Occultation Newsletter

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Edited and Published by H. F. DaBoll at 6 N 106 White Oak Lane, St. Charles, Illinois 60174 U. S. A.

OCCULTATION OF KAPPA GEMINORUM BY EROS

David W. Dunham

J Meeus, Erps-Kwerps, Belgium, and M. Gaven, Worcester Park, England, have pointed out that the 3.7-magnitude star Kappa Geminorum (Z.C. 1170, spectral type G5) will be occulted by the minor planet 433 Eros on 1975 January 24.02 U.T. Predictions by Brian Marsden reported in I.A.U. Circular No. 2695 shows that the path will begin north of Fargo, North Dakota, pass 3/5 of the way from Minneapolis to Duluth, Minnesota; very close to Wausau and Green Bay, Wisconsin; near Lansing and Ann Arbor, Michigan; between Akron and Cleveland, Ohio; Near Pittsburgh, Pennsylvania; between Fredericksburg and Alexandria, Virginia; over Cape Charles, Virginia; over western Puerto Rico; about 50 km east of Caracas, Venezuela; across westernmost Brazil; and entering the Pacific about halfway between Lima and Arequipa, Peru. The estimated path uncertainty is 300 km, so the path might go over cities such as Minneapolis, Milwaukee, Detroit, Washington, Baltimore, Norfolk, San Juan, or Caracas. The path width is expected to be only about 15 km wide, with the occultation lasting perhaps as long as a tenth of a minute. An occultation of Kappa Geminorum's 8.2-magnitude companion (separaration 7".0 in p.a. 238°) will occur some 1000 to 1500 km farther east.

During the next few months, the position of the predicted path will likely be improved with recent observations. As it stands, there is only about 1 chance in 20 that an observer in the vicinity of the path will see the occultation. We should try to spread as big a net as possible in order to catch the event. We should coordinate plans by defining several parallel tracks at 5-km intervals (these could be plotted on aeronautical charts of 1:500,000 scale) and make plans to have observers within 1 km of each of these tracks. If possible, we should have a few observers along each track, separated by perhaps 200 miles along the track, due to the bad weather at that time of year. Clear areas in high pressure zones tend to be relatively small in January, but hopefully one set of observers will be in one. Each observer should be equipped with a portable short-wave radio and tape recorder, and hopefully a cheap, simple photometer (plans for which probably will be published in a future issue of *Sky and Telescope*) attached to a telescope in order to get an accurate record of the event. Since the event will be easily visible with binoculars, and even the naked eye, amateurs might publicize the event in their area, showing an all-sky map and inset of Gemini to show how to locate the star. Timings might be made by many people by recording a pre-selected AM broadcast station, which could be calibrated with a WWV master tape, as we often do for grazes. But even without timings, observations by many people in a metropolitan area could pinpoint the path, and determine the width of Eros perpendicular to the path, very accurately. A lot of coordination at the regional and local level will be needed to take full advantage of this unusual opportunity.

[Ed: As per phone conversation, David W. Dunham (Dept. of Astronomy, University of Texas, Austin, TX 78712) will be overall coordinator. Those interested in taking part should contact him, or their regional or local coordinator, if known. As of 30 Sept., the only such assignments are for the two northernmost regions: James H. Fox (8301 Isle Av. S., Cottage Grove, MN 55016) for the region from North Dakota to central Wisconsin; and Homer F. DaBoll (6 N 106 White Oak Ln., St. Charles, IL 60174) for the region roughly along the western side of Lake Michigan. Lower Michigan and Ohio probably will be the next region. A Pennsylvania to Virginia region might round-out coverage on the North American mainland.]

ABOUT THE NAME

We find ourselves in the embarrassing position of having promised something which now seems pointless.

A number of name suggestions have been submitted, which seems to imply that some subscribers would favor a name change. We thank those who submitted suggestions, and feel that some are very appropriate, and show considerable ingenuity. All names submitted, to date, are listed here. We leave it to you, to decide which suggestions were submitted seriously, and which with tongue in cheek.

"Occultation Newsletter", "The Occult Messenger", "The Graze Gazette", "The Hidden Star", "The Cloud", "The Tempest", "Curse of the Occult", "Now You See It, Now You Don't", "Star and Stopwatch", "The Shadow", "Grazing Times", "Vanishing Point", "Flash", "Blink", and "Clouded Contact".

However, we have received such a flood of negative comments about changing the name, that although there is not a total consensus, the weight of opinion seems to be so overbalanced toward retaining the original name that it is inconceivable that any other individual suggestion could win against "Occultation Newsletter". We are sure that we would only waste time, money, and postage by proceeding to a vote.

You will notice that our masthead has been redesigned. The version which appeared on Vol I, No. 1 represented our personal effort. The redesign is the work of the editor's father, Raymond F. DaBoll, a well-known designer and one of the World's foremost calligraphers.

PLANETARY OCCULTATIONS

Conducted by Mike Reynolds

Recent observations

1 March 1974 - Occultation of Mars by a 42% sunlit Moon. Another report has been received concerning the total occultation of Mars (See Vol I, No. 1 for earlier reports). R. Pike, Mississauga, Ontario, reports that he observed the second contact of Mars.

2 March 1974 - Occultation of Saturn by a 64% sunlit Moon. Three more reports have been received (See Vol I, No. 1 for earlier reports). D. Hall, Leicester, England, reports that he obtained timings of 1st and 2nd contacts of the ring system, 1st contact of ring B, and 1st and 2nd contacts of the ball. He also attempted to time the immersion of Titan. D. Lemay, Rimouski, Quebec, observed the total occultation thru thin clouds. D. Bohme, German Democratic Republic, observed all 4 contacts of the planet.

17 July 1974 - Occultation of Venus by a 6% sunlit Moon. The most spectacular planetary occultation of this year was marked by both good and bad weather. Some 30 reports have been submitted, mentioning 95 observers. Others should be listed, but their names were not given by the group leaders. Please send any additional reports of observations to either Dr. Dunham or me. Many observers attempted to time, photograph, or just watch the total occultation, which was described by many as the most impressive occultation they had ever seen. Observers reported seeing a bright glow seconds before

Venus' -3.4 magnitude disk began reappearing. Weather and low Moon altitude or interfering Sun altitude were problems for many observers, especially low Moon altitude for 1st and 2nd contacts. The majority of observers report that 3rd contact was easy to time. Following is a listing of observers who attempted to time, photograph, or observe the event.

Name	Home Location	Contacts	Instrument
Benjamin, B.	Peoria, IL	3	4 1/2" Refl
Bishop, R.	Avonport, N.S.	3,4	8" Refl
Blundell, B.	Manhasset, NY	2	6" Refl
Bolster, R.	Alexandria, VA	1,2,3,4	6.4" Mak
Brooks, J.	Chatham, VA	1,2,3,4	6" Refl
Brown, L.	Little Rock, AR	3,4	8" Cat
Carney, H.	Jacksonville, FL	3,4	6" Refl
Dickinson, W.	Norfolk, VA	1,4	8" Refl
Diedrich, D.	Elyria, OH	1,2,3	8" Refl
Dolan, G.	New Canaan, CT	Observer	(?)
Ervin, M.	Jacksonville, FL	Observer	3" Refr
Fellers, D.	Topeka, KS	Photographer	8" Celest
Fisher, J.	Little Rock, AR	3,4	6" Refl
Freyaldenhoven, C.	Little Rock, AR	3,4	6" Refl
Garber, G.	Norfolk, VA	2,3	2.4" Refr
Geisert, T.	Topeka, KS	Photographer	12" Refl
Green, D.	Boone, NC	Clouded-out	(?)
Green, F.	Wilmington, DE	1,3,4	3 1/2" Questar
Green, W.	Orlando, FL	Photographer	4" Refr/200 mm Tele
Griese, J.	New Canaan, CT	1,4	2.4" Refr
Harrington, P.	New Canaan, CT	Observer	(?)
Hays, R.	Chicago, IL	1,2,3,4	6" Refl
Henderson, R.	Farmington, IL	2,3	(?)
Hogan, G.	Jacksonville, FL	Observer	6" Refl
Keller, O.	Lebanon, PA	1,2,3,4	3 1/2" Refr
King, M.	Ferguson Cove, N.S.	1,2	3 1/2" Quest
Kloppenstein, J.	Atlantic Beach, FL	2,3	8" Refl
Koller, H.	Newarket, Ont.	1,2,3,4	3" Refr
Lemay, D.	Rimouski, Que.	Photographer	(?)
Moffitt, H.	Des Moines, IA	1,2	4 1/4" Refl
Mortfield, P.	Toronto, Ont.	Photographer	(?)
Nissen, W.	Arlington, VA	1,2,3	8" Celest
Osorio, J.	Portugal	1,2,3,4	4" Refr
Pike, R.	Mississauga, Ont.	1,2,3,4	6" Refr
Printy, T.	Jacksonville, FL	Observer	2.4" Refr
Ringler, G.	Cleveland, OH	1,2,3,4	6" Refl/2.4" Refr
Rose, M.	Jacksonville, FL	Observer	4 1/4" Refl
Roscoe, M.	Jacksonville, FL	3,4	6" Refl
Sharpe, D.	Satellite Beach, FL	Obs. thru clouds	(?)
Sherrod, C.	Little Rock, AR	3,4	6" Refl
Simmons, K.	Jacksonville, FL	3,4	6" Refl
Sisson, D.	Jacksonville, FL	3,4	6" Refl
Slabinski, V.	Arlington, VA	2	6" Refr
Stein, W.	Bloomington, IN	2,4	6" Refl
Sweetsir, R.	Jacksonville, FL	3,4	8" Schmidt-Cass
Sullivan, C.	Hagerstown, MD	Observer	(?)
Talbert, D.	Greensboro, NC	3,4	(?)
Van Zandt, R.	Peoria, IL	1,2,3,4	9" Refr
Webber, A.	Chadds Ford, PA	1,3	10" Refl
Warren, W.	Bloomington, IN	2,3	4" Refr
Wilds, R.	Topeka, KS	3	4 1/2" Refl
Winder, R.	Niagara Falls, Ont.	Photographer	(?)
Wolters, D.	Jacksonville, FL	3,4	2.4" Refr
Young, W.	Arlington, VA	2,3	8" Schmidt-Cass

In the listing, "Observer" indicates no attempt or an unsuccessful attempt to make timings. Altogether, 95 contact timings have been reported, with 54 observers listed in the table.

The partial occultation of Venus was the object of an all-out effort by many observers, but weather laid a foul hand upon many expeditions. The only successful observation was made by N. P. Wieth-Knudsen, with his wife's assistance, at Sävsjön, Sweden. They report that they observed about 50-75% of the occultation, the rest being obscured by clouds. G. Nash, Dorset, England, reports that he and a group of observers travelled to Ojþvik, Norway, but were caught by lousy weather. In the United States, where the event was considered more favorable because of the Sun altitude, there were several expeditions attempted. D. Harvey, Omaha, NE and J. Kloeppel, Sioux City, IA, both attempted the graze near the Nebraska-Iowa border, but were foiled by a narrow band of clouds in an otherwise clear sky. H. DaBoll, St. Charles, IL led an expedition at Sundell, MI, which included J. Phelps, Calumet Park, IL and J. Zoda, Maple Park, IL. Mr. DaBoll reports that they enjoyed the dry and relatively mosquito-free interior of their car while watching for non-existent breaks in the cloud cover. The major expedition was led by J. Fox, Cottage Grove, MN. It included 22 timing stations near Osseo, WI, and a sub-group of 6 timing stations, under D. Dunham, Austin, TX, about 15 miles farther east, near Fairchild, plus many other observers, not named here, who planned to photograph, or just watch. In the Osseo group were D. Barnes, (Twin Cities) MN; D. Church, Schaumburg, IL; A. Drabik, Lockport, IL; J. Fox; R. Hill, Greensboro, NC; T. Hise, Cedar Rapids, IA; J. Hoff, St. Paul, MN; L. Jahn, Naperville, IL; G. Jallen, St. Paul, MN; D. Joyce, Chicago, IL; D. Junek, St. Paul, MN; L. Loper, Merritt Island, FL; F. Olsen, Cedar Rapids, IA; E. Peiffer, St. Paul, MN; H. Povenmire, Indian Harbor Beach, FL; P. Raimondi, Naperville, IL; M. Reynolds, Jacksonville, FL; B. Stevens, Chicago, IL; J. Stewart, (not known); D. Tate, St. Paul, MN; D. Tweet, (Twin Cities) MN; and C. Vaughn, Jacksonville, FL. The best that can be said about the weather at Osseo is that some stations did see a hint of where the Moon was. The group at Fairchild consisted of E. Bram, St. Louis, MO; D. Dunham; S. Griffith, San Antonio, TX; B. Labadie, Tulsa, OK; D. Ray, San Antonio, TX; and M. Stone, Kirkwood, MO. At Fairchild, Venus and the Moon were seen for about 2 minutes, but only between 3rd and 4th contacts, so no timings were obtained. So, it appears that the cloud layer extended along the graze path. Once again, if you have not sent in your data for this event to either Dr. Dunham or me, please feel free to do so.

Upcoming Planetary Occultations

16 October 1974 - Occultation of Mercury by a 2% sunlit Moon. The closest planet to the Sun will be occulted by the Moon, near noon, on Wednesday, October 16th, for observers in the southwestern United States. The 2%

sunlit Moon will be only 17° east of the Sun and probably not visible in the daylight. Mercury will be of magnitude +0.1, with a 9" disk, 20% of that disk illuminated. Mercury might be located with setting circles, using the R.A. and dec. differences from the Sun (1^h 01^m east, 8°8 south), or by pointing to stars the night before the event, as was done for a daytime graze of Jupiter (*Sky and Telescope*, Oct. 1965, p. 250). The telescope mount should be fixed, or the leg positions well preserved. The star should be located and the mount fixed, by either masking tape or marking pencil. Three possibilities listed next column; the best possibility is Theta Capricorni:

Star	Mag	Solar Time Difference	Mercury will be
β Ceti	4.6	14^h 22^m	0°2 south
δ Aquarii	3.5	15 30	1.8 south
θ Cap.	4.2	17 19	0.4 south

However, observers on the west coast will not be able to use Theta Capricorni, as the Sun will still be above the horizon 17^h 19^m before Mercury disappears.

Circumstances of the occultation at five locations are given in the following table, and can also be found in the *Sky and Telescope* Occultation Supplement:

STATION	PHEN.	U.T.	a	b	P.A.	DUR.
Oregon	D	18^h 23.2^m	—	—	45°	54^s
(121.0 W, 42.5 N)	R	18 48.5	—	—	3	55
N. California	D	18 09.0	-1.9	+1.9	69	28
(122.0 W, 38.0 N)	R	18 58.1	-0.4	-1.5	340	30
California	D	18 09.3	-2.0	+1.7	72	27
(120.0 W, 36.0 N)	R	19 02.1	-0.6	-1.5	338	29
S. California	D	18 10.8	-2.0	+1.4	77	26
(117.0 W, 33.0 N)	R	19 08.8	-0.8	-1.6	334	28
Ariz.-N. Mex.	D	18 33.8	—	—	53	46
(109.0 W, 34.0 N)	R	19 10.6	—	—	357	48

Note: DUR. is the time required for Mercury's disk to disappear or reappear. Since the planet is crescent, the full disk cannot be seen, and the events will actually take only about 2/3 of this predicted time.

The northern limit of the occultation passes 12 miles southwest of Portland, Oregon (18:29 U.T.); 100 miles southwest of Salt Lake City, Utah (18:47); 30 miles northeast of Albuquerque, New Mexico (18:57); 15 miles northeast of San Angelo, Texas (19:10); 5 miles southwest of Austin, Texas (19:16); and 60 miles southwest of Houston, Texas (19:22). In a 15-mile-wide strip centered on this line, Mercury will be partially occulted. Predictions are available from David W. Dunham

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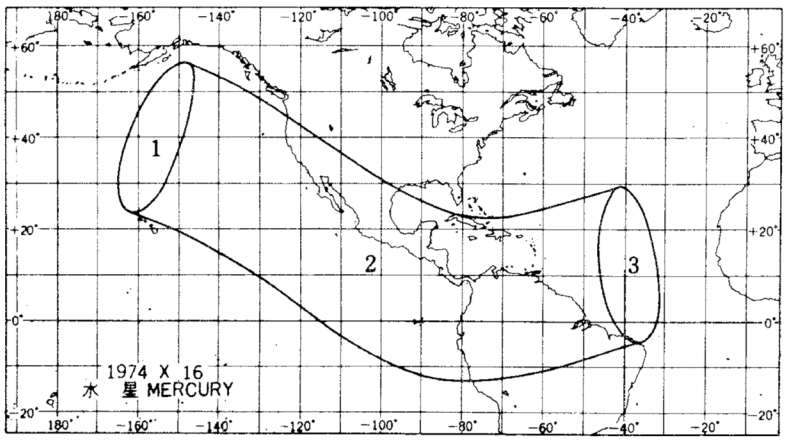
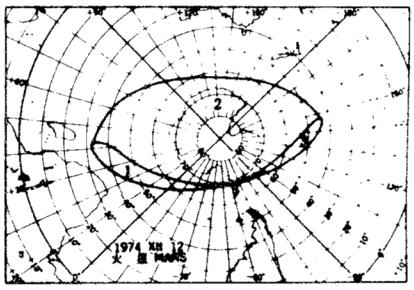
The occultation will also be visible from Mexico, the Caribbean (except the Bahamas), and northern South America (the event occurs after sundown in a small area of northeastern Brazil).

Observers are advised to try to observe the event from a shaded area, e.g., a porch, where the Sun will be to your back and the telescope in the shade, if possible. A large instrument with a long focal length is also advisable. If you attempt either the total or partial occultation, we would like to hear of your results, good or bad. This will be valuable for planning of next year's occultation of Mercury. Please include names and home cities of all team members, number of events timed, etc.



Path of Occultation of Mercury - 16 October 1974

In region 1, only the reappearance will be visible.
In region 2, both the disappearance and the reappearance will be visible.
In region 3, only the disappearance will be visible.
(Reprinted by permission from the Japanese Ephemeris 1974, published by the Hydrological Department of Japan)



An occultation of Mars will occur on 12 December 1974, at about 6^h U.T., being visible from Antarctica. The partial occultation will not be visible from any major land mass.

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NEW DOUBLE STARS

David W. Dunham

The table lists additions and corrections to the University of Texas double star list of 1974 May 9 not listed in the July issue. No double stars are known to have been discovered during occultations since last May, and most of the entries involve corrections based on visual observations provided by Paul Couteau, Chairman of the I.A.U. Commission on Double Stars, at Nice Observatory, France, or obtained by Wilson at Flower and Cook Observatory. Visual data are available for nine stars which were "discovered" during occultations; these should generally be better than the one-dimensional occultation data. However, the magnitudes deduced from photoelectric occultation records should be superior to the visual estimates, so the former have been retained in appropriate cases. As a consequence, the "primary" for the SAO 98132 became the secondary, so that 180° has been added to the visual p.a. One fairly wide and doubtful occultation double is probably a single star, according to the visual observations made with the 50 cm refractor at Nice. Four other stars in the 1974 May list were observed to be single at Nice (SAO 75867, 76920, 79164, and 97881), but could be double because the separation deduced from the occultation was overestimated. This is especially possible during grazing occultations. Original records were consulted in making decisions for these cases. The phenomena described for SAO 76920 sound more like a near-graze than a double, but a close double could enhance the phenomena seen. A position angle was not listed, but presumably the event was a near graze with a separation too small to resolve directly. For SAO 97881, the observer estimated 0^{s}2 between steps and did not quote the p.a., so the separation could be under 0".1.

An updated version of the full list is not yet ready, but will be distributed either with the third issue of this newsletter or before. In the table, abbreviations are the same as in the first issue, with the following changes and additions: Under M (method), V = visual double star observation and T = visual total occultation (rather than V). Under N (new double star code), blank = single; A = visual double noted by Aitken or Burnham; and C = visual double noted by Couteau, Innes, or others. Journal references are given when available. MNRAS refers to Mon. Not. Roy. Astr. Soc. 61, 414 (1901). This article notes that Delta Scorpii "Glided, took 0^{s}4 to disappear" as seen at the Cape Observatory, South Africa, on 1899 July 18. So neither R. Nolthenius nor R. Brown et al. were the first to see evidence of this star's non-spectroscopic companion. Couteau's references are all in the A. & A. Supp. Series, volume and page numbers given after his name. Wilson refers to Univ. Penns. Astr. Ser. VI. IV. (1941). A search of a small part of Couteau's lists and the early South African occultation records turned up a few of the entries on the list, indicating that future thorough searches could be quite fruitful.

[Note added in press: The table shows the status of SAO 146239 (Z.C. 3326) as being changed from double to single. Late word from David Dunham indicates that very recent photoelectric observation shows that the star is definitely double, with a separation of about 0".07.]

NEW UNIVERSITY OF TEXAS SPECIAL DOUBLE STARS, DATE 1974 SEPTEMBER 18

SAO	ZC	M	N	MG1	MAG2	SEP	PA	MAG3	SEP3	PA3	REFERENCE OR DATE, DISCOVERER, NOTES
75542		T	X	9.3	10.3	0.7	250				1972 Jan. 24, R. Nolthenius, Tucson, AZ
75867		G	X	9.2	9.7	0.05	10				1972, R. Nolthenius, AZ
75886	0486	T	L	5.4	7.9	0.15	38	7.9	0.20	38	J.B.A.A. 3, 187 (1893 Jan. 26, J. Tebbutt, Winsor, N.S.W.)
76152		V	C	8.4	10.1	0.26	4				Couteau 6, 179 (1970 Dec.)
76333		V									Couteau (1968 Nov. 19)
76499		T	X	7.3	10.5	0.3	125				1973 Apr. 7, H. DaBoll, St. Charles, IL
76729		T	X	8.6	8.6	0.1	90				1974 Mar. 1, Kirby, Weymouth, England (G. Kirby)
76814		T	K	8.5	8.5	0.1	80				1974 Mar. 2, D. Sharp, Satellite Beach, FL
76920	0752	T	K	5.4	5.4	0.1	0				J.B.A.A. 83, 358 (1956, V. A. Firsoff)
76954	0761	V	A	6.5	7.5	0.51	158				Burnham's Catalogue
77184	0817	T	T	5.6	5.6	0.1	90	10.9	37.8	348	MNRAS (1901 Feb. 26, R. Innes, Cape); A.D.S. 4048
77221		V	C	8.8	9.4	0.35	146				Couteau 6, 179 (1970 Dec.)
77410		T	K	9.4	9.4	0.06	140				1974 Mar. 30. D. Sharp, Satellite Beach, FL
77776		V	C	8.1	9.0	0.16	190				Couteau, 12, 141 (1972 Nov.)
78862		V	C	8.7	11.3	0.82	256				Couteau 15, 254 (1973 Jan.)
78970		V	C	9.5	9.9	0.77	249				Couteau, 15, 254 (1973 Jan.)
79164		G	X	8.1	8.5	0.1	21				1970 Apr. 13, D. Dunham, Palisades, NY
79558	1152	T	X	7.7	7.7	0.1	87				1972 Jun. 13, M. Overbeek, Glendower, South Africa
79804		V	C	8.0	8.7	0.18	33				Couteau, 12, 143 (1973 Jan.)
80491	1329	V	C	7.3	7.9	0.17	30				Couteau, 10, 275 (1972 Feb.)
80666	1363	V	C	5.7	6.2	0.25	62				Wilson (1937 Apr.)
80674	1365	V	C	6.9	6.9	0.10	107				Wilson (1940 Jan.)
92727		T	K	9.3	9.6	0.7	40				1972 Mar. 18, D. Dunham, Austin, TX
95419	0944	V	C	6.2	6.2	0.27	137				Wilson (1934 Aug., G. Kuiper, Lick Observatory, CA)
97724		V	C	9.6	9.6	0.15	30				Couteau 15, 254 (1973 Jan.)
97813		V	C	9.4	10.0	0.88	31				Couteau 15, 254 (1973 Feb.)
97881	1275	T	X	6.4	6.4	0.1	100				MNRAS (1898 Apr., D. Gill, Cape, South Africa)
98132		V	C	10.0	10.1	0.33	224				Couteau, 15, 254 (1973 Mar.)
98267	1341	T	Y	5.0	5.0	0.1	101	11.8	11.3	325	1974 May 26, G. Kirby, Weymouth, England; A.D.S. 7115
98357		T	X	10.7	10.7	0.4	90				MNRAS (1898 May 26, D. Gill, Cape, South Africa)
98955	1484	V	C	4.1	4.6	0.10	93				Wilson (1940 Jan.)
118355	1547	V	C	4.4	4.8	0.11	86				Wilson (1940 Jan.)
118454		T	X	9.2	9.2	0.1	116				1972 Jul. 14, M. Overbeek, Glendower, South Africa
139544	1973	V	C	6.6	7.6	0.39	262				Wilson (1936 Jan., G. Kuiper, Lick Observatory, CA)
146239	3326	G									1973 Dec., H. Povenmire, FL; 1974 Apr., R. Binzel, OH
163998		T	X	9.3	10.0	0.21	310				1971 Nov. 24, R. Nolthenius, Tucson, AZ
186328	2617	V	K	5.1	5.9	0.26	12				Wilson (1937 May; doubtful)
187239	2721	V	X	4.1	4.1	0.13	27				Wilson (1937 May; some doubt)

GRAZES OBSERVED IN 1974 REPORTED TO THE UNIVERSITY OF TEXAS

David W. Dunham

Reports of 1974 expeditions not published in the first issue are listed here. The format is the same as for the first list, except for the reduction in size. Timings of 2nd and 3rd contacts during partial occultations and total solar eclipses (when observed near the edge of the path, like a graze; also including Bailey's beads events) are counted. "PLE" under the % Snl column indicates that the event was observed during a partial lunar eclipse.

Some important errors in Watts' data were noted during grazes observed in August. During the graze of ZC 634 on the 12th, the mountain at Watts angle 183° did not exist, being at least 1" lower than predicted, at that latitude libration. The same mountain was not seen during the graze of ZC 2779 on March 17th, at only slightly different librations. The mountain did apparently make a strong showing during the graze of ZC 969 on the 14th, when the latitude libration had increased considerably out of the Cassini edge region, but the 2" high mountain at W.A. 180°5 was not there. The 180°5 mountain apparently was present, and sunlit, as predicted, on the 12th, but the latitude libration increased 2°5 during the two days, altering the profile, especially the mountain in question, considerably. The large north shift observed during the Cassini-region graze of ZC 984 the same night might have ruined the July 17th partial occultation of Venus as seen from the United States, if it had not been cloudy; circumstances were rather similar for the two events.

Herald's observations of numerous Bailey's beads events made his eclipse trip the most successful graze on the list. In spite of an automobile accident, the June 14th expedition was the most successful one for a distant star, in terms of number of timings. The August 14th expedition in California had the largest number of observers. At Manhattan, Illinois, on August 12th, the Sun's altitude was +1°8 at central graze, but the 5.3-mag. star was easily seen, except when in contact with sunlit lunar mountains. Seven minutes after the graze, the star was still fairly easy to follow.

1974 Mo	Dy	Star Number	Mag	% Snl		CA	Location	# Sta	# Tm	C	Ap cm	Organizer	St	WA	b
1	12	1587	6.0	80-		S	Mayport, Florida	3	2	2	15	Michael Reynolds			
1	27	Z24524	9.0	11+		3S	Red Rock, Ariz.	1	11		15	Richard Nolthenius			
2	17	Z18744	7.6	19-		S	Kingsland, GA	3	2	2	15	Michael Reynolds			
3	1	Mars	1.1	41+	-9S		Lumberton, N. Car.	6	12	7	10	Michael Reynolds			
3	27	0411	7.3	12+		N	Nogales, Arizona	1	7		15	Richard Nolthenius			
4	13	Z19187	8.5	61-	-1S		Catalina, Ariz.	1	1		15	Richard Nolthenius			
4	13	2775	7.6	58-			Canberra, Austrl.	1	0		6	M. Taylor			
4	15	Z22070	7.8	39-			Canberra, Austrl.	1	4	8	6	M. Taylor			
4	25	Z03626	8.3	8+	15N		Los Angeles, Tex.	3	13	6	15	David Dunham	2N	15	-12
6	4	Z16065	8.8	PLE		N	Randburg, South Africa	1	3		20	Jan Hers			
6	14	0051	7.2	36-		N	Oasis, California	3	28		13	Bob Fischer			
6	18	0599	4.5	4-		5N	Palm Bay, Florida	2	8	7	10	Michael Reynolds			
6	20	Sun	-27.	0		N	Quininup, Western Australia	1	65	9	6	David Herald	6N	13	2
6	20	Sun	-27.	0		N	Albany, Western Australia	4	4	9		S. E. Williams	6N	13	2
6	22	1219	7.7	7+		N	Goulburn, Australia	2	5	5	10	A. Hume			
7	1	2290	2.5	90+	-7N		Santa Polonia, Mexico	4	5	6	6	David Dunham	8N	348	26
7	1	2290	2.5	90+	-10N		Midway, Georgia	1	1	4	15	Michael Reynolds		345	26
7	17	Venus	-3.4	6-	-12N		Sävsjön, Sweden	1	4		6	N. Wieth-Knudsen		11	14
7	23	1629	6.8	18+	-1N		Barbarosa, Texas	4	6	7	10	Steven Griffith			
8	10	Z02028	7.7	57-	8N		Mango, Florida	1	2	8	20	Thomas Campbell			
8	11	0465	4.5	48-	1N		Northglenn, Colo.	2	10	4	15	Derald Nye			
8	11	0485	6.9	46-	4N		Centralia, Kans.	2	8	8	15	Richard Wilds		0358	-24
8	11	0487	5.2	46-	4N		Hermosa, Texas	5	27	8	6	David Dunham	3S	358	-25
8	12	Z03541	8.3	35-	5N		Orangeville, Miss.	1	10	9	15	Robert Gardner			
8	12	0634	5.3	35-	-3S		Richland, Kansas	4	14	8	30	Richard Wilds	5N	180	-9
8	12	0634	5.3	35-	-1S		Manhattan, Ill.	3	3	5	15	Homer DaBoll		181	-9
8	13	0792	5.1	25-	-1S		Cambridge, Minn.	1	4	8	11	Don Tate		180	8
8	14	0969	7.1	16-	1S		Franklinville, IL	4	5	7	30	Homer DaBoll		181	24
8	14	0984	5.6	15-	1N		Adelanto, Calif.	7	14			Bob Fischer	C1	3N359	24
8	14	0984	6.6	15-	0N		Searchlight, Nev.	2	7	8	8	Walter Morgan		359	24
8	25	Z15588	7.5	54+	8S		Raisin, Texas	1	8	7	20	Don Stockbauer		0170	18
8	27	2615	8.3	73+	9S		San Xavier, Ariz.	1	7	7	15	Richard Nolthenius			
8	28	Z19712	8.8	82+	18S		Lakeside, Calif.	1	4		25	Keith Horne			
9	7	0446	8.0	72-	6N		Creedmoor, Texas	1	1	4	25	David Dunham	2N	355	-26
9	9	Z04052	8.6	50-	3N		Red Rock, Arizona	1	5		15	Richard Nolthenius			
9	11	Z06686	8.3	29-	2S		Meriden, Conn.	1	6	9	20	Edward Wetherbee			
9	12	1198	6.2	19-	3S		Port Penn, Del.	1	2		9	Frank Green			
9	12	Z08055	8.1	19-	4S		Temple Ter., Fla.	1	8	8	20	Thomas Campbell		182	46
9	13	Z09086	8.5	10-	4S		Boone, N. Car.	1	5	5	20	Daniel Green			

SOME OBSERVING HINTS

Thomas H. Campbell, Jr.

I would like to share some knowledge of two types of WWV time signal receivers with other observers. Enclosed are some clippings from recent Radio Shack catalogs [Ed: not reproduced here]. I'm not trying to sell anyone on their products, but I don't think any other manufacturer can beat their price. I own both types of the receivers shown. The "Timekube" works great; it is sensitive and works very satisfactorily with its own built-in antenna. I have used it on all of my expeditions since June 1974.[Ed: The "Timekube ad shows a unit only 3 1/8" by 4 1/2" by 3 1/2"; 10-section telescoping antenna; 3 crystal-controlled WWV frequencies, 5, 10, and 15 MHz; including crystals, battery, operating manual; cat. # 12-169 @ $49.95]

The less expensive WWV converter works reasonably well with a 6-foot or longer antenna. It is not as sensitive as the "Timekube", and poor radio propagation will result in a loss of signal. I would say that it will bring in WWV 90% of the time. The converter picks up the 10 MHz signal and converts it to 1630 KHz, which can be picked up by a portable AM broadcast band receiver placed nearby. [Ed: The converter is sold in kit form, not including battery; cat. # 28-133 @ $5.95] A simple modification, adding 2 extra crystals, a 3-position wafer switch, and 2 tuning coils, will enable the converter to pick up WWV on 5, 10, and 15 MHz. The extra parts needed can be purchased for about $20 more, including a 6-foot whip antenna, a plastic box to enclose the AM radio with the converter, an on-off swich, etc.

[Another note from Mr. Campbell reports an unusual observation during the 1974 Sept. 12 graze of Z08055, which is included in this issue's list] "The interesting thing about this one was that I was in my own back yard, 3.1 miles inside the limit, and got 10 event times. Duration was 7 1/2 minutes. 3 close events at beginning, 7 events near end of graze."

THE TWELVE MOST SUCCESSFULLY-OBSERVED GRAZES

David W. Dunham

The twelve most successfully-observed and reported grazing occultations are listed in the table to the best of my knowledge. Under "Place" and "Organizer", expeditions are listed in the order of the number of timings they contributed to the total. The Iota Capricorni expedition led by Povenmire is the most successful single expedition. No grazes observed during 1974 have made the top dozen.

Rank	Timings	Date	Star	Place(s)	Organizer(s)
1	310	1973 Feb. 10	Merope	Houston, Texas Manor, Texas Islamorda, Fla.	Paul Maley Scott Killen Harold Povenmire
2	235	1970 Dec. 4	Iota Capricorni	Titusville, Fla.	Harold Povenmire
3	173	1973 Oct. 21	16 Sextantis	Phelan, Calif. Hext, Texas McMillan Mine, AZ Odessa, Texas	Robert Fischer David Dunham Richard Nolthenius Tom McNeal
4	153	1971 Oct. 26	Psi Sagittarii	St. Augustine, FL " " " Dunnellon, Fla.	Michael Reynolds Harold Povenmire Everett Randall
5	145	1972 Feb. 20	Z.C. 483	Sun City, Calif. " " " Globe, Arizona Algerita, Texas Homestead, Fla. Salado, Texas Conroe, Texas	Robert Fischer Clifford Holmes Richard Nolthenius David Dunham Harold Povenmire Michael McCants R. Jordon
6	135	1970 Oct. 24	Nu Leonis	Westmoreland, CA	Robert Fischer
7	134	1973 Oct. 1	32 B. Scorpii	Helendale, Calif.	Robert Fischer
8	105	1971 Oct. 28	Theta Capricorni	Malabar, Florida Tampa, Florida	Harold Povenmire Everett Randall
9	101	1970 Mar. 28	Tau Scorpii	China Lake, CA Barstow, Calif. Dixon, Calif. Lodi, California Newberry, Calif.	James McMahon Robert Fischer Garth Alton Trudy Bell James Little
10	96	1966 Sept. 10	Z.C. 1089	Black Creek, Wis.	Edward Halbach
11	92	1972 Aug. 5	125 Tauri	Ramona, Calif.	Robert Fischer
12	83	1970 Aug. 22	26 Arietis	Kane Springs, CA Chugwater, Wyo.	Robert Fischer Robert Sandy

SEVERAL MISCELLANEOUS ITEMS

David W. Dunham

In bulletin number 111 issued by the National Bureau of Standards, a proposal is made to reduce the radiated power of WWVH from 10 to 5 kilowatts on 5, 10, and 15 MHz in order to conserve energy and money. I feel there are better ways to conserve energy. Observers around the Pacific Ocean who will be adversely affected by this are encouraged to complain to: National Bureau of Standards; Frequency-Time Broadcast Services Section - 273.02; Boulder, Colorado 80302, U.S.A.

Observers in the central and western Pacific areas should watch for occultations of a few bright Hyades stars, and many faint stars, during the November 29th total lunar eclipse (E.T. of contacts: I, 13:29.3; II, 14:35.8; III, 15:52.4; IV, 16:58.9). Data for predicting occultations of non-SAO stars may be available later from George Haysler, Austin. Predictions for SAO stars occulted during the eclipse are included in the U.S.N.O. total occultation lists. Lunar features can be used to locate reappearing stars during the eclipse. Subtract 259° from predicted p.a.'s to find the selenodetic latitude of the point of emersion on the Moon's west limb.

The policy for graze predictions described on p. 5 of O.G.O.-VIII has been extended slightly to include observers who have returned the old information forms during the past two years, or the form sent to B-region observers in April. Predictions will expire at the end of the quarter containing the date of the information form plus two years. The month of expiration has already been indicated on many graze prediction address labels.

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. Work on the keypunching of the observations has been delayed, but a notice giving details will be sent to computors soon.

Thomas Campbell (temple Terrace, FL) reports that the reappearance of SAO 79100 from behind the rings of Saturn occurred at $9^{h}\ 32^{m}\ 14\overset{s}{.}5$ U.T. on August 29, as seen with the 26" Schmidt-Cassegrain at the University of South Florida. Any observations of this event should be reported to HMNAO.

One observer asked if a single observer's observations within a graze zone are of any value. Certainly; one is better than none! Only one observer is needed to spot serious prediction errors and determine the relative ecliptic latitudes of the star and Moon's limb to 0".1 or better. This accuracy is significantly increased by two or more (the more the better) observers.

Another observer questioned the value of timings of occultations of planets. At present, such observations are not being used. But occultation observations provide a way to overcome the problem of irradiation, which seriously affects the accuracy of meridian circle observations of the planets. As the lunar ephemeris and limb are pinned down better, lunar occultations of planets might be used to improve the ephemerides of the planets.

Another question was whether *Occultation Newsletter* qualifies as a professional journal for income tax purposes. I suppose that it could for those whose profession involves occultations.

Many observers did not receive the first issue of *Occultation Newsletter*, O.G.O.-VIII, etc., until late in August. This, combined with late vacations means that observer information forms are still (mid-September) being received. This, combined with the press of other duties, has made me decide to wait for the third issue to publish a list of the 1973 total occultation counts reported on the forms.

The funding problems mentioned in O.G.O.-VIII have become worse than expected. Starting in October, I will be receiving only half-salary, and am looking for employment elsewhere, in case the situation does not improve at the beginning of 1975. If I leave Austin, probably no graze predictions will be computed there, and in addition to the cutbacks described in O.G.O.-VIII, it will probably be necessary to compute graze predictions only for those who indicated that they will predominantly lead expeditions (this might be avoided if two or more new computors become operational). If our graze grant, due to be decided upon in December, is approved, the project will continue and expand, but if not, we should seriously think of a name for a formal occultation organization. There does seem to be enough interest in such an organization to pay expenses such as publications and postage for graze predictions. There has been one favorable development; a student has been assigned to work with me on expanding the University of Texas double star list to include all zodiacal SAO visual doubles, for his senior project.

IN MEMORIAM

Occultation observer Melvin Helms, of Oklahoma City, OK, passed away in September 1973. We extend our sympathy to Mrs. Helms for her loss, and our thanks to her for the contribution in memory of her husband.

THE REMOTE OCULAR TECHNIQUE

Under date of September 22, 1974, James H. Fox, Cottage Grove, MN, writes: "Les Buege, St. Paul, MN, should be credited for this idea. Saturday was my first time to verify the method on a graze, although I have used it on totals before:

Using a low-power, wide-field eyepiece, the star can be isolated from lunar glare by moving the eye back behind the exit pupil of the eyepiece. This is particularly useful when the Moon is [gibbous]. The wide field allows the star to be tracked thru the field by moving the eye behind the exit pupil."

Early in 1968, Edward Halbach, Milwaukee, WI, showed us how he likes to track a star during a graze, with his eye as much as 12 inches back of the *normal* eyepiece on a telescope *with a clock drive*. Since then, without a clock drive, we frequently have used the technique successfully for difficult disappearances, but would be reluctant to use it for grazes or reappearances, unless the earthlit limb were visible.

ERRATA

In Vol I, No. 1:

Page 3, col. 2, line 1 should read;
er observed the Saturn occultation in

Page 10, col. 1, line 2 should read;
mean longitude of $(-37\pm5)'' T^2$

Page 10, col. 1, line 18 should read;
(which are independent of $\dot{G}$) must

Page 10, col. 1, line 23 should read;
implies $\dot{G}/G=(-0.9\pm0.3)\times10^{-10}$/yr.

Page 10, col.2, line 21 should read;
J. Veverka, L. Wasserman, and C. Sagan

ON OBSERVING REAPPEARANCES

Bob Bailey, Houston, Texas, writes "I would like to see articles on techniques of observing occultations, particularly reappearances. I have a few ideas about that, myself, but would like to know what techniques others use to locate the point of reappearance."

Answers to this note will fit in with our stated objectives #3 and #5 as outlined in Vol I, No. 1. While we always welcome contributions having to do with observing techniques, we now make a special request for notes on observing reappearances, for publication in the near future.

To help locate the dark limb during the gibbous phase, try using an ocular of such power that the lunar disk almost fills the apparent field. First, center the disk in the field, and judge, by cusp angle, where the star will reappear, and how far and in which direction the image of the terminator must be displaced in order for the reappearance point to be centered. Maintain the latter view until the reappearance occurs.

Large observatory instruments may have accurate coordinate readouts, in which case, simply set to the coordinates of the star, and wait for reappearance somewhere near the crosshairs. It may be necessary to calibrate the readout to coordinates of the current epoch.

As some of David Dunham's earlier papers bear directly on the subject, we quote from them, with his permission. Wherever the term "axis angle" was originally used, we have substituted the term "Watts angle", as it is now the quantity provided in the predictions.

From ADDITIONAL NOTES (O.G.O.-II), August, 1964:

James McCullough in Pomfret, Connecticut, also suggests that the problem of measuring the position angle can be solved rather easily at the telescope, if it is equatorially mounted, by swinging the scope north-south and watching the Moon on a cross-wire. A right-angle eyepiece holder makes observing more comfortable, and by taping a piece of paper around the 90° holder and marking it in degrees, the position angle can be measured directly at the telescope by rotating the 90° holder and watching the cross wire in the eyepiece.

From NEW OCCULTATION PREDICTIONS - IV, 10 July 1968:

. . . one reappearance timing is therefore worth about ten disappearance timings. . . . If the telescope has a good clock drive and an eyepiece with crosshairs, the star can be centered near the center of the field before the disappearance and tracked until it reappears. Observers with equatorially-mounted telescopes can use the position angle if they have some way to measure angles at the eyepiece. The telescope can be clamped in declination and moved in R.A. to determine the east-west direction [Ed: If it is a portable mount, and if you have the time, let a star drift thru the field to determine the east-west direction].

Walter Fellows . . . put a translucent piece of paper in the focal plane of one of his eyepieces. A circle is drawn on the paper which has about the mean angular diameter of the Moon, with radial lines drawn for measuring angles. There is a circular hole in the paper at the intersection of one of the radial lines and the circle. The Moon's outline can be seen on the circle. The eyepiece is then rotated so that the hole is at the predicted P.A. [Ed: or C.A.] of reappearance. [For a fuller discussion, see the article, W. Fellows, "A Fixed-Eyepiece Refractor with Heated Observatory", Sky and Telescope 41, 310. (May 1971)]

If an observer has no mechanical way to determine the location of an emerging star, the *Watts*, cusp, or vertex angles are most useful. I find that the *Watts* angle, which can be used to tell where, on a map of the Moon's near side, the star will reappear, is most useful, at the following times, when features near the limb are visible: when the waning Moon is greater than 80% sunlit (because the terminator is not far from the dark limb); when the waning Moon is less than about 40% sunlit (so that the features are visible by earthshine); when the Moon is in eclipse; and whenever emersions occur on the bright limb. The following is approximately true for *Watts* angles between about 210° and 330° when the Moon is gibbous, so that features at the terminator must be used: the latitude libration should be added to the predicted latitude where the star is expected to reappear on the Moon's disk, so that if the lat. libration is -6, the star will reappear about 6° south of the latitude predicted from the *Watts* angle alone. [Ed: Negative latitude libration lets us see farther around the Moon's southern limb, and apparently displaces all features northward, so we must look near a feature which is farther south, i.e., at a numerically smaller Watts angle on our map, for a star at the west limb, than if the libration were zero.] During the other waning phases (80% to 40% sunlit), the cusp angle must generally be used, and can be used fairly successfully since the cusp is then well-defined. If the occultation occurs close to the cusp during any of the waning crescent phases, the cusp angle is then usually the best guide. The vertex angle can be used only with refractors [Ed: substitute "telescopes such as classical Cassegrains and refractors, used with mid-star diagonals"], but can be useful when the dark limb is visible by earthshine, especially when the angle is near 0°, 90°, 180°, or 270°.

SATELLITE AND AIRCRAFT PHOTOS FOR RECONNAISSANCE USE

We have received a note from Thomas H. Campbell, Jr., further annotated by David W. Dunham. Mr. Campbell writes:

ERTS I Satellite, Skylab, Apollo, and Gemini, and aerial photos are available to the public. These high-resolution photos can be ordered for almost any area and scale, in black & white or color composites. These photos are highly useful to aid in scouting for a graze site. Since most topographic maps are old editions, they don't show new developments that might make a site unfavorable. For more details, write to Miss Frederika A. Simon; EROS Data Center; 10th & Dakota Ave.; Sioux Falls, SD 57198. Enclose $1.25 for standard U.S. catalog. Tell her your application for the photos, and you will be assigned a reference number for all future correspondence.

Dr. Dunham adds:

Detailed aerial photography is often available via U.S.G.S., which may be more recent than available maps, but probably not as recent as satellite photography, whose scale generally precludes accurate positioning.

FROM THE PUBLISHER

The 3-column, reduced type size format will not necessarily be used in each issue, but will depend on how much contributed material is received for a particular issue. In current economic conditions, we cannot publish four issues of more than 10 pages without raising the subscription price, at today's circulation level. When and if an issue exceeds the 10-page limit, we will go to the reduced format, which will allow us to print, in 4.4 pages, what otherwise would have required 10 pages. In 10 pages of the reduced format, we could include what otherwise would have required more than 22 pages.

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