for Z 04736. If the Yale position for Z 04736 was used, the observed shift is the same as for Z 04733. The grazes observed from Turnersville, Texas on 1974 April 10 and Dec. 6 refer to a small crossroads with only a couple of houses, about 15 miles south of Austin and 3 miles east of Buda, the nearest town with a post office. There is another Turnersville in Texas, a city with a population of a few thousand, west of Waco.

1975 Mo	Dy	Star Number	Mag	% Snl	CA	Location	# Sta	# Tm	C C	Ap cm	Organizer	St	WA	b
2	6	2618	6.6	16-		Colombo, Sri Lanka	1	1	4	4	Rex Ian De Silva			
2	13	Z24383	7.8	3+	12N	Tucson, AZ	2	13	6	15	R. Nolthenius	4S	358	-64
2	17	Z01668	8.2	28+	5N	Edinburg, TX	1	10		43	Jim Moravec		5	-36
2	17	Z01668	8.2	28+	9N	Key Largo, FL	1	6		25	Harold Povenmire		9	-36
2	20	Z03766	7.8	58+	9N	Cottage Grove, MN	5	11	8	20	James Fox	0	11	8
2	20	Z03766	7.8	58+	10N	Sheboygan, WI	6	29	6	15	Paul Murn		12	8
2	20	Z03847	8.5	60+	14N	Tucson, AZ	1	[illegible]	7	15	R. Nolthenius	[illegible]	16	10
2	21	0847	3.0	69+	-12S	Colo. Springs, CO	1	6	5	15	Derald Nye			
2	21	0847	3.0	69+	-13S	Tulsa, OK	1	4	6	25	Byron Labadie			
2	21	0847	3.0	69+	-14S	N. Little Rock, AR	6	15	7	6	Robert Dow			
2	21	Z04733	9.2	70+	15N	Austin, TX	1	2	4	23	George Haysler	4N	16	25
2	21	Z04736	8.5	70+	15N	Kyle, TX	2	5	6	25	Don Stockbauer	7S	16	25
2	22	0995	4.1	78+	12N	Hannover, D.B.R.	1	4	2	15	Klaus Frick			
2	22	0995	4.1	78+	12N	Nessa, D.D.R.	1	2	4		Dietmar Boehme			
2	23	1158	5.2	88+	19N	Sebastian, FL	3	26		25	Harold Povenmire			
3	3	Z15050	7.5	56-	4S	Cooma, Australia	2	7	6	31	David Herald	10S	185	0
3	3	2267	5.1	55-	3N	Canberra, Austrl.	6	27	8	15	David Herald	0	356	0
3	8	2922	7.4	17-	2N	Vernon, OK	1	4	5	25	Byron Labadie			
3	19	0633	5.4	32+	9N	Corn Creek, NV	4	18	9	10	Walter Morgan	3N	11	5
3	19	0633	5.4	32+	11N	Lubbock, TX	7	14		25	Rogers Orr	3N	13	5
3	19	0633	5.4	32+	12N	Italy, TX	27	90	8	6	Danny Morrison	3N	14	5
3	19	0633	5.4	32+	13N	El Jobean, FL	4	7	6	15	Thomas Campbell	3N	15	5
3	19	0642	6.9	32+	11N	Timnath, CO	5	14	7	11	Derald Nye			
3	19	0642	6.9	32+	12N	LaFontaine, KS	2	8	9	10	Richard Wilds	6N	14	7
3	19	Z03586	7.1	32+	11N	Elsinore, CA	8	19			Bob Fischer	12N	13	6
3	19	Z03586	7.1	32+	12N	Green Valley, AZ	3	4	9	15	R. Nolthenius	9N	14	6
3	19	Z03586	7.1	32+	13N	Falfurrias, TX	1	4		15	Jim Moravec		15	6
3	19	0651	5.9	32+	12N	Agency, MO	6	21	9	15	Robert Sandy	6N	14	9
3	21	0935	6.9	52+	8N	Yates Center, KS	2	13	8	5	Richard Wilds	5N	10	35
3	21	0935	6.9	52+	9N	Sheldon, MO	3	6	9	15	Robert Sandy	5N	10	35
3	21	0935	6.9	52+	12N	Andrews, NC	2	9	8	20	Daniel Green		13	35
4	2	2638	5.4	58-	S	Gundaroo, Austrl.	3	2	6	15	David Herald	10N		
4	3	Z19435	7.8	50-	N	Kansas City, MO	1	4	7	15	Robert Sandy			
4	4	Z20849	9.0	41-	0S	Tucson, AZ	1	2		15	R. Nolthenius	C0	181	-46
4	16	0755	6.3	19+	12N	Mertzon, TX	2	7	9	16	Wade Eichhorn	11N	15	21
4	16	0755	6.3	19+	12N	Fredericksburg,TX	8	35	9	25	David Dunham	11N	15	21
4	16	0755	6.3	19+	12N	Uhland, TX	9	28	7	15	George Haysler	11N	15	21
4	16	0755	6.3	19+	12N	Old Ocean, TX	3	6	7	15	Paul Maley	11N	15	21
4	16	0881	5.9	25+	11N	C. Trafalgar,Spain	6	23			Luiz Quijano	6N	14	34
4	17	Z05333	6.9	28+	11N	Potwin, KS	2	14	6	5	Richard Wilds	2N	14	-3
4	17	1010	8.0	34+	N	Nigel, S. Africa	1	8	7	10	Luciano Pazzi			
4	18	Z06702	9.0	38+	N	Coal City, IL	1	3	3	20	John Phelps			
4	18	Z06850	7.2	39+	9N	Auburn, CA	2	4	3	9	Bill Fisher	S		
4	20	1332	5.7	61+	7N	West Chester, PA	1	7	5	10	Clifford Bader			
4	20	1410	5.3	69+	N	Nylstroom,S.Afr.	5	16	8	5	Jan Hers	3N		6
5	1	2833	7.0	68-	3N	Pauline, KS	1	5	4	35	Richard Wilds		354	-43
5	1	2833	7.0	68-	4N	Bradfordton, IL	1	1	7	15	Berton Stevens		353	-43
5	1	2833	7.0	68-	5N	Thomasboro, IL	1	5	7	20	John Phelps	7S	352	-43

Berton Stevens (Chicago) has nearly completed the computer program which will read the new limb correction cards generated at USNO, and print predicted profiles. We expect to have it in operation in time for the predictions for the second half of 1975. An explanation of the new profiles is planned for the next issue.

Time and space preclude a summary of numerous recent occultation publications in this issue. This feature, and the 1974 total occultation count, will appear in the next issue.

FROM THE PUBLISHER

Our intent is to provide you with a publication of high quality, at the lowest price consistent with not losing money. The price will be adjusted, from time to time, to IOTA and to individual subscribers, such that our long run profit or loss will be zero. In view of constantly rising prices, we are sure that it will not be very long until an increase in subscription price will be needed, but with less than one year's operating experience, it is not yet clear whether the ledger will show red or black after Vol. I, No. 5 has been sent. After that time, we will re-assess the situation. If an increase is called-for, it will apply only to issues after Vol. I, No. 9. We will not accept any subscription running past Vol. I, No. 9 (but will hold excess payments as a credit to your account) until after publication of Vol. I, No. 6, in which issue we will have more to say about the subscription price. The added circulation, which presumably will come with IOTA, will help to hold down the price, while the impending postal rate increases will do the opposite.

Subscribers outside Hawaii and North America are reminded that IOTA dues include air mail mailing of the newsletter, but individual subscriptions still go by surface mail unless you request air mail and pay for the difference in rates.

PLANETARY OCCULTATIONS

Conducted by Mike Reynolds

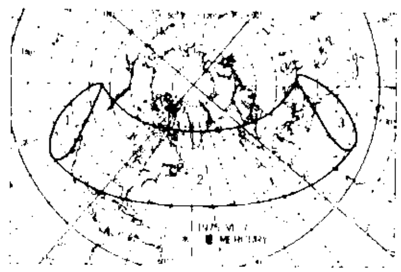
Upcoming Event

7 July 1975 - Occultation of Mercury by a 3% sunlit waning moon. On Monday morning, 7 July, the planet Mercury will be occulted during daylight conditions (13 hours Ephemeris Time). As a total occultation, it will be visible through most of Mexico, the U.S., Canada, the north Atlantic, and the lands surrounding the Mediterranean. As a northern limit partial, it will be a bright limb event running through British Columbia, Greenland, Iceland, Denmark, and the Black Sea. It will be very difficult, even as a dark limb, southern limit partial running through Mexico, southern Florida, and northern Africa. However, it will not be as difficult as the 16 October 1974 occultation of Mercury, at least for North American observers, as moon and planet will be higher in the sky than the sun, and can be located before sunrise and followed until the occultation. Near Mexico City, the partial will be seen in an almost dark sky, but for our expedition near West Palm Beach, Florida, conditions can not be better than marginal. Anyone wishing to join the expedition may write me for more information. David Dunham is seriously considering leading an expedition in Mexico.

Here are some suggestions related to experiences at the 16 October 1974 event (see p. 20 of the 3rd issue): Use 75 to 100 power; this gives the observer a fair field to locate the elusive moon and Mercury. If possible, set up in the shade of a tree or building. Observers should also use blankets over their heads (which should be fun in south Florida 95° F. heat) to keep out excess light. A reflector is recommended over a refractor, due to the light-shading ability of a reflector. A GOOD mount is necessary and a clock drive is required if an observer wishes to follow the event. Observers without clock drives on the 16 October event had to readjust their telescopes too often to make timings feasible.

Dr. Dunham will not be able to supply predictions for the total occultation, except for observers who are too close to the southern limit, in Mexico, Florida, southern Georgia, and southeastern Alabama who do not plan to try for the partial. There will be considerable delay for any requests which he receives after about May 23rd, his approximate date of departure from Texas. All other North American observers can either compute local predictions from the Occultation Supplement or get them from Nicholas M. Esposito, as noted in "Special Occultation Predictions", p. 60, of the January 1975 issue of Sky and Telescope. Europeans can calculate times from HMNAO predictions published in the various European journals.

Path of Occultation of Mercury
7 July 1975
(Reprinted by permission from the Japanese Ephemeris 1975, published by the Hydrological Department of Japan)



In region 1, only the R will be seen.
In region 2, D and R will be seen.
In region 3, only the D will be seen.

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A RETICLE EYEPIECE FOR OBSERVING REAPPEARANCES

Robert L. Sandy

Much has been written in past papers by Dunham and others about the problems or difficulties associated with trying to time star reappearances accurately, and several ideas have been suggested as to how to observe them more successfully. The primary problem, of course, has been knowing exactly where to look, as the star is invisible behind the moon right up to the time it reappears. The problem is compounded if the moon is in a gibbous phase, say 65% sunlit, or more, so that the dark limb is not visible by earthshine.

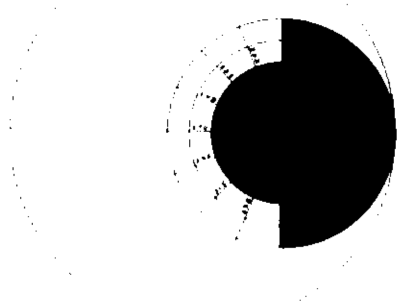
Anyone receiving USNO total occultation predictions knows that the values of his timings increase when the moon is near full phase. I began timing occultations on a regular basis in 1960, and after several times getting up in the wee hours of the morning to time predicted reappearances, only to miss getting accurate timings because I was not looking close enough to the points of reappearance, I designed and completed (in March, 1972) a most valuable aid - a special reticle permanently mounted in an eyepiece.

Walter Fellows probably was the first (1968) to design an eyepiece reticle specifically for use in timing star reappearances (see p. 18 of the 2nd issue, and p. 310 of the May 1971 Sky and Telescope). I saw his reticle eyepiece while visiting him in August, 1969 and was very impressed; so much so that when a star reappeared in the window of his reticle, I was so enthralled that I forgot to start the stopwatch!

Where Walter's reticle is drawn on tissue paper laid in the focal plane of a wide-angle Erfle eyepiece, mine is photographed on a piece of 35 mm Eastman High Contrast Copy film. This film has extremely fine grain and ultra-high resolution, and in the unexposed portions of this negative-type film, the base is as clear as glass or cellophane. The design for my reticle was drawn on a large piece of flat black artist board, using white ink. White lines, circles, and numbers drawn on the black board came out black on the processed film. The original drawing was made five times the desired final size.

My telescope for observing occultations is a 6-inch f/7.58 clockdriven Newtonian. It is important that the reticle be scaled to the focal length of the telescope objective, i.e., as the reticle is scaled for use with a focal length of 45.5 inches, it can be used only with telescopes having focal lengths within about 3 inches of that figure.

In the illustration, please note that there are two circles; the larger represents the moon's apparent size when it is at minimum perigee distance, and the smaller represents maximum apogee. I will be happy to supply, to anyone interested, the simple formula for converting the angular diameters at perigee and apogee into the linear dimensions needed for a reticle. The numbered spokes on the reticle represent PA, at 22°5 intervals. The large, dense, black area (created with a paper cutout rather than white ink) on the reticle is used to block out most of the moon's bright side.



After the film was processed, a scratch-free frame was selected, cut circular, and placed in the focal plane of the eyepiece, with a thin piece of 2" X 2" slide mounting glass (anti-reflection coated) cemented to the film to protect it from getting scratched, and to keep it flat.

The eyepiece selected for mounting the reticle should be of the Erfle design, to provide a large real field. It is suggested that a combination of objective and eyepiece focal lengths be chosen so as to give a real field approaching, or even exceeding 1°. As my telescope primary has a focal length of 45.5 inches, my 16.3 mm Galoc wide angle Erfle eyepiece gives 71 power and a real field of 1° (two moon diameters can be observed in the field). My experience with the Galoc has been very good, and I recommend it to serious observers (see ads in the popular astronomical journals). It definitely works well with the "remote ocular technique" mentioned in the 2nd and 3rd issues of Occultation Newsletter.

The reticle eyepiece is used in the following way. Move the equatorially-mounted telescope in R.A. only, and rotate the eyepiece in the drawtube until the moon is seen to move parallel to the 270° line on the reticle, which properly orients the reticle. Then, as the eyepiece does not have an extremely flat field, bring a star, or a detached peak, into the PA segment in which the star to be timed is expected to reappear, and focus on it. Then re-position, so that the moon is centered within the reticle circles. The large black area of the reticle is dense, but not opaque, so the moon can still be seen behind it. Of course, it is even easier to center the moon if the earthlit limb, and consequently the entire circular outline, is visible. The clock drive is then needed to hold the moon stationary in the field.

The USNO predictions give the PA of the predicted point of reappearance. Interpolate this value between the calibrated spokes, and between the apogee and perigee circles, and watch that spot, as that is just where the star will pop out.

In pre-reticle days, I would not have even considered trying to time a reappearance whose USNO observability code was less than 7. With the reticle, I have been accurately timing 5's. Using the reticle eyepiece, I find that my personal equation for reappearances is often as good as for disappearances.

If there are at least 10 interested observers, I will consider producing the reticle, at a small price. The original drawing can be photographed at different distances, to provide the correct scales. I would need to know: f.l. of objective; type and f.l. of eyepiece to be used; and the diameter of the hole in the apparent field restricting ring of the eyepiece. As the film is available only in 35 mm size, I can only make reticles for standard 1-1/4 inch O.D. or smaller eyepieces.

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OCCULTATION SIMULATION AND TRAINING

Mike Reynolds

Many observers will remember the "fright" of timing their first grazing occultations. For some, it was easy; others find much difficulty in knowing exactly what to do, even though they have been told. The pressure of timing an event to $0^{s}.3$ accuracy can scare some observers into missing their first couple of grazes, and may even affect observers who have timed several grazes.

One answer to this is constant timing of total occultations. This gives the observer a chance to practice accuracy and possibly wear the "scare" off. But many times, the observer may not have a chance to time totals before his first graze. An answer might be an occultation simulator.

Working with a fairly large occultation team, most of the observers have very little experience. Through the years, I have worked on an occultation simulator, which will simulate either a graze or total, and determine the observer's personal equation. The simulator is made up with a large (8X10) positive of the moon, which is lit from the rear. The stars (5 "stars" are used for the graze) are miniature lights. They are used in succession, to appear as a single star moving, which makes for a very realistic simulation. The simulator, which is light-tight, is set up about 100 feet from the observer, who uses a small telescope. The magnitude of the star can be varied by a rheostat, so that spectacular, favorable, and marginal grazes can be observed. The observer's personal equation can be determined by various methods, e.g., the electronic digital reaction time tester constructed by Tom Campbell (see p. 25 of the 3rd issue).

The observer can become familiar with observing grazes before his first attempt at the real thing, possibly increasing the accuracy of his data and taking any pressure off of him. Even the "experienced" observer could touch up before the graze, making accuracies much better. And besides, how can a simulated graze be clouded-out?

SOME OBSERVING MISCELLANY

Bill Fisher, of Colfax, California, has submitted comments on what might be considered three separate topics. The comments on use of a split timer (a stopwatch with two second hands which start simultaneously, but which can be stopped individually) and on personal equation are from a letter to Gordon E. Taylor, HMNAO.

"After re-reading N.A.O. TECHNICAL NOTE, Number 5: The Visual Observation of Occultations, I have a comment to make in regard to paragraph 2 on Page 4 where the use of a stopwatch is discussed: Many stopwatches run unevenly during the first minute or two, especially when subjected to changes in temperature, such as when the watch is removed from a cool place and held in the observer's hand for several minutes. For this reason I consistently use the 'split action' type of watch for all observations, and I believe I get more reliable timings by using the following procedure:

"I allow the watch to acquire body temperature by carrying for 15 minutes or more in an inside pocket. I then start the watch at an even minute mark at least 5 minutes before the predicted time of the occultation, and in the final 2 minutes note if any drift has occurred, using a magnifying glass to examine the watch. I write down the amount of the discrepancy, and if more than 0.2 second, re-start. At the occultation event I push the button for the first stophand, leaving the other running. As quickly as possible, within the next minute, I compare the running hand with the time signal and note if the drift or discrepancy has changed; usually it has not changed more than 0.1 second. I then record the time as corrected for the drift of the watch. I believe this method eliminates errors resulting from watch uncertainty, and I recommend it for those who use a watch regularly to time occultations.

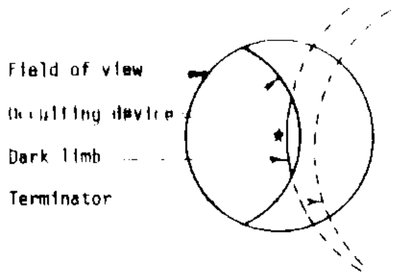
"When a multiple event is predicted, such as a double star, I start the watch as much as 15 minutes ahead and may re-start several times to get all drift leveled off, and then in the last 2 minutes re-check and note any variation from the even minute marks. Two events can thus be timed with quite reliable accuracy. If more than two events are expected, I use a tape recorder to record the time signals and an oscillator note superimposed to mark the events.

"Regarding personal equation: I feel that an experienced observer is more accurate at timing a reappearance for this reason: When he is watching the approach of a disappearance, an observer may tend to anticipate the event and push the button late due to mental processes involved--where, during a reappearance he has no anticipation factor, he re-acts to the sudden appearance of the star. I found this to be true when I timed the reappearance of the secondary of an unanticipated double before I realized the magnitude was far too faint--and missed the primary about 0.9 sec later!"

Mr. Fisher's remarks about personal equation remind us of some of our early measurements of personal equation, using an artificial star and a 2-pen strip chart recorder. Of course, averaging a large number of measurements gave a precision quite unrelated to the accuracy of the figure as applied to the event of a real star, but it was interesting to note that for several observers, the personal equation was shorter for reappearances than for disappearances - about 20 milliseconds shorter. We attribute this to persistence of vision; the eye still sees the star there for 20 ms after it has gone, but when it reappears, the stimulus is immediate.

Mr. Fisher's final topic concerns an eyepiece occulting device, as contrasted with the Fellows and Sandy eyepiece reticles - perhaps not as elegant as a reticle, but a lot less work, and probably just about as useful if it is used in conjunction with a telescope which has no drive:

"Make a tube of black paper, or other suitable material, about 1 inch long, which will slip snugly into the skirt of later type eyepieces, or into the eyepiece tube for older types without skirt. Determine the focal point of the eyepiece as you would for installing crosshairs. Make a small crescent shape of black paper or cardboard that will fit into the paper tube, and when at the focal point, cover about one-half the field of view, in area. After experimentation, glue the crescent in place, in the paper tube. Try the device first on a disappearance; locating the star in the center of the eyepiece field, and rotating the eyepiece so the crescent is blocking the rest



of the field on the side from which the moon is approaching. The crescent will hide most of the brightly lighted portion of the moon, reducing glare and reflections, while the star remains in the center of the field where eyepiece resolution is best. For reappearances, orient the crescent so it will leave the proper point to Watts angle or cusp angle on the moon exposed, as the rest of the moon moves out of sight behind the occulting device.

"This idea is not new: It was used by Margaret Mitchell many years ago, to find double stars."

NEW DOUBLE STARS

David W. Dunham

The table lists additions and corrections to the special double star list of 1974 May 9 not listed in previous issues. Most components indicated were discovered during occultations. However, some are non-Aitken visual doubles which do not have double star codes in the SAO or USNO SZ catalog, and others are simply clarifications of incorrectly-coded stars which Don Stockbauer discovered during his work with visual doubles.

Time has not permitted the addition of the data described in the last paragraph of the double star section on p. 21 of the last issue, but I expect to do it this month. In addition, Don Stockbauer has found several hundred visual doubles listed in the Lick Observatory IDS catalog, which are in the SAO and USNO SZ catalog, but which do not now have double star codes in the latter. We plan to publish the full list, probably also including the known Aitken doubles which do have double codes in the SZ. We expect to distribute it to members of IOTA early this summer, and sell it to others interested in buying it. Obtaining recent observations of many of the rapidly changing pairs from the Astrometry and Astrophysics Division of the USNO, and resolving some other problems, may cause some delay in issuing the "final" edition we want. A preliminary version will be sent to graze computors sooner.

A companion to Alcyone (Z.C. 552) is rather clearly evident in a photoelectric record obtained with the 272-cm reflector at McDonald Observatory on 1971 Nov. 4. The event was a reappearance, 97% sunlit waning moon, made at a wavelength of 6943 ±250 Å. Several other better-quality photoelectric records, all in blue light, and all disappearances, show no trace of the companion, so it must be regarded as quite doubtful. However. the companion might be very red (late spectral type) and possibly not evident in the only other trace made in red light (at Fick Observatory, Iowa, 1971 Dec. 28) because the event was a disappearance (so the companion probably disappeared before the primary, in the noisier unocculted portion, or possibly the two stars disappeared nearly simultaneously). Some anomalous phenomena have been observed visually during very favorable grazes of Alcyone, which could be explained by duplicity.

Dunham noted possible quick step events during the total occultation disappearance of Z.C. 651 at Italy, Texas, adding support for duplicity as an explanation of several step events observed during the graze at Agency, Missouri. A photoelectric record obtained at McDonald Observatory shows no trace of a companion. However, the record ends less than 0^{s}3 after the drop, so a second drop may have been missed. The background level after the drop seems to be noisier than the records for similarly bright stars observed that night, possibly caused by a companion which remained visible after the primary disappeared.

Z.C. 852 was included in the original University of Texas Double Star List of a year ago, but the parameters for the third star were recently improved by Nolthenius, using the 1972 graze data.

NEW ZODIACAL SPECIAL DOUBLE STARS, DATE 1975 MAY 5

SAO	ZC	M	N	MG1	MAG2	SEP	PA	MAG3	SEP3	PA3	DATE, DISCOVERER, NOTES
76183	0548	P	K	6.8	9.8	0.299	173				1971 Sept. 10, D. Evans, McDonald Observatory, Texas
76199	0552	P	K	3.0	4.6	0.031	207				1971 Nov. 4, D. Evans, McDonald Observatory, Texas
76585	0651	G	X	6.7	6.7	0.15	55				1975 Mar. 19, R. Sandy, Agency, Missouri
76733		G	K	9.3	9.3	0.07	6				1975 Feb. 20, R. Nolthenius, Tucson, Arizona
77111		P	K	9.0	11.2	0.116	304				1975 Mar. 20, D. Evans, McDonald Observatory, Texas
77360	0852	G	L	5.2	7.2	0.0003		8.5	0.32	313	1972 Aug. 5, R. Nolthenius, Ramona, California
77421		V	T	9.2	13.1	1.3	214	8.8	29.9	63	A.D.S. 4277CD, A; to correct error
77423		V	T	9.5	9.7	0.4	114	9.2	29.9	243	A.D.S. 4277AB, C; to correct error
77926		P	X	8.6	9.9	0.039	272				1975 Jan. 25, J. Africano, McDonald Observatory, Texas
79953		T	V	8.5	9.5	0.3	270				1935; communicated by T. C. Van Flandern, USNO
92369	0194	P	V	8.6	9.1	0.024	252				1975 Jan. 20, J. Africano, McDonald Observatory, Texas
93288		T	V	9.3	9.7	0.3	78				1975 Mar. 17, N. Wieth-Knudsen, Tisvildelunde, Denmark
95988		P	K	9.3	10.2	0.021	163				1975 Feb. 22, J. Africano, McDonald Observatory, Texas
96427		T	K	9.0	9.0	0.05	115				1975 Mar. 21, N. Wieth-Knudsen, Tisvildelunde, Denmark
96561		P	K	8.8	11.2	0.077	317				1975 Jan. 26, J. Africano, McDonald Observatory, Texas
96646		P	K	9.2	11.0	0.071	262				1975 Jan. 26, J. Africano, McDonald Observatory, Texas
96687		P	V	8.8	9.4	0.045	84				1975 Jan. 26, J. Africano, McDonald Observatory, Texas
97120	1158	G	K	6.0	6.0	0.03	24				1975 Feb. 23, H. Povenmire, Sebastian, Florida
97953		P	V	8.7	10.0	0.049	311				1975 Feb. 24, J. Africano, McDonald Observatory, Texas
109666	0155	V	A	6.8	7.6	33.0	83				A.D.S. 903; to correct error
117837		P	K	9.0	10.2	0.029	249				1975 Feb. 25, J. Africano, McDonald Observatory, Texas
118150		P	K	8.2	10.5	0.252	320				1975 Mar. 25, J. Africano, McDonald Observatory, Texas
138830		G	X	8.1	8.1	0.1	212				1975 Jan. 4, D. Dunham, Four Corners, California
146307	3340	G	K	8.3	8.3	0.05	143				1974 Nov. 23, H. Povenmire, Rockledge, Florida
159654		V	C	9.0	13.4	2.9	17				Non-Aitken double listed in Lick Observatory I.D.S.
159691		V	C	9.0	13.2	2.1	199				Non-Aitken double listed in Lick Observatory I.D.S.
162065		T	X	9.5	10.5	1.0	46				1974 Oct. 21, C. Turk, Pinelands, South Africa
184077		V	C	9.0	11.2	10.1	156				Non-Aitken double listed in Lick Observatory I.D.S.
184125		V	C	8.2	12.7	1.9	231				Non-Aitken double listed in Lick Observatory I.D.S.